

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**Course Structure for Civil Engineering**  
**B. Tech Course (2015-16)**

**II B. Tech – II Sem**

| S.No. | Course Code | Subject  | L         | Tu        | Lab       | C         |
|-------|-------------|--|-----------|-----------|-----------|-----------|
| 1     | 15A54401    | Probability and Statistics                       | 3         | 1         | -         | 3         |
| 2     | 15A52301    | Managerial Economics & Financial Analysis        | 3         | 1         | -         | 3         |
| 3     | 15A01401    | Strength of Materials – II                       | 3         | 1         | -         | 3         |
| 4     | 15A01402    | Surveying – II                                   | 3         | 1         | -         | 3         |
| 5     | 15A01403    | Structural Analysis – I                          | 3         | 1         | -         | 3         |
| 6     | 15A01404    | Hydraulics & Hydraulic Machinery                 | 3         | 1         | -         | 3         |
| 7     | 15A01405    | Fluid Mechanics & Hydraulic Machinery Laboratory | -         | -         | 4         | 2         |
| 8     | 15A01406    | Surveying Laboratory – II                        | -         | -         | 4         | 2         |
| 9     | 15A01407    | Comprehensive Online Examination-I               | -         | -         | -         | 1         |
|       |             | <b>Total</b>                                     | <b>18</b> | <b>06</b> | <b>08</b> | <b>23</b> |

**Note:-** Survey camp for a duration of two weeks to be conducted before the commencement of III B.Tech, I – Sem class work, in the II B.Tech, II – Sem break. This survey camp has to be evaluated for 50 marks by the internal faculty. It has a weightage of 2 credits. The marks and credits will be incorporated in IV – B.Tech, II – Sem marks memo.

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

**B. Tech II - II sem (C.E)**

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## **(15A54401) PROBABILITY AND STATISTICS**

**(Common to CSE, IT, Civil, Mech.)**

**Objectives:** To help the students in getting a thorough understanding of the fundamentals of probability and usage of statistical techniques like testing of hypothesis, Statistical Quality Control and Queuing theory

### **UNIT – I**

Basic concepts of Probability – Random variables – Expectation – Discrete and continuous Distributions – Distribution functions. Binomial and poisson distributions Normal distribution – Related properties.

### **UNIT – II**

Test of Hypothesis: Population and Sample - Confidence interval of mean from Normal distribution - Statistical hypothesis - Null and Alternative hypothesis - Level of significance. Test of significance - Test based on normal distribution - Z test for means and proportions.

### **UNIT – III**

Small samples - t- test for one sample and two sample problem and paired t-test, F-test and Chi-square test (testing of goodness of fit and independence).

### **UNIT – IV**

Statistical Quality Control: Concept of quality of a manufactured product -Defects and Defectives - Causes of variations - Random and assignable - The principle of Shewhart Control Chart-Charts for attribute and variable quality characteristics- Constructions and operation of  $\bar{X}$  - Chart, R-Chart, p - Chart and C-Chart.

### **UNIT – V**

Queuing Theory: Pure Birth and Death process, M/M/1 & M/M/S & their related simple problems.

### **TEXT BOOKS:**

1. Probability & Statistics by E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher.
2. Probability & Statistics for engineers by Dr. J. Ravichandran WILEY-INDIA publishers.

### **REFERENCES:**

1. Probability & Statistics by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publications.
2. Statistical methods by S.P. Gupta, S.Chand publications.
3. Probability & Statistics for Science and Engineering by G.Shanker Rao, Universities Press.
4. Probability and Statistics for Engineering and Sciences by Jay L.Devore, CENGAGE.
5. Probability and Statistics by R.A. Jhonson and Gupta C.B.

**Outcomes:** The student will be able to analyze the problems of engineering & industry using the techniques of testing of hypothesis, Statistical Quality Control and Queuing theory and draw appropriate inferences.

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**B. Tech II - II sem (C.E)**

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**(15A52301) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**

**Course Objectives:** The objective of this course is to equip the student with the basic inputs of Managerial Economics and Economic Environment of business and to impart analytical skills in helping them take sound financial decisions for achieving higher organizational productivity.

## **Unit I: INTRODUCTION TO MANAGERIAL ECONOMICS**

Managerial Economics – Definition- Nature- Scope - Contemporary importance of Managerial Economics - Relationship of Managerial Economics with Financial Accounting and Management. **Demand Analysis:** Concept of Demand-Demand Function - Law of Demand - Elasticity of Demand- Significance - Types of Elasticity - Measurement of elasticity of demand - Demand Forecasting- factors governing demand forecasting- methods of demand forecasting.

## **UNIT II: THEORY OF PRODUCTION AND COST ANALYSIS**

**Production Function-** Least cost combination- Short-run and Long- run production function- Isoquants and Isocosts, MRTS - Cobb-Douglas production function - Laws of returns - Internal and External economies of scale - **Cost Analysis:** Cost concepts and cost behavior- Break-Even Analysis (BEA) -Determination of Break Even Point (Simple Problems)- Managerial significance and limitations of Break- Even Point.

## **UNIT III: INTRODUCTION TO MARKETS AND NEW ECONOMIC ENVIRONMENT**

**Market structures:** Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition- Monopoly-Monopolistic Competition-Oligopoly-Price-Output Determination - Pricing Methods and Strategies-Forms of Business Organizations- Sole Proprietorship- Partnership – Joint Stock Companies - Public Sector Enterprises – New Economic Environment- Economic Liberalization – Privatization - Globalization.

## **UNIT IV: INTRODUCTION TO FINANCIAL ACCOUNTING AND ANALYSIS**

Financial Accounting – Concept - Emerging need and Importance - Double-Entry Book Keeping- Journal - Ledger – Trial Balance - Financial Statements - Trading Account – Profit & Loss Account – Balance Sheet (with simple adjustments). Financial Analysis – Ratios – Liquidity, Leverage, Profitability, and Activity Ratios (simple problems).

## **UNIT V: CAPITAL AND CAPITAL BUDGETING**

Concept of Capital - Over and Undercapitalization – Remedial Measures - Sources of Short term and Long term Capital - Estimating Working Capital Requirements – Capital Budgeting – Features of Capital Budgeting Proposals – Methods and Evaluation of Capital Budgeting Projects – Pay Back Method – Accounting Rate of Return (ARR) – Net Present Value (NPV) – Internal Rate Return (IRR) Method (simple problems)

**Learning Outcome:** After completion of this course, the student will be able to understand various aspects of Managerial Economics and analysis of financial statements and inputs therein will help them to make sound and effective decisions under different economic environment and market situations.

### **TEXT BOOKS:**

1. Managerial Economics 3/e, Ahuja H.L, S.Chand, 2013.
2. Financial Management, I.M.Pandey, Vikas Publications, 2013.

### **REFERENCES**

1. Managerial Economics and Financial Analysis, 1/e, Aryasri, TMH, 2013.
2. Managerial Economics and Financial Analysis, S.A. Siddiqui and A.S. Siddiqui, New Age International, 2013.
3. Accounting and Financial Management, T.S.Reddy & Y. Hariprasad Reddy, Margham Publishers.

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B. Tech II - II sem (C.E)

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## (15A01401) STRENGTH OF MATERIALS – II

*OBJECTIVE: Study of the subject provides the understanding of principal stress, strains, springs, columns and structures.*

### UNIT – I

**PRINCIPAL STRESSES AND STRAINS:** Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr’s circle of stresses – Principal stresses and strains – Analytical and graphical solutions.

**THEORIES OF FAILURES:** Various Theories of failures like Maximum Principal stress theory – Maximum Principal strain theory – Maximum shear stress theory – Maximum strain energy theory – Maximum shear strain energy theory.

### UNIT – II

**THIN CYLINDERS & THICK CYLINDERS :** Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – Changes in dia, and volume of thin cylinders – Thin spherical shells.

Introduction Lamé’s theory for thick cylinders – Derivation of lamé’s formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage – Thick spherical shells.

### UNIT – III

**TORSION OF CIRCULAR SHAFTS** – Theory of pure torsion – Derivation of Torsion equations: – Assumptions made in the theory Theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

### SPRINGS:

Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple –springs in series and parallel – Carriage or leaf springs.

### UNIT – IV

**COLUMNS AND STRUTS :** Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler’s theorem for long columns – assumptions – derivation of Euler’s critical load formulae for various end conditions – Equivalent length of a column – Slenderness ratio – Euler’s critical stress – Limitations of Euler’s theory – Rankine – Gordon formula – Long columns subjected to eccentric loading – Secant formula – Empirical formulae – Straight line formula – Prof. Perry’s formula.

### UNIT – V

**UNSYMMETRICAL BENDING :** Introduction – Centroidal principal axes of section – Graphical method for locating principal axes – Moments of inertia referred to any set of

rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid - Location of neutral axis – Deflection of beams under unsymmetrical bending.

**BEAMS CURVED IN PLAN :** Introduction – circular beams loaded uniformly and supported on symmetrically placed Columns – Semicircular beam simply-supported on three equally spaced supports.

**TEXT BOOKS:**

- (1) A Text book of Strength of materials by R.K.Bansal – Laxmi Publications (P) Ltd., New Delhi.
- (2) Strength of Materials by R.Subramanian, Oxford University Press.

**REFERENCES :**

- (1) Strength of Materials by S.S.Rattan, TMH Publishers.
- (2) Strength of Materials by D.S. Prakasa rao, University press, Hyderabad.
- (3) Strength of Materials by B.C.Punmia.- Laxmi publications
- (4) Mechanics of Structures, by Ghosh& Datta, New Age Publishers

**OUTCOMES:**

*On completion of the course, the students will be able to:*

- (1) apply the principle of virtual work*
- (2) determine deflection of a beam for various loading conditions*
- (3) apply unit load method to find the deflection of truss*
- (4) determine different stresses developed in thick cylinders*
- (5) visualize the behavior of column for combined bending and axial loading*

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## **(15A01402) SURVEYING – II**

***OBJECTIVE:** To ensure that the student develops knowledge in the working of advanced instruments, setting out of curves from the field measurements and basic knowledge on remote sensing*

### **UNIT-I**

**TRIGONOMETRIC LEVELLING :** Introduction; Determination of the level of the top of an object, When its base is accessible and When its base is not accessible; Determination of the height of the object when the two instrument stations are not in the same vertical plane; Axis signal correction; Difference in elevation by single observation and reciprocal observations.

### **UNIT-II**

**TACHEOMETRIC SURVEYING:** Definition, Advantages of Tacheometric surveying- Basic systems of tacheometric measurement , Principle of stadia measurements, Determination of constants K and C, Inclined sight with staff vertical; Inclined sight with staff normal to the line of sight, Movable hair method, Tangential method, Subtense bar, Errors in Tacheometry.

### **UNIT-III**

**TRIANGULATION:** Principles of triangulation, Uses of triangulation survey; Classification of triangulation; operations of triangulation survey; Signals and towers, Satellite station; Base line & Extension of the base line.

**SETTING OUT WORKS:** Introduction, Control stations; Horizontal control; Reference grid; Vertical control; Positioning of a structure; offset pegs, Setting out a foundation: reference pillars, batter boards, Setting out with a theodolite; Graded stakes; setting out a sewer; Setting out a culvert.

### **UNIT-IV**

**CURVES:** Simple curves–Definitions and Notations, designation of a curve, Elements of simple curves, location of tangent points, selection of peg interval, Methods of setting simple curves(based on equipment) – Rankines method, Two theodolite method. Compound curves – Elements of compound curve, setting out compound curve. Reverse curves – Elements of reverse curve, relationship between various elements.

### **UNIT-V**

**ELECTRONIC DISTANCE MEASUREMENTS:** Introduction, Basic concepts- electromagnetic waves, basic definitions, phase of the wave ,units, types of waves; distance from measurement of transit time, Computing the distance from the phase differences, , EDM instruments, electronic theodolites, total station-models, fundamental measurements, recording, traversing, data retrieval.

**REMOTE SENSING:** Introduction, Principle of Remote sensing, EM Radiation and the atmosphere, interaction of EM radiation with earth's surface, remote sensing observation platforms, sensors, applications of remote sensing. Geographical Information System: Introduction and principle of Geographical Information System, components of GIS, applications.

**TEXT BOOKS:**

1. Text book of surveying by C.Venkataramaiah, Universities Press.
2. Surveying Vol. 1 & II by Dr. K. R. Arora; Standard Book House;
3. Higher Surveying by Chandra, New age Publishers.

**REFERENCE BOOKS:**

1. Surveying Vol. 1and 2 – By S.K. Duggal. Tata Mc. Graw Hill Publishing Co.
2. Advanced Surveying by Satheesh Gopi, R.Shanta Kumar and N.Madhu, Pearson education
3. Surveying Vol-I&II by B.C. Punmia ,Laxmi Publications
4. Advanced Surveying by Mahajan, Santhos K. Dhanpat Rai & Sons, Nai Sarak, Delhi, 1987.

**OUTCOMES:**

*On completion of the course, the students will be able to:*

- (1) carry out advanced surveying techniques in the field of civil engineering applications such as structural, highway engineering and geotechnical engineering*
- (2) setting out works and carrying out of various curves alignment,*
- (3) use of various advanced instruments involved in surveying with respect to utility and precision*
- (4) Knowledge on remote sensing elements and their applications.*



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## (15A01403) STRUCTURAL ANALYSIS – I

**OBJECTIVE:** To make the students to understand the principles of analysis of structures of static and moving loads by various methods.

### UNIT – I

**ENERGY THEOREMS :** Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces – Castigliano’s first theorem-Deflections of simple beams and pin jointed trusses.

### UNIT – II

**ANALYSIS OF INDETERMINATE STRUCTURES :** Indeterminate Structural Analysis – Determination of static and kinematic indeterminacies – Solution of trusses with upto two degrees of internal and external indeterminacies – Castigliano’s theorem..

### UNIT – III

**FIXED BEAMS & CONTINUOUS BEAMS :** Introduction to statically indeterminate beams with uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads – Shear force and Bending moment diagrams – Deflection of fixed beams effect of sinking of support, effect of rotation of a support.

### UNIT – IV

**SLOPE-DEFLECTION:** Introduction, derivation of slope deflection equation, application to continuous beams with and without settlement of supports- Analysis of single bay, single storey, portal frame including side sway .

### UNIT – V

**MOMENT DISTRIBUTION METHOD** Introduction to moment distribution method-application to continuous beams with and without settlement of supports. Analysis of single storey portal frames – including Sway

### TEXT BOOKS :

- (1) Structural Analysis – I by Dr.Hemant Patil, Dr.Yogesh Patil and Jignesh Patil by Synergy Knowledge ware publications, Mumbai.
- (2) Structural Analysis by Aslam Kassimali, Cengage Publishers.
- (3) Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Publishers.

### REFERENCES :

- (1) Analysis of Structures by T.S. Thandavamoorthy, Oxford University Press, New Delhi.
- (2) Introduction to structural analysis by B.D.Nautiyal, New Age international publishers, New Delhi.
- (3) Structural Analysis – D.S.Prakasa rao - Univeristy press, Hyderabad.
- (4) Basic Structural Analysis by K.U.Muthu, I.K.International Publishers, India.
- (5) Structural Analysis by S S Bhavikatti – Vikas Publishing House.
- (6) Analysis of Structures – Vol-I&II by V.N.Vazirani & M.M.Ratwani, Khanna Publications, New Delhi.

**OUTCOMES:**

*On completion of the course, the students will be able to:*

- (1) The student would be able to apply knowledge of various energy theorems.*
- (2) The student would be able to apply knowledge to analyse concept of deflection, bending moment and shear force diagram in beams, and columns under various loading conditions using different analysis methods.*
- (3) The student would be able to apply knowledge on study of slope and deflection of various members with sinking supports also.*

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## (15A01404) HYDRAULICS AND HYRAULIC MACHINERY

**OBJECTIVE:** *The main objective of this course is to deal with the concepts of flow through open channels and their applications and the principles of hydraulic machines and hydraulic models.*

### UNIT – 1

**OPEN CHANNEL FLOW-UNIFORM FLOW:** Introduction, Classification of flows, Types of channels; Flow analysis: The Chezy equation, Empirical formulae for the Chezy constant, Hydraulically efficient channel sections: Rectangular, Trapezoidal, Triangular and Circular channels; Velocity distribution; Energy and momentum correction factors. Application of Bernoulli's equation to open channel flow.

**OPEN CHANNEL FLOW- NON – UNIFORM FLOW:** Concept of specific energy; Specific energy curves; Critical flow; Critical flow in a rectangular channel; Critical slope; discharge curve, Different slope conditions; Channel transitions- Reduction in width of a rectangular channel, Raised bottom in a rectangular channel, venture flume, Momentum principle applied to open channel flow; Specific force; Specific force curve.

### UNIT – II

**OPEN CHANNEL FLOW- GRADUALLY VARIED FLOW:** Introduction, Dynamic equation; Dynamic equation for GVF in wide Rectangular channel, classification of channel bottom slopes, Surface Profiles; Characteristics of surface profiles, Back water Curves and Draw down curves; Examples of various types of water surface profiles; Control section, Computation of surface profiles by single step method.

**OPEN CHANNEL FLOW- RAPIDLY VARIED FLOW:** Hydraulic jump; Elements and characteristics of hydraulic jump; Hydraulic jump in rectangular channels, height and length of the jump, Energy loss in a hydraulic jump, Types of hydraulic jump; applications of hydraulic jump; Location of hydraulic jump,.

### UNIT – III

**IMPACT OF JETS:** Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for

Work done and efficiency-Angular momentum principle, Torque and head transferred in roto dynamic machines.

**HYDRAULIC TURBINES-I:** Introduction, head and efficiencies of hydraulic turbines, Classification of turbines; pelton wheel: parts, Velocity triangles, work done and efficiency, working proportions, design of pelton wheel. Radial flow reaction turbines: velocity triangles and work done for inward radial flow turbine, degree of reaction, discharge, speed ratio, flow ratio.

### UNIT – IV

**HYDRAULIC TURBINES-II:** Francis turbine: main components and working, work done and efficiencies, design proportions; design of Francis turbine runner. Kaplan turbine: main

components and working, working proportions. Draft tube: theory and efficiency; specific speed, unit quantities, characteristic curves of hydraulic turbines. Cavitation: causes, effects. **CENTRIFUGAL PUMPS:** Introduction, component parts and working of a centrifugal pump, work done by the impeller; heads, losses and efficiencies; minimum starting speed; Priming ;specific speed; limitation of suction lift, net positive suction head(NPSH);Performance and characteristic curves; Cavitation effects ;Multistage centrifugal pumps; troubles and remedies.

#### **UNIT – V**

**DIMENSIONAL ANALYSIS AND SIMILITUDE:** Introduction, dimensions; Dimensional homogeneity; Methods of dimensional analysis- Rayleigh's method; Buckingham – Pi theorem; model analysis; similitude-types of similarities; Dimensionless numbers; Model laws ;Partially submerged objects; types of models; Scale effect.

**BOUNDARY LAYER THEORY& DRAG AND LIFT:** Boundary layer – concepts, Prandtl's contribution, Characteristics of boundary layer along a thin flat plate, laminar and turbulent Boundary layers, separation of BL. expression for drag and lift; Lift and Drag Coefficients; pressure drag and friction drag; Streamlined and bluff bodies.

#### **TEXT BOOKS :**

- (1) Fluid Mechanics, Hydraulic and Hydraulic Machines by Modi & Seth, Standard book house.
- (2) A text of Fluid mechanics and hydraulic machines by Dr.R.K.Bansal – Laxmi Publications (P) Ltd., New Delhi.
- (3) Introduction to Fluid Mechanics & Fluid Machines by S.K.Som & G.Biswas, Tata Mc.Grawhill publishers PVt.Ltd.

#### **REFERENCES :**

- (1) Fluid mechanics and Fluid Machines by Rajput, S.Chand & Co.
- (2) Fluid Mechanics & Fluid Machines by Narayana Pillai, Universities press.
- (3) Fluid Mechanics and Machinery -Kothandaraman, New Age Publishers.
- (4) Flow in Open channels by K.Subramanya. Tata McGraw-Hill Publishers.
- (5) Fluid Mechanics and Machinery, CSP Ojha, Oxford Higher Education

#### **OUTCOMES:**

*On completion of the course, the students will be able to:*

1. *visualize fluid flow phenomena observed in Civil Engineering systems such as flow in a pipe, flow measurement through orifices, mouth pieces, notches and weirs*
2. *analyze fluid flows in open channel hydraulics and devices such as weirs and flumes*
3. *design open channels for most economical sections like rectangular, trapezoidal and circular sections*
4. *measure velocity through instruments in open channel and pipe flow*
5. *calculate forces and work done by a jet on fixed or moving plate and curved plates*
6. *apply the working principles of Impulse and Reaction turbines*
7. *select the type of turbine required with reference to available head of water and discharge*
8. *determine the characteristics of centrifugal pump*
9. *apply the working principles of the Reciprocating pump*

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**(15A01405) FLUID MECHANICS AND HYDRAULIC MACHINERY  
LABORATORY**

**OBJECTIVE:** *The object of the course to make the students understand the fluid flow concepts and get familiarity with flow measuring devices.*

**SYLLABUS :**

1. Calibration of Venturimeter
2. Calibration of Orifice meter
3. Determination of Coefficient of discharge for a small orifice by a constant head method.
4. Determination of Coefficient of discharge for an external mouth piece by variable head method.
5. Calibration of contracted Rectangular Notch and /or Triangular Notch.
6. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
7. Verification of Bernoulli's equation.
8. Impact of jet on vanes.
9. Study of Hydraulic jump.
10. Performance test on Pelton wheel turbine.
11. Performance test on Francis turbine.
12. Efficiency test on centrifugal pump.

**Reference Books:-**

1. Fluid Mechanics and Hydraulic Machines: A Lab Manual by [T.S. Desmukh](#), Laxmi Publications.
2. Experiments In Hydraulics & Hydraulic Machines By **Prakash**, Phi Publications.

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## **(15A01406) SURVEYING LABORATORY – II**

**OBJECTIVE:** *To impart the practical knowledge in the field, it is essential to introduce in curriculum. Drawing of Plans and Maps and determining the area are pre requisites before taking up any Civil Engineering works.*

### **LIST OF EXERCISES:**

1. Study of theodolite in detail – practice for measurement of horizontal and vertical angles.
2. Measurement of horizontal angles by method of repetition and reiteration.
3. Trigonometric Leveling – Heights and distance problem (Two Exercises).
4. Heights and distance using Principles of tachometric surveying (Two Exercises)
5. Curve setting – different methods. (Two Exercises)
6. Setting out works for buildings & pipe lines.
7. Determination of area using total station.
8. Traversing using total station.
9. Contouring using total station.
10. Determination of remote height using total station.
11. Distance, gradient, Diff. height between tow inaccessible points using total stations.