**MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI**

**TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES**

**COURSE NAME : CIVIL ENGINEERING GROUP**

**COURSE CODE : CE/CS/CR**

**DURATION OF COURSE : 6 SEMESTERS** **WITH EFFECT FROM 2009-10**

**SEMESTER : FIFTH** **DURATION : 16 WEEKS**

**PATTERN : FULL TIME - SEMESTER** **SCHEME : E**

| SR. NO. | SUBJECT TITLE | Abbreviation | SUB CODE | TEACHING SCHEME | | | EXAMINATION SCHEME | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TH | TU | PR | PAPER HRS | TH (01) | | PR (04) | | OR (08) | | TW (09) | | SW (16005) |
| | | | | | | | | Max | Min | Max | Min | Max | Min | Max | Min | |
| 1 | Irrigation Engineering | IEN | 12136 | 04 | 02* | -- | 03 | 100 | 40 | -- | -- | -- | -- | 25@ | 10 | 50 |
| 2 | Estimating & Costing | ECO | 12137 | 03 | -- | 04 | 04 | 100 | 40 | -- | -- | 25# | 10 | 50@ | 20 | |
| 3 | Theory of Structures | TST | 12138 | 03 | 01 | -- | 03 | 100 | 40 | -- | -- | -- | -- | -- | -- | |
| 4 | Highway Engineering | HEG | 12139 | 03 | -- | 02 | 03 | 100 | 40 | -- | -- | -- | -- | 25@ | 10 | |
| 5 | Design of Steel Structure | DSS | 12140 | 03 | -- | 02 | 04 | 100 | 40 | -- | -- | -- | -- | 50@ | 20 | |
| 6 | Building Services & Entrepreneurship Development | BED | 12141 | 02 | 01 | 02 | -- | -- | -- | -- | -- | 50@ | 20 | -- | -- | |
| 7 | Professional Practices-V | PPR | 12142 | -- | -- | 04 | -- | -- | -- | -- | -- | -- | -- | 50@ | 20 | |
| | | | **TOTAL** | **18** | **03** | **14** | -- | **500** | -- | -- | -- | **75** | -- | **200** | -- | **50** |

Student Contact Hours Per Week: **35 Hrs.**

**THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.**

Total Marks **: 825**

@ Internal Assessment, # External Assessment, [ ] No Theory Examination., * Practical on alternate week

Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Termwork, SW- Sessional Work

- Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subjects is to be converted out of 50 marks as sessional work (SW).
- Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms.
- Code number for TH, PR, OR and TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.

**Course Name : Civil Engineering Group**

**Course Code : CE/CS/CR/CV**

**Semester : Fifth for CE/CS/CR and Sixth for CV**

**Subject Title : Irrigation Engineering**

**Subject Code : 12136**

**Teaching and Examination Scheme**:

| Teaching Scheme | | | Examination Scheme | | | | | |
|---|---|---|---|---|---|---|---|---|
| TH | TU | PR | PAPER HRS | TH | PR | OR | TW | TOTAL |
| 04 | 02* | -- | 03 | 100 | -- | -- | 25@ | 125 |

*** On alternate week**

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

**Rationale:**

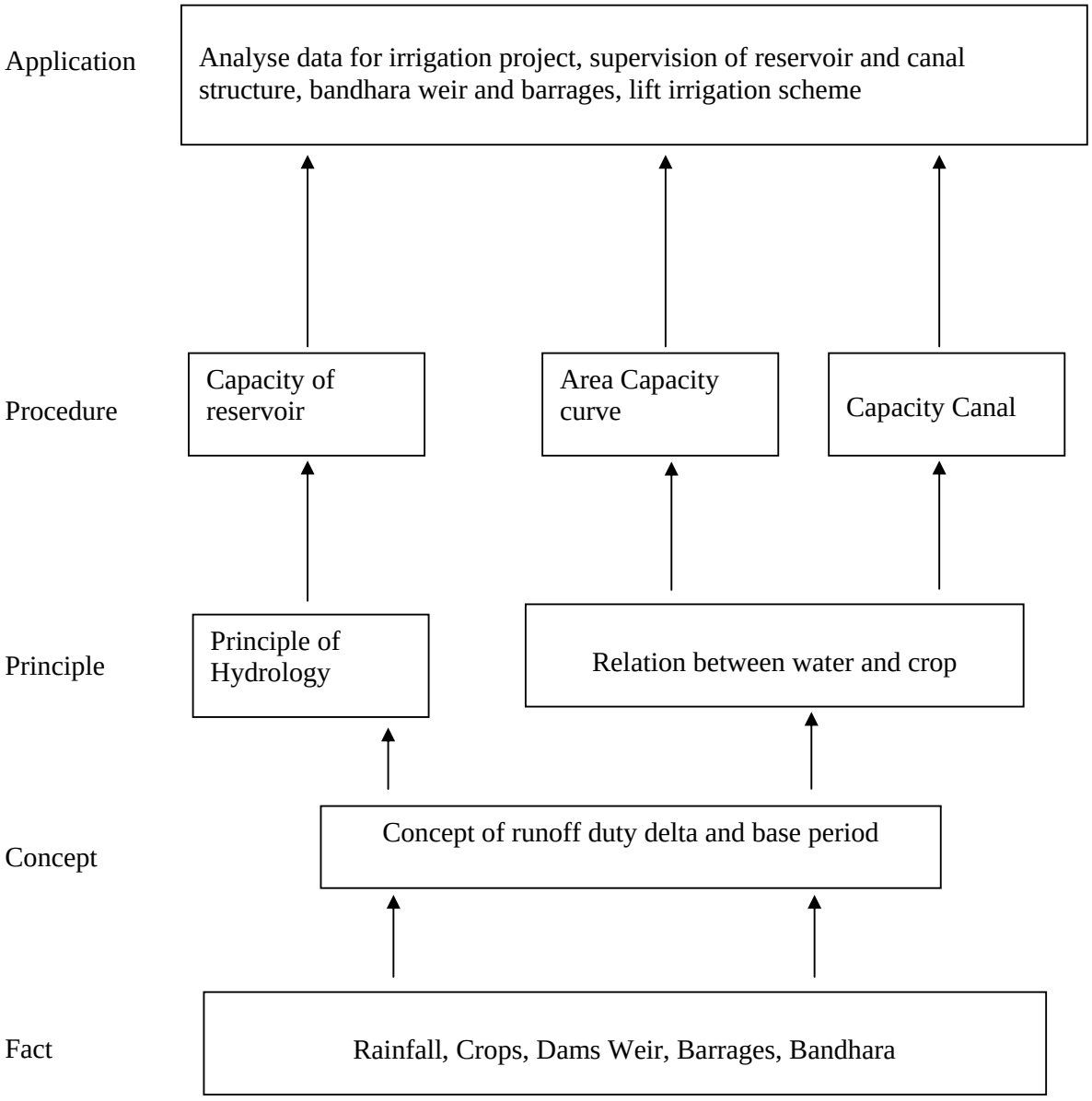
India is an agricultural country where majority of persons live in villages. Agricultural industry is the backbone of Indian economy. India being the tropical country, rainfall is available only for three to four months and is not uniform. To increase the yield of the farmers, assured uniform supply of water throughout the year is essential. This is possible only with enhancing the irrigation facilities in the country.

Irrigation is an age-old art. The aim of the subject is to present the science and practice of irrigation engineering in a concise form comprising practically all the modern development. The input to the subject is the knowledge of survey for investigation, hydrology for calculation of yield from rainfall records and hydraulics for designing the storage, conveyance and outlet structures.

**Objectives:** The students will be able to:

1. Collect the data for irrigation system.
2. Calculate the yield from catchments.
3. Calculate the capacity of Canals.
4. Calculate the storage capacity of reservoirs.
5. Find out and fix the control levels of reservoirs.
6. Decide the section of Dams, Weirs and Barrages.
7. Classify the Canals and design the Canals.
8. Classify different irrigation systems.

**Learning Structure**:



**Contents**: **Theory**

| Chapter | Name of the Topic | Hours | Marks |
|---|---|---|---|
| **01** | **Introduction**<br>Definition – Irrigation and irrigation engineering, advantages of irrigation, ill effects of over irrigation, types of irrigation project-purpose wise and administrative wise, Methods of irrigation. | 02 | 04 |
| **02** | **Hydrology**<br>Definition of hydrology, hydrological cycle and its components. Definition of rainfall, Factors affecting rainfall , rain gauge and rain gauge station , types of rain gauges ( names only0 average annual rain fall and its calculation , definition of run of , factor affecting run off, calculation of run off by run of coefficient, inglis' formula , Stranges and Binnie's tables and curves. Maximum food discharge and methods of calculation. Yield and Dependable yield and methods calculation. | 08 | 12 |
| **03** | **Water Requirement Of Crops**<br>Cropping seasons and crop in Maharashtra. Definition – Crop period base period Duty Delta , Types of Duty, factors affecting Duty , relation between Duty Delta and base period Definition – CCA , GCA, IA, intensity of irrigation, time factor, capacity factor. Problems on water requirement and capacity of canal. Modified Penman method. Assessment of irrigation water. | 08 | 12 |
| **04** | **Investigation And Reservoir Planning**<br>Survey for irrigation project data collected for irrigation project. area capacity curve, silting of reservoir, rate of silting, factors affecting silting , methods to control. Control levels and respective storage in reservoir. Fixing control levels (Numerical) | 08 | 12 |
| **05** | **Dams And Spillways**<br>Types of dams – Earthen dams and Gravity dams ( masonry and concrete) Comparison of earthen and gravity dams with respect to foundation, seepage, construction and maintenance Earthen Dams – Components and their function , typical cross section seepage through embankment and foundation seepage control though embankment and foundation . Methods of constructions, types of failure of earthen dams and remedial measures.<br>Gravity Dams Theoretical and practical profile, typical cross section, drainage gallery, joint in gravity dam, high dam and low dam<br>Spillways-Definition, function, location and components. Emergency and services, ogee spillway and bar type spillway, discharge over spillway. Spillway with and with out gates. | 14 | 24 |

| | | | |
|---|---|---|---|
| **06** | **Bandhara , Precolation Tanks And Lift Irrigation**<br>Advantages and disadvantages of bandhara irrigation layout and component parts, solid and open bandhara.<br>Percolation Tanks – necessity and importance, selection of site. Layout of lift irrigation scheme its components and their functions. Irrigation department standard design and specification. | 06 | 08 |
| **07** | **Diversion Head Works**<br>Weirs – components parts, function and types, layout of diversion head works with its components and their function, canal head regular, silt excluders and slit ejectors.<br>Barrages – components and their function. Difference between weir and barrage irrigation department standard design and specifications. | 08 | 12 |
| **08** | **Canals**<br>CANALS – classification of canals according to alignment and position in the canal network, Cross sections of canals in cutting, embankment, partial cutting and embankment. Design of most economical canal section with numerials.<br>Canal lining – Definition, purpose, types of canal lining advantages of canal lining properties of good canal lining material.<br>CD. works- different C.D. works, canal falls, escapes, cross regulators and canal outlets. | 10 | 16 |
| | **Total** | **64** | **100** |

**Assignments:**

Term work shall consist of the following assignments.

Data should be collected from irrigation engineering department or irrigation project and processed accordingly

1. Study of National Water Policy and Maharashtra Water Policy.
2. Collection of information and prepare list of documents and drawings required for irrigation project.
3. Calculation of yield from given Tope sheet of a catchment area, plotting catchment area, determination of catchment area by plan meter.
4. Canal capacity calculation from a given commend area and cropping pattern.
5. Plotting of area capacity curve of a given contour map of irrigation project
6. From a given data fixation of control levels of reservoir.
7. Layout of drainage in earthen dam on A4 size plate
8. Neat labeled sketch of ogee spillway with gate and energy dissipation arrangement.

9. Neat labeled cross section of earthen embankment showing all the components. on A4 size plate

**Learning Resources:**
**Book:**

| Sr. No. | Author | Title | Publisher |
|---|---|---|---|
| 01 | S. K. Garg | Irrigation and hydraulic structure | Khanna publisher, New Delhi |
| 02 | B.C.Punmia | Irrigation Engineering | Laxmi Publication, Delhi |
| 03 | K.Subramaniyan | Engineering hydrology | S Chand Publication. |

**Websites:**

www.damsinternational.com

www.dams.org

www.narmada.org

www.guj.nwrws.gujrat.gov.in

www.rajirrigation.gov.in

**Course Name : Civil Engineering Group**

**Course Code : CE/CS/CR/CV**

**Semester : Fifth for CE/CS/CR and Sixth for CV**

**Subject Title : Estimating & Costing**

**Subject Code : 12137**

**Teaching and Examination Scheme:**

| Teaching Scheme | | | Examination Scheme | | | | | |
|---|---|---|---|---|---|---|---|---|
| TH | TU | PR | PAPER HRS | TH | PR | OR | TW | TOTAL |
| 03 | -- | 04 | 04 | 100 | -- | 25# | 50@ | 175 |

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

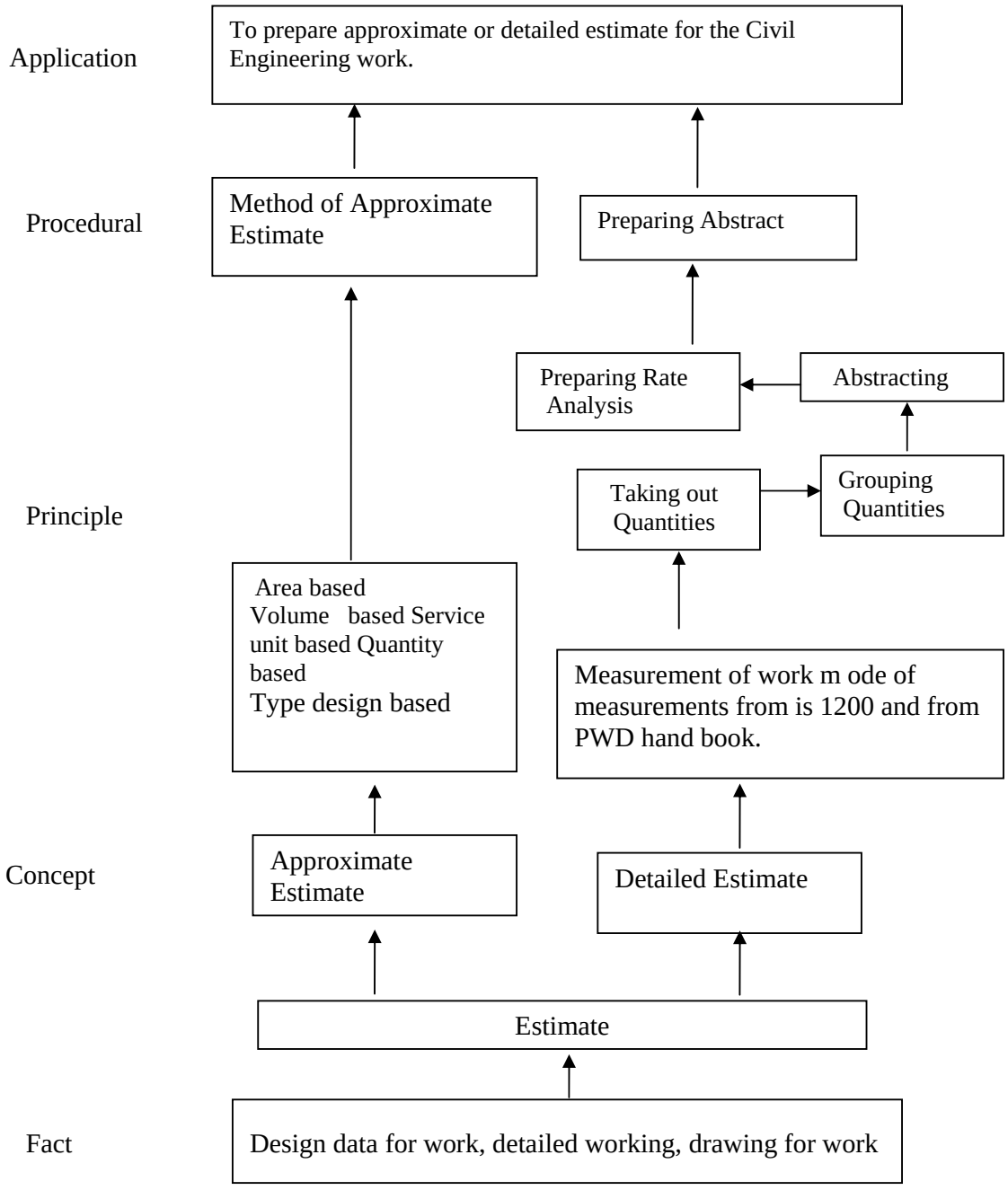
**Rationale:**

This is a core technology subject which will enable the students to learn core facts, concepts, principles & procedures in Estimating & Costing. With this knowledge and skill, he will be able to prepare estimate before start of construction and systematically procure materials during execution using specifications for ensuring appropriate type of construction processes & quality of engineering products in specialized areas in Building Construction, Irrigation, Transportation and Environmental Engineering.

**Objectives:** Students should be able to:

1) Decide approximate cost of civil engineering structure.
2) Prepare check list of items of construction.
3) Prepare estimate for civil engineering work.
4) Prepare rate analysis of item of construction.
5) Take measurement of completed work.
6) Compare actual quantity with estimated quantity.

**Learning Structure:**



**Contents: Theory**

| Chapter | Name of the Topic | Hours | Marks |
|---|---|---|---|
| 01 | **Overview Of Estimating & Costing:**<br>1.1 Meaning of the terms estimating, costing. Purpose of estimating and costing.<br>1.2 Types of estimate - Approximate and Detailed.<br>Approximate estimate - Plinth area rate method, Cubical Content method, Service Unit method, Typical bay method, Approximate Quantity method. Problems on Plinth area rate method & application of Service unit method for selection of service unit for different types of buildings.<br>1.3 Types of detailed estimate and its uses.<br>Detailed estimate, Revised estimate, Supplementary estimate, Revised & supplementary estimate and Maintenance & Repair estimate. | 04 | 12 |
| 02 | **Detailed Estimate**<br>2.1 Unit quantity method, Total quantity method, Data required for detailed estimate. Factors to be considered during preparation of detailed estimate,<br>2.2 Steps in preparing detailed estimate. Taking out quantities, squaring, abstracting.<br>2.3 Preparing check list – by adoption of Sequence of execution. Describing item of works, formats of measurement Sheet , Abstract sheet, face sheet | 04 | 10 |
| 03 | **Mode of Measurements**.<br>3.1 Units of Measurements for different item of works as per IS 1200 & As per PWD specification Book<br>3.2 Desired accuracy in taking measurements of various items of works<br>3.3 Rules of deductions for openings as per IS 1200 for brickwork, plastering, painting. | 04 | 06 |
| 04 | **Procedure for Preparing Detailed Estimate:**<br>4.1 Procedure for taking out quantities for various items of works as per IS 1200.<br>a) for Load bearing Structure –Long Wall and short wall method, Center line method .<br>b) Framed Structure building. –centre line method<br>c) Percentage of reinforcement for various structural members.<br>d) Preparing bar bending Schedule for footing, column beam, slab and chajjas<br>4.2 Provisions to be made in detailed estimate viz. contingencies, work charged establishment, centage charges, water Supply & Sanitary arrangements, Electrification. | 16 | 32 |
| 05 | **Rate analysis**<br>5.1 Meaning of term Rate analysis – Factors affecting rate analysis, lead (standard & extra), lift, task work, materials and labour, Market Rate and labour rate. | 08 | 20 |

| | | | |
|---|---|---|---|
| | 5.2 Transportation of Materials, capacity of conveyance for different materials. Transportation Charges.<br>5.3 Labour - Categories of labours, labour rates, overhead charges, contractor's profit, water charges.<br>5.4 Preparing rate analysis of different items of work viz P.C.C., Brickwork, RCC works, plastering, flooring only.<br>5.5 District Schedule of rates, completed rates & labour rates. | | |
| 06 | **Estimate for Civil Engineering works**<br>a) Framing estimate by taking out quantities of road embankment using mean area method , mid sectional area method, ,Prismoidal formula method and also to draw L-section of road embankment.<br>b) BBM septic tank for 25 users<br>c) Community well for 10m. dia. | 12 | 20 |
| | **Total** | **48** | **100** |

**Assignments:**
Skills to be developed:

**Intellectual Skills:**

a. List various items of work with their units in a Civil Engineering Structure.
b. Calculate quantities of various items of work.
c. Prepare rate analysis.

**List of Assignments:**

1) Prepare Check list of items of following type of Civil Engineering works.

a) Load Bearing type Building
b) Framed structure type building
c) W.B.M.Road
d) Septic Tank
e) Community well

2) Writing the rules of deduction's for below mentioned items of work as per IS 1200.
a) Brickwork b) Plastering / Pointing work c) Painting work

3) Taking out quantities of various items of work for load bearing building.

i) Excavation for foundation
ii) Plain Cement Concrete of foundation
iii) U.C.R./B B Masonry work in foundation and plinth.
iv) D.P.C.
v) Plinth Filling.
vi) Brick Masonry work.

vii) Flooring,skirting, dados

viii) Plastering.(Internal & External)

ix) Wood work in doors.

4) Taking out quantities of following items for a small R.C.C. Hall

i) Concrete work for footing, Column, Beam, slab.

ii) Schedule of Reinforcement for Structural members and computation of quantity of reinforcement.

iii) Calculation of Form work for all above items.

5) Preparing detailed estimate of a RCC single storied residential building for all items of work. (The quantity of reinforcement shall be calculated by percentage.)

6) Preparing Rate analysis of following items: Building work – Brick work, P.C.C., R.C.C., Plastering, Flooring.

7) Taking out quantities of earth work for a Road profile prepared in surveying subject. Prepare the lead statement (Quarry Chart).

8) Taking out quantities for a Community well.

9) Taking out quantities for Septic Tank.

**(Drawings shall be provided for the above exercises by subject teacher.)**

**Learning Resources:**

**Books:**

| Sr. No. | Title | Author | Publisher |
|---|---|---|---|
| 01 | Estimating & costing in Civil Engineering | B.N. Datta | UBS Publishers Distributors Pvt Ltd New Delhi |
| 02 | Estimating & costing, Specification and Valuation in Civil Engineering | M. Chakraborti | M. Chakraborti , Calcutta |
| 03 | Estimating & costing | S.C. Rangwala | Charotar Publication Anand |
| 04 | Civil Engineering Estimating, Contracts and accounts Vol . I | B.S. Patil | Orient Longman, Mumbai |
| 05 | Estimating & costing | G. S. Birdie | Dhanpat Rai and Sons Delhi |

**Video Cassettes /CDS:**

| Sr. No. | Title |
|---|---|
| 01 | MSBTE CAI Package. |
| 02 | Q. E. PRO software |

**3. IS/International Codes:**

| Sr. No. | Title |
|---|---|
| 01 | IS 1200- Method of Measurement of building and Civil engineering works |

**Course Name : Civil Engineering Group.**

**Course Code : CE/CS/CR/CV**

**Semester : Fifth For CE/CS/CR and Sixth For CV**

**Subject Title : Theory of Structures**

**Subject Code : 12138**

**Teaching and Examination Scheme**:

| Teaching Scheme | | | Examination Scheme | | | | | |
|---|---|---|---|---|---|---|---|---|
| TH | TU | PR | PAPER HRS | TH | PR | OR | TW | TOTAL |
| 03 | 01 | -- | 03 | 100 | -- | -- | -- | 100 |

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head sessional work. (SW)**

**Rationale:**

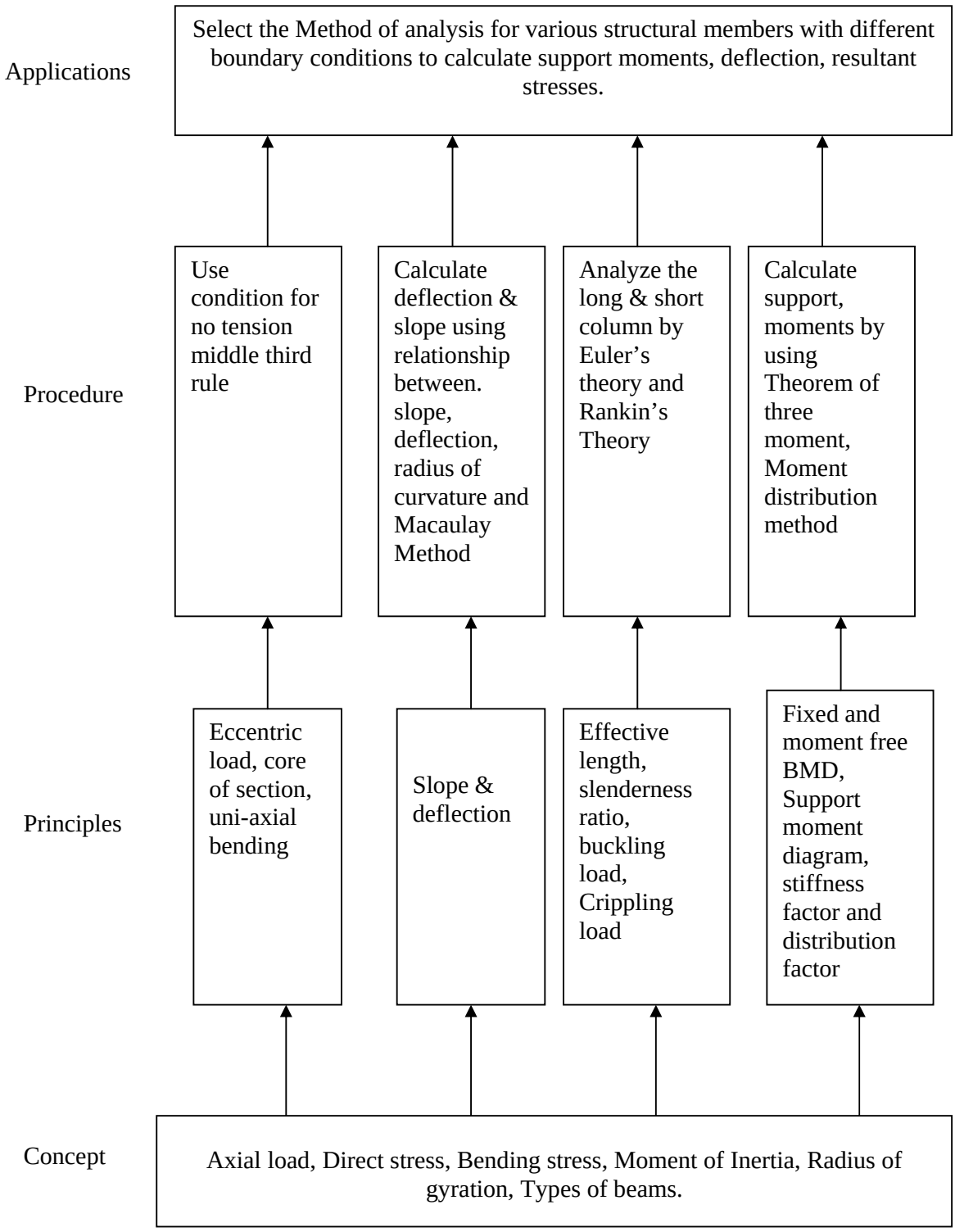
In the field situation, structural members are subjected to axial as well as eccentric loads and may be determinate or indeterminate in nature. The members like fixed beam, continuous beam, portal frame are indeterminate structures. The methods of analyzing these members are studied in this subject. The maximum permissible deflection is to be checked for various structural members. This subject also deals with analysis of members for deflection and also with combined direct and bending stresses. The result of these various analysis is the prerequisite for the design of structures.

**Objectives:**

The students will be able to-

1. Calculate the stresses in the members due to eccentric load & wind pressure
2. Find slope & deflection in beams
3. Calculate support moments in fixed beams and draw SFD and BMD
4. Calculate support moments for continuous beam, portal frame and draw SFD and BMD.
5. Design of medium and long columns.

**Learning Structure**



## CONTENTS: THEORY

| Chapter | Name of the Topic | Hours | Marks |
|---|---|---|---|
| **01** | **Direct And Bending Stresses**<br>1.1 Concept of direct and eccentric loads, eccentricity about one principal axis, nature of stresses, maximum and minimum stresses, resultant stress distribution diagram.<br>1.2 Condition for no tension or zero stress at extreme fiber, limit of eccentricity, core of section for rectangular and circular cross sections, middle third rule.<br>1.3 Columns, pillars, walls and chimneys of uniform section subject to lateral wind pressure, coefficient of wind resistance, stress distribution at bases | 10 | 20 |
| **02** | **Slope And Deflection**<br>2.1 Concept of slope and deflection, stiffness of beam<br>2.2 Relation among bending moment,slope, deflection and radius of curvature, differential equation (no derivation), double integration method to find slope and deflection of simply supported and cantilever beam<br>2.3 Macaulay's method for slope and deflection,, application to simply supported and cantilever beam subjected to concentrated and uniformly distributed load, locating point of maximum deflection and its magnitude. | 10 | 20 |
| **03** | **Fixed Beam**<br>3.1 Concept of fixity, effect of fixity, advantages and disadvantages of fixed beam.<br>3.2 Principle of superposition.<br>3.3 Fixed end moments from first principle for beam subjected to UDL over entire span, central point load, Point load other than mid span.<br>3.4 Application of standard formulae in finding moments and drawing S.F. and B.M. diagrams for a fixed beam (Derivation need not be asked in the examination) | 06 | 12 |
| **04** | **Continuous Beam**<br>4.1 Definition, effect of continuity practical example, nature of moments induced due to continuity, concept of deflected shape<br>4.2 Clapeyron's theorem of three moment (no derivation)<br>4.3 Application of theorem maximum up to three spans and two unknown support moment only, Support at same level, spans having same and different moment of inertia subjected to concentrated loads and uniformly distributed loads over entire span.<br>4.4 Drawing SF and BM diagrams for continuous beams. | 08 | 16 |

| | | | |
|---|---|---|---|
| **05** | **Moment Distribution Method**<br>5.1 Introduction, sign convention<br>5.2 Carry over factor, stiffness factor, distribution factor.<br>5.3 Application of moment distribution method for various types of continuous beams subjected to concentrated loads and uniformly distributed load over entire span having same or different moment of inertia up to three spans and two unknown support moment only, SF and BM diagrams (Supports at same level)<br>5.4 Application of moment distribution method to single storey single bay symmetrical portal frames, SF and BM diagrams | 08 | 16 |
| **06** | **Columns**<br>6.1 Definition, classification of column<br>6.2 Buckling of axially loaded compression member, Types of end conditions for column, effective length, radius of gyration, slenderness ratio<br>6.3 Assumptions in the theory of long column Euler's theory, buckling load and Rankine's theory, crippling load , factor of safety, safe load<br>6.4 Application of Rankine's and Euler theory, designing solid circular or hollow circular sections<br>6.5 Limitations of Euler's formula. | 06 | 16 |
| | **Total** | **48** | **100** |

**Learning Resources:**
**Books:**

| Sr. No. | Author | Title | Publisher |
|---|---|---|---|
| 01 | S. B. Junnarkar | Mechanics of structures Volume-I,II | Charotar Publishing House, Anand |
| 02 | S. Ramanrutham | Theory of structures | Dhanpatrai & Sons, Delhi |
| 03 | Dr. B.C. Punmia | Theory of structures | SBH, New Delhi |
| 04 | R. S. Khurmi | Theory of structures | S.Chand Publications, Delhi |
| 05 | V.N. Vazirani, M.M. Ratwani | Analysis of structures Vol-I | Khanna Publishers, Delhi. |
| 06 | A.S. Anand | Theory of structures | Satya Prakashan, New Delhi |

**Course Name : Civil Engineering Group**

**Course Code : CE/CS/CR/CV**

**Semester : Fifth for CE/CS/CR and Sixth for CV**

**Subject Title : Highway Engineering**

**Subject Code : 12139**

**Teaching and Examination Scheme:**

| Teaching Scheme | | | Examination Scheme | | | | | |
|---|---|---|---|---|---|---|---|---|
| TH | TU | PR | PAPER HRS | TH | PR | OR | TW | TOTAL |
| 03 | -- | 02 | 03 | 100 | -- | -- | 25@ | 125 |

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

**Rational:**

Road is important, largest and basic mode of transportation in India. The transportation by road is the only one mode which could give maximum service to all. The road is also easy and effective mode of transportation. There is very much scope of road development work and its maintenance in our country.

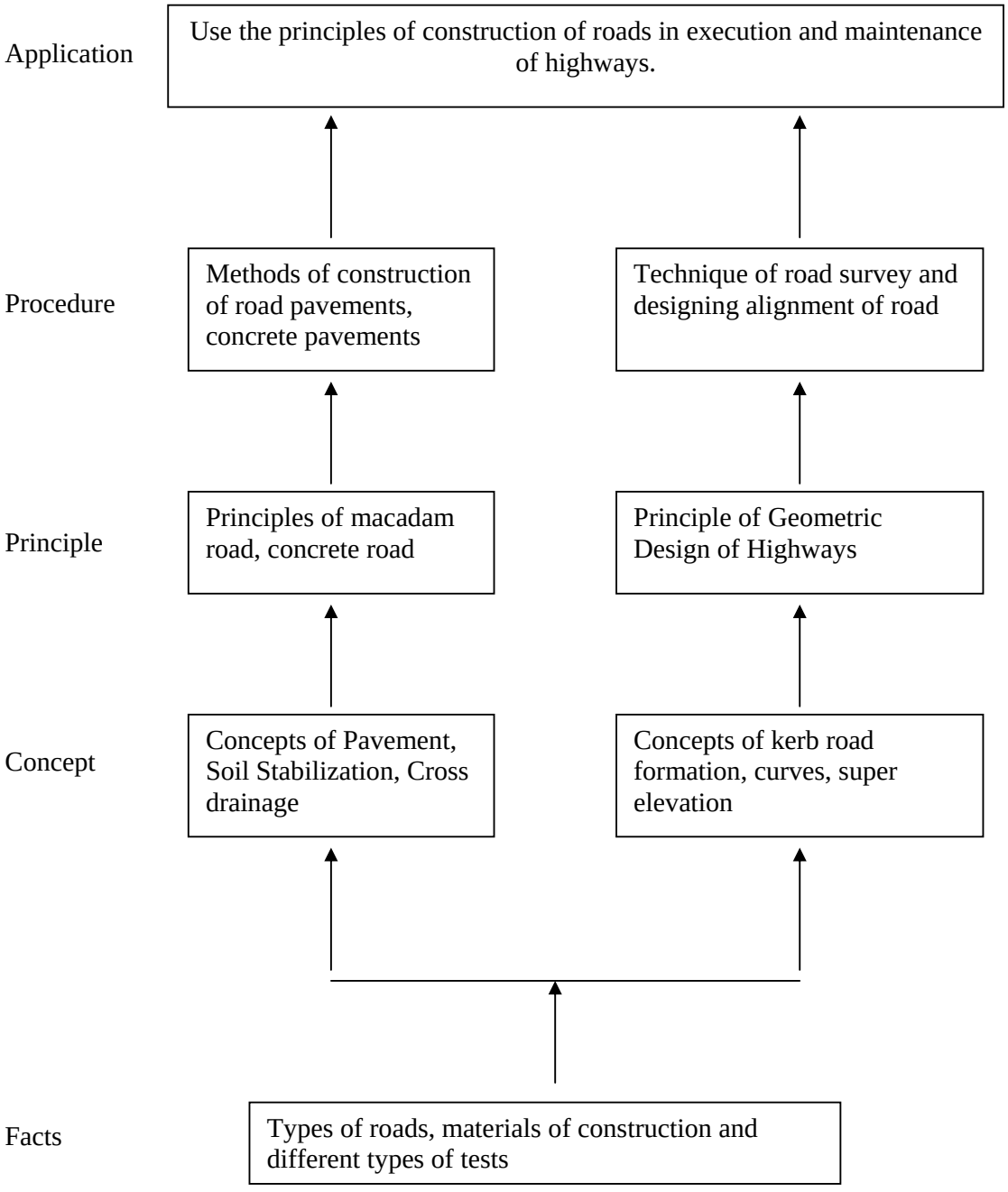
Students of Diploma in Civil Engineering have very much job opportunities in this field. He could work as a technician in P.W.D. and road construction organization. Also He could take the road construction works on contract basis. This subject gives the knowledge and skills required to carry investigation, planning, design, construction, maintenance works related to the roads.

**Objectives:**

Student should to able to:

1. Survey and investigation for location of new road.
2. Organize, supervise and co-ordinate construction activities of road.
3. Prepare & interpret the drawings related to the work.
4. Select & test materials on site and laboratory as per requirements.
5. Handle skilled workers and monitor quality control parameter related to work
6. Improve, maintain and repairs of existing roads.

**Learning Structure:**



**Contents**: **Theory**

| Chapter | Name of the Topic | Hours | Marks |
|---|---|---|---|
| **01** | **Road Engineering** :<br>1.1 Importance of roads in India.<br>1.2 Classification of roads according to Nagpur plan (Location and function), and third road development plan. Traffic and tonnage,<br>1.3 Classification of urban roads. | 02 | 04 |
| **02** | **Investigation for Road Project**<br>2.1 Reconnaissance survey, Preliminary survey and Location survey for a road project.<br>2.2 Detailed survey for cross drainage- L-section and C/S sections.<br>2.3 Fixing the alignment of road, factors affecting alignment of road.<br>2.4 Drawings required for road project- Key map, Index map, Preliminary survey plan and detailed location survey plan, L-section and C/S sections cross drainage work, land acquisition plan.<br>2.5 Survey for availability of construction material, location plan of quarries. | 04 | 08 |
| **03** | **Geometric Design Of Highways**<br>3.1 Camber- definition, purpose, types, IRC – specifications.<br>3.2 Kerbs, road margin, road formation, right of way.<br>3.3 Design speed- IRC – specifications<br>3.4 Gradient – definition, types, IRC specifications<br>3.5 Sight distances– definition, types- SSD,OSD,ISD, IRC specification, problems<br>3.6 Curves–Necessity, types– horizontal, vertical and transition curves.<br>3.7 Extra Widening of roads on Horizontal curve, problems<br>3.8 Super Elevation – definition, formula for calculating super elevation, minimum and maximum values of super elevation, and methods of providing super elevation, problems<br>3.9 Sketching of standard C/S of national highway in embankment and cutting. | 14 | 28 |
| **04** | **Construction of Roads Pavements and materials**<br>4.1 Types of road materials and Tests – soil, aggregates, bitumen, Cement Concrete. Test on soil sub grade- C.B.R. test, Test on Aggregate – Los Angeles abrasion, impact, and shape test. Tests on bitumen- Penetration, Ductility and Softening point test.<br>4.2 Pavement – objective of pavement, structure of pavement, function of pavement components, types of pavement.<br>4.3 Construction of earthen road – general terms used- borrows pits, spoil bank, lead and lift, balancing of earthwork. Construction procedure.<br>4.4 Soil stabilized roads – necessity, methods of soil | 12 | 24 |

| | | | |
|---|---|---|---|
| | stabilization, brief details of mechanical soil stabilization.<br>4.5 Water bound macadam roads – materials used, size and grading of aggregates and screening, construction procedure including precautions in rolling.<br>4.6 Construction of bituminous roads.<br>Terms used– bitumen, asphalt, emulsion, cutback, tar, common grades adopted for construction.<br>Types of bituminous surface – prime coat, tack coat, seal coat, Surface dressing – procedure of construction bituminous penetration macadam, and Bitumen / Tar carpets – procedure of construction.<br>4.7 Cement concrete pavements- Construction procedure and equipments, Construction joints, joint filler, joint sealer. | | |
| **05** | **Traffic Engineering**<br>5.1 Traffic Engg- Definition, Traffic characteristics<br>5.2 PCU,Traffic density, traffic capacity<br>5.3 Traffic volume study<br>5.4 Traffic control devices - road signs, marking, Signals, Traffic island and its types<br>5.3 Road intersections- intersections at grade and grade separator intersections.<br>5.4 Parking studies<br>5.5 Accident Studies | 06 | 16 |
| **06** | **Hill Roads**<br>6.1 Alignment survey for hill roads<br>6.2 Geometric of hill road, construction of hill roads.<br>6.3 Drainage structures in hill roads, side drains, catch water drains<br>6.4 Land slides- causes and prevention. | 04 | 08 |
| **07** | **Drainage of Roads**<br>7.1 Importance of highway drainage<br>7.2 Surface drainage system in urban roads, cross drainage<br>7.3 Sub-surface drainage –Longitudinal drains and cross drains. | 03 | 08 |
| **08** | **Maintenance and Repairs of Roads**<br>8.1 Necessity of maintenance of roads<br>8.2 Classification of maintenance operation –routine and periodic maintenance, special repairs and resurfacing<br>8.3 Maintenance of W.B.M., bituminous and cement concrete roads. | 03 | 04 |
| | **Total** | **48** | **100** |

**List of Assignments:**

1. Road project for a road of minimum 0.5 km. length having at least one small cross drainage work.
   - 1.1 Site selection.
   - 1.2 Reconnaissance survey.
   - 1.3 Fixing the alignment.

1.4 Detailed profile survey along the alignment and cross section of road and CD Work.

1.5 Prepare computer generated drawing of longitudinal section and typical cross sections of the road in cutting and filling.

1.6 Prepare computer generated drawing of proposed typical CD work/culvert. (Using CAD)

2. Visit to a road under construction/constructed to study the construction of (a) WBM road (b) flexible pavement (c) Rigid pavement roads for observing the type of construction and construction equipments.

3. Preparing drawings of detailed cross sections of
(a) major district road b) state Highway (c) National highway (d) Express Highway in cutting and banking showing details and dimensions with proper scale. (Any two)

4. Traffic volume study and its representation of an important road intersection in your city.

1. Visit to a W.B.M. and Bituminous road for observing the different types of defects in roads. Prepare a visit report. Which should consist of (a) List of various defects observed b) Suggestions regarding the possible remedial measure.

**Learning Resources:**
**Books:**

| Sr. No. | Author | Title | Publisher Address |
|---|---|---|---|
| 01 | Khanna & Justo | Highway Engineering | Khanna Publication |
| 02 | L.R. Kadiyali | Traffic Engineering | -- |
| 03 | N.L. Arora, S.P. Luthara | Transportation Engineering | I.P.H. New Delhi |
| 04 | Vazarani & Chandola | Transportation Engineering | Khanna Publication |
| 05 | Biridi & Ahuja. | Road, Railway, Bridges | S.B.H.New Delhi |
| 06 | Kamala. | Transportation Engineering | T.M.H. New Delhi |
| 07 | -- | DATA book of P.W. D. | -- |

**2. IS / International Codes. :** IRC 36 – 1970, IRC 16 –1965, IRC 20 -1966

**Course Name : Civil Engineering Group.**

**Course Code : CE/CS/CR/CV**

**Semester : Fifth for CE/CS/CR and Sixth for CV**

**Subject Title : Design of Steel Structures**

**Subject Code : 12140**

**Teaching and Examination Scheme**:

| Teaching Scheme | | | Examination Scheme | | | | | |
|---|---|---|---|---|---|---|---|---|
| TH | TU | PR | PAPER HRS | TH | PR | OR | TW | TOTAL |
| 03 | -- | 02 | 04 | 100 | -- | -- | 50@ | 150 |

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

**Rationale:**

Design of steel structure is the subject placed at technology level. This subject requires pre-requisite knowledge, skill and competencies acquired from the subject applied mechanics and mechanics of structure.

Steel is extensively used as a construction material in the construction of civil engineering work such as high rise buildings, industrial building, transmission towers, railway bridges, overhead tanks, chimney, bunkers, silos etc.

Construction in steel is to be supervised by Civil Engineering Technicians. For effective supervision and quality control Technicians must have good knowledge of design of steel structure.

The design of steel structure involve the planning of structure for specific purpose, proportioning and selection of members to carry loads in most economic manner and erection of structure at site. This can be achieved by proper functional planning and providing adequate strength to withstand direct and induced forces which may acts on the structure during its life time. The knowledge of material properties and behaviors of structural member, methods of structural analysis, determining design loads and method of design by using latest IS codes and hand books and design aids.

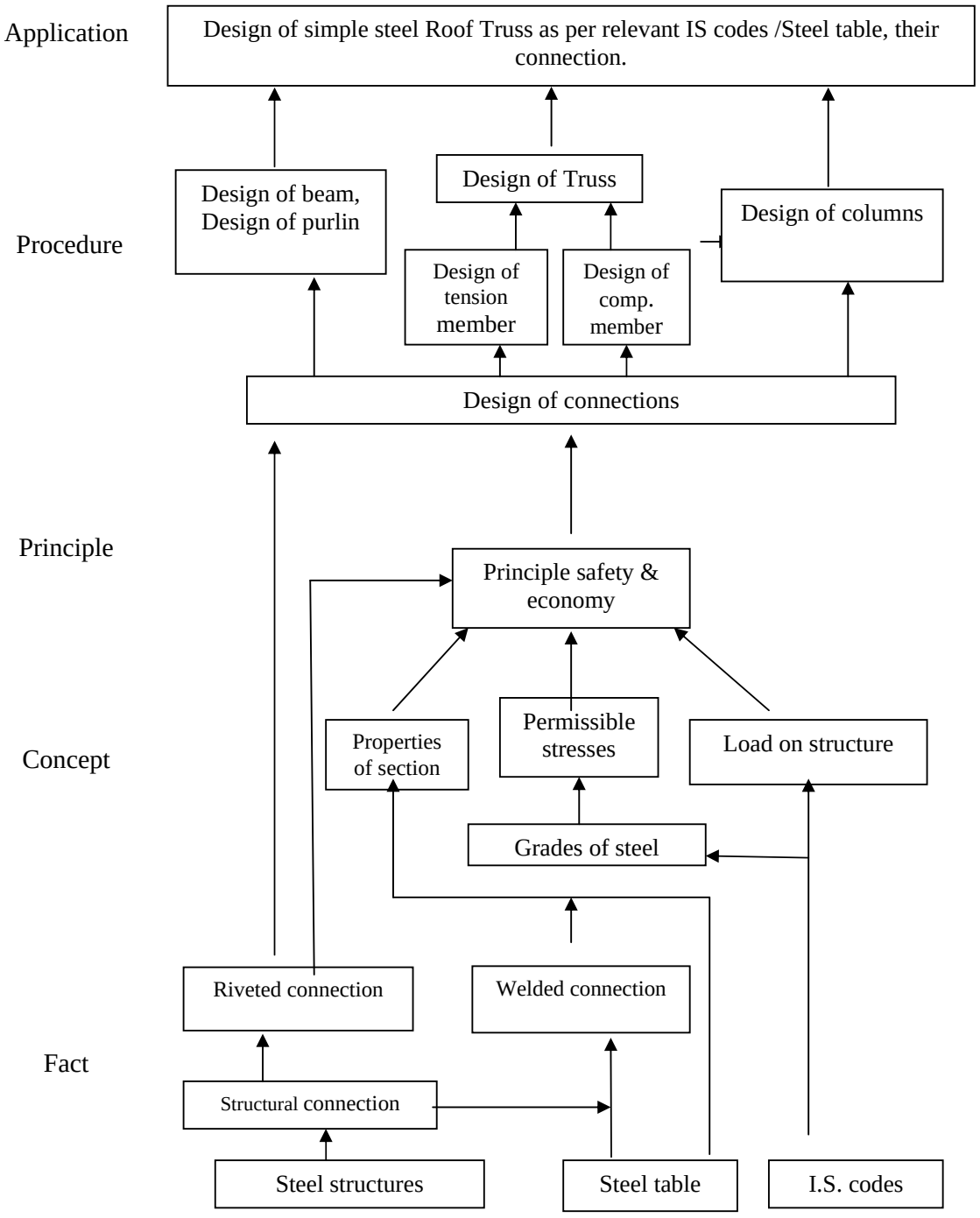
**Objectives:**

Students will be able to:

1) Analyze the steel structure and its members for determining the forces acting in the member
2) Select proper material and sections from steel table
3) Calculate design values for members
4) Use IS 875 Part 1, 2 and 3 provisions for dead load, live load and wind load.

5) Design the tension member, compression member, beam, purloins and column bases and their connection.
6) Use of IS 800 – 1984 for designing the member.
7) Read and interpret the structural drawings
8) Prepare the detailed working drawing of steel roof truss, showing sections and connections.

**Learning Structure**:



**Contents: Theory**

| Chapter | Name of the Chapter | Hours | Marks |
|---|---|---|---|
| **01** | **Introduction**<br>Types of sections used, Grades of steel and strength characteristics; advantages and disadvantages of steel as construction material; Use of steel table and relevant I.S. code; Types of loads on steel structure and its I.S. code specification. | 02 | 08 |
| **02** | **Connections**<br>Riveted connections, Types of rivets and their use, Types of riveted joint and its failure, Strength of riveted joint and efficiency of a riveted joint. Assumptions in theory of riveted joint Design of riveted joint for axially loaded member. Welded connection Introduction, Permissible stress in weld, strength of weld, advantages and disadvantages of welded joint. Types of weld and their symbols. Types of welds and their symbols. Design of fillet weld and butt weld subjected to axial load. | 08 | 16 |
| **03** | **Design of Tension Member**<br>Types of sections used, permissible stresses in axial tension and gross and net cross- sectional area of tension member<br>Analysis and Design of tension member with welded and riveted connection.<br>Introduction to Lug Angle and Tension splice. | 06 | 12 |
| **04** | **Design of Compression Member**<br>Angle struts. Types of sections used, effective length, radius of gyration, slenderness ratio and its limit, permissible compressive stresses.<br>Analysis and design of axially loaded angle struts with welded and riveted connection.<br>Stanchion and columns. types of sections used; simple and built up sections, effective length, Analysis and design of axially loaded column. Introduction to lacing and battening. (No numerical problems on lacing and battening) | 10 | 20 |
| **05** | **Steel Roof Truss**<br>Types of steel roof truss and its selection criteria.<br>Calculation of panel point load for dead load, live load and wind load as per I.S. 875-1987. Analysis and design of steel roof truss. Design of angle purlin as per I. S. Arrangement of members at supports. | 10 | 20 |
| **06** | **Beams**<br>Different steel sections used; simple and built-up sections. Permissible bending stresses. Design of simple beams, check for shear only. Design of built-up beams (symmetrical I-Section with cover plates only), check for shear only.<br>Introduction to Plate Girder: Various components and their functions. (No numerical problems on plate girder) | 06 | 12 |

| | | | |
|---|---|---|---|
| **07** | **Column Bases**<br>Types of column bases. Design of slab base and concrete block. Introduction to gusseted base (no numerical problems on gusseted base) | 06 | 12 |
| | **Total** | **48** | **100** |

**TERMWORK:**

Term work shall consist of sketch book and design report of steel roof truss for an industrial building, two full imperial size sheet shall be used for drawings.

**1. Sketch Book:**

Sketch book shall consists of any eight plates out of the below mentioned :

1. Typical sketches of sections of tension member, determination of net effective cross sectional area of tension member for angle section.
2. Typical sketches of sections of compression member, determination of effective length for different end conditions.
3. Type of trusses for different spans.
4. Riveted and welded connections for axially loaded member.
5. Column section and slab base
6. Important information of clauses of IS800-1984 and IS875 (Part-1,2 & 3)
7. Typical sketches of composite section for tension /compression member
8. Column to beam connection showing lug angle
9. Plate Girder with various component

**2. Design of Steel roof truss:**

The student should draw two full imperial size sheets covering design of steel roof truss any one of the truss fink, fan, pratt, lattice truss for Span from 8 to 16 meter the design shall cover calculations for the dead load, live load, wind load with design of the various elements. The drawing shall include detailing the truss for below mentioned elements.

a. Architectural drawing
b. Data for structural design
c. Key plan at tie level
d. Detailed layout of steel roof truss.
e. Details at end support.

**Learning Resources:**
**1. Books:**

| Sr. No. | Author | Title | Publisher |
|---|---|---|---|
| 1 | S. K. Duggal | Design of steel structures | Tata Macgraw Hill Publication Company ltd. New Delhi |
| 2. | M. Raghupati | Design of steel structures | Tata Macgraw Hill publication Company ltd. New Delhi |
| 3. | L. S. Negi | Design of steel structures | Tata Macgraw Hill publication Company ltd. New Delhi |
| 4. | Ramchandra | Design of steel structures | Dalpatrai and Sonts publication Company ltd. New Delhi |

**2. IS Codes:**

1. IS 800-1984 Indian Standard code of practice for use of structural steel in general building construction, BIS New Delhi.
2. IS-875 Part-1, 2, and 3- 1987 Indian Standard code of practice for use of structural steel in general building construction, BIS New Delhi
3. IS hand book No. 1 Properties of structural steel rolled section.
4. Steel table.

**Course Name : Civil Engineering Group**

**Course Code : CE/CS/CR**

**Semester : Fifth for CE/CS/CR and Sixth for CV**

**Subject Title : Building Services and Entrepreneurship Development**

**Subject Code : 12141**

**Teaching and Examination Scheme:**

| Teaching Scheme | | | Examination Scheme | | | | | |
|---|---|---|---|---|---|---|---|---|
| TH | TU | PR | PAPER HRS | TH | PR | OR | TW | TOTAL |
| 02 | 01 | 02 | -- | -- | -- | 50@ | --- | 50 |

**Notes:** 1. One theory and Two practical hours are for Building Services.
2. One theory and one tutorial hour are for Entrepreneurship Development

**Part - A: Building Services**

**Rationale:**

Building can not be used for occupancy unless various services required for effective working of a building is provided. It creates healthy and working environment in the building. By considering design aspect and recent material student will develop the skill and ability to became an

entrepreneur for this services.

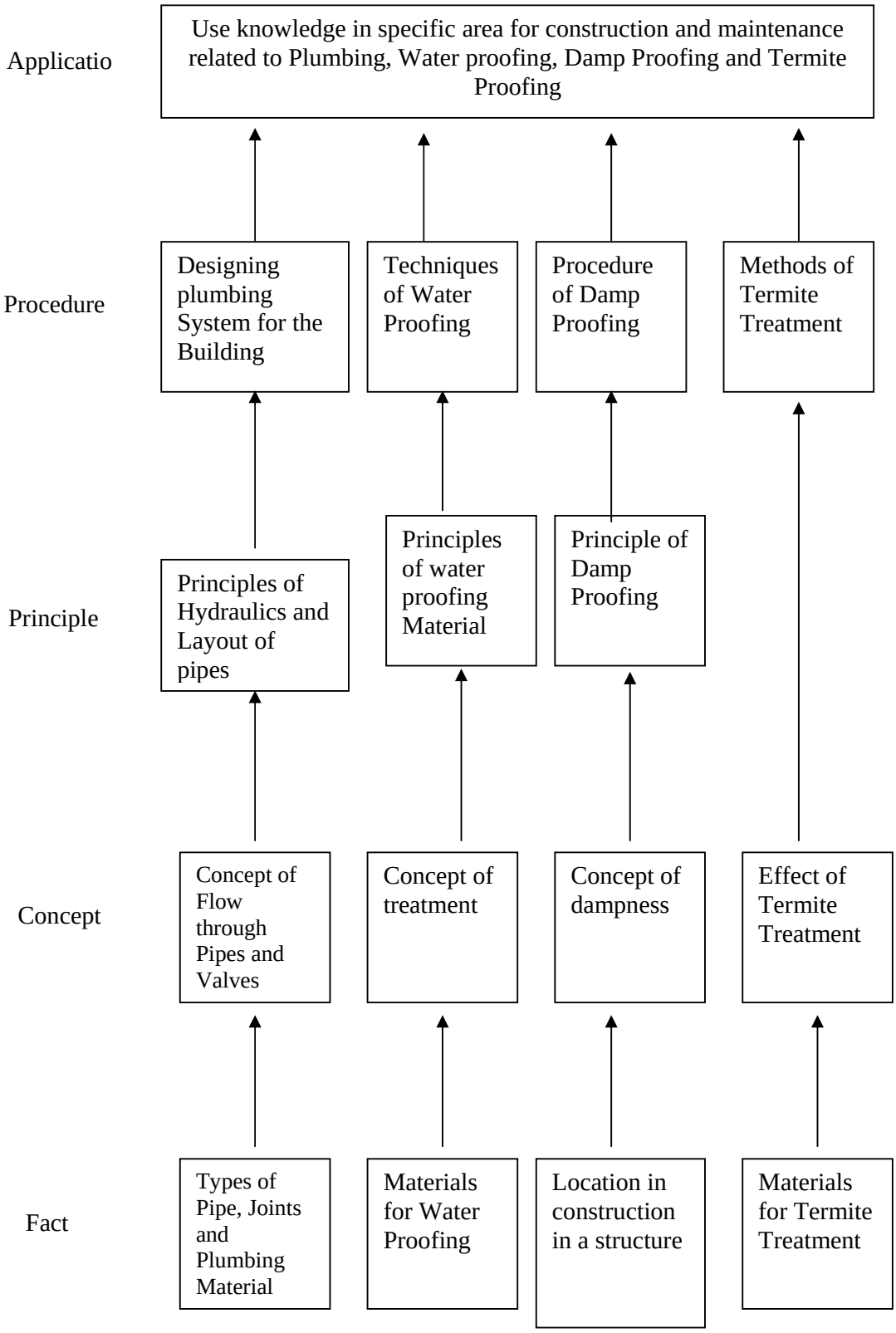
Govt. of India has also view for development of small scale sector seriously from last couple of years & special schemes, concessions are also offered for this sector with development of small industries there is also good change of self employment to new generation to suppose student to the real life problems by case study and visits to the successful entrepreneurs.

**Objectives:**

Students will be able to:

1. Plan and design various building services required in residential and commercial buildings.
2. Apply various methods of providing these services & its maintenance.

**Learning Structure**



**Contents: Theory**

**A: Building Services:**

| Chapter | Name of the Topic | Hours |
|---|---|---|
| **01** | **Plumbing**<br>1.1 Elements of plumbing<br>Objectives of plumbing, purpose of plumbing, role of plumber, licensing of plumbers their functions, sewer Air, supply pipes, drainage & vent pipes application for obtaining supply connection.<br>1.2 Pipes joints & fittings<br>Introduction. Types of Pipe – G.I. Pipes, PVC Pipes, Copper pipes, C.I. Pipes, A.C. Pipes, prestressed concrete pipes, joints in pipes, method of fixing pipes such as G.I. fitting C.I. fitting.<br>1.3 Valves & Terminal Fittings<br>Types of valves & its purpose, sluice valve, reflux valve, scour valve, Air relief valve, pressure relief valve, gate valves, Bio-taps & stop valve self closing valve. Flush valve, mixing valve.<br>1.4 Sanitary fixture & Building drainage system<br>Building sanitary fittings – water closet, flushing appliances, urinals, washbasins, flushing cisterns, principles of building drainage siphonic action, traps & its types. Capacity & sizing of pipe, soil pipe, waste pipe, rain water pipe, system of plumbing. Installation of pipes, testing of pipes. | **08** |
| **02** | **Water Proofing Treatment**<br>Introduction, material required for water proofing and its specification.<br>Water proofing of water closet and bath room procedure & Cross section.<br>Terrace and basement water proofing, Precautions to be taken while water proofing. | **04** |
| **03** | **Termite Proofing**<br>Introduction, general principles of termite proofing.<br>Methods of termite proofing.<br>Material used in termite proofing treatment. | **02** |
| **04** | **Damp Proofing**<br>Sources of dampness & its effects.<br>Material used for damp proofing,<br>Methods of damp – proofing. Damp proofing treatment in building such as basement, floors, walls. | **02** |
| | **Total** | **16** |

**Practical:**

1. Practical on joining P.V.C. / G.I. Pipes & fittings/Models and writing report on the process.
2. Practical based on sanitary fitting like, traps, wash basin & water closet fittings.
3. Prepare drawing for water supply. Layout plan for campus showing following details service pipe, communication pipe. consumer pipe, water meter, rain water pipes
4. Prepare drawing for drainage line plan for campus showing following details:
   Inspection chambers sewage pipes, traps, man holes.

5. Market survey for different materials available in market their trade names & rates used for water proofing, termite proofing and damp proofing treatment and writing report on the materials collected.

**Learning Resources:**

**1. Books:**

| Sr. No. | Author | Title | Publisher |
|---|---|---|---|
| 01 | S. Deolalikar | Plumbing Design & Practice | Sata M.C. Graw hill publishing company, New Delhi |
| 02 | Prof. S.M. Patil | Building services | Patil Publication & Goregaon, Mumbai. |
| 03 | S.R. Mohan & Vivek Anand | Design & Practica Handbook on plumbing | Standard Publishing, New Delhi. |
| 04 | Sandeep Mantri | A to Z of practical building and its management | Mantri Institute of Development & research, Pune. |
| 05 | Bindra & Arora | Building Construction | Dhanpat rai publishing |
| 06 | Rangwala | Building Construction | Charotor publishing House Anand |

**2. IS / International Codes:**

1. National Building Code – 1983, Bureau of Indian Standards, New Delhi.

**Part B: Entrepreneurship Development**

**Rationale:**

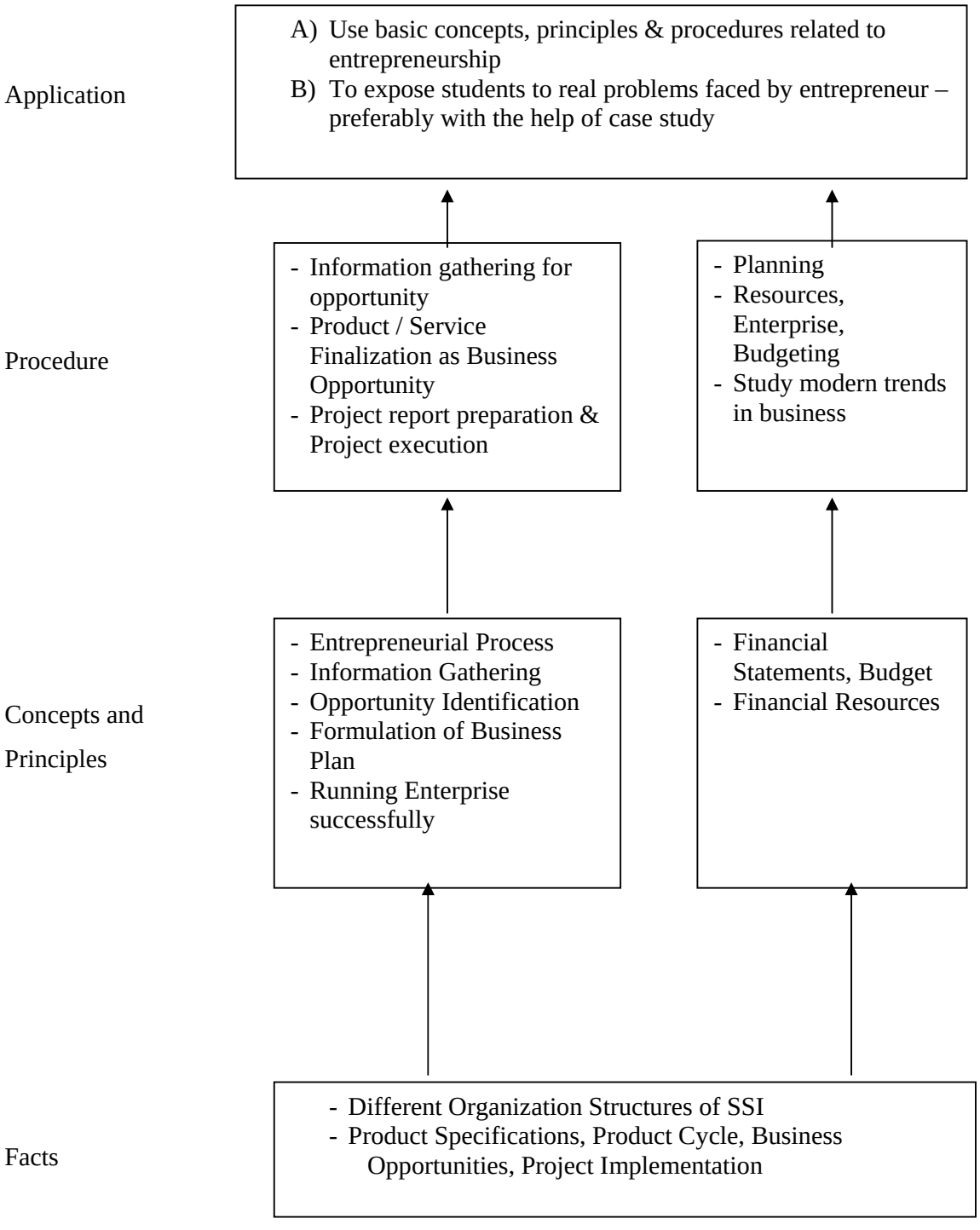
Globalization, liberalization & privatization along with revolution in Information Technology, have thrown up new opportunities that are transforming lives of the masses. Talented and enterprising personalities are exploring such opportunities & translating opportunities into business ventures such as- BPO, Contract Manufacturing, Trading, Service sectors etc. The student community also needs to explore the emerging opportunities. It is therefore necessary to inculcate the entrepreneurial values during their educational tenure. This will help the younger generation in changing their attitude and take the challenging growth oriented tasks instead of waiting for white- collar jobs. The educational institutions should also demonstrate their uniqueness in the creation of enterprising personalities in their colleges. This subject will help in developing the awareness and interest in entrepreneurship and create employment for others.

**Objectives:**

Students will be able to

1) Identify entrepreneurship opportunity.
2) Acquire entrepreneurial values and attitude.
3) Use the information to prepare project report for business venture.
4) Develop awareness about enterprise management.

**Learning Structure:**



Contents: Theory

| Chapter | Name of the Topic | Hours |
|---|---|---|
| **01** | Entrepreneurship, Creativity & Opportunities<br>1.1) Concept, Classification & Characteristics of Entrepreneur<br>1.2) Creativity and Risk taking.<br>1.2.1) Concept of Creativity & Qualities of Creative person.<br>1.2.2) Risk Situation, Types of risk & risk takers.<br>1.3) Business Reforms.<br>1.3.1) Process of Liberalization.<br>1.3.2) Reform Policies.<br>1.3.3) Impact of Liberalization.<br>1.3.4) Emerging high growth areas.<br>1.4) Business Idea Methods and techniques to generate business idea.<br>1.5) Transforming Ideas in to opportunities transformation involves Assessment of idea &Feasibility of opportunity<br>1.6) SWOT Analysis | **03** |
| **02** | Information and Support Systems<br><br>2.1) **Information Needed and Their Sources**.<br>Information related to project, Information related to support system,<br>Information related to procedures and formalities<br>2.2) Support Systems<br>1) Small Scale Business Planning, Requirements.<br>2) Govt. & Institutional Agencies, Formalities<br>3) Statutory Requirements and Agencies. | **03** |
| **03** | **Market Assessment**<br>3.1) Marketing –Concept and Importance<br>3.2) Market Identification, Survey Key components<br>3.3) Market Assessment | **02** |
| **04** | **Business Finance & Accounts**<br>**Business Finance**<br>4.1) Cost of Project<br>1) Sources of Finance<br>2) Assessment of working capital<br>3) Product costing<br>4) Profitability<br>5) Break Even Analysis<br>6) Financial Ratios and Significance<br>**Business Account**<br>4.2) Accounting Principles, Methodology<br>1) Book Keeping<br>2) Financial Statements<br>3) Concept of Audit, | **03** |

| | | |
|---|---|---|
| **05** | **Business Plan & Project Report**<br>5.1) Business plan steps involved from concept to commissioning:<br>Activity Recourses, Time, Cost<br><br>5.2) **Project Report**<br>1) Meaning and Importance<br>2) Components of project report/profile **(Give list)**<br><br>5.3) **Project Appraisal**<br>1) Meaning and definition<br>2) Technical, Economic feasibility<br>3) Cost benefit Analysis | **03** |
| **06** | **Enterprise Management and Modern Trends**<br><br>6.1) Enterprise Management: -<br>1) Essential roles of Entrepreneur in managing enterprise<br><br>2) Product Cycle: Concept And Importance<br><br>3) Probable Causes Of Sickness<br><br>4) Quality Assurance<br><br>5) Importance of Quality, Importance of testing<br>6.2) E-Commerce<br><br>Concept and process<br>6.3) Global Entrepreneur | **02** |
| | **Total** | **16** |

| Sr. No | Assignments |
|---|---|
| 1 | Assess yourself-are you an entrepreneur? |
| 2 | Prepare project report and study its feasibility. |

**Learning Resources:**
**1) Reference Books:**

| Sr.No. | Name Of Book | Author | Publisher |
|---|---|---|---|
| 1 | Entrepreneurship Development | E. Gorden<br>K.Natrajan | Himalaya Publishing. Mumbai |
| 2 | Entrepreneurship Development | Preferred by Colombo plan staff college for Technical education. | Tata Mc Graw Hill Publishing co. ltd. New Delhi. |
| 3 | A Manual on How to Prepare a Project Report | J.B.Patel<br>D.G.Allampally | EDI STUDY MATERIAL<br>Ahmadabad (Near Village |

| | | | |
|---|---|---|---|
| 4 | A Manual on Business Opportunity Identification & Selection | J.B.Patel<br>S.S.Modi | Bhat , Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428 , Gujrat,India<br>P.H. (079) 3969163, 3969153<br>E-mail : ediindia@sancharnet.in/olpe @ediindia.org<br>Website :<br>http://www.ediindia.org |
| 5 | National Directory of Entrepreneur Motivator & Resource Persons. | S.B.Sareen<br>H. Anil Kumar | |
| 6 | New Initiatives in Entrepreneurship Education & Training | Gautam Jain<br>Debmuni Gupta | |
| 7 | A Handbook of New Entrepreneurs | P.C.Jain | |
| 8 | Evaluation of Entrepreneurship Development Programmes | D.N.Awasthi , Jose Sebeastian | |
| 9 | The Seven Business Crisis & How to Beat Them. | V.G.Patel | |
| 10 | Entrepreneurship Development of Small Business Enterprises | Poornima M. Charantimath | Pearson Education, New Delhi |
| 11 | Entrepreneurship Development | -- | McGraw Hill Publication |
| 12 | Entrepreneurship Theory and Practice | J.S. Saini<br>B.S.Rathore | Wheeler Publisher<br>New Delhi |
| 13 | Entrepreneurship Development | | TTTI, Bhopal / Chandigadh |

**2) Video Cassettes**

| NO | SUBJECT | SOURCE |
|---|---|---|
| 1 | Five success Stories of First Generation Entrepreneurs | EDI STUDY MATERIAL<br>Ahmadabad (Near Village Bhat , Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428 , Gujrat,India<br>P.H. (079) 3969163, 3969153<br>E-mail : ediindia@sancharnet.in/olpe@ediindia.org<br>Website : http://www.ediindia.org |
| 2 | Assessing Entrepreneurial Competencies | |
| 3 | Business Opportunity Selection and Guidance | |
| 4 | Planning for completion & Growth | |
| 5 | Problem solving-An Entrepreneur skill | |

**Glossary:**

**Industrial Terms:**

Terms related to finance, materials, purchase, sales and taxes.

**Components of Project Report:**

1. Project Summary (One page summary of entire project )
2. Introduction (Promoters, Market Scope/ requirement)
3. Project Concept & Product (Details of product)
4. Promoters (Details of all Promoters- Qualifications, Experience, Financial strength)
5. Manufacturing Process & Technology
6. Plant & Machinery Required
7. Location & Infrastructure required
8. Manpower ( Skilled, unskilled )
9. Raw materials, Consumables & Utilities
10. Working Capital Requirement (Assumptions, requirements)
11. Market ( Survey, Demand & Supply )
12. Cost of Project, Source of Finance
13. Projected Profitability & Break Even Analysis
14. Conclusion.

**Course Name : Civil Engineering Group**

**Course Code : CE/CS/CR/CV**

**Semester : Fifth for CE/CS/CR and Sixth for CV**

**Subject Title : Professional Practices-V**

**Subject Code : 12142**

**Teaching and Examination Scheme:**

| Teaching Scheme | | | Examination Scheme | | | | | |
|---|---|---|---|---|---|---|---|---|
| TH | TU | PR | PAPER HRS | TH | PR | OR | TW | TOTAL |
| -- | -- | 04 | -- | -- | -- | -- | 50@ | 50 |

**Rationale:**

Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, attitude and ability to communicate and attitude, in addition to basic technological concepts.

The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

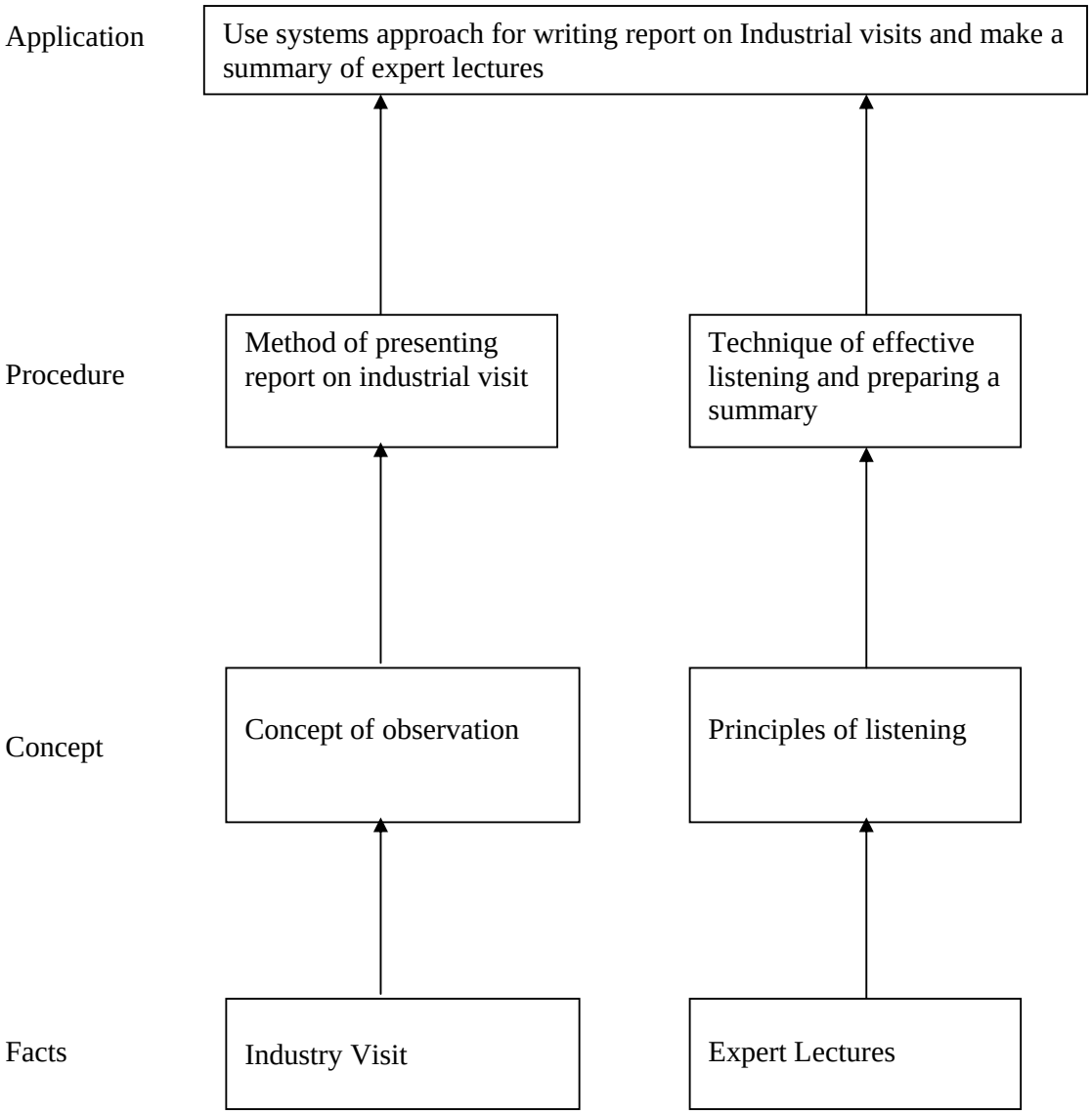
**Objectives:**

Student will be able to:

1. Acquire information from different sources.
2. Prepare notes for given topic.
3. Present given topic in a seminar.
4. Interact with peers to share thoughts.
5. Prepare a report on industrial visit, expert lecture.

| Sr. No. | Content |
|---|---|

**LEARNING STRUCTURE:**



| | |
|---|---|
| 1 | **Structured industrial visits shall be arranged and report of the same should be submitted by the individual student, to form a part of the term work.**<br>Following are the suggested type of Industries/ Fields –(Any three visits)<br>i) Irrigation project for observing components of dam and canal.<br>ii) Steel structure for study of its details.<br>iii) Residential apartment /public building to study plumbing system.<br>iv) Hot mix plant |
| 2 | **The Guest Lecture/s from field/industry experts, professionals to be arranged (2 Hrs duration), minimum 2 nos. from the following or alike topics. The brief report to be submitted on the guest lecture by each student as a part of Term work.**<br>a) Construction of highway, material of construction ,machinery used and manpower requirement .<br>b) To set up a small scale industry.<br>c) Planning and design of irrigation project. |
| 3 | **Information Search ,data collection and writing a report on the topic**<br>a) Collecting an estimate from P.W.D.<br>b) International Plumbing code and material specifications from market.<br>c) Collecting market rates for material and labor for building items .<br>d) Collecting D.S.R. /C.S.R. from PWD and its use for preparing revise estimate. |
| 4 | **The students should discuss in group of six to eight students and write a brief report on the same as a part of term work. The topic of group discussions may be selected by the faculty members. Some of the suggested topics are -**<br>i) Recent trends in civil engineering as a service industry.<br>j) Waterproofing and leakage prevention.<br>k) Troubleshooting in plumbing system.<br>l) Causes of failure of road. |
| 5 | **Seminar :**<br>Seminar topic should be related to the subjects of fifth semester Each student shall submit a report of 5 to10 pages and deliver a seminar (Presentation time – 10 minutes) |