

**CERTIFICATE
OF
VOCATIONAL EDUCATION
EXAMINATION (YEAR-12)**



SYLLABUS

CIVIL ENGINEERING TECHNICIAN

Correspondence should be addressed to

**THE CHIEF EXECUTIVE & SECRETARY
COUNCIL FOR THE INDIAN SCHOOL CERTIFICATE
EXAMINATIONS
PRAGATI HOUSE, 3^RD FLOOR
47- 48 NEHRU PLACE
NEW DELHI- 110019**

The certificate course in **CIVIL ENGINEERING TECHNICIAN (C.E.T)** is equivalent class XII of higher secondary level, having an advantage of acquiring a basic knowledge of Civil Engineering.

A successful candidate has two options open to him

(a) Become a small Entrepreneur and execute Civil Engineering Contracts.

(b) Find suitable employment in the Construction Industry.

A successful candidate if interested has a third option of taking up higher studies in Civil Engineering by joining the Institute of Engineers (India) as student member straight way. Subsequently, the candidate can sit for examination of the institute in see 'A' and see 'B'. To pursue study to secure A.M.I.C.E.

CONTENTS OF SYLLABUS

I. Compulsory Subjects:

English 5

General Foundation: Industrial
Sociology & Entrepreneurship 10

3 Environmental Education :
(separate Booklet)

II. Elective subjects:

1. Construction Technology,
Building Material & practice 18

2. Geometrical & Building Drawing 34

3. Construction Estimating Costing
Management & Accounts 43

4. Engineering Science 54

5. List of tools & equipments 56

CIVIL ENGINEERING TECHNICIAN

S No	SUBJECT	CLASS XI	HOURS	MARKS	CLASS XII	HOURS	MARKS
1	English (Compulsory)	Paper I Paper II	1½ 1½	50 50	Paper I Paper II	1½ 1½	50 50
2	General Foundation Industrial sociology & Entrepreneurship (Compulsory)	Paper I- Sociology Paper II- Environmental Education & Rural Development	3 3	50 50	Paper I- Complete Course Paper II- Entrepreneurship Project & Plan	3 3	50 50
3	Construction Technology Building Material & Practice	Paper I- construction Technology & Building Material – Theory-Paper II Practical	3 6-8	40 60	Paper I- Construction Technology & Building Material – Theory Paper II – Practical	3 6-8	40 60
4	Geometrical & Building Drawing and Bye - Laws	Plane and Solid Geometry Building Drawing (elementary) Practical	4-6	100	Paper I – Building working Drawing & Bye- Laws Paper II- Practical	3 6	40 60
5	Construction Estimating, Costing Management & Accounts	Paper I – Construction Estimation and Costing Theory Paper II- Practical	3 3	50 50	Paper I – Construction Management & Accounts Paper II - Practical	3 3	50 50
6	Engineering Science & Surveying	Engineering Science Theory Physics, Chemistry & Mathematics	3	100	Paper I – Surveying Theory Paper II - Practical	3 6-8	40 60

AIMS:

On successful completion on the course, the technician should be able to:

- (1) To identify, select and use various types of tools, plants and instruments required for civil engineering jobs.**
- (2) To understand the various techniques involved in building maintenance road maintenance and know the properties of materials including precautions in their use required for the same.**
- (3) To undertake masonry, mortar, cement and concrete work for building construction bridge construction and maintenance.**
- (4) To prepare and apply white-wash, colour wash, distemper, cement paint & plastic/emulsion paints as per specifications for Decoration**
- (5) To prepare surface and lay various types of floors such as P.V.C., linoleum, rubber, cork, timber and asphalt floors.**
- (6) To install and repair water supply and sanitary fixtures and fittings and waste disposal systems.**
- (7) To undertake carpentry & joinery required in building. Commercial establishments Institution Building**
- (8) To cut, fix and clean glass as per specification.**
- (9) To survey a plot of land with chain and plane table and to plot the plan. And the help of to calculate the area of a plot with plan meter, and prepare and enlarge with plane pantograph. To set up and read a levelling.**
- (10) To undertake construction and maintenance of fencing walls culverts and roof various types.**

ENGLISH LANGUAGE- Paper – I

CLASS XI AND XII

DETAILED SYLLABUS

Objective : To provide experience of the structure and vocabulary of English to enable students to

1. Study other subjects in the curriculum
2. Develop communication skills for vocational purposes.

There will be two papers as follows:

Paper 1 (1½ hours)

Question One Either

(a) Candidate will be required to write a report in about three hundred words based on information provided.

OR

(b) Candidates will be required to write a passage of about three hundred words in the form of a description of events, or of a process, directions or instructions.

[Both types – (a) and (b) – will be set]

Question Two

Candidates will be required to write a letter from a choice of two subjects. Suggestions will be given. The lay-out of the letter with address, introduction, conclusion, etc., will form part of the assessment.

Question Three

An unseen passage of prose of about three hundred words will be given. Questions based on the passage will be of the objective type and will include multiple-choice answers, which may be verbal or diagrammatic. All questions will have to be answered. Questions will test the candidate's understanding of ideas expressed in the passage as well as the meaning of words and the function of structures.

Question Four

An unseen passage of about two hundred and fifty words will be given. A question or questions will be asked to test the candidate's ability to extract information from a passage. Candidates will be directed to provide the required information in the form of enumerated notes, not in connected prose.

English – Paper II

1½ Hours

50 Marks

OBJECTIVE: To provide experience of a variety of English Prose, Poetry, Play, Addressing issues of human interest and concern.

Candidates are requested to answer five questions from the selected pieces. The question will be set to test the candidates ability to recall and respond to the information contained therein.

Question 1 will be compulsory, which will be set from the stories selected from Twelve Contemporary Short Stories. Another five questions will be set, one from each of the parts. i.e From Twelve Contemporary Short Stories, Poems, Essays, Excerpts of plays and from Great Modern Lives. Candidates are to answer any four out of the five questions. Total five questions to be answered.

Q1. Compulsory + Any four.

I. Twelve Contemporary Short Stories. (OUP)

- | | | |
|--------------------|---|-------------------------------|
| 1. Ruskin Bond | : | The Eyes Have It. |
| 2. Roald Dahl | : | Parson's Pleasure |
| 3. Jug Suraiya | : | Badger |
| 4. R.K. Narayan | : | Martyr's Corner |
| 5. Bernard Malamud | : | The First Seven Years |
| 6. Allen Seally | : | How Raj Kapoor Saved My Life. |

II. Poems

- | | | |
|---------------------------|---|----------------------|
| 1. Wystan Hugh Auden | : | The unknown Citizen |
| 2. David Herbert Lawrence | : | The best of School |
| 3. Robert Frost | : | The road not taken |
| 4. Edgar A Guest | : | It couldn't be done. |
- (The Art of Dynamic Thinking – Melvin Powers. Better yourself books)

III. Essays

1. **J.B. Priestley** : **Too many people**
2. **E.R. Braithwaite** : **Job Hunting**

IV. Excerpts from plays (Shakespeare)

1. **Merchant of Venice**
Prince of Arragon's Speech : "..... Who chooseth me shall get as much as he deserves"
2. **Julius Caesar** :
Mark Anthony's Speech : "Friends, Romans, Countrymen....."

V. 100 Great Modern Lives – Ed. John Canning (Rupa & Co.)

1. **Douglas Collier** : **Jamshedji Tata**
2. **Andrew Ewart** : **Henry Ford.**

**GENERAL FOUNDATION AND
INDUSTRIAL SOCIOLOGY ENTERPRENEURSHIP**

Class XI

1. Constitution of India	2 Hrs.
2. Industrialization through five years plans.	2 Hrs.
3. Industrial safety, First Aid and Hygiene & Safety Management.	2 Hrs.
4. Population Education	3 Hrs.
5. Unemployment and Automation	3 Hrs.
6. Qualities of an Ideal Supervisor	1 Hrs.
7 Environmental Education	2 Hrs.
8 Rural Development	2 Hrs.

Paper II – Environment Education & Rural Development.

1 Environmental Resources, Human Resources and Natural Resources.	2Hrs.
2 Population its impact.	1Hr.
3 Impact of industrialization on environment.	1Hr.
4 Effect of modern agriculture on environment.	2Hr.
5 Occupational Hazards.	2Hr.
2. Rural Development	5Hrs
3. Globalization	6Hrs.
4. Concerns Today	8 Hrs.

2nd. Year (XII)

1. 1.	
2. Factories Act – 1948	
3. Minimum Wages Act – 1946	
4. Workmen’s Compensation Act – 1923.	
5. Employees State Insurance Act – 1948.	
6. Payment of wages Act – 1936.	
7. Maternity Benefit Act – 1961.	
8. Contract Labour Act – 1971.	
9. Industrial Disputes Act – 1947.	
10. Employees Provident Fund Act – 1952.	13 Hrs.

- | | |
|--|--------|
| 2. a Entrepreneurship. | 2 Hrs. |
| b. All about small business including Indian Contract Act – 1872.
The sale of Goods Act – 1930. | 3 Hrs. |
| 3. Estimating and Costing | 6 Hrs. |
| 4. Project Planning and Project Report Making. | 4 Hrs. |
| 5. Building people | 5 Hrs. |
| 6. Science & Technology | 7 Hrs. |

Paper II

Entrepreneurship Project Plan 12 Hrs. + Practical Time

GENERAL FOUNDATION AND INDUSTRIAL SOCIOLOGY ENTERPRENEURSHIP

Class XI

Theory 3 Hrs.

Marks – 50

Sociology – Paper – I

1. **CONSTITUTION OF INDIA.**
Features of the constitution & Preamble.
 1. Fundamental rights
 2. Fundamental duties
 3. Directive principles of state policy
 4. Differences between fundamental Rights and Directive principles – citizen's role in nation building
 5. Role of taxes direct, indirect.

2. **INDUSTRIALISATION THROUGH FIVE YEAR PLANS**
 1. VIII five year plan
 2. IX five year plan (A critical appraisal)
 3. Discuss – critically the industrial achievement during the plan period 1st. to 7th.
Five year plan.
 4. Importance of public sector.

3. **INDUSTRIAL SAFETY, FIRST AID AND HYGIENE**
 - i. Efficient worker safe worker.
 - a. Causes of work Injuries.
 - i. Bad house keeping
 - ii. Hand tools
 - iii. Portable electric tools
 - iv. Working around machines
 - v. Safety equipments
 - vi. Lifting weight
 - vii. Padders
 - viii. Fire

- b. Types of injuries and appropriate first aid**
 - i. Severe bleeding**
 - ii. Cessation of breathing**
 - iii. Shock**
 - iv. Poisoning**
 - v. Drowning**
 - vi. Fractures**
 - vii. Burns**
 - viii. Fainting**
- c. Safety Management.**

4. POPULATION EDUCATION.

- a. Family Planning, small family norms, gender equality, female infanticide, Abortion laws / Euthanasia.**
- b. Worker and his family – Love and Sex – Qualities of an ideal husband – Qualities of an ideal wife. Setting up a home.**

5. UNEMPLOYMENT AND AUTOMATION

- i. Definition of unemployment**
 - ii. Types of unemployment**
 - a. Casual, seasonal, cyclical.**
 - b. Technological, frictional.**
- Automation and Computerization**
- i. Tools that substitute hand.**
 - ii. Machine that substitute muscles.**
 - iii. Computers that substitute brains.**

6. QUALITIES OF AN IDEAL SUPERVISOR

- 6.1 Be a part of the management**
- 6.2 Be a leader of the workmen under you.**
- 6.3 Be a policeman when needed**
- 6.4 Knowledge of technical job.**
- 6.5 Quality control and waste control.**
- 6.6 Planning and scheduling.**
- 6.7 Method of improvement.**
- 6.8 Cost control.**
- 6.9 Training your men.**
- 6.10 Safety and first aid.**
- 6.11 Working conditions of your men.**
- 6.12 Problems in supervising women.**
- 6.13 Wage payment.**
- 6.14 Job evaluation**
- 6.15 Merit rating**
- 6.16 Labour laws.**
- 6.17 Economics**
- 6.18 Use of psychological tools.**
- 6.19 Common sense**
- 6.20 Cool and collective.**

7. ENVIRONMENTAL EDUCATION

1. Environmental resources (energy, air, water, soil, minerals, plants, animals), carrying capacity, effects of exploitation.

2. Population explosion and incompatibility between resources and number, demands on environment to meet 'basic human needs' and 'aspiration of more ambitious goals, its effect on environment'.

3. Impact of industrialization on environment:

3.1 Irreversible changes in landscape.

3.2 Encroachment / degradation of environment and its effects.

4. Effects of modern agriculture on environment:

4.1 Use of high-yielding varieties and deprivation of genetic resources.

4.2 Canal irrigation and water logging.

4.3 Use of fertilizers and pesticides and its effects on environment.

4.4 The dangers in manufacturing, storing, transporting, disposing of insecticides.

5. Land use, soil degradation, population pressure and depletion of forests, grassland and cropland.

6. Environment pollution of air, water and soil and its effects on the living world.

7 . Hazardous industrial and agricultural products:

7.1 Safety and health risks connected with their use,

7.2 Impact on environment when used.

8. Misuse of medical technology: the drug menace.

9. Properties of materials (bio-degradable & non-degradable)

10. Typical environmental problems

10.1 Deforestation

10.2 Desertification

10.3 Landslides

10.4 Silting and drying of water resources.

10.5 Pollution of lakes and waterways.

10.6 Toxic substances

11. Occupational hazards

11.1 Organizational risks.

11.2 Equipment related risks.

11.3 Process related risks.

11.4 Product related risks.

12. Environmental action

12.1 Environmental protection and conservation of resources.

12.2 Pollution control, environmental pollution laws and regulations.

- 12.3 Waste disposal.**
- 12.4 Desirable nutrition and sanitation practices.**
- 12.5 Recuperation, recycling and substitution.**
- 12.6 Community action for ecological restoration, social and agro forestry.**
- 12.7 Economic use for resources (material, energy, money, time)**
- 12.8 Living in harmony with nature, the environmental ethics.**

13. Occupational safety

- 13.1 Fire safety**
- 13.2 Safe handling of equipment and materials.**
- 13.3 Safety precautions in lab/workshop/work site.**
- 13.4 First aid.**
- 13.5 Safety management.**

8. RURAL DEVELOPMENT.

- 1. Land use profile in India**
- 2. Causes of economic backwardness: the ‘poverty trap’**
- 3. Measures to increase agriculture productivity by improving the inputs.**
- 4. Afforestation – social and farm forestry (environmental, social and economic enhancement).**
- 5. Rural waste re -cycling-biogas plant, compost making.**

Provision of basic health services for the community – provision of medical care, improvement of environmental sanitation, control of communicable diseases, mother and child health care, school health services. Development of desirable health, nutrition and environmental sanitation practices in the community.
- 7. Activization of agencies responsible for rural development.(Integrated Rural Development Programme. Small Farmers Development Agency, etc.)**
- 8. Innovations and Development of Rural Industries.**

ENVIRONMENTAL EDUCATION AND RURAL DEVELOPMENT

Class XI

Theory 3 Hrs.

Marks – 50

Sociology – Paper – II

1. i Environmental Resources (energy, air, water, soil, minerals, plants & animals)
 - ii. Population – Human resources and Natural resource. Exploitation and Exploration of natural resources. Conservation of natural resources waste products management. Respect for laws regulating Community living. Respect for others freedom. Concern for public property.
 - iii. Impact of industrialization on environment.
 - a. Irreversible change in landscape.
 - b. Encroachment / degradation of environment and its effects.
 - iv. Effect of modern agriculture on environment.
 - a. Effect of high-yielding varieties and deprivation of genetic resources.
 - b. Canal irrigation and water logging.
 - c. Use of fertilizers and pesticides and effect.
 - d. The dangers in manufacturing, storing, transporting, disposing of insecticides.
 - v. Land use, soil degradation , population pressure and depletion of forest grasslands and cropland. Environment pollution of air water and soil and its effect on the living world.
 - vi. Measure of medical technology the drug abuse.
 - vii. Biodegradable and non-degradable materials.
 - viii Typical environmental problems. Deforestation, Desertification, Landslides, silting and drying of water resources, pollution of lakes and resources, toxic substances.
 - ix Occupational Hazards
 - a. Organizational risks
 - b. Equipment related risks.
 - c. Process related risks.
 - d. Product related risks.
2. Rural development (with reference to the 20-point programme, 1986)
 - a. Land use profile in India.
 - b. Causes of economic backwardness, the poverty trap.
 - c. Measures to increase agriculture productivity by improving the inputs.
 - d. Afforestation – social and farm forestry. (environmental, social and economic enhancement)
 - e. Rural waste recycling – bio gas plant, compost making.
 - f. Provision for basic health service for the community – medical care, environmental sanitation, communicable diseases, mother and child health care, school health service.
Development of desirable health, nutrition and environmental sanitation practices in the community.

- g. Activisation of agencies responsible for rural development. (Integrated rural development programme IRDP, small farmers development agency, marginal farmer's development agency.**
- h. Innovation and development of rural industry.**

3 Globalization.

- a. Globalization as a worldwide aspiration linking human values.**
- b. Modernism and Internationalism.**
- c. Global broadcasting and journalism, role of news agencies, effects of the global reach of broadcasting, risk to cultural values due to bombardment of foreign base media.**

4. Concerns today.

- a. Nuclear disarmament - CTBT**
- b. Human rights, Gia hypothesis, Malthusian theory, Darwinism & Francis Galton and the Eugenists.**
- c. Consumer and the competitive market.**

- d. Dehumanization due to technological advances.**
- e. Advertising and its impact.**
- f. Impact of society moving towards quick fix solutions leading to corrupt practices.**
- g. Underemployment and unemployment.**
- h. The ethical and the moral impact of the Internet.**
- i. Reaching out : Types of communication networks and their utilities –e-mail, facsimile, video conferencing, understanding of the internet as a global knowledge base and communication network.**

4. Minimum wages Act, 1948.

- i. Living wage, Fair wage, Minimum wage & subsistence wage.**
- ii. Scope**
- iii. Salient features**
 - a. Minimum time rate of wages**
 - b. Minimum piece rate**
 - c. A guarantee time rate**
 - d. Overtime rate.**
- iv. Provisions**
 - a. Payment in cash**
 - b. Cost of living**
 - c. Maintaining records**
 - d. Violation and enforcements.**
- v. Workmen's compensation Act – 1923**
 - a. Objectives – imposition of compensation.**
 - b. Scope – Certain category of railway men**
 - c. To all wage earners earning up to Rs.1000/- per month in certain notified establishments.**
 - d. For death, permanent total disablement, permanent partial disablement, Temporary disablement.**

5 Employees State Insurance Act 1948.

- i. Objectives - Benefits to employees in case of sickness, maternity, disablement, dependents, employment injury.**
- ii. Scope – Applies to all non-seasonal factories, shops, hotels, restaurants. Not applicable to men of armed forces and those drawing above Rs.5,000/- per month.**
- iii. Finance - Employees contribution – 2½ %**
 - Employer's contribution – 5 %****Those drawing less than Rs.6/- per day are exempt from contribution.**

6 Payment of Wages Act – 1936.

- i. Objectives – To ensure wages for employees drawing less than Rs.1600/- per month.**
- ii. Provisions :**
- iii. i. State Government to enforce.**
- ii. Fixation of wages periods**
- iii. Deductions :**
- iv. Fines**
- v. Absence from duty**
- vi. Damages, Loss**
- vii. House / Accommodation**
- viii. Advances or over payment**
- ix. Income Tax societies.**
- x. Co-operative**
- xi. Insurance premium**
- xii. Levy on mines.**

- 7. Maternity Benefit Act - 1961**
- i. Objective – To regulate employment of women in certain establishment for certain period before and after child birth.**
 - ii. Scope – Applies to factories, mines, circus, industries, plantations and Government establishment.**
 - iii. Provisions – Eligibility conditions, period for benefit paid, rate of benefit.**
- 8. Contract labour Act – 1970.**
- i. Object – To regulate the employment of contract labour.**
 - ii. Scope – Applies to establishment in which twenty or more workers are employed or were employed on any day of the preceding 12 months as contract labour to every contractor who employs or who employed on any day of the preceding twelve months, twenty or more workers.**
 - iii. Terms – Contractor, Establishment**
 - iv. Main provisions.**
 - a. Setting up of advisory Boards**
 - b. Registration of establishments**
 - c. Welfare and health of contract labour**
 - e. Penalties and Procedures.**
- 9. Industrial Disputes Act – 1947.**
- i. Definition of industrial disputes.**
 - ii. Machinery set up by the Act.**
 - iii. Labour court, Board of enquiry, Industrial tribunal, Conciliation**
 - iv. Adjudication**
- 10. Employees Provident Fund Act – 1952.**
- Object & Scope – Applied to all factories and establishments and notified industries employing 20 or more people.**
- i. Rate of contribution**
 - ii. Protection from attachment**
 - iii. Membership**
 - iv. Family pension scheme**
 - v. Benefit of the scheme.**
- (The latest amendments to the Act must be taken into consideration)**

11

Entrepreneurship

All about small business.

- i. Small Business**
- ii. Need for small business**
- iii. Economic Contribution**
- iv. Possible types of business**
- v. Employer and labour relation**
- vi. Buyer and seller relation**
- vii. Incentives in certain areas**
- viii. Assistance from District Industries Center.**
- ix. Assistance from small scale industries.**
- x. Service industries.**

Managerial Qualities of an Entrepreneur

- i. Should be confident**
- ii. Should be dynamic**
- iii. Should be creative**
- iv. Should be able to take initiative**
- v. Should be flexible**
- vi. Should be result oriented**
- vii. Should be energetic and hard working**
- viii. Should be far sighted**
- ix. Should accept challenges**
- x. Should be able to communicate effectively.**
- xi. Should be aware of ancillary development.**

13

Estimating and costing.

14

Project planning & project report making.

Indian Contract Act – 1872.

- i. Definition of contract, offer, acceptance, performance of contract.**
- ii. Indemnity and Guarantee.**
- iii. Different kinds of agents.**

The sale of Goods Act – 1930

- i. Definition of Buyer, Seller, Delivery Goods.**
- ii. Price**
- iii. Formation of the contract sale.**
- iv. Difference between sale & hire purchase.**

- 15 Building People.**
- i. Privatization v/s Nationalization**
 - ii The need for governments to govern and leave economic activities to the people, Role of NGOs.**
 - iii Generation of financial resources to meet governmental expenses.**
 - iv Impact of privatization on economic development with specific reference to Insurance, Telecommunications, Railways and Electricity.**
- 16. Science & Technology.**
- i. Animal and human aggression**
 - a. Human and non-human signals of aggression.**
 - b. Weapons devised by man for offence and defence.**
 - c Nuclear weapons, control on weapons manufacture, sale of foreign power.**
 - d. Technology – does it make war more or less likely?**

 - ii. Science and Technology as change agents**
 - a. Affect of scientific developments on our lives – at work and at home.**
 - b. Business on net – e- commerce, its feasibility and implications.**

 - iii. Cosmology and space research**
 - a. Current theories about the origins of the universe.**
 - b. Probability of existence of Extra Terrestrial Intelligence.**

 - iv. Emergence of new technologies their appreciation**
 - a. Non-Digital and Digital technology.**
 - b. Communication technology.**
 - c. Information technology.**

ENTREPRENEURSHIP PROJECT PLAN

PAPER – II

3 Hrs.

CURRICULUM IN ENTREPRENEURSHIP DEVELOPMENT

Entrepreneurship curriculum is divided into five major modules:

- 1. Entrepreneurial career orientation.**
- 2. Entrepreneurial spirit (values and attitudes) and behavioural competencies.**
- 3. Entrepreneurial motivation.**
- 4. Enterprise launching competency.**
- 5. Enterprise management competencies.**

1. ENTREPRENEURIAL CAREER ORIENTATION

Today, most prevalent and commonly pursued career after education is that of a wage earner . The great potential of self-employment and the incentives thereof are not well known. This information, orientation and necessity related to future career option will orient students to entrepreneurial career.

2. ENTREPRENEURIAL SPIRIT AND BEHAVIOURAL COMPETENCIES.

Entrepreneurial spirit consists of values and attitude. Since value provides the direction and attitude decides the tendency to act in a given situation, certain competencies are needed to actually take action governed by values and attitudes. These competencies will help students in entrepreneurial career.

3. ENTREPRENEURIAL MOTIVATION

Force, drive and energy are needed to pursue the path of entrepreneurial career. Since forces are provided by creating an urge in the individual for efficiency that reflects through competition with other or with one's standards of performance, the total process is termed as entrepreneurial motivation.

4. ENTERPRISE LAUNCHING COMPETENCY

This includes competencies related to sensing opportunities; project/product; project formulation availing incentives; resource mobilization and finally launching the enterprise.

5. ENTERPRISE MANAGEMENT COMPETENCIES

The enterprise may be small or big but it demands management abilities in its own/manager. The various management functions such as production, marketing, finance, etc., are crucial functions for entrepreneurs. This module will help students in developing enterprise management competencies.

3. CONSTRUCTION TECHNOLOGY, BUILDING MATERIAL & PRACTICE

CLASS - XI DETAILED SYLLABUS

PAPER - 1 - THEORY - Three Hours - 40 marks

CONSTRUCTION TECHNOLOGY

- 1. Introduction to building elements**
Components such as foundation, plinth, walls, lintel, doors and windows, floors, roofs, stairs and stair cases.
- 2. Foundations**
Meaning, necessity of foundation, constructional detail of spread footing, foundation for walls, masonry and R.C footing and R.C column. Stepped foundations. Cases of failures of foundations and their remedial measures.
- 3. Masonry**
Meaning, bricks, masonry, stone masonry, technical terminology involved in use of stone brick masonry. Conventional brick. Modular brick and hollow blocks.
 - 3.1 General principle in brick masonry construction, bonds in brick masonry, characteristics of a brick bond. English bond, Flemish bond and their characteristics. Alternate courses in straight wall in English bond for one brick, 1½ brick and 2 brick walls. Alternate courses of right angle wall 1 brick, thick in English bond Laying brick masonry. Defects in brickwork.**
 - 3.2 Stone masonry: Use of stone masonry. Dressing of stones.**
 - 3.3 Walls: types of walls & their use. Cavity wall, Hollow block wall.**
- 4. Arches and Lintels**
 - 4.1 Meaning and use of Arches & Lintels.**
 - 4.2 Glossary of terms used in Arches.**
 - 4.3 Arches.**
 - 4.3.1 Types of Arches**
 - 4.3.2 Brick Arches and their construction.**
- 5. Doors and Windows**
 - 5.1 Glossary of terms used in doors and windows.**
 - 5.2 Names and Uses of various types of doors & windows.**
- 6. Floors**
 - 6.1 Ground Floor, First Floor, Second Floor E.T.C.**
 - 6.2 Glossary of terms: floor finish, topping under layer, base course, rubble filling and their purpose, types of stone slabs used in lean to roof, floor finishes.**

7. **Roofs**
 - 7.1 **Glossary of terms for pitched roofs. Lean to roof**
 - 7.2 **Roof coverings for pitched roofs.**
 - 7.3 **Drainage arrangement for pitched roofs.**
 - 7.4 **Their construction and their leak and damp proofing.**
 - 7.5 **Flat roof construction - R.C slab, R.B.C - slab etc.**
8. **Stairs and Staircase**
 - 8.1 **Glossary of terms.**
 - 8.1 **Relations between rise and tread width of stair, landing, etc.characteristics of good stairs.**
 - 8.2 **Various types of stairs.**
 - 8.3 **Fabricated steel stair.**

BUILDING MATERIALS

1. **Stones**
 - a. **Rock and its classification.**
 - b. **Characteristics of a good building stone.**
 - c. **Properties and occurrence of various building stones, their use/trade names and their units of purchase.**
 - d. **Aggregate - its meanings, classification and use. Sieve analysis trade/commercial name and units to purchase of various types of aggregates.**
2. **Clay products : (Bricks, Tiles & Terra - cotta)**
 - 2.1 **Bricks**
 - 2.1.1 **Use of bricks.**
 - 2.1.2 **Classification of bricks as per I.S. NO. 1077 (Revised).**
 - 2.1.3 **Field testing of bricks - for dimension, texture, colour, shape, water absorption and efflorescence**
 - 2.1.4 **Shapes of bricks used for special purpose.**
 - 2.1.5 **Stacking & counting of bricks.**
 - 2.1.6 **Units of purchase.**
 - 2.1.7 **Manufacture of modular bricks Fly ash bricks.**
 - 2.2 **Tiles**
 - 2.2.1 **Clay Flooring tiles and Roofing tiles.**
 - 2.2.2 **General properties & uses of clay roofing tiles.**
 - 2.2.3 **General properties & uses of glazed earthenware tiles, their properties & uses.**
 - 2.3 **Terra - cotta**
 - 2.3.1 **Meaning - earthen ware**
 - 2.3.2 **Properties and uses of earthen and stone wares.**
 - 2.3.3 **Soil Waste pipes.**
 - 2.3.4 **Water closets,glazed sanitary wares**
 - 2.3.5 **Gully traps.**

- 3 Cement**
 - 3.1 Meaning**
 - 3.2 Types of Cement, properties & uses.**
 - 3.3 Field test for ordinary Portland cement.**
 - 3.4 Units of purchase.**
 - 3.5 Storage of cement: Requirements of godown for cement. Method of stacking.**
- 4. Lime**
 - 4.1 Meaning**
 - 4.2 Quick Lime and Hydrated lime.**
 - 4.3 Classification of lime as per I.S.I. 721 (Revised) properties and uses.**
 - 4.4 Local/Trade/Commercial names and units of purchase.**
 - 4.5 Methods of storage of different types of lime.**
 - 4.6 Field testing of Hydraulic lime.**
- 5. Concrete and mortar**
 - 5.1 CONCRETE**
 - 5.1.1 Meaning**
 - 5.1.2 Cement concrete**
 - 5.1.3 Lime concrete**
 - 5.1.4 Surkhi concrete**
 - 5.1.5 Composite mortar concrete**
 - 5.1.6 Reinforced brick lime concrete**
 - 5.1.7 Pre - cast concrete**
 - 5.1.8 Pre - stressed concrete.**
 - 5.2 MORTAR**
 - 5.2.1 Meaning**
 - 5.2.2 Lime mortar**
 - 5.2.3 Cement mortar**
 - 5.2.4 Surkhi mortar**
 - 5.2.5 Mud mortar**
- 6. Timber and Allied products**
 - 6.1 TIMBER**
 - 6.1.1 Meaning**
 - 6.1.2 Soft wood and hard wood**
 - 6.1.3 Characteristics of a good timber.**
 - 6.1.4 Qualities of seasoned timber.**
 - 6.1.5 General defects in timber, their causes and remedial measures.**
 - 6.1.6 Preservation of timber, names of preservatives and their uses.**
 - 6.1.7 Common Indian timbers, their properties, availability & use.**

- 6.1.8 Storage of timber**
- 6.1.9 Market form of timber & their units of purchase.**

6.2 ALLIED PRODUCTS

- 6.2.1 Plywood, hard board, Block board, Sunmica; their used and specifications.**
- 6.2.2 Commercial names of above-mentioned products and units of purchase.**

1) Building Finishing Materials

- 7.1 White washing materials required for white washing, their commercial names and units of purchase.**
- 7.2 Colour washing materials required for colour washing, their commercial names and units of purchase.**
- 7.3 Distemping, Types of distempers, their properties & uses/commercial names and units of purchase.**
- 7.4 Wall papering, papers used for wall papering, their commercial names and units of purchase.**
- 7.5 Paints**
 - 7.5.1 Characteristics of a good paint.**
 - 7.5.2 Ingredients of oil paints.**
 - 7.5.3 Preparations of oil paints.**
 - 7.5.4 Different types of paints, their properties and uses.**
 - 7.5.5 Ready made paints, their commercial names and units of purchase.**
- 7.6 Varnish**
 - 7.6.1 Meaning**
 - 7.6.2 Characteristics of a good varnish**
 - 7.6.3 Ingredients of varnish, their uses, properties and commercial names.**
- 7.7 Polish**
 - 7.7.1 Meaning**
 - 7.7.2 Types of polishes and uses.**
 - 7.7.3 Commercial names and units of purchase.**
- 7.8 Hard Wares.**
 - 7.8.1 Screws**
 - 7.8.2 Nails**
 - 7.8.3 Nuts and Bolts.**
 - 7.8.4 Hinges**
 - 7.8.5 Door fittings - Tower bolt, Draw bolt Haspenstible, Latches. Door knob. Mortice Lock**
 - 7.8.6 Door closers & stoppers**

2) Miscellaneous Materials

- 8.1 Plastics, Properties and their use in buildings.**
- 8.2 Sound insulating materials, characteristics of a good sound insulating material, different sound insulating materials, their commercial names and units of purchase.**
- 8.3 Fire proofing materials, characteristics of good fire proofing materials, different fire proofing materials, their commercial names and units of purchase.**
- 8.4 Damp proofing materials, characteristics of good damp proofing material, different damp proofing materials, their commercial names and units of purchase.**
- 8.5 Glass: types of Glass, market forms, specifications and units of purchase.**
- 8.6 Sandpaper & Emery paper, their uses, specifications and units of purchase.**
- 8.7 Names of cleaning materials for floor, walls, glass panes and their units of purchase.**
- 8.8 Non-ferrous metals & alloys - such as Brass, Aluminium, Copper, their properties and uses.**
- 8.9 Adhesives: Types, commercial names, uses, and units of purchase.**
- 8.10 Linoleum - Market forms, properties and uses.**

CONSTRUCTION TECHNOLOGY PRACTICALS - II

Hours - 6 to 8 marks

Full Marks- 60 marks

- 1) **General clearance of the site.**
- 2) **Excavation for an open trench.**
- 3) **Setting of bricks for spread footing foundation (DRY BRICKS WITHOUT MORTAR)**
 - 3.1 **Setting of bricks for 1 brick thick wall in English bond up to two metre high (Dry bricks without mortar).**
 - 3.2 **Setting of bricks for 1 brick thick wall in Flemish bond two metre height (Dry brick without mortar).**
 - 3.3 **Setting brick, for two brick thick pillar up to 1 metre height (Dry brick without mortar).**
 - 3.4 **To visit a building under construction at various stages of construction from excavation, and foundation to completion of building.**
- 4) **Stones**
 - 4.1 **Use of dressing tools.**
 - 4.2 **Sharpening of chisels for dressing stones.**
 - 4.3 **Dress a stone & finish it to various surface finishes.**
- 5) **Arches and Lintels**
 - 5.1 **Students should be asked to lay dry bricks in various forms of Arches at ground surface. (This will include cutting of bricks to required shape)**
 - 5.2 **Bond bar for a 1.3 meter span brick lintel (Student should be able to make standard hook).**
 - 5.3 **Lay a 1.3 meter span brick lintel at ground surface (Without using mortar).**
- 6) **Doors and windows**
 - 6.1 **Students should be asked to go to the locality and record various types of door used and the timber used for them. Types of construction: Doors; Battened door, panel door, flush door, Windows: wooden and fabricated from steel sections**
- 7) **Ground Floor**
 - 7.1 **To list the various operations of construction of floors of given type during the construction of the following buildings.**
 - 7.1.1 **Govt. residential buildings,**
 - 7.1.2 **Govt. public buildings,**
 - 7.1.3 **Private residential buildings,**

(The student will also be asked to list down the deviation in operations observed from theory lesson.)

8) Roofs

Flat Roof: Study of construction of R.C.C. Roof and R.B.C. roof of buildings under construction. Students will note down details of arrangement. He will also observe the process of mixing & laying of concrete and concealed pipe layout for electrical wiring. Pitched roof: G. I. Tin sheet, A.C Corrugated sheet, Tiled roof, Thatch roof. Fabrication of truss from steel sections or tubular sections (PIPE)

9) Stairs and Stair cases

9.1 To study the construction foundation for a stair cases.

9.2 To study the shuttering arrangement done for a stair case.

9.3 To study the bar laying arrangement done for a stair case.

9.4 To study the laying of cement concrete for a stair case. N.P.

(The teacher should keep in touch with the construction work in the locality & thus find out the stage at which the construction work is to be shown to his students).

BUILDING MATERIALS

1) Market Survey: For trade/commercial names, specification, units of purchase and prevalent market rates for the following:

- 1.1 Stone (Blocks & slabs)**
- 1.2 Bricks. Hollow blocks, etc.**
- 1.3 Tiles- Flooring tiles and clay roofing tiles.**
- 1.4 Terra Cotta-earthen ware, stone ware, S.W. pipes, water closets gully traps & glazed earthen tiles.**
- 1.5 Cement - ordinary Portland, quick setting cement & other special cement.**
- 1.6 Lime: Hydraulic lime, & limes.**
- 1.7 Stones Aggregates: Coarse aggregate, medium aggregate and fine aggregate.**
- 1.8 Brick ballast & surkhi.**
- 1.9 Marketable forms of various types timber available in market.**
- 1.10 Various preservatives of timber available in market.**
- 1.11 Timber allied products such as plywood, hard board, block board, and sunmica.**
- 1.12 Materials required for white Washing/colour wash such as lime, Zinc white and Aluminum, etc.**
- 1.13 Various types of distempers such as oil bound and Water bound.**
- 1.14 Papers for wall papering.**
- 1.15 Various types of paint available in the local market.**
- 1.16 Various types of varnishes & polishes available in the local market.**
- 1.17 Hardware - such as screws, nails, bolts & nuts, hinges for door fitting, door closer and stoppers.**
- 1.18 Plasters, and its products available in the local market.**
- 1.19 Sound insulating material available in the local Market.**
- 1.20 Fire proofing materials available in the local market.**
- 1.21 Dam proofing materials available in he local market, use of damp proofing chemical.**
- 1.22 Various types of glasses available in the local market.**
- 1.23 Sand paper & emery papers of various grades and qualities.**
- 1.24 Cleaning Materials for floors, walls, glass panes etc.**
- 1.25 Ferrous materials in various markets forms.**
- 1.26 Non ferrous materials such as Brass, Aluminum, Copper, zinc, & lead.**
- 1.27 Various types of adhesives**
- 1.28 Market forms of Linoleum.**

2) Brick

2.1 Stacking of bricks

2.2 Counting of bricks

2.3 Field testing of bricks such as for texture, dimensions water absorption, colour & efflorescence.

3) Cement and Lime

3.1 Testing of cement & lime in the field.

3.2 Testing of brick, testing of cement concrete cubes.

4) VOLUMETRIC MEASUREMENT OF COARSE & FINE AGGREGATES -

Sieve analysis fineness modulus of sand.

5) TYPE OF JOINERY

Dove Tail Joint, Mortice and tenon Joint , Tongue and groove joint and splice joint.

CONSTRUCTION TECHNOLOGY

DETAILED SYLLABUS

CLASS – XII

Paper - I THEORY - Three Hours.

- 40 marks

Deep Foundation, Engineering classification of soil, Bearing capacity. General concept of piled, foundation.

1) Stone Masonry

- 1.1. Tools required for stone masonry.
- 1.2. Types of stone masonry.
- 1.3. Different types of joinery in stone masonry.

2) Brick Masonry

- 2.1 Tools required for brick masonry.
- 2.2 Methods of laying Bricks in walls.
- 2.3 Precaution to be taken in construction of walls.
- 2.4 Methods of fixing new work with old work
(Toothing Racking back and Block Building)
- 2.5 Defects in Brick work, Maintenance of Brick Masonry construction.

3) Mortar and Concrete

- 3.1 Concept of water cement ratio, workability & curing.
- 3.2 Tools required for preparation of different types of mortar.
- 3.3 Methods of preparation of different types of mortar of different proportions.
- 3.4 Function affecting the strength of mortar.
- 3.5 Tools required for preparation of concrete.
- 3.6 Preparation of concrete of different proportion (This includes batching & mixing).
- 3.7 Factors affecting strength of concrete.

4) Concept of frame structure

- (i) R.C.C. frame including foundation
- (ii) Structural steel frame & Relative advantage.

5) Floors

- 5.1 Tools required for laying cement Concrete, Terrazzo, Mosaic, Marble and Stone slab in floor.
- 5.2 Materials required for cement Concrete, Terrazzo, Mosaic, Marble and stone slab floors.
- 5.3 Method of construction of cement concrete floor of 1:2:4 mix.
- 5.4 Method of construction of Terrazzo & Mosaic floor, Methods of construction of Marble and stone slab floors.
- 5.5 Methods of construction of Brick floor.
- 5.6 Causes of defects in Brick, Cement concrete, Terrazzo & Mosaic marble and stone floors and their remedies.

- 5.7 Repair of old floors.
 - 5.8 Methods of Cleaning, Cutting & polishing of Mosaic, Terrazzo and marble floors - (Materials & tools required).
- 6) Roofs
 - 6.1 Tools required to fix A. C. sheet & G. I. Sheet & roof covering.
 - 6.2 Methods for fixing of A. C. sheet and G. I. sheet roofs coverings.
 - 6.3 Tools required to lay R.C.C. (including knowledge for bending and binding and placement of bars)
 - 6.3 Repair of cracks in R.C.C. structure (Methods, Tools & Materials required).
 - 7) Wall, Fencing & Gates
 - 7.1 Construction & Maintenance of Compound wall, Fencing.
 - 7.2 Fabricated steel gate.
 - 8) Road work
 - 8.1 Earth work for Road formation, Embankment & cutting,
 - 8.2 Road construction and road surfacing.
 - 8.3 Method of embankment construction, simple culverts
 - 9) Surface Finishes
 - 9.1 Plastering.
 - 9.1.1 Tools required for Plastering.
 - 9.1.2 Methods of cement & lime plastering.
 - 9.1.3 Preparation of surface for plastering.
 - 9.1.4 Application of plaster coats.
 - 9.1.5 Curing of plaster.
 - 9.1.6 Defects in plasterwork and their preparations.
 - 9.1.7 Repairs of defective plaster.
 - 9.2 Painting.
 - 9.2.1 Tools & Material required for painting.
 - 9.2.2 Operation involved in painting of a masonry works.
 - 9.2.3 Repair of old painting.
 - 9.3 Painting of wood work
 - 9.3.1 Tools required for painting.
 - 9.3.2 Painting of a new wood work - preparation of surface Knotting, Priming, Stopping, Under Coast & finishing coat.
 - 9.3.3 Repairing of old wood work - Methods of cleaning old surface repainting of old surface.
 - 9.4 Painting or iron and steel work.
 - 9.4.1 Methods of painting of new steel work.
 - 9.5 Painting of other surfaces
 - 9.5.1 Methods of painting of brick work and plastered surface.
 - 9.5.2. Faults or defects in painting work and their remedial measures.

9.6 Varnishing and polishing

9.6.1 Tools required for varnishing and polishing.

9.6.2 Process of varnishing and Polishing. Preparation of surface, knotting and priming. Application of varnish coats.

9.6.3 Methods of polishing metal.

9.7 Distempering.

9.7.2 Tools required for distempering.

9.7.3 Methods of application of distempers - preparation of surface, priming coat & final coat.

9.8 Cement painting

9.8.2 Tools & materials for cement painting.

9.8.3 Process for application of cement based paint on new and old surfaces.

9.9 Wall papering.

9.9.2 Tools and materials required for wall papering.

9.9.3 Process for placing wall paper in old and new walls.

10) Damp proofing :

9.1 Sources of Dampness.

9.2 Effect of Dampness.

9.3 Precautions to be taken to prevent dampness.

9.4 Methods of damp proofing basement ground floors, plinth and walls. Special damp proofing arrangements in bathrooms, W.C. and kitchen. Damp proofing for flat and pitched roofs and window sills.

9.5 Methods for laying damp proof Coats in existing buildings.

11) Timber Works

10.1 Repair and maintenance of decayed timber components in buildings & replacement of fittings.

12) Glazing Work

11.1 Tools required

11.2 Methods of cutting glass and fixing glass as described

11.3 Material required for cleaning old glass panes and method of cleaning.

10) Vitrified Tiles Work

10.1 Method of cleaning of China Clay glazed Tiles and materials required for cleaning, use of glazed tiles for flooring, wall dado etc.

12)Anti- termite Treatment in Buildings

11.1 Method of anti-termite treatment for walls.

11.2 Anti-termite treatment for soil.

11.3 Anti-termite treatment for wood work in Building.

13)Rolled Structural Steel Section

12.1 Rolled Structural steel section comprising of Beam, Channel & angles

12.2 Use of such materials for fabrication of Shed

12.3 Method of fabrication by riveting, bolting and welding

12.3 Maintenance of Steel Structures and prevention from corrosion.

BUILDING TECHNIQUES

- 1. Carpentry**
 - 1.1 Carpentry tools, their use their care and maintenance.**
 - 1.2 Joinery in wood work.**
 - 1.3 Uses of timber for various purposes.**
 - 1.4 Joinery, Materials used in joinery-(screw, nails, nuts, bolts, glues, etc)**
- 2. Fitting**
 - 2.1 Tools used in filing, tapping, marking and measuring.**
- 3. Masonry**
 - 3.1 Tools of a mason, their use, care and maintenance.**
- 4. Shuttering**
 - 4.1 Object of shuttering**
 - 4.2 Types of shuttering**
 - 4.3 Materials used in shuttering.**
 - 4.4 Characteristics of a good shuttering**
 - 4.5 Constructional details of shuttering for beams, columns and slabs.**
- 5. Scaffolding**
 - 5.1 Purpose of scaffolding.**
 - 5.2 Materials used for scaffolding.**
 - 5.3 Types of scaffolding.**
 - 5.4 Characteristics of a good scaffolding.**
 - 5.5 Various types of rope knots and metal coupling.**
 - 5.6 Erection of a scaffolding.**
- 6. Plumbing**
 - 6.1 Different types of pipes& fittings for water supply.Their specifications & use.**
 - 6.2 Different types of pipes & fittings for sewerage. Their specifications & use.**
 - 6.3 Sanitary fittings & fixtures such as water closets, wash**
 - 6.4 basins, urinal-posts, stop cock, kitchen sink, bid cock, pillar cock.**
 - 6.5 Materials for joinery for water pipe & sewer pipe.**
 - 6.6 Pipe and sewer joinery. Procedure to be adopted while making joinery in water pipes & sewer.**
 - 6.7 Gradient followed in a sewer pipe laying of sewer.**
 - 6.8 Brief ideal of inspection chamber, manhole, intercepting, chamber and ventilating pipes and their use.**
 - 6.9 Plumber tools, their use, care and maintenance.**

7. Steel Structures

- 7.1 Rolled Structural Steel section comprising - Beam, Channel and Angle**
- 7.2 Use of such material for fabrication of shed**
- 7.3 Method of fabrication by riveting, bolting and welding.**
- 7.4 Maintenance of Steel Structures and prevention from corrosion.**

CONSTRUCTION TECHNOLOGY PRACTICAL

Paper II

Full Marks- 60 marks Hours-(6to8)

1) Stone Masonry

1.1 Identification of commonly used building stone.

1.2 To repair cracks in stone masonry.

2) Brick Masonry : In cement Mortar or mud mortar

2.1 To raise a brick wall –full brick width & two full brick width 40 cm, in English or Flemish bond to a ht. Of 2.0m. On Spread footing.

2.2 To repair old brick work.

3) Mortar and Concrete

3.1 To prepare Lime mortar and cement mortar.

4) Lintels

4.1 To make R.C.C. or brick lintel of a span 1.00m. after making proper arrangement for centering.

5) Roofs

5.1 To repair cracks in various types of roofs to stop leakage.

5.2 To repair the Mangalore tile roof covering.

6) Surface Finishing

6.1 To plaster a given brick surface of area 1.0 x 1. 0m.

6.2 To repair a defective plaster surface.

6.3 Pointing To do pointing on old brick masonry work.

6.4 Painting

6.4.1 Painting of wood/steel work (old & new).

6.5 White washing/distempering colour washing/Cement painting: to practice/Whitewashing/Distempering/ colour washing/Cement painting of area of 2m X2m.

6.6 Decorative plaster and plaster of pains.

7) To repair wooden worn-out door/ window/ ventilators/other wooden structures.

8) To replace broken glazed tiles. (N.B.) The students should be encouraged to do repair work in the institution building under the guidance of the teacher; quality of work should be the main objective.

BUILDING PRACTICES

1) Carpentry

1.1 Use of carpentry tools as follows.

1.1.1 Sawing of timber.

1.1.2 Planing of timber by using various types of planers.

1.1.3 Exercises involving the use of screw, nuts, bolts and glue, adhesive etc.

1.1.4 Painting + Polishing wood work.

2) Fitting

2.1 Use of hand saw for cutting pipe, iron rod Including rod cutting and bending and m .s. plate shaping.

3) Masonry

3.1 Exercises involving use of mason tools such as cutting of bricks, making bricks ready for various architectural mouldings.

4) Scaffolding

Erection of scaffolding by using various materials available. (The students should be able to make various rope knots for scaffolding.)

5) Shuttering

Exercises involving preparation of shuttering for arches lintels. R.C.C./R.B.C. roofs, etc.

6) Plumbing

6.1 Cutting of pipe to required length - G I. & P. V. C.

6.2 Cutting of thread on a given piece of pipe - G. I. & P. V. C.

6.3 Joining G. I. Pipes, plastic pipes by suitable method - .

6.4 Joining of sewerage pipes i.e. cast-iron and stoneware for disposal of waste water.

6.5 Exercises involving the fittings of various pipe fittings.

6.6 Exercises involving the fittings of various sewerage fittings.

6.7 Installation & construction of water storage tank and distribution pipe line.

6.8 Septic tank, Bio-gas plants.

BYE – LAWS & GEOMETRICAL BUILDING WORKING DRAWINGS

PRACTICAL- PAPER II

DETAILED SYLLABUS

CLASS – XI

(4-6 hours) Full marks 60

Candidates will be required to reach a minimum standard in the subject as a whole. The use of drawing board, Tee- Square and set- square will be required. (Candidates may, if they wish, use a drawing board fitted with a parallel motion straight edge. The use of drafting machines will be permitted). A2 size paper will be used. The recommendations of IS: 962:1967 Indian Standard, Code of Practice for Architectural and Building Drawing should be followed. The use of models is to be encouraged in studying this syllabus.

Section I: Introduction to Engineering Drawing

Use of drawing instruments and material; Lettering technique and Practice; Methods of dimensioning drawing.

PART A ENGINEERING DRAWING

1) Free Hand Sketching

- 1.1 Different types of lines as per I.S.I.**
- 1.2 Practice in free – hand sketching of horizontal, vertical and inclined lines, geometrical figures such as triangles, rectangles and circles.**
- 1.3 Preparing sketch plants, layouts etc.**

2) Principle of projection.

- 2.1 Recognition of objects from the given pictorial view.**
- 2.2 Identification of surfaces from different objects and pictorial views.**
- 2.3 Sketching practice of pictorial views from objects.**
- 2.4 Principles orthographic projections.**
- 2.5 Three views of a given object.**
- 2.6 Invisible, centre, extension and dimension.**
- 2.7 Location and drawing of missing lines.**

3) Dimensioning Technique and Requirement of views.

- 3.1.1 Necessity of Dimensioning.**
- 3.1.2 Methods and principles of Dimensioning as per I.S.I. 696 Requirement of views for complete Dimensioning.**

4) Section

- 1.1 Importance
- 1.2 Methods of representing the section
- 1.3 Conventional sections for various materials.
- 1.4 Classifications of sections.
- 1.5 Conventions in sectioning.

5) Symbols and Convention

- 5.1 Civil engineering and sanitary fitting symbols.
- 5.2 Electrical, fitting symbols for interior domestic installations.
- 5.3 Building line plan, drawing with electrical and civil engineering symbols.

AUTO-CAD

(ENGINEERING DRAWING, CIVIL)

COURSE CURRICULUM (THEORY)

FUNDAMENTAL OF COMPUTER:

Different Components of a digital computer, concept of PCs & their specifications, Data representation in digital Computer.

STARTING AUTOCAD:

Overview of CAD, Advantages of AutoCAD over Conventional method of drafting. System requirement, Installing AutoCAD, pointing device (mouse, tablet), Understanding the Auto CAD Interface (Toolbar, Menus), Cursor Menu, the command window, the Text window). Using scripts to run command.

ORGANISING YOUR DRAWING:

Conforming to standards & using different set up methods.

IDEA OF USING COORDINATE SYSTEM:

Using a Coordinate system to specify points, Using Direct distance entry, Shifting and Rotating the Co-Ordinate system.

IDEA ABOUT CREATING OBJECTS:

Drawing Lines, Drawing curved objects, Creating Point Objects, changing the drawing order of objects, Creating Solid-filled areas, Creating Regions, Hatching Areas, Custom objects and Proxies.

IDEA OF DRAWING WITH PRECISION:

Adjusting snap and grid alignment, Using Ortho mode, Calculating points and values, Calculating areas, Calculating Distance and Angle, Displaying coordinates & Inquiry methods.

IDEA OF CONTROLLING THE DRAWING DISPLAY:

Using zoom and pan, using aerial View Using Named View, Using Tiled View ports, Turning Visual Elements On & off.

IDEA OF EDITING OBJECTS:

Working with named objects.

USING LAYERS, COLOURS AND LINE TYPES:

IDEA ABOUT ADDING TEXT TO DRAWINGS :

Working with Text styles, using line Text, and checking spelling.

IDEA OF DIMENSIONING AND TOLERANCING:

Dimensioning concepts, creating concepts, creating Dimensions, adding dimensions, editing dimensions, Creating dimensions style, Idea of Using style families, using style overrides. Working with Dimension styles, Adding Geometric tolerances. Creating and Modifying arrowheads.

IDEA OF USING BLOCKS, ATTRIBUTES AND XREFS :

Working with blocks, & External Reference.

Section II: Plane Geometry

Construction and use of scales including diagonal scales. Enlargement and reduction of irregular plane figures. Construction of triangles, quadrilaterals and polygons. Similar Plane figures, Problems on circles, tangents and normals. Loci such as the paths of points in simple link mechanism. Methods of construction of ellipse, including its elementary properties, parabola and rectangular hyperbola cycloidal (sp.) and involute curve.

Section III: Solid Geometry

Orthographic projection. (Diagrams printed in the question papers may be in either First or Third Angle projection; the projection used will be stated. Solutions in either First or Third Angle projection will be accepted.) Projection involving use of auxiliary planes; simple problems on auxiliary projection. Simple problems on the intersection of prisms, pyramids, cylinders, right circular cones and spheres. Determination of true length of a line in space: sections and surface developments of prisms, pyramids, cylinders and right circular cones. Isometric and oblique projection without the use of Isometric scale perspective view.

GEOMETRICAL BUILDING WORKING DRAWINGS PRACTICAL- PAPER II

DETAILED SYLLABUS

CLASS – XI (4-6 hours) Full marks 40

(1) BUILDING BYE LAWS

Guidelines for preparation of Building plan conforming to National Building Code & Municipal Rules.

BUILDING DRAWING PAPER II (ELEMENTARY)

Class XI

SECTION 1

Candidates will be required to answer ALL questions.

The course on building drawing should be based on the form and construction of simple buildings and flats of building; small dwelling houses up to five floors (ground + four), garages, sheds and green – houses.

Orthographic projection in either First or Third Angle projection, including sectional views of buildings and parts of buildings and details, e.g. foundations, walls (including openings), jambs, sills, lintels and arches, floors and roofs, doors and windows, simple stairs.

Preparation of simple working drawings and details from free-hand sketches.

Free -hand sketching on both orthographic and pictorial from of simple building details sessional work one project comprising 4 nos drawing preparation (3hrs p/w)

Drawing paper (folded) will be provided but candidates may use any type of drawing paper for answering the question provided it is of suitable quality and of the correct size.

- 1) Practice in Lettering Techniques of letters and numerical in 3,5,8 and 12 mm series.**
- 2) Practice of free hand sketching of:**
 - 2.1 Horizontal lines, vertical lines and inclined lines.**
 - 2.2 Triangles and rectangles**
- 3) Sketching practice of pictorial views from given objects**
- 4) To sketch three views of simple objects.**
- 5) To draw missing line of a given incomplete drawing of a given object.**

BUILDING BYE-LAWS&BUILDING WORKING DRAWINGS WITH AUTOCAD

PRACTICAL PAPER II DETAILED SYLLABUS

CLASS XII FULL MARKS 60 - 4 to 6 hours

Working drawing basics – Building codes and standards for reference, Selection of appropriate scale for drawings, Procedure of preparing working drawings, Plans – Standard symbols for wiring and electrical fittings, plumbing symbols, Heating / Air-conditioning and ventilating symbols, Roof plans and plot plans, Elevations –Exterior elevations,

Interior elevations, Sections

- (i) Residential building upto five floor.**
- (ii) Commercial building**
- (iii) Institution building**
- (iv) Community centre / Library building**
- (v) Land scaping**
- (vi) Colouring of the drawing on the print. Conforming to Building bye law**
- (vii) Structural detailing (R.C. + steel) sessional sheets 4.**

Typical (FSD), Scheduling-Schedules for doors and windows, Schedules for finishes, Information to be indicated on the sheet – Job title usually consisting of Name of project, Name of owner and site address. Subject of drawing, scale or scales in the drawing, date of drawing Job number, Drawing number suffix, drawing reference if a classification system is adopted. Names of Architect, engineer and – consultant together with addresses and phone nos. Architect, and engineers seal., dates and initials of individual making the drawing or tracing, general notes, table for revision, north point, - 1:1 or :’1:20.

Recommended scales to be used for working drawings. For details drawings – 1:1 or’1:20 and 10mm grid Recommended. For working drawings 1:50/or 1:200 and a 6mm grid is recommended. Reproduction of drawings- blue printing- chemically Treated paper, semi-dry prints, Ammonia vapour machine prints, electrostatic copying, direct copying, method of cutting and folding prints, preserving original drawings-indexing, storing, preserving and retrieving drawings.

6) Reading Practice of Building Drawings

Read the plan, elevations and sectional elevation of the following: Foundations, doors, windows, roofs, floors, slabs, stairs, beams, columns and complete buildings drawings.

7) Sketching Practice of Building Drawings. Practice of making rough sketches of the plan, elevation and sectional elevation of following :

Foundations, doors, windows, floors, roofs, slabs, beams, columns and complete building drawings. Layout of kitchen, Bathroom and toilet.

AUTO-CAD (ENGINEERING DRAWING, CIVIL) COURSE **CURRICULUM (PRACTICAL)**

FUNDAMENTAL OF COMPUTERS:

Overview Of Operating System: Different DOS Commands, Working Concepts With Windows 95/98.

STARTING AUTOCAD:

Overview of CAD, Advantages of Auto CAD, Method of Drafting system requirements, Accessing Commands -(Using a Toolbar, a Menu, the command, line, commands, Transparently, Long file names), Switching from dialog box to command line ,Editing command or text window text. Correcting mistakes, refreshing the screen display, Modifying the Auto CAD Environment, Opening Existing Drawing, Saving Drawings, Exiting Auto CAD.

ORGANISING YOUR DRAWING:

Conforming to standards, setting up new drawings, Using Different set up methods of organising information on Layers & using templates.

USING COORDINATE SYSTEM:

Using a Co-ordinate system to specify points, using a Direct distance entry, shifting and rotating the Coordinate System.

CREATING OBJECTS:

Drawing lines, Drawing curved objects, Creating point Objects, changing the drawing order of object, creating Solid-filled areas, creating Regions, Hatching Areas, Custom objects and proxies.

DRAWING WITH PRECISION:

Adjusting snap and grid alignment, Using ortho mode, Snapping to Geometric points on objects, Using points Filters Using Tracking, specifying measurement & Divisions, Drawing construction line. Displaying coordinates and locating points.

CONTROLLING AND DRAWING DISPLAY:

Using Zoom & pan, Using Aerial View, Using Named View ,Using Tiled View ports, Turning Visual Element On & off.

EDITING OBJECTS:

Selecting objects, editing object using the object Properties toolbar, matching properties of other objects, Copying objects, moving objects erasing objects, resizing Objects, inserting breaks in objects, exploding Objects, editing polylines, editing multilines, editing Splines, chamfering objects, filleting objects, editing hatches.

USING LAYERS, COLOURS AND LINE TYPES:

Working with layers, working with colours, working with Line types, assigning layers, colours, and line types to Objects.

ADDING TEXT TO DRAWINGS:

Working with Text styles, using line Text, Using Multiline text substituting fonts, using text editors for multiline text.

DIMENSIONING AND TOLERANCING:

Dimensioning concepts, creating concepts, creating Dimensions, adding dimensions, editing dimensions, Creating dimensions style, Using style families, using style overrides. Working with Dimension styles, Adding Geometric tolerances. Creating and Modifying arrowheads.

USING BLOCKS, ATTRIBUTES AND XREFS :

Working with blocks, working with attributes, using External Reference.

5.CONSTRUCTION ESTIMATING COSTING MANAGEMENT & ACCOUNTS

PART B : CONSTRUCTION ESTIMATING AND COSTING

Theory - 3 hrs PAPER 1 FULL.MARKS- 50Marks

CLASS- XI

1) Introduction

Types of estimates, drawing to be attached with these estimates, preparation of rough cost estimates.

2) Different Methods of taking out quantities

Centre line, into – in, out-to-out.

2.1 Taking quantities for walls of different shapes.

2.2 Various forms used in estimating- measurement forms, abstract of cost and material statement form.

2.3 Measuring Tapes.

2.4 Taking quantities for floor slab

3) Specifications

3.1 Simple specification for construction of building

For painting, varnishing, polishing of wood painting and polishing of metal work.

3.2 Units of measurement and units of payment of different items of work.

4) Calculation of quantities of Materials for:

4.1 Plain cement of concrete of different properties.

4.2 Brick and stone masonry in cement and lime mortar.

4.3 Plastering and pointing with cement mortar in different proportions.

4.4 White washing and colour washing

5) Analysis of Rates :

Of the following items of work when the data regarding labour, rates of material and rates of labour if given:

5.1 Earthwork in excavation and filling with a concept of lead and lift.

5.2 Cement concrete in foundation.

5.3 R.C.C. and R.B.C. in roof slabs.

5.4 First class burnt brick masonry in cement mortar.

5.5 Coarse rubble stone masonry in cement mortar.

5.6 Cement Plaster.

- 5.7 Cement pointing – flush – deep pointing.**
- 5.8 White washing on a new surface.**
- 5.9 Painting new wood work.**
- 5.10 Cement concrete floor.**
- 5.11 Panelled and glazed door.**

- 8) Preparation of detailed Estimates.**
Complete with detailed reports, specifications, and abstract of cost and material statement for a small residential building with flat roof.

5.CONSTRUCTION ESTIMATING COSTING MANAGEMENT & ACCOUNTS

PRACTICALS

Paper –II

3 hours-

50 marks

2.1

- 1) To read the given drawings of simple buildings
- 3) To read drawings of foundations, doors, windows, roofs, floors, beams and columns, etc.
- 4) To read complete set of given building drawings.
- 5) To make rough sketch of plan, elevation and sectional elevation of foundations, doors, windows, roofs, floors, slabs, stairs, beams, columns and complete building drawings.
- 6) To calculate quantities of materials for:
 - 10.1 Plain concrete of different proportion.
 - 10.2 Bricks and stone masonry in cement and lime mortar.
 - 10.3 Plastering and pointing with cement mortar in different proportions.
 - 10.4 White washing and colour washing.
- 7) To do rate analysis of the following items of work.
 1. Earth work in excavation.
 2. Cement concrete in foundation.
 3. R.C.C. and R.B.C. in roof slabs.
 - 4 Brick masonry in cement mortar.
 - 5 Coarse rubble measuring stone in concrete mortar.
 - 6 Coarse procedure.
 7. Cement Plaster.
 8. White washing on a new surface.
 - 9 Painting new wood work.
 - 10 Cement concrete floor.
 - 11 Panelled and glazed door.
- 8) To prepare a detailed estimate of a small residential building with flat roof.

PART A: CONSTRUCTION MANAGEMENT

CLASS XII

DETAILED SYLLABUS

Paper – I

THEORY (3 hours)

PART A

Full Marks -50

1) Introduction

1.1 Classification of construction into light, heavy and industrial construction.

1.2 Resource for Construction industry – men, machines, materials and money, Need for management.

9) Construction Planning

2.1 Stages at which planning is done; pre-tender and contract planning by the contractor.

2.2 Preparation of construction schedule, labour schedule, material schedule, equipment schedule and finance schedule.

10) Construction Labour:

3.1 Labour welfare

3.2 Payment of wages, Minimum Wages Act

3.3 Workman compensation act

3.4 Contract labour act

3.5 Labour insurance

11) Inspection and Quality Control:

4.1 Technical services required for inspection, major items in construction job requiring quality control and writing reports on site visit.

4.2 (I) Supervision of construction

4.3 (ii) Problems arising out of operation of contract. (a) Extra items

(b) Changes in items

(c) Changes in drawing.

PART B: ACCOUNTS CONSTRUCTION MANAGEMENT

- 1) Introduction: Necessity of Maintaining Accounts**
 - 1.1 List of reference book on account.**
- 2) Stores**
 - 2.1 Stores, their necessity and safe custody.**
 - 2.2 Monthly balance return of stock.**
 - 2.3 Surplus and shortages of stock – action for ratification of stock register.**
 - 2.4 Losses of stock, reporting the loss, estimates of loss of stock and writing off.**
- 3) Works**
 - 3.1 Classification of works according to cost**
 - a) Major works b) Minor works c) Petty works**
 - 3.2 Methods of carrying out work**
 - a) departmentally through daily labour**
 - b) through contractors**
 - c) Labour contract**
 - 3.3 Different types of contract**
 - a) Percentage rate contract as per CPWD Schedule**
 - 1) Labour rate (% above or below) for various items for covered area construction (private construction only)**
 - ii Through rate basis (% above or below)**
 - b) Item rate contract**
 - 3.4 Allotment of works**
 - a) Concept of quotation and tenders**
 - b) Contract agreement brief reference**
 - c) Works under rules and forms**
 - d) Deposit works**
 - e) Earnest money.**
 - f) Security deposit**
 - g) Secured advance**

CONSTRUCTION MANAGEMENT

PART A

(PRACTICAL PAPER –II) 3 hours Full Marks 50

- 1. To visit construction industry and classify into**
 - 1.1 Light construction**
 - 1.2 Heavy construction**
 - 1.3 Industrial construction**
 - 1.4 To visits construction sites and sketch various types of machinery involved in light/ heavy construction**
- 2. To prepare the following:**
 - 2.1 Construction schedule**
 - 2.2 Labour schedule**
 - 2.3 Material schedule for a given construction Job**
- 3. To note the salient points of wages act, compensation act and labour act.**
- 4. To visit a construction site and note down the salient points being taken care of for quality control of construction work. Report observations made at site.**
- 5. Site supervision of building, road, or other structure**
- 6. Recording measurements from site work.**

PART B : ACCOUNTS

- (1) To do practice of making entries in stock book**
- (2) To prepare an item rate contract for a given construction job**
- (3) To prepare a percentage rate contract as per current schedule of rates for a given small building**
- (4) To prepare an item rate contract for making a garage or site store of 5.5 m long 3.5 m wide and 3.0 m high with asbestos corrugated roof.**
- (5) To visit public works department and discuss with sub-divisional engineer about the following:**
 - 5.1 Quotation: Inviting quotations for supply of building materials like Bricks, Stone Aggregate, sand etc.**
 - 5.2 Contract agreement**
 - 5.3 Work order rules: Issue of work orders for petty works like wall plaster, floor repairs etc.**
 - 5.4 Deposit works.**
 - 5.5 Measurement book, Bill preparation**
 - 5.6 Site order book, muster roll.**

6. SURVEYING AND ENGINEERING SCIENCE

CLASS XI Paper-1- ENGINEERING SCIENCE THEORY

(3 hours)

Full Marks 100

Consisting of part 1 (physics) part2 (mathematics) and part 3 (chemistry)

Part 1 – PHYSICS

- 1. Velocity and acceleration. Laws of motion. Force, mass and acceleration. Acceleration due to gravity. Measurement of g., including examples of bodies moving with variable acceleration, treated graphically.**
- 2. Angular Velocity and angular acceleration**
- 3. Composition and resolution of velocity. Simple problem on projectiles, involving combined horizontal and vertical motion.**
- 4. Measurement and effects of force. Equilibrium of concurrent forces in plane. Parallelogram, triangle and polygon of forces. Reaction, resultant and equilibrant. Bow's notation, Equilibrium of body on inclined plane. Treatment by graphical and mathematical methods.**
- 5. Moments. Application to parallel forces, layers, vertically loaded rigid beams. Centre of gravity : experimental determination and calculation in simple cases. Its relation to stability.**
- 6. Temperature and temperature scales.**
- 7. Thermal expansion of solids, liquids and gases. Coefficient of linear expansion of solids and coefficient of cubical expansion of liquids and gases. Charles' Law Absolute Temperature.**
- 8. Strength of materials. Simple problems. Hooke's Law, Stress and strain. Young's modulus. Tension and compression. Elastic limit. Ultimate strength. Factors of safety:**
- 9. Friction. Conditions affecting friction. Lubrication. Conditions should include types of materials, their surface finish, and wetness or dryness.**
- 10. Machines. Simple single-string pulley systems. Simple and differential wheel and axle, Weston pulley block. Screw jack. Worm (single start thread and wheel). Gear and belt drives. Velocity ratio, mechanical advantage and efficiency.**

Part II – GENERAL MATHEMATICS

1. Arithmetic

- I. Logarithms and Logarithmic expressions : Common and natural
- II. Define a logarithm to any base
- III. Convert simple indices relationship to logarithmic relationships and vice versa.
- IV. Deduce the laws of logarithms in the following terms where b is any base.
 $\log_b (MN) = \log_b M + \log_b N$
 $\log_b (M/N) = \log_b M - \log_b N$
 $\log_b b^a = a \times \log_b b$
- v. State that $\log_b 1 = 0$, $\log_b b = 1$
- vi. State that as $x \rightarrow 0$, $\log_b x \rightarrow (-)$
- vii. Apply the laws of logarithms to simplify the expressions
- viii. Apply the laws of logarithms to solve equations
- ix. Determine natural logarithms from tables and by calculator
- x. Evaluate expressions and solve equation involving natural logarithms.

2. Mensuration

- i. Areas and perimeters of common plane figure.
- ii. Surface areas, volumes and masses of common regular solids of prismoidal and cylindrical shapes
- iii. Surface areas, volumes and masses of common regular solids of pyramidal, conical and spherical shapes
- iv. Areas of irregular figures using the co-ordinate rule

3. Algebra

- i. **Formulae and Laws**
Evaluation of formulae and expressions with or without the use of calculators
- ii. **Determine a logical sequence of steps to evaluate an expression containing at least two variables / constants e.g. ax , $(a+x)^n$, with and without the use of a calculator**
- iii. **Draw up a table of values by carrying out repeated calculation from an equation or formulae for different values of the variables**
- iv. **Simple quadratic equations**
- v. **Recognise Factors of quadratic expressions, including $(a + b)^2$, $(a - b)^2$ and $(a^2 - b^2)$**
- vi. **Factorise quadratic expressions, including perfect squares and the difference of two squares.**
- vii. **Recognise some simple quadratic expressions which do not factorise e .g $(a^2 + b^2)$**
- viii. **Define the roots of an equation**
- ix. **Determine the equation which is satisfied by a given pair of roots**
- x. **Recognise a quadratic expression, a quadratic equation**
- xi. **Solve quadratic equations with real roots by factorisation**
- xii. **Solve quadratic equations which provide real roots by the use of the formula_____**
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$
- xiii **Form and solve quadratic equations which are mathematical models of practical problems, e.g. linear accelerated motion, second order chemical reaction.**
- xiv **Check a solution of equation by substitution, disregarding irrelevant roots.**
- xv **Solve simultaneous quadratic and linear equations**

4. Trigonometry

- i Some properties of trigonometric functions
- ii sketch a sine wave over one complete cycle by relating the angle of rotating unit radius to the vertical projection
- iii Sketch a cosine wave over one complete cycle by relating the angle of rotating unit radius to the horizontal projection
- iv Define $\tan A = \frac{\sin A}{\cos A}$ and sketch the graph of $\tan A$ as A varies from 0° to 360°
- v Derive the relationship $(\sin^2 A + \cos^2 A) = 1$
- vi Describe the periodic properties of trigonometric functions

- vii State and use the sine rule for a labelled triangle in the form of
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

- viii Apply the sine rule in the solution of practical problems
- ix Formulae for cosine rule and area of a triangle
- ix State the cosine rule for a labeled triangle in the form of $a^2 = b^2 + c^2 - 2bc \cos A$

Part III: Chemistry

Elementary chemistry

States of aggregation of matter, Indestructibility of matter and of energy Elements and Compounds .The balance, weight and measures Effect of pressure and temperature on volume of gases Coefficient of cubical expansion of liquid and gases Charles's Law, Absolute Temperature Common laboratory processes, Mixture Decantation, Combination by weight and volume Decomposition, dissociation. Combustion, Oxidation, Reduction, Acids, bases and Salts, Neutralisation

Inorganic chemistry

Hydrogen, Oxygen Nitrogen, Ozone, Air, Ammonia, Acetylene Sulphuric Acid, Hydrochloric acid, Nitric Acid Water Coal, Coal gas Sodium, Potassium, Calcium, Magnesium, Carbon, Phosphorus, Zinc, Copper, Lead, Aluminium, Tin, Nickel, Iron, & steel .Silver Oxides, Hydroxides, Chlorides, Nitrates, Sulphates, Carbonates, Hydrogen peroxide, Carbon monoxide, Carbon dioxide, Sulphur dioxide, sulphide, Chlorine, Bleaching powder, Chlorates of Calcium and Potassium, Catalytic agents.

SURVEYING

CLASS - XII

DETAILED SYLLABUS

Paper – I –THEORY

(3 hours) FULL MARKS 40

- 1) **Definition and object of surveying**
Tools and equipment such as chain, arrows, pegs, ranging rods, cross staff, measuring tapes, etc
- 2) **Chain Surveying**
Testing of a chain, principles of chaining, survey reconnaissance, base line, main station, tie station, tie lines and their selections. Well conditioned and ill conditioned triangles, upkeep of a field book, overcoming obstacle. Ranging a line – direct and reciprocal ranging. Errors in chaining, chaining along sloping grounds, off sets, rectangular and oblique. Principle and uses of an optical square, conventional signs for plotting, finding area of a plotted map by various methods including the use of planimeter. use of Cadastral survey map for verifying Location of a plot of land. problems of finding correct lengths and areas measured with incorrect chain: advantages and disadvantages of chain surveying.
- 3) **Compass Surveying**
prismatic compass, surveying compass, bearing of lines, angle measurements magnetic and true bearing, local attraction, detection and elimination, methods of plotting compass survey traverse : their merits and demerits, adjustments of closing errors by graphical methods. Finding true north by sun's shadow; errors in compass survey and how to avoid the advantages and disadvantages of compass survey
- 4) **Use of levelling instruments for site levelling work. Road cross- section and trench excavation for drain, use of levelling book**
- 5) **Plane Table Survey : setting up the table, measure the line. Fixing stations. Use of plane table for survey.**
- 6) **Theodolite survey. Description of Theodolite Instrument Principle and study of version measuring horizontal bearing vertical angles**

SURVEYING PRACTICAL -II

Paper – II (6 to 8 hours.) Full mark 60

1. Chain Surveying
 - 1.1 Ranging a line.
 - 1.2 Chaining a line and recording in the field book.
 - 1.3 Testing and adjustment of chain.
 - 1.4 Taking off sets : (a) perpendicular (b) Oblique with a tape only
 - 1.5 Setting out right angle with a tape

2.
 - i) Chaining of a line involving reciprocal ranging.
 - ii) Testing and adjustment of Indian optical squares.
 - iii) Taking off sets and setting out angles with a cross staff and Indian optical squares.
 - iv) use of prismatic compass for field survey.

3. Use of leveling instruments for establishing elevation and level. Finding gradient of a drain or ground surface. Road cross section.

4. Use of plane table for field survey to collect site information.

5. Use of the theodolite instrument for survey.
 - (i) For marking centre line of a building
 - (ii) Measuring horizontal and Vertical angles.

6. List of Abbreviations for the names of units.

metre	m	square, cubic metre	m ² , m ³
cubic centimetre	cm ³	litre	l
millilitre	ml	second(time)	s
minute (time)	min	hour	h
day	d	cycle per second	c/s
degrees (temperature)	°C, °K.	Kilo gram	kg
degrees (interval)	degC,degK degF	tonnes	mt

LIST OF EQUIPMENTS-CIVIL
DRAWING CLASS

Sl no.	Items	Size	Nos
1a	Draughtsman table	60*85 cm	25 Nos
1b	Draughtsman's seating stool	nil	25 Nos
2a	Instructor's table	1.2m*0.8m	1 no
2b	Instructor's chair	nil	1no
3	Steel Almirah for storing materials	big	1 no
4	Geometrical models (wooden)		
a	Cube	6cm	1 no
b	Rectangular Block	10*15*20 cm	1 no
c	Sphere	6cm dia	1 no
d	Square pyramid 6cm sq base	6cm height	1 no
e	Cylinder 6cm dia	10 cm height	1 no
f	Hexagonal prism	10 cm height	1 no
5 a	Printing Frame complete with glass in the front and stand	60cm*45cm	1 no
5b	Ammonia Box 100 cm long*	20-*20*20 cm	1 no
6	Engine divided wooden/plastic scale having graduations 1:1 & 1:2, 1:2.5 & 1.5, 1:10 & 1:20 1:50 & 1:100		1 no
7	Diagonal scale	15cm long	1 no
8	8 digit Electronic Calculator(ordinary)		1 no
9	Drawing pencils	F,HB,B	1 no each
10	Good quality soft eraser		1 no
10b	Erasing shield		1 no

LIST OF EQUIPMENTS DRAWING INSTRUMENTS

A. Each student should have the under noted items of drawings instruments for one's use.

Sl no.	Items	Size	Nos
1	TEE Square	12.5cm long	1 no
2	Set Square beveled edge 45°	20 cm long	1 no
3	Protractor-semi circular beveled edge	10 cm	1 no
4	Template for Architect		1set
5	Drawing Compass & divider	12cm long	1 no each
6	Optical square of brass body		6 nos
7	Prismatic Compass 12 cm dia complete with tripod		6nos
8a	Dumpy Level complete with stand (having range upto 200 m)		4nos
8b	Telescopic leveling staff 4 m long (marked in cm & m)		4nos
9a	Plane table with tripod table	60cm*85cm	6nos
9b	Plane table accessories Hanger Alidade Hand level Plumb Bob made of brass		1 no 6nos 6nos 6nos 6nos
10	Ordinary Transit theodilite complete with tripod(having Vernier)		3 nos
11	Simple Planimeter		1 no

**LIST OF EQUIPMENTS
CONSTRUCTION TECHNOLOGY**

Sl no.	Items	Size	<u>Numbers</u>
1	Mason's trowel	20cm*10cm	6 nos
A	Pointing Trowel	8 cm*4 cm	6 nos
B	English Trowel	20cm*10cm	2nos
2	Wooden float	20cm*15cm	6nos
3	Mason's hammer & chisels		6 nos
4	Mason's Tri Square	30cm*45cm	6 nos
5	Hand tools		
	a. spade		4 nos
	b. pickaxe		2 nos
	c. shovel		3 nos
6	Mason's Iron Pan	50cm dia	6 nos
7	Steel Float	20 cm *15 cm	3 nos
8	Crow Bar	3cm dia*1.2m	6 nos
9	Galvanised Iron buckles		4 nos
10	Wire Brush standard size		4 nos
11	Wooden measuring box 0.0034m³ (1.2cft)		4 nos
12	Weighing machine		1 nos
13	Sledge hammer(5kg)		1nos
14	Vicat Machine(for cement testing)		1nos
15	Cast Iron mould	15cm*15cm *15cm	6 nos
16	Slump Cone - for determining moisture content in concrete	bottom dia-20cm top dia 10 cm height 30cm	2 nos
17(a)	A set of I.S. Sieves for analysing size of large aggregate .	30 cm dia	1 set
(b)	A set of I S Sieves 200 mesh for testing fineness of cement		1 Nos
(c)	I S Sieve for analysing particle size of sand		1 Nos
18	10 cm Angur for collection of soil sample		1 Nos

**LIST OF EQUIPMENTS
CARPENTER'S TOOLS**

Sl no.	Items	Size	Nos
1	Hand saw 45 cm long		6 nos
2	Gimlet		6 nos
3	Carpenter's Square		3 nos
4	Mortice chisels (batali)	12mm,20 mm 25 mm	2 of each
5	Bench Vice for wood work		4 nos
6	Jack planner	30cm long 20cm long	3 nos 3 nos
7	Rebate planner		2 nos
8	Carpenter's hammer		4 nos
9	Carpenter's hand drill bits 3mm 5mm		3 sets
10	Angur	12 mm 10mm	1no each
11	Screw driver	45 cm long	2 nos
12	Glass cutting pen		1 nos

LIST OF EQUIPMENTS

Plumbing

Sl no.	Items	Size	Nos
1	Hand hack saw	30 cm	3 nos
2	Flat file	20 mm	2 nos
	Round file	12 mm dia	1 nos
3	Adjustable pipe wrench for pipes	50 mm N.B.	3 nos
4	Pipe threading die frame	15mm N.B.	1 set
a		25mm N.B.	1 set
b		30mm N.B.	1 set
c		40mm N.B.	1 set
d			
5	Plumber's Bench Vice heavy duty		4 nos
6	Pipe Vice with portable stand		1 nos
7	Chisel & hammer 12 cm chisel for cutting steel		2 nos
8	Hammer 2.5 kg		2 nos
9	Pliers 20 cm adjustable type		2 nos