

## 6.1 EARTHQUAKE RESISTANT BUILDING CONSTRUCTION

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### RATIONAL

Diploma holders in civil engineering have to supervise construction of various earthquake resistant buildings. Therefore, the students should have requisite knowledge regarding terminology of earthquake and the precautions to be taken while constructing earthquake resistant buildings

### DETAILED CONTENTS

1. Elements of Engineering Seismology (08 hrs)  
General features of tectonic of seismic regions. Causes of earthquakes, Seismic waves, earthquake size (magnitude and intensity), Epicentre, Seismograph, Classification of earthquakes, Seismic zoning map of India, Static and Dynamic Loading, Fundamental period.
2. Seismic Behaviour of Traditionally-Built Constructions of India (07 hrs)  
Performance of building during earthquakes and Mode of failure (Out-of-plane failure, in-plane failure, Diaphragm failure, Connection failure, Non-structural components failure)
3. Special construction method, tips and precautions to be observed while planning, designing and construction of earthquake resistant building. (08 hrs)
4. Introduction to IS: 4326, IS: 13828, IS: 1893(Part 1), 154326 and IS: 13920 (latest edition) (05 hrs)
5. Seismic Provision of Strengthening and Retrofitting Measures for Traditionally-Built Constructions, Brick and RCC Structures (08 hrs)
6. Provision of reinforcement detailing in masonry and RC constructions (06 hrs)
7. Disaster Management: Disaster rescue, psychology of rescue, rescue workers, rescue plan, rescue by steps, rescue equipment, safety in rescue operations, debris clearance and casualty management. (06hrs)

## **INSTRUCTIONAL STRATEGY**

The student may be taken for visit to various building construction sites where precautions related to earthquake resistant construction are being taken so that the students may appreciate the importance of the subject.

## **RECOMMENDED BOOKS**

1. Elements of Earthquake Engineering by Jai Krishana and AR Chandrasekaran; Sarita Parkashan, Meerut.
2. Manual Published by Earthquake Engineering department, IIT Roorkee / IIT Kanpur
3. IS 13920, IS: 13827, IS: 13828, IS 1893, IS 4326 (latest edition)
4. Singh, Harbhajan “ Earthquake Resistant Building Construction” Abhishek Publishers, Chandigarh

## **SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	08	19
2	07	15
3	08	17
4	05	10
5	08	19
6	06	08
7	06	12
<b>Total</b>	<b>48</b>	<b>100</b>

## 6.2 RAILWAYS, BRIDGES AND TUNNELS

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### RATIONALE

The subject will cater to the needs of those technicians who would like to find employment in the construction of railway tracks, bridges and tunnels. The subject aims at providing broad based knowledge regarding various components and construction of railway track, bridges and tunnels

### DETAILED CONTENTS

#### PART – I: RAILWAYS

(35 hrs)

1. Introduction to Indian Railways
2. Railway surveys: Factors influencing the railways route, brief description of various types of railway survey
3. Classification of permanent way describing its component parts
4. Rail Gauge: Definition, types, practice in India
5. Rails – types of rails
6. Rail Fastenings: Rail joints, types of rail joints, fastenings for rails, fish plates, bearing plates
7. Sleepers: Functions of sleepers, types of sleepers, requirements of an ideal material for sleepers.
8. Ballast: Function of ballast, requirements of an ideal material for ballast
9. Crossings and signalings: Brief description regarding different types of crossings/ signalings (Latest electronics operated signal devices )
10. Maintenance of track: Necessity, maintenance of track, inspection of soil, track and fixtures; maintenance and boxing of ballast maintenance gauges, tools
11. Earth work an drainage: Features of rail road, bed level, width of formation, side slopes, drains, methods of construction, requirement of drainage system

## **PART-II: BRIDGES**

(35 hrs)

### 12. Introduction

Bridge – its function and component parts, difference between a bridge and a culvert

### 13. Classification of Bridges

Their structural elements and suitability:

13.1 According to life-permanent and temporary

13.2 According to deck level – Deck, through and semi-through

13.3 According to material –timber, masonry, steel, RCC, pre-stressed

13.4 According to structural form;

- Grade Separators-Railway Overbridges (ROB), Railway underbridge (RUB)
- Beam type –RCC, T-Beam, steel girder bridges, plate girder and box girder, balanced cantilever, Trussed bridges.
- Arch type – open spandrel and filled spandrel barrel and rib type
- Suspension type – unstiffened and stiffened and table (its description with sketches)
- According to the position of highest flood level submersible and non submersible

13.5 IRC classification

### 14. Bridge Foundations: Introduction to open foundation, pile foundation, well foundation

### 15. Piers, Abutments and Wingwalls

15.1 Piers-definition, parts; types –solid (masonry and RCC), open

15.2 Abutments and wing walls – definition, types of abutments (straight and tee), abutment with wing walls (straight, splayed, return and curved)

15.3 Launching of Equipment Bridges

### 16. Bridge bearings

Purpose of bearings; types of bearings – fixed plate, rocker and roller.

17. Maintenance of Bridges
  - 17.1 Inspection of Steel and Equipment bridges
  - 17.2 Routine maintenance

### **PART - III: TUNNELS**

(10 hrs)

18. Definition and necessity of tunnels
19. Typical section of tunnels for a national highway and single and double broad gauge railway track
20. Ventilation –necessity and methods of ventilation, by blowing, exhaust and combination of blowing and exhaust
21. Drainage method of draining water in tunnels
22. Lighting of tunnels

- Notes:** i) Field visits may be organized to Bridge construction site or a Bridge/Tunnel construction site/Railways tracks to explain the various components and a field visit report shall be prepared by the students, as teamwork
- ii) Examiners should set questions from all the parts

### **INSTRUCTIONAL STRATEGY**

This subject is of practical nature. While imparting instructions, teachers are expected to organize demonstrations and field visits to show various components and construction of railway track, bridges and tunnel.

### **RECOMMENDED BOOKS**

1. Vaswani, NK, “Railway Engineering”, Publishing House, Roorkee
2. Rangwala, SC, “Railway Engineering”, Anand, Charotar Book Stall
3. Deshpande, R, “A Text Book of Railway Engineering”, Poonam United Book Corporation
4. Algia, JS “Bridge Engineering”, Anand, Charotar Book Stall
5. Victor Johnson, “Essentials of Bridge Engineering” Oxford and IBH, Delhi
6. Rangwala S.C., “Bridge Engineering”, Anand, Charotar Book Stall
7. IRC Bridge Codes

8. MORTH drawings for various types of bridges
9. MORTH pocket books for bridge Engineers, 2000 (First Revision)
10. Subhash C Saxena, "Tunnel Engineering", Dhanpat Rai and Sons, Delhi

SUGGESTED DISTRIBUTION OF MARKS

<b>Topic No.</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	35	43
2	35	43
3	10	14
<b>Total</b>	<b>80</b>	<b>100</b>

## 6.3 QUANTITY SURVEYING AND VALUATION

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### RATIONALE

Diploma holders in Civil Engineering are supposed to prepare material estimates for various Civil Engineering works namely; buildings, irrigation works, public health works and roads etc. In addition, they must have basic knowledge regarding analysis of rates, contracting, principles of valuation. Therefore, this subject has great importance for diploma holders in Civil Engineering.

### DETAILED CONTENTS

1. Introduction to quantity surveying and its importance. Duties of quantity surveyor (02 hrs)
2. Types of estimates (03 hrs)
  - 2.1 Preliminary estimates
    - Plinth area estimate
    - Cubic rate estimate
    - Estimate per unit base
  - 2.2 Detailed estimates
    - Definition
    - Stages of preparation – details of measurement and calculation of quantities and abstract
3. Measurement (03 hrs)
  - 3.1 Units of measurement for various items of work as per BIS:1200
  - 3.2 Rules for measurements
  - 3.3 Different methods of taking out quantities – centre line method and long wall and short wall method
4. Preparation of Detailed and Abstract Estimates from Drawings for: (30 hrs)
  - 4.1 A small residential building with a flat roof and pitched roof building comprising of
    - Two rooms with W.C., bath, kitchen and verandah
  - 4.2 Earthwork for unlined channel
  - 4.3 WBM road and pre-mix carpeting
  - 4.4 Single span RCC slab culvert
  - 4.5 Earthwork for plain and hill roads
  - 4.6 RCC work in beams, slab, column and lintel, foundations
  - 4.7 users septic tank - 10 users  
- 50 users

5. Calculation of quantities of materials for (08 hrs)
- 5.1 Cement mortars of different proportion
  - 5.2 Cement concrete of different proportion
  - 5.3 Brick/stone masonry in cement mortar
  - 5.4 Plastering and pointing
  - 5.5 White washing, painting
  - 5.6 R.C.C. work in slab, beams
6. Analysis of Rates (10 hrs)
- 6.1 Steps involved in the analysis of rates. Requirement of material, labour, sundries, contractor's profit and overheads
  - 6.2 Analysis of rates for finished items when data regarding labour, rates of material and labour is given:
    - Earthwork in excavation in hard/ordinary soil and filling with a concept of lead and lift
    - RCC in roof slab/beam/lintels/columns
    - Brick masonry in cement mortar
    - Cement Plaster
    - White washing, painting
    - Stone masonry in cement mortar
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  - 6.3 Running and maintenance cost of construction equipment
7. Contractorship (06 hrs)
- Meaning of contract
  - Qualities of a good contractor and their qualifications
  - Essentials of a contract
  - Types of contracts, their advantages, dis-advantages and suitability, system of payment
  - Single and two cover-bids; tender, tender forms and documents, tender notice, submission of tender and deposit of earnest money, security deposit, retention money, maintenance period
  - Classification and types of contracting firms/construction companies
8. Preparation of Tender Document based on Common Schedule Rates (CSR) (12 hrs)
- Introduction to CSR and calculation of cost based on premium on CSR
  - Exercises on writing detailed specifications of different types of building works from excavation to foundations, superstructure and finishing operation
  - Exercises on preparing tender documents for the following
    - a) Earth work
    - b) Construction of a small house as per given drawing
    - c) RCC works



- d) Pointing, plastering and flooring
  - e) White-washing, distempering and painting
  - f) Wood work including polishing
  - g) Sanitary and water supply installations
  - h) False ceiling, aluminum (glazed) partitioning
  - i) Tile flooring including base course
  - j) Construction of W.B.M/Concrete road
9. Exercises on preparation of comparative statements for item rate contract (02 hrs)
10. Valuation (04 hrs)
- a) Purpose of valuation, principles of valuation
  - b) Definition of various terms related to valuation like depreciation, sinking fund, salvage and scrap value, market value, fair rent, year's purchase etc.
  - c) Methods of valuation (i) replacement cost method (ii) rental return method

### **INSTRUCTIONAL STRATEGY**

This is an applied engineering subject. Teachers are expected to provide working drawings for various Civil Engineering works and students be asked to calculate the quantities of materials required for execution of such works and use of relevant software for preparing estimates. Teachers should conceptualize making analysis of rates for different items of works. It will be advantageous if students are given valuation reports for reading.

### **RECOMMENDED BOOKS**

1. Pasrija, HD, Arora, CL and S. Inderjit Singh, "Estimating, Costing and Valuation (Civil)", New Asian Publishers, Delhi,
2. Rangwala, S.C, Estimating and Costing", Anand, Charotar Book Stall
3. Chakraborti, M, "Estimating, Costing and Specification in Civil Engineering", Calcutta
4. Dutta, BN, "Estimating and Costing
5. Mahajan Sanjay, "Estimating and Costing" Satya Parkashan, Delhi

### SUGGESTED DISTRIBUTION OF MARKS

<b>Topic No.</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	02	03
2	03	04
3	03	04
4	30	40
5	08	08
6	10	12
7	06	08
8	12	12
9	02	03
10	04	06
<b>Total</b>	<b>80</b>	<b>100</b>

## 6.4 CONSTRUCTION MANAGEMENT AND ACCOUNTS

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### RATIONALE

This is an applied civil engineering subject. The subject aims at imparting basic knowledge about construction planning and management, site organisation, construction labour, control of work progress, inspection and quality control, accidents and safety and accounts.

### DETAILED CONTENTS THEORY

#### CONSTRUCTION MANAGEMENT:

1. Introduction: (06 hrs)
  - 1.1 Significance of construction management
  - 1.2 Main objectives of construction management and overview of the subject
  - 1.3 Functions of construction management, planning, organising, staffing, directing, controlling and coordinating, meaning of each of these with respect to construction job.
  - 1.4 Classification of construction into light, heavy and industrial construction
  - 1.5 Stages in construction from conception to completion
  - 1.6 The construction team: owner, engineer, architect and contractors, their functions and inter-relationship
2. Construction Planning: (12 hrs)
  - 2.1 Importance of construction planning
  - 2.2 Stages of construction planning
    - Pre-tender stage
    - Contract stage
  - 2.3 Scheduling construction works by bar charts
    - Definition of activity, identification of activities
    - Preparation of bar charts for simple construction work

- Preparation of schedules for labour, materials, machinery and finances for small works
  - Limitations of bar charts
- 2.4 Scheduling by network techniques
- Introduction to network techniques; PERT and CPM, differences between PERT and CPM terminology
3. Organization: (06 hrs)
- 3.1 Types of organizations: Line, line and staff, functional and their characteristics
4. Site Organization: (06 hrs)
- 4.1 Principle of storing and stacking materials at site
- 4.2 Location of equipment
- 4.3 Preparation of actual job layout for a building
- 4.4 Organizing labour at site
5. Construction Labour: (08 hrs)
- 5.1 Conditions of construction workers in India, wages paid to workers
- 5.2 Important provisions of the following Acts:
- Labour Welfare Fund Act 1936 (as amended)
  - Payment of Wages Act 1936 (as amended)
  - Minimum Wages Act 1948 (as amended)
6. Control of Progress: (04 hrs)
- 6.1 Methods of recording progress
- 6.2 Analysis of progress
- 6.3 Taking corrective actions keeping head office informed
- 6.4 Cost time optimization for simple jobs - Direct and indirect cost, variation with time, cost optimization

7. Inspection and Quality Control: (08hrs)
- 7.1 Need for inspection and quality control
  - 7.2 Principles of inspection
  - 7.3 Stages of inspection and quality control for
    - Earth work
    - Masonry
    - RCC
    - Sanitary and water supply services
8. Accidents and Safety in Construction: (10 hrs)
- 8.1 Accidents – causes and remedies
  - 8.2 Safety measures for
    - Excavation work
    - Drilling and blasting
    - Hot bituminous works
    - Scaffolding, ladders, form work
    - Demolitions
  - 8.3 Safety campaign and safety devices

## **ACCOUNTS**

9. Public Work Accounts: (20 hrs)

Introduction, technical sanction, administrative approval, allotment of funds, re-appropriation of funds bill, contractor ledger, measurement book running and final account bills complete, preparation of bill of quantities (BOQ), completion certificate & report, hand receipt, acquittance roll. Muster Roll labour, casual labour roll-duties and responsibility of different cadres, budget-stores, returns, account of stock, misc. P.W. advances T & P – verification, survey report, road metal material charged direct to works, account - expenditure & revenue head, remittance and deposit head, defination of cash, precaution in custody of cash book, imprest account, temporary advance, treasury challan, preparation of final bills. Students must learn to prepare accounts register, stock register.

## **INSTRUCTIONAL STRATEGY**

This is highly practice-based course and efforts should be made to relate process of teaching with direct experiences at work sites. Participation of students should be encouraged in imparting knowledge about this subject. To achieve this objective the students should be taken to different work sites for clear conception of particular topics, such as site organization, inspection of works at various stages of construction and working of earth moving equipment

## RECOMMENDED BOOKS

1. Harpal Singh, "Construction Management and Accounts", Tata McGraw Hill Publishing Company., New Delhi
2. Peurifoy, RL, "Construction Planning, Equipment and Methods", McGraw Hill, Tokyo
3. Singh, Harbhajan “ Construction Project Management” Abhishek Publishers, Chandigarh
4. Verma, Mahesh; "Construction Equipment and its Planning and Application
5. Dharwadker, PP; "Management in Construction Industry", , Oxford and IBH Publishing Company, New Delhi
6. Gahlot PS; Dhir, BM; "Construction Planning and Management", Wiley Eastern Limited, New Delhi
7. Softwares :  
(a) MS Project – Microsoft USA  
(b) Primavera

## SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	09
2	12	14
3	06	09
4	06	08
5	08	12
6	04	06
7	08	09
8	10	11
9	20	22
<b>Total</b>	<b>80</b>	<b>100</b>

## 6.5 HIGHWAY CONSTRUCTION AND MAINTENANCE

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### RATIONALE

Highway construction and maintenance is one of the major job of these diploma holders. Details of road construction and their maintenance had been dealt in this subject. So that students are aware of all aspects of road construction and their maintenance.

### DETAILED CONTENTS

1. Subgrade (10 hrs)  
Thickness of subgrade, special requirements during high water level conditions-IRC guidelines. Subgrade preparation of existing soil subgrade in cutting and embankment, minimum CBR requirements. Subgrade drainage, Subgrade preparation from transported soil. Preventive measures to control moisture ingress stabilization by lime, geo-synthetic etc. Determination of optimum lime content, quantity of lime, soil excavation and mixing of lime, compaction and curing. Quality control tests and their frequency, statistical tools of quality control - criteria of acceptance
2. Granular Sub-bases and Bases (10 hrs)
  - 2.1 Granular Sub-base (GSB) – Coarse graded and closed graded GSB, different gradings as per MORT&H specifications, physical and engineering properties of GSB, thickness of GSB layer, construction procedure
  - 2.2 Water Bound Macadam (WBM) – Size and grading requirements, size of screenings, physical requirements of aggregate, construction procedure details
  - 2.3 Wet Mix Macadam (WMM) – Grading requirements, physical requirements of aggregate, proportioning and design of WMM, Wet Mix plant, construction features
3. Interface Treatments (04 hrs)  
Purpose of interface treatments
  - 3.1 Prime Coat – uses, materials, quantity requirements, equipments - sprayers and bitumen distributors
  - 3.2 Tack Coat – Materials, quantity, quality control at site – Aluminium sheet method

4. Bituminous Courses (10 hrs)
  - 4.1 Bituminous Macadam: Size and grading, physical properties of aggregates, binders, binder content as per MORT & H constructional features
  - 4.2 Dense Bituminous Macadam: application, grading of aggregates, binders, physical properties requirements, quantity of bitumen, proportioning of aggregate, Marshall Method (introduction only)
  - 4.3 Surface Courses – Semi-dense bituminous concrete and bituminous concrete (S.D.B.C and B.C), application, grading of aggregate, binders, quantity of bitumen  
  
Quality control – thickness of layer, bitumen content, sampling frequency, permissible variations
  - 4.4 Mastic Asphalt: Application areas, composition of Mastic Asphalt, binder, lime and their specifications, thickness requirements. Preparation of mastic asphalt at site – mastic cooker, laying and keying, advantage of mastic asphalt
  - 4.5 Seal Coat: Applications, composition of seal coat, quantity of raw materials
5. Treatments for Repair (04 hrs)
  - 5.1 Liquid Seal – Description, materials, procedure, application
  - 5.2 Fog Seal - Description, materials, procedure, application
  - 5.3 Slurry Seal - Description, materials, procedure, application
  - 5.4 Sand Bituminous Premix Patching - Description, materials, procedure, application
6. Equipment and Machinery (10 hrs)
  - 6.1 Hot mix plant - plant types - Batch mixing and drum mixing plant, selection of appropriate type
  - 6.2 Asphalt Paver: Functions of paver, types, components of a paver – hopper, tractor unit and screed unit
  - 6.3 Tippers – Transportation Trucks, type of vehicle and cover
  - 6.4 Compaction equipment – Pneumatic typed rollers (PTR), vibratory roller

**Note:** Students must be taken to field visits to:

- i) Hot mix plant unit and ii) Site of construction of Highway



## **INSTRUCTIONAL STRATEGY**

While imparting instructions, it is recommended that emphasis should be laid on constructional details and quality control aspects. Students should be asked to prepare sketches and drawings, clearly indicating specifications and constructional details for various sub components of a highway. It will be also advantageous to organize field visits to show the actual construction of roads at site.

## **RECOMMENDED BOOKS**

- i) Khanna, SK and Justo, CEG, "Highway Engineering", Nem Chand and Bros., Roorkee
- ii) Vaswani, NK, "Highway Engineering" , Roorkee Publishing House, Roorkee,
- iii) Bindra, SP; "A Course on Highway Engineering" , Dhanpat Rai and Sons, New Delhi
- iv) Sharma, RC; and Sharma, SK; "Principles and Practice of Highway Engineering", Asia Publishing House, New Delhi
- v) Duggal AK, Puri VP., "Laboratory Manual in Highway Engineering", New Age Publishers (P) Ltd, Delhi,
- vi) RK Khitoliya, "Principles of Highway Engineering (2005)", Dhanpat Rai Publishing Co., New Delhi
- vii) Rao, GV' Transportation Engineering
- viii) Duggal AK, "Maintenance of Highway – a Reader", NITTTR, Chandigarh
- ix) Duggal AK "Types of Highway construction ", NITTTR Chandigarh
- x) Singh, Jagrup, "Highway Engineering", Eagle Publications Jalandhar

## **IRC Publications**

- i) MORT & H Specifications for Road and Bridge Works (Fifth Revision)
- ii) MORT & H Pocket book for Highway Engineers, 2001
- iii) MORT & H Manual for Maintenance of Roads, 1983

### SUGGESTED DISTRIBUTION OF MARKS

<b>Topic No.</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	10	22
2	10	22
3	04	08
4	10	20
5	04	08
6	10	20
<b>Total</b>	<b>48</b>	<b>100</b>

## 6.6 EMPLOYABILITY SKILLS – II

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### RATIONALE

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. Our diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject to prepare students for employability in job market and survive in cut throat competition among professionals.

### DETAILED CONTENTS

#### 1. Oral Practice

- i) Mock interview (05 hrs)
- ii) Preparing for meeting (05 hrs)
- iii) Group discussion (05 hrs)
- iv) Seminar presentation (05 hrs)
- v) Making a presentation (12 hrs)
  - a) Elements of good presentation
  - b) Structure and tools of presentation
  - c) Paper reading
  - d) Power point presentation

**6.7 MAJOR PROJECT WORK  
(INDUSTRY/FIELD ORIENTED - PRACTICE BASED)**

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As far as possible students should be given live project problems with a view to :

- i) Develop understanding regarding the size and scale of operations and nature of field work in which students are going to play their role after completing the courses of study.
- ii) Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.
- iii) Provide first hand experience to develop confidence amongst the students to enable them to use and apply classroom based knowledge and skills to solve practical problems of the world of work.
- iv) Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience. It is necessary that each organization is visited well in advance by respective teachers and activities to be performed by students are well defined. The chosen activities should be such which are of curricular interest to students and of professional value to industrial/field organizations. Each teacher is expected to supervise and guide 5 - 6 students.

Effort should be made to identify actual field problems to be given as project work to the students. Project selected should not be too complex which is beyond the comprehension level of the students. The placement of the students for such a practical cum project work should match with the competency profile and interest of students. Students may be assessed both by industry and polytechnic faculty. The suggested performance criteria is given below:

a) Punctuality and regularity	10
b) Initiative in learning/working at site	10
c) Level/proficiency of practical skills acquired	10
d) Sense of responsibility	10
e) Self expression/Communication skills	10
f) Interpersonal skills	10
g) Report writing skills	20
h) Viva voce	20

**Some of suggested projects are given below:** These are only guidelines, teacher may take any project related to Civil Engineering depending upon the availability of projects. Preference should be given to practical oriented projects.

According to the need of the polytechnic, the following major projects are suggested:

1. Construction of a small concrete road consisting of following activities
  - Survey and preparation of site plan
  - Preparation of drawings i.e. L-Section and X-Section
  - Estimating earth work
  - Preparation of sub grade with stone ballast
  - Laying of concrete
  - Testing of slump, casting of cubes and testing
  - Material estimating and costing with specifications
  - Technical report writing
2. Water Supply system for a one or two villages
  - Surveying
  - Design of water requirements and water distribution system
  - Preparation of drawing of overhead tank
  - Material estimating and costing
  - Specifications
  - Technical report writing
3. Construction of toilets and baths for a shopping complex in a township
4. Construction of bridal path 4 kms long
5. Construction of shopping complex by detailing of RCC drawings, estimating and costing of material
6. Rainwater harvesting
  - Assessment of catchment's area
  - Intensity of rainfall
  - Collection of water
  - Soak pit design
  - Supply of water
  - Monitoring during rainy season
7. Design and construction of septic tank with soak pit for 100 users
8. Preparing plumbing detailed drawings of a two storey building and material estimate and costing
9. Planning and design of sports stadium in a township or cluster of villages
10. Design of small residential building including structural members, specifications, estimating and costing of materials, report writing and municipal drawings for water supply and sewerage system
11. Concrete Mix Design

12. Construction of concrete cubes by mixing appropriate quantity of fly ash with fibres
  - (i) the fibres like polypropylene, carbon, steel etc. can be used
  - (ii) students will show the comparison between concrete mixed with fibres verses the quality controlled concrete.
  
13. Estimation and designing of a State Highway Road
  - (i) Reconnaissance survey of proposed road
  - (ii) To take L - section and cross sections
  - (iii) Fixing of grades
  - (iv) Estimation of cutting and filling of earth mass
  - (v) Plane tabling survey of proposed road
  - (vi) Estimation of proposed road
  
14. Designing a small height gravity dam
  - (i) Constructing of catchment area
  - (ii) Calculating the reservoir capacity
  - (iii) Designing of gravity dam by taking into account various forces
  
15. Designing of ferro-cement water tank and toilet. Testing of the ferro-cement products in civil engineering labs.

Note:

The projects undertaken should be field oriented

The semester will be divided into three parts. The second part will be of one month duration (in the month of February/March) for project work. During this time the students will work on actual construction sites and will prepare report(s) under the guidance of a teacher which is to be evaluated as per curriculum. The teacher will remain in contact with site supervisor/site engineer for taking feedback about the student's performance and his grading.