

NEP-2020 Aligned Curriculum for
Three Year (Six Semester) Diploma Programme in
CIVIL ENGINEERING
(Environmental and Pollution Control)
(5th & 6th Semester)
For the State of Uttar Pradesh



Prepared by:
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PREFACE

An important issue generally debated amongst the planners and educators world over is how technical education can contribute to sustainable development of the societies struggling hard to come in the same bracket as that of the developed nations. The rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In India, a shift has taken place from the forgettable years of closed economy to knowledge based and opens economy in the last few decades. In order to cope with the challenges of handling new technologies, materials and methods, we have to develop human resources having appropriate professional knowledge, skills and attitude. Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Now it is time to consolidate and infuse quality aspect through developing human resources, in the delivery system. Polytechnics play an important role in meeting the requirements of trained technical manpower for industries and field organizations.

In order to meet the requirements of future technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of diploma programmes. The curricula for diploma programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of diploma programme.

The real success of the diploma programme depends upon its effective implementation. However best the curriculum document is designed, if that is not implemented properly, the output will not be as expected. In addition to acquisition of appropriate physical resources, the availability of motivated, competent and qualified faculty is essential for effective implementation of the curricula.

It is expected of the polytechnics to carry out job market research on a continuous basis to identify the new skill requirements, reduce or remove outdated and redundant courses, develop innovative methods of course offering and thereby infuse the much needed dynamism in the system.

Director

Institute of Research Development & Training

ACKNOWLEDGEMENTS

We gratefully acknowledge the guidance and contribution received from the following Persons

- 1, Sh. Narendra Bhooshan, IAS, Additional Chief Secretary, Department of Technical Education, Government of Uttar Pradesh, for his exemplary vision & approach.
2. Smt. Selva Kumari J., IAS, Secretary, Directorate General, Department of Technical Education, Government of Uttar Pradesh for his exemplary vision & approach.
3. Sh. F.R. Khan, Director, I.R.D.T. Kanpur for continually motivating, guiding and taking keen interest in the review of curriculum..
4. All the participants from industries, Polytechnics and other technical institutions for their professional inputs during curriculum workshops.
5. CDC Officer and other concerning staff of IRDT for their support and assistance in conducting curriculum workshops.
6. In the last but not least would like to thanks management of the industries who spare not only their precious time but also allowed the visit of their industries to the team making the curriculum

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1. SALIENT FEATURES

- 1) **Name of the Programme** : Diploma Programme in Civil Engineering.
(Environmental & Pollution Control)
- 2) **Duration of the Programme** : Three years (Six Semesters)
- 3) **Entry Qualification** : Matriculation or equivalent NSQF Level as
Prescribed by State Board of Technical
Education, UP
- 4) **Pattern of the Programme** : Semester Pattern
- 5) **NSQF Level** : Level - 5
- 6) **Ratio between theory and Practical:** 40 :60 (Approx.)

7) **Industrial Training**

Four and six weeks of industrial training is made mandatory after the II and IV semesters during summer vacation. Total marks allotted to industrial training will be respectively 50 & 100.

In the last (6th Semester) we have made the one semester Industrial training/Internship as optional along with usual classroom training.

8) **Ecology and Environment**

As per Govt. of India directives a subject on Environmental Science has been incorporated in the curriculum.

9) **Entrepreneurship and Start-ups**

A full subject Entrepreneurship & Start-ups has been incorporated in the curriculum.

10) **Student Centred Activities**

A provision of min. 4 hrs per week has been made for organizing Student Centered Activities for overall personality development of students. Such activities will comprise of co-curricular activities such as expert lectures, self-study, games, hobby classes like photography, painting, singing etc. seminars, declamation contests, educational field visits, NCC, NSS, library and other cultural activities.

11) **Project work**

A project work has been included in the curriculum to enable the student get familiarize with the practices and procedures being followed in the industries and provide an opportunity to work on some live projects in the industry.

2. PROGRAM OUTCOMES (POs)

PO1: Basics and Discipline specific Knowledge

Assimilate knowledge of basic mathematics, science and engineering fundamentals.

PO2: Problem's Analysis and solution

Identify, analysis and solve problems using standard methods and established techniques.

PO3: Design and Development

Design solutions for technical problems. Assist in designing components, systems, or processes to meet specific requirements.

PO4: Engineering Tools, Experimentation, and Testing

Use modern engineering tools and appropriate techniques to conduct experiments as per BIS standard.

PO5: Socio/Economic/Environmental impact assessment/remedy.

Apply relevant technologies while considering societal needs, environmental impact keeping in view sustainable and ethical responsibilities.

PO6: Project Management and Communication

Apply engineering management principles, work effectively as an individual or I
n a team, and communicate clearly on activities.

PO7: Lifelong Learning

Recognize the importance of continuous learning and actively pursue self-improvement to keep pace with technological developments.

3. EMPLOYMENT OPPORTUNITIES FOR DIPLOMA HOLDERS IN CIVIL ENGINEERING (ENVIRONMENTAL & POLLUTION CONTROL)

Keeping in view, the present scenario of activities in the field of Civil Engineering (EP&C), following employment opportunities are visualized for diploma holders in Civil Engineering (EP&C)

a) Wage Employment in:

- i) Government Departments/ Public sector /Boards / Corporations/ private construction companies
- ii) Service sector i.e. Estate Offices of Business organizations/Universities/ Colleges, Hotels, Hospitals etc. specially for repair and maintenance of buildings and their upkeep.
- iii) Military Engineering Services/BRO/Defence/Railways/Power Projects/Banks/ Municipal Corporations and Committees/Airport Authority and Harbours etc.
- iv) Installation of communication towers and framed structure.
- v) Testing laboratories
- vi) Technical institutions.

b) Self-employment opportunities:

- i) Small building contractors/Licensed contractors (Class B)
- ii) Approved building planner and valuer
- iii) Plumbing and water supply fitting contracts
- iv) White washing, distempering, repair and maintenance of buildings, renovations, POP work, texture work, false ceiling, specialized flooring etc. Anti - termite treatment Erection job
- v) Construction material suppliers/marketing
- vi) Preparation of computer aided design and drafting jobs
- vii) Estimating and costing jobs/bill maker
- viii) Assessment/valuation of Surveyor/loss buildings etc.
- ix) Water proofing of existing and new building

- x) A small enterprise like precast elements/hume pipes/water proofing chemicals, RCC pipes, hollow blocks, shuttering etc.
- xi) Rain water harvesting system installation
- xii) Sanitary Installation

4. LEARNING OUTCOMES OF DIPLOMA PROGRAMME IN CIVIL ENGINEERING (ENVIRONMENTAL & POLLUTION CONTROL)

At the end of the programme, a diploma holder in Civil Engineering will be able to:

1.	Communicate effectively in English with others
2.	Apply basic principles of Mathematics and Science to solve engineering problems
3.	computer application software Prepare computerized reports, presentations using IT tools and
4.	Use cutting tools and tooling for fabrication of jobs by following safe practices during work
5.	Use appropriate procedures for preventing environmental pollution and energy conservation
6.	Use basic concepts and principles of fluid mechanics as applied to civil engineering practices.
7.	Apply concepts of mechanics to solve Engineering problems
8.	Carry out various types of surveying like levelling, plane tabling, theodolite surveying, and tachometry and contouring; and use modern surveying techniques like total station, remote sensing, GIS and GPS.
9.	Select, Use and carry out testing of construction materials including ecofriendly and advanced materials as per their suitability and availability
10.	Supervise various building construction works from substructure to superstructure and their finishing operations.
11.	Prepare, read and interpret, component drawing, building drawings and layout
12.	Supervise production, placement and quality control of concrete operations.
13.	Supervise construction of pre-cast elements.
14.	Carry out layout plan of water supply, sewerage and sanitary systems and monitor quality of water and waste water
15.	Supervise constructional aspects pertaining to irrigation structures
16.	Prepare, read and interpret public health and irrigation engineering drawings
17.	Analyse and design simple structural elements of R.C.C.
18.	Supervise constructional aspects pertaining to highway engineering

19.	Prepare, read and interpret R.C.C. drawings
20.	Prepare topographical plan of an area
21.	Use various computer software's in the field of Civil & Environment Engineering
22.	Supervise constructional aspects pertaining to railways, bridges and tunnels
23.	Analyses, use and treat various types of soils for foundation purpose
24.	Plan and execute given task/projects as a team member/ leader
25.	Analyses and design simple structural elements of steel
26.	Prepare material estimates as per CSR, Specifications, costing, valuation and tender documents as per given drawings and prepare bill of quantity of construction.
27.	Apply basic principles of construction management techniques and accounts in Civil Engineering
28.	Carry out repair, maintenance and retrofitting of buildings as per requirement
29.	Use various advanced constructional techniques for construction of high rise and earthquake resistant structures keeping safety aspects in mind.
30.	Plan and execute activities related to disaster management.
31.	Apply the knowledge and skills gained through various courses in solving live problems/projects in the field
32.	Demonstrate appropriate values and attitude.

5. ABSTRACT OF CURRICULUM AREAS

a) HUMANITIES & SOCIAL SCIENCES COURSES(HS)

1. Communication Skills in English
2. Sports & Yoga
3. Entrepreneurship and Starts-ups

b) BASIC SCIENCES COURSE (BS)

4. Mathematics
5. Applied Physics
6. Applied Chemistry

c) ENGINEERING SCIENCE COURSE (ES)

7. Engineering Graphics
8. Engineering Workshop Practice
9. Introduction to Information Technology
10. Fundamental of Mechanical and Electrical Engg.
11. Engineering Mechanics

d) PROGRAMME CORE COURSE (PC)

12. Construction Materials
13. Basic Surveying
14. Basic Surveying Lab.
15. Mechanics of Material
16. Mechanics of Material Lab.
17. Building Construction
18. Building Planning and Drawings
19. Concrete Technology
20. Concrete Technology Lab.
21. Summer Internship
22. Hydraulics
23. Hydraulics Lab.
24. Advance Surveying

25. Advance Surveying Lab.
26. Theory of Structure
27. Design of Reinforced Cement Concrete Structures
28. Reinforced Cement Concrete Structures Drawing
29. Water Resource Engineering
30. Public Health Engineering
31. Environmental management (specialized subject)

e) PROJECT WORK, SEMINAR AND INTERNSHIP IN INDUSTRY OR ELSE WHERE

- Summer Internship-I (4 weeks) after IIInd Semester.
- Summer Internship-II (6 weeks) after IVth Semester.
- Major Project (In-House)/Internship/Industrial Training.

f) AUDIT COURSES (AU)

- Environmental Science
- Essence of Indian Knowledge and Tradition (Q)
- Indian Constitution

g) PROGRAM ELECTIVE

- Construction Management
- Advance Construction Technology

h) OPEN ELECTIVE

- Disaster Management
- Project Management
- Renewable Energy Technology
- Energy Conservation and Audit

6- STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN CIVIL ENGINEERING (ENVIRONMENTAL & POLLUTION CONTROL)

5th SEMESTER

Sr. No.	SUBJECTS	COURSE TYPE & CATEGORY	STUDY SCHEME			Credits	MARKS IN EVALUATION SCHEME									Total Marks of Internal & External
			Periods/Week				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT						
			L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot		
5.1	TRANSPORATION ENGG.	PROGRAM CORE (THEORY)	02	-	-	2+0=2	40	-	40	60	3	-	-	60	100	
5.2	ESTIMATING COSTING AND VALUATION	PROGRAM CORE (PRACTICUM/THEORY)	01	-	04	1+2=3	20	20	40	60	3			60	100	
5.3	GEOTECHNICAL ENGG.	PROGRAM CORE (THEORY)	02	-	-	2+0=2	40	-	40	60	3	-		60	100	
5.4	DESIGN OF STEEL STRUCTURE AND DRAWING	PROGRAM CORE (PRACTICUM/THEORY)	01	-	04	1+2=3	20	20	40	60	3	-	-	60	100	
5.5	ENVIRONMENTAL MANAGEMENT	PROGRAM CORE (THEORY)	02	-	-	2+0=2	40	-	40	60	3	-	-	60	100	
5.6	OPEN ELECTIVE- 01 a) DISASTER MANAGEMENT b) PROJECT MANAGEMENT	OPEN ELECTIVE (THEORY)	02	-	-	2+0=2	50	-	50	-	-	-	-	-	NA	
	OR *ADVANCE SKILL DEVELOPMENT: ADVANCED PLUMBING (TATA TECH.)	OPEN ELECTIVE (Certification Course)	-	-	-	-	-	-	-	-	-	-	-	-	NA	
5.7	TRANSPORATION ENGG. LAB	PROGRAM CORE (PRACTICAL)	-	-	04	0+2=2	-	60	60	-	-	40	3	40	100	
5.8	GEOTECHNICAL ENGG. LAB	PROGRAM CORE (PRACTICAL)	-	-	04	0+2=2	-	60	60	-	-	40	3	40	100	
5.9	INDIAN CONSTITUTION (Q)	AUDIT COURSE	02	-	-	-	50	-	50	-	-	-	-	-	-	
5.10	SUMMER INTERNSHIP** (4 -6 WEEKS)		-	-	-	2	-	60*	60*	-	-	40*	3	40*	100*	
	#STUDENT CENTERED ACTIVITIES	-	-	-	08			50	50	-	-	-	-		50	
Total			12	0	24	20	210	220	430	300		120		420	850	

(Q) It is compulsory to appear and to pass the examination, but marks will not be included for percentage and division of obtained marks.

* Students will submit the certificate.

** Students will present a seminar/viva on their summer internship/ ADVANCE SKILL CERTIFICATION along with certificate, project and report.

6- STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN CIVIL ENGINEERING (ENVIRONMENTAL & POLLUTION CONTROL)

6th SEMESTER

Sr. No.	SUBJECTS	COURSE TYPE & CATEGORY	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME										Total Marks of Internal & External
							INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT							
			L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot			
6.1	PROGRAM ELECTIVE-01 a) CONSTRUCTION MANAGEMENT b) ADVANCE CONSTRUCTION TECHNOLOGY	PROGRAM CORE (THEORY)	03	01	-	4	40	-	40	60	3	-	-	60	100		
6.2	ENTREPRENEURSHIP AND START-UP	PROGRAM CORE (THEORY)	02	-	-	2	40	-	40	60	3	-	-	60	100		
6.3	OPEN ELECTIVE-02 a) RENEWABLE ENERGY TECHNOLOGY b) ENERGY CONSERVATION AND AUDIT	PROGRAM CORE (THEORY)I	02	-	-	2	50	-	50	-	-	-	-	-	NA		
	OR ADVANCE SKILL DEVELOPMENT	OPEN ELECTIVE (Certification Course)					-	-	-	-	-	-	-	NA			
6.4	PROJECT	PROGRAM CORE (PRACTICAL)	04	-	16	12	-	240	240	-	-	160	3	160	400		
#STUDENT CENTERED ACTIVITIES			-	-	08	-	-	50	50	-	-	-	-	-	50		
Total			11	01	24	20	160	150	310	240		150		390	650		

Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, library, Cultural Activities and self-study etc.

OR

SIXTH SEMESTER (INDUSTRIAL PATHWAY)

Sr. No.	SUBJECTS	Category & Course Type	STUDY SCHEME			Credits(C) (L+T)+P=C	MARKS IN EVALUATION SCHEME									Total Marks of Internal & External	Assessment
			Periods/Week				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT							
			L	T	P		Th	Pr	Tot	Th	Hrs	P r	Hrs	Tot			
6.1	Entrepreneurship and Start-ups (ONLINE Mode)	Humanities & Social Science (Theory)	-	-	-	2	-	-	-	100	03	-	-	100	100	Theory	
6.2	Industrial Hands On Practice	Industrial Training	-	-	-	12	150*			200**						350	
6.3	Industrial Project	Industrial Training	-	-	-	4	50*			50**						100	
6.4	# Seminar	In House	-	-	-	2	-	100	100	-	-	-	-	-	100		
Total			-	-	-	20	-							-	650		

NOTE:

1. The Industrial training tenure should not be less than 14 Weeks.
2. Industry must be registered with MSME / Directorate of industries/Limited Organization/ State/Central Government establishments.
3. Monthly progress reports of Intern/ Trainee should be attested and forwarded by industrial supervisor (allotted to Intern/Trainee) during industrial Internship/Training.
4. The Industrial unit/organisation must evaluate students using the format provided by polytechnic in the form of marks.
5. The Industrial Hands on Practice, Industrial Project and seminar must be evaluated on the basis of the AICTE Internship Policy: Guidelines and procedures (Chapter -9 Procedures / format for organizing internship)
6. “*Entrepreneurship and Start-up*” course is also mandatory in Industrial internship/training mode. It will be conducted online mode by his/her polytechnic institute. After completing the online course, students must appear for exam conducted by the Board of Technical Education, Lucknow.
7. *Evaluation by faculty mentor

The institute will depute one faculty member for mentoring at least 20-30 students undertaking apprenticeship training. Such mentors will monitor, guide and provide counselling to the students as and when required. Faculty mentor of the institute(s) may make a surprise visit to the internship/apprenticeship site to check the student's presence physically. (The Proforma of the evaluation is attached as the Annexure -1)

8. **** Evaluation by industry :** The industry shall assess the candidates based on the following parameters attendance, discipline and punctuality, familiarity of tools and material, engineering skills, application of knowledge and problem-solving skills, comprehension and observation, professional ethics, safety and environmental consciousness, communication skills, supervisory skills and general conduct during the period (The Proforma of the evaluation is attached as the Annexure -2)
9. **# Evaluation through seminar presentation/Viva-Voce at the institute :** The student will give a seminar based on his training report, before an expert committee constituted by the concerned department as per norms of the institute. The evaluation will be based on the following criteria:

SEMESTER-V

PROGRAM CORE/ THEORY	5.1 TRANSPORTATION ENGINEERING	L	T	P
		2	-	-

COURSE OBJECTIVES:

Following are the objectives of this course:

- To identify the types of roads as per IRC recommendations.
- To understand the geometrical design features of different highways.
- To perform different tests on road materials.
- To identify the components of railway tracks.

COURSE OUTCOMES:

After completing this course, student will be able to:

CO1- Identify the types of roads as per IRC recommendations.

CO2- Understand the importance of the roads, development of roads and classification of roads, highway pavements, Geometrical design.

CO3- Study the highway alignment, road machineries and construction of different types of Roads.

CO4- Understand the components of railway and methods of laying the rails.

CO5- Learn the Railway fixtures, Types of stations, station yards, Signalling and Control of movement of trains.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning
CO1	3	1	1	1	1	1	2
CO2	3	1	3	3	1	3	2
CO3	3	2	2	3	3	3	3
CO4	3	1	2	1	3	1	1
CO5	3	2	3	3	2	1	2

Legend: High (3), Medium (2), Low (1) and No mapping (-)

DETAILED COURSE CONTENT

UNIT – I OVERVIEW OF TRANSPORTATION ENGINEERING (3 periods)

- Role of transportation in the development of nation, Scope and Importance of roads in India and its' Characteristics. Functions of IRC, CRRI, MoRT & H, NHAI
- Different modes of transportation – Land way, Waterway, Airway.
- General classification of roads.

- Selection and factors affecting road alignment.

UNIT– II GEOMETRIC DESIGN OF HIGHWAY

(8 periods)

- Camber: Definition, purpose, types as per IRC – recommendations.
- Kerbs: Road margin, road formation, right of way.
- Design speed and various factors affecting design speed as per IRC – recommendations.
- Gradient: Definition, types as per IRC – Recommendations.
- Sight distance (SSD): Definition, types Intermediate sight distance and Over taking sight distance, IRC – recommendations, simple numerical.
- Curves: Necessity, types: Horizontal, vertical curves.
- Extra widening of roads: numerical examples.
- Super elevation: Definition, formula for calculating minimum and maximum Super elevation and method of providing super-elevation.
- Standards cross-sections of national highway in embankment and cutting.

UNIT– III CONSTRUCTION OF ROAD PAVEMENTS

(8 periods)

- Different types of road materials in use: soil, aggregate and binders and their Tests – CBR, Test on aggregates-Flakiness and Elongation Index tests, Impact Value, Abrasion value, Aggregate crushing value. Test on Bitumen- penetration, Ductility, Flash and Fire point test and Softening point test.
- Pavement – Definition, Types, Structural Components of pavement and their functions
- Construction of WBM road. Merits and demerits of WBM & WMM road.
- Construction of Flexible pavement/Bituminous Road, Types of Bitumen and its properties, Emulsion, Cutback, Tar, Terms used in Bituminous Road -prime coat, tack coat, seal coat, Merits and Demerits of Bituminous Road.
- Cement concrete road -methods of construction, Alternate and Continuous Bay Method, Construction joints, filler and sealers, merits and demerits of concrete roads. Types of joints.
- Pavement Maintenance and Highway Drainage.
- Road Construction Machinery: Pavemaker, Roller, Excavator, Grader, Bulldozer, Hot mix plant, Dumper, Drag line, Back-hoe etc.

UNIT– IV BASICS OF RAILWAY ENGINEERING

(5 periods)

- Classification of Indian Railways, zones of Indian Railways
- Mass Transit System
- Permanent way: Ideal requirement, Components; Rail Gauge, types, factors affecting selection of a gauge.
- Rail, Rail Joints - requirements, types.
- Creep of rail: causes and prevention.
- Sleepers - functions and Requirement, types - concrete sleepers and their density
- Ballast - function and types, suitability.
- Rail fixtures and fastenings – fish plate, spikes, bolts, keys, bearing plates, chairs- types of anchors and anti-creepers.

UNIT– V TRACK GEOMETRICS, CONSTRUCTION AND MAINTENANCE

(4 periods)

- Alignment- Factors governing rail alignment.
- Track Cross sections – standard cross section of single and double line in cutting and embankment. Important terms-permanent land, formation width, side drains,
- Railway Track Geometrics: Gradient, curves- types and factors affecting, grade compensation, super elevation, limits of Super elevation on curves, cant deficiency, negative cant, coning of wheel, tilting of rail.
- Branching of Tracks, Points and crossings, Turn out- types, components, functions and inspection. Track junctions: crossovers, scissor cross over, diamond crossing, track triangle.
- Station -Purpose, requirement of railway station, important technical terms, types of railway station, factors affecting site selection for railway station.
- Station yard: Classification- Passenger, goods, locomotive and marshalling yards. Function & drawbacks of marshalling yards.
- Track Maintenance- Necessity, Classification, Tools required for track maintenance with their functions, Organisation of track maintenance, Duties of permanent way inspector, gangmate and key man.

SUGGESTED LEARNING RESOURCES:

1. L.R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., Delhi (ISBN: 978-93-82609-858) Edition 2018
2. Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Brothers, Roorkee.
3. Arora, N. L., Transportation Engineering, Khanna Publishers, Delhi.
4. Saxena S C and Arora S P, A Textbook of Railway Engineering, Dhanpat Rai Publication.
5. Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg , Standard Book House, New Delhi.
6. Sharma, S.K., Principles, Practice and Design of Highway Engineering,, S. Chand Publication, New Delhi.
7. Duggal, Ajay K. and Puri, V. P., Laboratory Manual in Highway Engineering, New Age International (P) Limited, Publishers, New Delhi.
8. Subramanian, K.P., Highway, Railway, Airport and Harbour Engineering, Scitech Publications, Hyderabad.
9. D.V.Gupta, Vikram Singh, Transport Engineering -I, Asian Publishers, Muzaffarnagar, ISBN No. 978-93-5502-113-7

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centered activities in class room and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	3	15
2	8	20
3	8	30
4	5	15
5	4	20
Total	28	100

PRATICUM/ THEORY	5.2 ESTIMATING COSTING AND VALUATION	L	T	P
		1	-	4

COURSE OBJECTIVES:

Following are the objectives of this course:

- To learn the procedure for estimating and costing of Civil Engineering works.
- To perform rate analysis for different items associated with construction projects.
- To use software for detailed estimate related to civil infrastructural projects.

COURSE OUTCOMES:

After completing this course, student will be able to:

CO1- Select modes of measurements for different items of works.

CO2- Understand the procedure of approximate estimate for various construction projects

CO3- Understand rate analysis for various items of works using Standard data and Schedule of Rates.

CO4- Interpret various systems of payment used in construction contracts.

CO5- Justify rate for given items of work using rate analysis techniques.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning
CO1	3	2	-	-	-	-	3
CO2	3	2	-	-	-	2	3
CO3	3	2	2	-	-	2	3
CO4	3	2	-	-	-	2	3
CO5	3	2	2	-	-	2	3

Legend: High (3), Medium (2), Low (1) and No mapping (-)

DETAILED COURSE CONTENT

UNIT – I FUNDAMENTALS OF ESTIMATING AND COSTING (10 periods)

- Estimating and Costing – Meaning, purpose, Administrative approval, Technical Sanction and Budget provision.
- Measurement : Units of measurement for various items of work, Rules for deduction in different category of work as per IS:1200
- Types of estimates – Approximate and Detailed estimate.
- Types and Uses of Estimates: Revised estimate, Supplementary estimate, Repair and

- maintenance estimate, renovation estimate.
- Roles and responsibility of Estimator.
- Standard formats of Measurement sheet, Abstract sheet, Face sheet.
- Modes of measurement and desired accuracy in measurements for different items of work as per IS:1200.

UNIT– II ESTIMATE

(20 periods)

- Detailed Estimate- Definition and Purpose, Data required for detailed estimate - Civil cost, GST, Contingencies, Supervision charges, Agency charges, work charged establishment, Procedure for preparation of detailed estimate- Taking out quantities and Abstracting.
- Long wall and Short wall method, Centre line method.
- Bar bending schedule for footing, column, beam, Lintel, chajja and slab elements.
- Earthwork - Quantities for roads, Embankment and canal by – Mid sectional area method, mean sectional area method, Prismoidal and trapezoidal formula method.
- A small residential building with a flat roof comprising of - Two rooms with W.C., bath, kitchen and verandah WBM road and pre-mix carpeting Single span RCC slab culvert Earthwork for plain and hill roads RCC work in beams, slab, column and lintel, foundation 10 users septic tank.

UNIT– III RATE ANALYSIS

(15 periods)

- Calculation of quantities of materials for : Cement mortars of different proportion, Cement concrete of different proportion, Brick/stone masonry in cement mortar of different proportion, Plastering, pointing and painting, D.P.C. and flooring.
- Categories of labours, their daily wages, types and number of labours for different items of work.
- Rate Analysis: Definition, purpose and importance. Procedure for rate analysis.
- Preparing rate analysis of different items of work pertaining to buildings and roads.

UNIT– IV TENDER AND CONTRACTORSHIP

(15 periods)

- Tender, tender forms and documents, tender notice, submission of tender and deposit of earnest money, security deposit, retention money, maintenance period.
- Meaning of contract, Types of contracts, their advantages, dis-advantages and suitability, system of payment.
- Exercises on writing detailed specifications of different types of building works: Earthwork, Brick work and RCC work.

UNIT– V REAL ESTATE (REGULATION AND DEVELOPMENT) ACT-2016 AND VALUATION

(10 periods)

- Introduction: Purpose and Salient features of Act.
- Definition and functions of Real Estate projects, Promoter, Agent and Allottees .
- Registration of Real Estate Projects.
- Valuation: Purpose of valuation, principles of valuation.
- Definition of various terms related to valuation like depreciation, sinking fund, salvage and

scrap value, market value, fair rent, year's purchase etc.

SUGGESTED LEARNING RESOURCES

1. Datta, B.N., Estimating and Costing in Civil engineering, UBS Publishers Distributors Pvt. Ltd. New Delhi.
2. Peurifoy, Robert L. Oberlender, Garold, Estimating construction cost (fifth edition), McGraw Hill Education, New Delhi.
3. Rangwala, S.C., Estimating and Costing, Charotar Publishing House PVT. LTD., Anand.
4. Birdie, G.S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd. New Delhi.
5. Patil, B.S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai.
6. Chakraborti, M., Estimating and costing, specification and valuation in civil engineering, Monojit Chakraborti, Kolkata.
7. CPWD and PWD Schedule of Rates.
8. Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Schedule of Rates.
9. D.V. Gupta, Vikram Singh, Quantity Surveying & valuation of Building & Civil Works, Asian Publishers, Muzaffarnagar, ISBN No. 978-93-5502-154-0

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centered activities in class room and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	10
2	20	25
3	15	25
4	15	25
5	10	15
Total	70	100

THEORY	5.3 GEOTECHNICAL ENGINEERING	L	T	P
		2	-	-

COURSE OBJECTIVES:

Following are the objectives of this course:

- To understand and determine physical and index properties and classification of soil
- To estimate permeability and shear strength of soil
- To know the load bearing capacity of soil
- To learn various soil stabilization and compaction methods

COURSE OUTCOMES:

After completing this course, student will be able to:

CO1- Identify and classify various types of soils.

CO2- Interpret the physical properties of soil related to given construction activities.

CO3- :Apply permeability, effective stress and shear strength test for foundation analysis.

CO4- Compute optimum values for moisture content for maximum dry density of soil

CO5- Interpret bearing capacity soil and selection of foundation. Soil sampling and Stabilization.

COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning
CO1	3	1	1	3	2	2	2
CO2	3	1	1	2	2	2	2
CO3	3	1	1	2	2	2	2
CO4	3	1	1	2	2	2	2
CO5	3	1	1	2	2	2	2

Legend: High (3), Medium (2), Low (1) and No mapping (-)

DETAILED COURSE CONTENT

UNIT – I OVERVIEW OF GEOLOGY AND GEOTECHNICAL ENGINEERING

(3 periods)

- Introduction of Geology, Branches of Geology, Importance of Geology for civil engineering structure and composition of earth, Definition of a rock: Classification based

on their genesis(mode of origin), formation. Classification and engineering uses of igneous, sedimentary and metamorphic rocks.

- Importance of soil as construction material in Civil engineering structures and as foundation bed for structures.

UNIT– II PHYSICAL AND INDEX PROPERTIES OF SOIL (7 periods)

- Soil as a three-phase system, water content, determination of water content by oven drying method as per BIS code, void ratio, porosity and degree of saturation, density index. Unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight. Determination of bulk unit weight and dry unit weight by core cutter and sand replacement method, Determination of specific gravity by pycnometer.
- Consistency of soil, Atterberg limits of consistency: Liquid limit, plastic limit and shrinkage limit. Plasticity index.
- Particle size distribution test and plotting of curve, Determination of effective diameter of soil, well graded and uniformly graded soils, BIS classification of soil.
- Effective Stress (Concept only), Stresses in subsoil, Definition and meaning of total stress, effective stress and neutral stress, Principle of effective stress, Importance of effective stress in engineering problems.

UNIT– III PERMEABILITY AND SHEAR STRENGTH OF SOIL (7 periods)

- Definition of permeability, Darcy's law of permeability, coefficient of permeability, factors affecting permeability, determination of coefficient of permeability by constant head and falling head tests, simple problems to determine coefficient of permeability. Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines, application of flow net, (No numerical problems).
- Shear failure of soil, concept of shear strength of soil. Components of shearing resistance of soil – cohesion, internal friction. Mohr-Coulomb failure theory, Strength envelope, strength equation for purely cohesive and cohesion less soils. Direct shear and vane shear test–laboratory methods.

UNIT– IV COMPACTION AND CONSOLIDATION (5 periods)

- Concept of compaction and consolidation, Standard and Modified proctor test as per IS code, Plotting of Compaction curve for determining: Optimum moisture content (OMC), maximum dry density (MDD), Zero air voids line. Factors affecting compaction, field methods of compaction – rolling, ramming and vibration. Suitability of various compaction equipments-smooth wheel roller, sheep foot roller, pneumatic tyred roller, Rammer and Vibrator, Difference between compaction and consolidation.
- Definition of earth pressure, Active and Passive earth pressure for no surcharge condition, coefficient of earth pressure, Rankine's theory and assumptions made for non-cohesive Soils.

UNIT– V BEARING CAPACITY OF SOIL AND STABILIZATION OF SOIL (6 periods)

- Bearing capacity and theory of earth pressure. Concept of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing pressure. Introduction to

Terzaghi's analysis and assumptions, effect of water table on bearing capacity.

- Field methods for determination of bearing capacity – Plate load and Standard Penetration Test. Test procedures as per IS:1888 & IS:2131.
- Concept of soil stabilization, necessity of soil stabilization, different methods of soil stabilization. California bearing ratio (CBR) test - Meaning and Utilization in Pavement Construction
- Necessity of site investigation and soil exploration: Types of exploration, criteria for deciding the location and number of test pits and bores. Field identification of soil – dry strength test, dilatancy test and toughness test.

Suggested learning resources:

1. Punmia, B.C., Soil Mechanics and Foundation Engineering, Laxmi Publication, Delhi.
2. Murthy, V.N.S., A text book of soil mechanics and foundation Engineering, CBS Publishers & Distributors Pvt. Ltd., New Delhi.
3. Ramamurthy, T.N. & Sitharam, T.G., Geotechnical Engineering (Soil Mechanics), S Chand and Company LTD., New Delhi.
4. Raj, P. Purushothama, Soil Mechanics and Foundation Engineering, Pearson India, New Delhi.
5. Kasamalkar, B. J., Geotechnical Engineering, Pune Vidyarthi Griha Prakashan, Pune.
6. Arora K R, Soil Mechanics and Foundation Engineering, Standard Publisher.
7. S.K.Sharma, Soil Mechanics & Foundation Engineering, Asian Publishers, Muzaffarnagar, ISBN No. 978-93-91541-60-6

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student-centered activities in class room and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	03	10
2	07	25
3	07	25
4	05	20
5	06	20
Total	28	100

PRATICUM/ THEORY	5.4 DESIGN OF STEEL STRUCTURE AND DRAWING	L	T	P
		1	-	4

COURSE OBJECTIVES:

This subject is an applied engineering subject. Diploma holders in Civil Engineering will be required to supervise steel construction and fabrication. He may also be required to design simple structural elements, make changes in design depending upon availability of materials. This subject thus deals with elementary design principles as per BIS code of practice IS: 800.

COURSE OUTCOMES:

After undergoing the subject, students will be able to:

- CO1- Explain structural properties of steel and its designation as per Indian Standards
- CO2- To understand the detailing and drafting of welded and bolted connections.
- CO3- To understand the detailing and drafting of Compression members and tension members.
- CO4- Explain different types of trusses, their different components and usability
- CO5- Analyze and design of simply supported steel beams
- Select various types of plate girders
- Supervise fabrication and erection of steel structure like trusses, columns and girders

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning
CO1	3	2	1	2	1	2	2
CO2	3	2	1	2	1	2	2
CO3	3	2	1	2	1	2	2
CO4	3	2	1	2	1	2	2
CO5	3	2	1	2	1	2	2

Legend: High (3), Medium (2), Low (1) and No mapping (-)

DETAILED COURSE CONTENT

UNIT – I INTRODUCTION

(5 periods)

- Structural Steel and Sections: Properties of structural steel, Designation and classification of structural steel sections as per IS handbook and IS: 800:2007,
- Tubular Sections
- Types of sections used for beams, tension and compression members

UNIT – II RIVETED, BOLTED AND WELDED CONNECTIONS (20 periods)

- Riveted Connections: Types of Rivet, Permissible stresses in rivets, types of riveted joints, specifications as per IS800, Failure of riveted joint, strength and efficiency of riveted joint, Design of Riveted Connection only axially loaded number (No staggered riveting)
- Bolt Connections: Types of bolt, permissible stresses in bolt, types of bolted joints, specifications for bolted joints as per IS 800. Failure of a bolted joint. Assumptions in the theory of bolted joints. Strength and efficiency of a bolted joint. Design of bolted joints for axially loaded members (No Staggered bolts).
- Welded connections: Types of welds and welded joints, advantages and disadvantages of welded joints design of fillet and butt weld for axially loaded members

UNIT – III TENSION AND COMPRESSION MEMBERS (15 periods)

- Tension Members: Analysis and design of single and double section tension members and their rivetted and welded connections with gusset plate as per IS:800-2007. Introduction to Lug Angle and Tension splice.
- Compression Members: Angle struts, type of section used, effective length, radius of gyration, slenderness ratio and its limits, permissible compressive stress Analysis and design of single and double angle sections compression members subjected to axial load. Introduction to analysis and design of axially loaded column. Introduction to lacing and battening (No numerical problem on lacing and battening)

UNIT – IV BEAMS, ROOF TRUSSES AND COLUMN BASES (10 periods)

- Beams : Analysis and design of single section simply supported laterally restrained steel beams. Introduction to plate girder and functions of various elements of a plate girder
- Roof Trusses: Form of trusses, pitch of roof truss, spacing of trusses, spacing of purlins, connection between purlin and roof covering. Connection between purlin and principal rafter (no design, only concept)
- Column Bases : Types of column bases i.e. slab base, gusseted base. Design of slab base and concrete block. Introduction to gusseted base (no numerical problems on gusseted base). Introduction to beam columns design of simple built up beams (Symmetrical I section with cover plates only)

UNIT – V STEEL STRUCTURE DRAWINGS (20 periods)

- (i) Drawing No. 1: Roof Truss –Drawing of Fink Roof Truss with details of joints, fixing details of purlins and roof sheets.

- (ii) Drawing No.2 :Column and Column Bases - Drawing of splicing of steel columns. Drawings of slab base, gusseted base and grillage base for single section steel columns.
- (iii) Drawing No.3 :Column Beam Connections (a) Sealed and Framed Beam to Beam Connections (b) Sealed and Framed Beam to Column Connections
- (iv) Drawing No. 4 :Plate Girder (Bolted) Plan and Elevation of Plate Girder with details at supports and connection of stiffness, flange angles and cover plate with web highlighting curtailment of plates.
- (v) Drawing No. 5 :Draw atleast one sheet using CAD software.

RECOMMENDED BOOKS

- Civil Engineering Drawing by Layal JS; SatyaParkashan, New Delhi
- Civil Engineering Drawings by Chandel RP
- Civil Engineering Drawing by Kumar; NS; IPH, New Delhi
- Civil Engineering Drawing by Malik RS and Meo GA; Asian Publishing House, New Delhi
- Steel Structures Design and Drawing by SinghBirinder; Kaption Publishing House, New Delhi
- e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.
- Gharpure, D.V.Gupta, Vikram Singh, Design Of Steel Structures, Asian Publishers, Muzaffarnagar, ISBN No.978-93-5502-160-1

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student-centered activities in class room and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	05	10
2	20	25
3	15	20
4	10	10
5	20	35
Total	70	100

THEORY	5.5 ENVIRONMENTAL MANAGEMENT	L	T	P
		2	-	-

COURSE OBJECTIVES:

Following are the objectives of this course:

- To learn about various types of natural and man-made disasters.
- To know pre- and post-disaster management for some of the disasters.
- To know about various information and organisations in disaster management in India.
- To get exposed to technological tools and their role in environmental management.

COURSE OUTCOMES:

After competing this course, student will be able to:

CO1-Acquainted with basic information on various types of environmental management

CO2-Knowing the precautions and awareness regarding various disasters

CO3-Decide first action to be taken under various disasters

CO4-To create awareness about harmful effects of pollution and to take preventive steps for controlling the pollution.

CO5-To help the students to acquire knowledge with reference to various sources of pollution and planning of remedial measures to control pollution.

COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning
CO1	3	2	1	-	-	2	3
CO2	2	3	2	-	-	3	2
CO3	2	3	3	2	-	3	2
CO4	3	2	2	3	2	3	3
CO5	3	3	2	3	2	3	3

Legend: High (3), Medium (2), Low (1) and No mapping (-)

DETAILED COURSE CONTENT

UNIT-1: ENVIRONMENTAL INDICATORS, PROTECTION OF ENVIRONMENT (5 periods)

Indicators of Ecological Environment, Indicators and Biodiversity, Indicators for Economic, Social and Aesthetic Environment. Uses of the Indicators for Public, Decision Makers, Judicial System, Researchers and other Groups. Development of the Indicators using procedure like basic data gathering identifying the critical factor and data distribution. Clean Environment, Need and Importance of Clean Environment, Sustainable Development, Need for Environmental Protection: Control of environmental pollution, Land and water management, Nature living resource conservation, Development of non-polluting sources of energy, Environmental education and awareness.

UNIT-2: LAND USE, POLLUTION AND ABUSE & MINING, DEFORESTATION AND THEIR EFFECTS (4 periods)

Land use, land use and environmental quality, land use and natural disasters, soil degradation problems: Erosion, Salinization and Waterlogging, Soil Pollution, Management Planning for Land Use and Environmental Improvement. Deforestation: Major Causes and its Effects, Benefits from Forests, Effects of Deforestation, Forest Management Strategies, Mining: Mining Operations, Impact of Mining on Environment.

UNIT-3: ENVIRONMENT IMPACT ASSESSMENT (E. I. A.) (3 periods)

Impact of Environmental Management Processes on Biological System including man. EIA of developmental projects like residential and commercial complexes, dams, reservoirs, canals, railways, highways, tunnels, bridges, etc.

UNIT-4: MANAGEMENT OF HAZARDS AND ACCIDENT PREVENTIONS (8 periods)

Formation of crisis group, Disaster management of dams, Reservoirs, High rise building in earthquake prone areas, bridges etc.

Terminology relating to chemical hazards, classification of chemicals, hazards and hazardous chemicals, Hazards associated with manufacturing storage and handling of chemicals, Examples of disasters such as Bhopal Gas (MIC) leakage episode and other, Hazards associated with particulate matter specially from cement, metallurgical industries and thermal power station, I.S. and other codes of safety for operational hazards in laboratories and industries.

UNIT-5: MEASURING TECHNOLOGIES & TREATMENT TECHNOLOGIES

(8 periods)

Measuring sampling techniques for quantification of various parameters under various conditions of air, water and land systems; Physical, chemical, and biological parameters. Standards based on B.I.S./Pollution Control Board, Water Treatment for domestic use, Industrial water treatment, Domestic waste water treatment, Industrial waste water treatment, Radioactive waste control and Air pollution control.

SUGGESTED LEARNING RESOURCES:

1. “Environmental Management” Author: N.K. Uberoi Publisher: Excel Books
2. “Environmental Management” Author: S.K. Dhameja Publisher: S.K. Kataria & Sons
3. Environmental Management: Principles and Practice” Author: Chris Barrow Publisher: Routledge
4. Environmental Impact Assessment” Author: Larry W. Canter Publisher: McGraw-Hill

<https://swayam.gov.in>, <https://nptel.ac.in>, <https://www.coursera.org>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	05	20
2	04	15
3	03	15
4	08	25
5	08	25
Total	28	100

OE-1/ THEORY	5.6 (a) DISASTER MANAGEMENT	L	T	P
		2	-	-

COURSE OBJECTIVES:

Following are the objectives of this course:

- To learn about various types of natural and man-made disasters.
- To know pre- and post-disaster management for some of the disasters.
- To know about various information and organisations in disaster management in India.
- To get exposed to technological tools and their role in disaster management.

COURSE OUTCOMES:

After completing this course, student will be:

CO1-Acquainted with basic information on various types of disasters

CO2-Knowing the precautions and awareness regarding various disasters

CO3-Decide first action to be taken under various disasters

CO4-Familiarised with organisation in India which are dealing with disasters able to select IT tools to help in disaster management.

CO5- Apply Remote Sensing and GIS techniques to analyze disaster-prone areas, vulnerability patterns and damage assessment for different types of natural and man-made disasters.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning
CO1	3	3	3	1	2	1	2
CO2	3	3	3	1	2	1	2
CO3	3	3	3	1	2	1	2
CO4	3	3	3	1	2	1	2
CO5	3	3	3	1	2	1	2

Legend: High (3), Medium (2), Low (1) and No mapping (-)

DETAILED COURSE CONTENT

UNIT – I: UNDERSTANDING DISASTER

(5 periods)

Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity– Disaster and Development, and disaster management.

UNIT – II: TYPES, TRENDS, CAUSES, CONSEQUENCES AND CONTROL OF DISASTERS

(6 periods)

Geological Disasters (earthquakes, landslides, tsunamis, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunderstorms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters) Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters.

UNIT- III: DISASTER MANAGEMENT CYCLE AND FRAMEWORK

(6 periods)

Disaster Management Cycle – Paradigm Shift in Disaster Management. Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Micro- zonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness. During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation

Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action.

UNIT– IV: DISASTER MANAGEMENT IN INDIA

(5 periods)

Disaster Profile of India – Mega Disasters of India and Lessons Learnt. Disaster Management Act 2005 – Institutional and Financial Mechanism, National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national), Non-Government and Inter Government Agencies

UNIT– V: APPLICATIONS OF SCIENCE AND TECHNOLOGY FOR DISASTER MANAGEMENT

(6 periods)

Geo-informatics in Disaster Management (RS, GIS, GPS and RS). Disaster Communication System (Early Warning and Its Dissemination). Land Use Planning and Development Regulations, Disaster Safe Designs and Constructions, Structural and Non Structural Mitigation of Disasters. S&T Institutions for Disaster Management in India

SUGGESTED LEARNING RESOURCES:

1. Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management
2. Bhandani, R. K., An overview on natural & man-made disasters and their reduction, CSIR, New Delhi
3. Srivastava, H. N., and Gupta G. D., Management of Natural Disasters in developing countries, Daya Publishers, Delhi
4. Alexander, David, Natural Disasters, Kluwer Academic London
5. Ghosh, G. K., Disaster Management, A P H Publishing Corporation
6. Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.
7. D.V.Gupta, Vikram Singh, Earthquake Engineering & Disaster Management, Asian Publishers, Muzaffarnagar, ISBN No. 978-93-91541-54-5

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	05	15
2	06	25
3	06	25
4	05	15
5	06	20
Total	28	100

OE-1 THEORY	5.6 (b) PROJECT MANAGEMENT	L	T	P
		2	-	-

COURSE OBJECTIVES:

Following are the objectives of this course:

- To develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.
- To develop an understanding of key project management skills and strategies.

COURSE OUTCOMES:

After completing this course, student will be:

CO1-Explain the principles of Project Management.

CO2- Create and manage project schedules.

CO3- Create structure and manage the project commitments.

CO4- Acquire to Gain enterprise support.

CO5-Apply crashing procedures for time and cost optimization.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning
CO1	3	-	-	-	-	3	1
CO2	3	-	-	-	1	3	1
CO3	3	-	-	-	1	3	1
CO4	3	-	-	-	1	3	1
CO5	3	3	-	-	1	3	1

DETAILED COURSE CONTENT

UNIT – I: CONCEPT OF A PROJECT

(5 periods)

Classification of projects- importance of project management- The project life cycle- establishing project priorities (scope-cost-time) project priority matrix- work break down structure.

UNIT – II: CAPITAL BUDGETING PROCESS

(5 periods)

Planning- Analysis-Selection-Financing-Implementation Review. Generation and screening of project ideas- market and demand analysis- Demand forecasting techniques. Market planning and marketing research process- Technical analysis

UNIT- III: FINANCIAL ESTIMATES AND PROJECTIONS

(5 periods)

Cost of projects-means of financing-estimates of sales and production-cost of production-working capital requirement and its financing-profitability projected cash flow statement and balance sheet. Break even analysis.

UNIT– IV: BASIC TECHNIQUES IN CAPITAL BUDGETING

(5 periods)

Non discounting and discounting methods- pay- back period- Accounting rate of return-net present value-Benefit cost ratio-internal rate of return. Project risk. Social cost benefit analysis and economic rate of return. Non-financial justification of projects.

UNIT– V: PROJECT ADMINISTRATION

(8 periods)

Progress payments, expenditure planning, project scheduling and network planning, use of Critical Path Method (CPM), schedule of payments and physical progress, time-cost trade off. Concepts and uses of PERT cost as a function of time, Project Evaluation and Review Techniques/cost mechanisms. Determination of least cost duration. Post project evaluation. Introduction to various Project management softwares.

SUGGESTED LEARNING RESOURCES:

1. Project planning, analysis, selection, implementation and review – Prasannachandra – TataMcGraw Hill
2. Project Management – the Managerial Process – Clifford F. Gray & Erik W. Larson - McGrawHill
3. Project management - David I Cleland - Mcgraw Hill International Edition, 1999
4. Project Management – Gopala krishnan – Mcmillan India Ltd.
5. Project Management-Harry-Maylor-Pearson Publication

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	05	15
2	05	15
3	05	20
4	05	20
5	08	30
Total	28	100

PRACTICAL	5.7 TRANSPORTATION ENGINEERING LAB	L	T	P
		-	-	4

COURSE OBJECTIVES:

Following are the objectives of this course:

- To identify the types of roads as per IRC recommendations.
- To understand the geometrical design features of different highways.

COURSE OUTCOMES:

After completing this course, student will be able to:

CO1- Identify the types of roads as per IRC recommendations.

CO2- Implement the geometrical design features of different highways.

CO3- Perform different tests on road materials.

CO4- Identify the components of railway tracks.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning
CO1	3	2	1	3	1	-	1
CO2	3	2	1	3	1	-	1
CO3	3	2	1	3	1	-	1
CO4	3	2	1	3	1	-	1
CO5	3	2	1	3	1	-	1

Legend: High (3), Medium (2), Low (1) and No mapping (-)

LIST OF PRACTICALS TO BE PERFORMED:

1	California Bearing Ratio (CBR) Test
2	Flakiness and Elongation Index of aggregates.
3	Angularity Number of aggregates.
4	Aggregate impact test
5	Los Angeles Abrasion test
6	Aggregate crushing test
7	Softening point test of bitumen.
8	Penetration test of bitumen.

9	Flash and Fire Point test of bitumen.
10	Ductility test of Bitumen.
11	Visit to railway track for visual inspection of fixtures, fasteners and yards.
12	Prepare the photographic report containing details for experiment No. 11.

SUGGESTED LEARNING RESOURCES:

1. L.R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., New Delhi (ISBN:978-93-82609-858) Edition 2018
2. Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Broth-ers, Roorkee.
3. Arora, N. L., Transportation Engineering, Khanna Publishers, Delhi.
4. Saxena S C and Arora S P, A Textbook of Railway Engineering, Dhanpat Rai Publication.
5. Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg , Standard Book House, Delhi.
6. Sharma, S.K., Principles, Practice and Design of Highway Engineering, S. Chand
7. Duggal, Ajay K. and Puri, V. P., Laboratory Manual in Highway Engineering, New Age Interna-tional (P) Limited, Publishers, New Delhi.
8. Subramanian, K.P., Highway, Railway, Airport and Harbour Engineering, Scitech Publications, Hyderabad.

PRACTICAL	5.8 GEOTECHNICAL ENGINEERING LAB	L	T	P
		-	-	4

COURSE OBJECTIVES:

Following are the objectives of this course:

- To understand and determine physical and index properties of soil.
- To estimate the permeability and shear strength of soil.
- To know the procedure for performing C.B.R test.
- To learn various compaction methods for soil stabilization.

COURSE OUTCOMES:

After completing this course, student will be able to:

CO1- Identify types of rocks and sub soil strata of earth.

CO2- Interpret the physical properties of soil related to given construction activities.

CO3- Use the results of permeability and shear strength test for foundation analysis.

CO4- Interpret the soil bearing capacity results.

CO5- Compute optimum moisture content values for maximum dry density of soil through various tests.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning
CO1	3	3	2	3	1	-	1
CO2	3	3	2	3	1	-	1
CO3	3	3	2	3	1	-	1
CO4	3	3	2	3	1	-	1
CO5	3	3	2	3	1	-	1

Legend: High (3), Medium (2), Low (1) and No mapping (-)

LIST OF PRACTICALS TO BE PERFORMED:

1. Identification of rocks from the given specimen.
2. Determine water content of given soil sample by oven drying method as per IS: 2720 (Part-II).
3. Determine specific gravity of soil by pycnometer method as per IS 2720 (Part- III).
4. Determine dry unit weight of soil in field by core cutter method as per IS 2720 (Part- XXIX).
5. Determine dry unit weight of soil in field by sand replacement method as per IS

2720 (Part-XXVIII).

6. Determine Plastic and Liquid Limit along with Plasticity Index of given soil sample as per IS 2720 (Part- V).
7. Determine Shrinkage limit of given soil sample as per IS 2720 (Part- V).
8. Determine grain size distribution of given soil sample by mechanical sieve analysis as per IS2720 (Part- IV).
9. Use different types of soil to identify and classify soil by conducting field tests- Through Visual inspection, Dry strength test, Dilatancy test and Toughness test.
10. Determine coefficient of permeability by constant head test as per IS 2720 (Part- XVII).
11. Determine coefficient of permeability by falling head test as per IS 2720 (Part- XVII).
12. Determine shear strength of soil by direct shear test as per IS 2720 (Part-XIII).
13. Determine shear strength of soil by vane shear test as per IS 2720 (Part-XXX).
14. Determine MDD and OMC by standard proctor test of given soil sample as per IS 2720 (Part-VII).
15. Determination of CBR value on the field as per IS2720 (Part - XVI).

SUGGESTED LEARNING RESOURCES:

1. Punmia, B.C., Soil Mechanics and Foundation Engineering, Laxmi Publication
2. Murthy, V.N.S., A text book of soil mechanics and foundation Engineering, CBS Publishers & Distributors Pvt. Ltd., New Delhi.
3. Ramamurthy, T.N. & Sitharam,T.G., Geotechnical Engineering(Soil Mechanics), S Chand andCompany LTD., New Delhi.
4. Raj, P. Purushothama, Soil Mechanics and Foundation Engineering, Pearson India
5. Kasamalkar,B.J.,Geotechnical Engineering, Pune Vidyarthi Griha Prakashan, Pune.
6. Arora K R, Soil Mechanics and Foundation Engineering, Standard Publisher.

AUDIT COURSE	5.9 INDIAN CONSTITUTION	L	T	P
		2	-	-

COURSE OBJECTIVES:

1. Understand the history, principles, and key interpretations of the Indian Constitution.
2. Understand the structure and key roles of the Indian Union Government, including the President, Prime Minister, and Council of Ministers.
3. Understand the composition, powers, and functions of the Lok Sabha, Rajya Sabha, and the Supreme Court.
4. Understand the roles and powers of the Governor, Chief Minister, Council of Ministers, and the State Secretariat.
5. Understand the structure and functions of local administration, including District, Municipal, and Zila Panchayat levels.
6. Understand the structure, role, and functions of the Election Commission of India.

COURSE OUTCOMES(COs) -

- CO1:** Understand the historical background, philosophy, and process involved in the making of the Indian Constitution.
- CO2:** Analyze the structure and functioning of the Union Government, including the roles, powers, and relationships of the President, Prime Minister, Council of Ministers, Lok Sabha, and Rajya Sabha.
- CO3:** Explain the organization and working of the State Government.
- CO4:** Evaluate the system of Local Administration in India by understanding the structure and functions of District Administration, Municipal Corporations, and Zila Panchayats.
- CO5:** Understand the role, powers, and significance of the Election Commission of India in ensuring free and fair elections in a democratic system.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	-	-	2	-	2	*	*
CO2	3	3	2	-	2	1	2	*	*
CO3	3	2	1	-	2	1	2	*	*
CO4	3	3	2	-	3	2	2	*	*
CO5	3	2	-	-	3	1	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED COURSE CONTENT

Unit 1: The Constitution – Introduction

(05 Periods)

- The History of the Making of the Indian Constitution
- Preamble and the Basic Structure, and its interpretation
- Fundamental Rights and Duties and their interpretation

Unit 2 – Union Government

(06 Periods)

- Structure of the Indian Union Government
- President – Election, Role and Power
- Prime Minister and Council of Ministers

Unit 03- Indian legislature & judiciary

(06 Periods)

- Composition of Lok Sabha and Rajya Sabha
- Powers & Functions of Lok Sabha and Rajya Sabha
- Structure of Supreme Court including Appointment of Judges
- Powers & Functions of Supreme Court

Unit 04 – State Government

(05 Periods)

- Governor – Role and Power
- Chief Minister and Council of Ministers
- State Secretariat

Unit 05 – Local Administration

(03 Periods)

- District Administration
- Municipal Corporation
- Zila Panchayat

Unit 06 – Election Commission

(03 Periods)

- Structure of Election Commission of India
- Role and Function of Election Commission

INSTRUCTIONAL STRATEGY:

Teacher may use demonstration of different materials that can make the subject interest and develop knowledge of building materials and construction methods in the student. In additions student give more emphasis on explaing practical application of construction of related structures efficiently and economically and encouraged study those processes which may find practical application in future career.

Means of assessments:

- Assignment & Quiz,
- Mid-Term and End-Term written test.

Recommended Books:

1. Ethics and Politics of the Indian Constitution Rajeev Bhargava Oxford University Press, New Delhi, 2008
2. The Constitution of India B.L. Fadia Sahitya Bhawan; New edition (2017)
3. Introduction to the Constitution of India DD Basu Lexis Nexis; Twenty-Third 2018 Edition.
4. Our Constitution Subhash Chand Kashyap NBT New Delhi.
5. Indian Polity M.laxmikant, Mc Graw Hill.

SUGGESTED DISTRIBUTION OF MARKS

Units	Time Allotted (hrs.)	Marks Allotted (%)
1	5	20
2	6	20
3	6	20
4	5	20
5	3	10
6	3	10
Total	28	100

PRACTICAL	SUMMER INTERNSHIP-I/SUMMER INTERNSHIP-II	L	T	P

SUMMER INTERNSHIP-I/SUMMER INTERNSHIP-II

(Summer Internship-I will be During summer vacation after II Semester & Summer Internship-II will be During summer vacation after IV Semester)

It is needless to emphasize further the importance of Professional Training of students during their 3 years of studies at Polytechnics. It is Professional training, which provides an opportunity to students to experience the environment and culture of corporate construction offices/ Government construction and Design departments/ Construction Agencies/ Builder's Organisations / Design Consultation units and commercial activities undertaken in field organizations. It prepares student for their future role as diploma Civil engg. In the world of work and enables them to integrate theory with practice. Polytechnics have been arranging Professional training of students of various durations to meet the above objectives.

This document includes guided and supervised Professional training of a minimum of 4 weeks duration to be organised during the semester break starting after first year and 6 weeks duration after second year i.e. after IInd & IVth Semester examinations.

The concerned HODs along with other teachers will guide and help students in arranging appropriate training places relevant to their specific branch. It is suggested that a training schedule may be drawn for each student before starting of the training in consultation with the training providers.

Students should also be briefed in advance about the organizational setup, Working environment, Designing and Drafting process, important machines and Drafting tools used in the training organization.

Equally important with the guidance is supervision of students training in the office/organization by the teachers. A minimum of one visit by the teacher is recommended. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

An external assessment of 50 marks has been provided in the study and evaluation scheme of IIIrd & 100 marks in Vth Semester. Evaluation of professional training report through viva-voce/presentation aims at assessing student's understanding of Drafting various working drawings, Designing process, practices in offices/field organization and their ability to engage in activities related to problem solving in professional setup as well as understanding of application of knowledge and skills learnt in real life situations. The formative and summative evaluation may comprise of weightage to performance in testing, general behaviour, quality of report and presentation during viva-voce examination. It is recommended that such evaluations may be carried out by a team comprising of concerned HOD, teachers and representative from Organisation . Teachers and students are requested to see the footnote below the study and evaluation scheme of II& IV Semester for further details.

The teacher along with field supervisors will conduct performance assessment of students. The components of evaluation will include the following:

- Punctuality and regularity 15%
- Initiative in learning new things/field exposure 20%
- Presentation and viva 40%
- Industrial training report 25%

SEMESTER-VI

PE-2 THEORY	6.1 (a) CONSTRUCTION MANAGEMENT	L	T	P
		3	1	-

COURSE OBJECTIVES:

Following are the objectives of this course:

- To understand the contract management and associated labour laws.
- To prepare and understand the principles involved in site layout.
- To know the procedure for scheduling of various activities in construction project.
- To understand the labour laws, procedure for arbitration, settlements.
- To know different safety measures in construction projects.

COURSE OUTCOMES:

After completing this course, student will be able to:

CO1- Understand how construction projects are managed, assess their feasibility, and plan resources effectively for civil engineering projects.

CO2- Understand contracts and tenders, as well as how construction companies manage money and paperwork, including the importance of keeping good records.

CO3- understand how to plan construction projects, schedule activities, and manage resources to meet project goals within budget and time constraints.

CO4-Understand the importance of quality in construction, learn methods to maintain it, and gain knowledge about resolving disputes in construction projects.

CO5- Understand the importance of safety in construction and the roles of different parties involved in safety management

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning
CO1	3	-	-	-	1	2	3
CO2	3	3	-	-	1	2	3
CO3	3	1	1	2	1	2	3
CO4	3	-	-	2	1	2	3
CO5	3	1	1	2	1	2	3

Legend: High (3), Medium (2), Low (1) and No mapping (-)

DETAILED COURSE CONTENT

UNIT – I CONSTRUCTION INDUSTRY AND MANAGEMENT (8 periods)

- Significance of construction management, Main objectives of construction management and overview of the subject, Functions of construction management, planning, organizing, staffing, directing, controlling and coordinating, meaning of each of these with respect to construction job, Classification of construction into light, heavy and industrial construction
- Stages in construction from conception to completion, The construction team: owner, engineer, architect and contractors, their functions and inter-relationship, Resources for construction industry

UNIT – II CONSTRUCTION PLANNING (12 periods)

- Importance of construction planning - Stages of construction planning - Pre-tender stage, Contract stage
- Contracts and e-tendering - Different types of contracts - Penalties and Arbitration
- Scheduling construction works by bar charts -
Definition of activity, identification of activities though -
Preparation of bar charts for simple construction work -
Preparation of schedules for labour, materials, machinery and finances for small works
- Scheduling by network techniques - Introduction to network techniques; PERT and CPM, differences between PERT and CPM terminology.
- Methods of recording progress: Analysis of progress, Taking corrective actions keeping head office informed, Cost time optimization for simple jobs - Direct and indirect cost, variation with time, cost optimization

UNIT- III ORGANIZATION (10 periods)

- Types of organizations: Line, line and staff, functional and their characteristics
- Site Organization : Principle of storing and stacking materials at site, Location of equipment, Preparation of actual job layout for a building, Organizing labour at site
- Important Acts for Labour welfare:
 - Labour Welfare Fund Act 1936 (as amended)
 - Payment of Wages Act 1936 (as amended)
 - Minimum Wages Act 1948 (as amended)
 - Acts relating to Labour Safety

UNIT IV ACCOUNTS AND ENTREPRENEURSHIP (17 periods)

- Introduction, technical sanction, 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, definition 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.

- Definition and concept, role and significance, risk and awards, Requirement of an entrepreneur development, Programmes Existing in India
- GST - Income Tax - Excise duty - Labour cess

UNIT– V INSPECTION, QUALITY CONTROL AND SAFETY IN CONSTRUCTION (9 periods)

- Need for inspection and quality control, Principles of inspection, Stages of inspection and quality control for - Earth work - Masonry - RCC - Sanitary and water supply services
- Safety in Construction Industry—Causes of Accidents, Remedial and Preventive Measures. Safety campaign and safety devices, safety training Fire safety.

SUGGESTED LEARNING RESOURCES

1. Sharma S C and Deodhar S V, Construction Engineering and Management, Khanna Book Pub-lishing, New Delhi
2. Gahlot, P.S. and Dhir, B.M Construction planning and management New Age International(P) Ltd. Publishers, New Delhi.
3. Shrivastava, U.K., Construction planning and management, Galgotia Publication Pvt Ltd. New Delhi
4. Mantri, S., The A To Z of Practical Building Construction and its Management, Satya Prakashan New Delhi
5. Khanna, O.P. , Industrial Engineering and management, Dhanpat Rai New Delhi
6. Punmia, B.C. and Khandelwal, K.K., Project Planning and Controlling with PERT And CPM, Laxmi Publications (P)Ltd.
7. Sengupta, B., Guha H., Construction Management and Planning, Tata-McGraw Hill.
8. Harpal, Singh, Construction Management and accounts, Mc-Graw Hill.
9. Sharma, S.C., Industrial Engineering and Management, Khanna Publications, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	15
2	12	25
3	10	20
4	17	25
5	09	15
Total	56	100

PE-2 THEORY	6.1 (b) ADVANCED CONSTRUCTION TECHNOLOGY	L	T	P
		3	1	-

COURSE OBJECTIVES:

Following are the objectives of this course:

- To gain knowledge on different materials in advanced construction
- To know different methods in concreting.
- To know the relevance of advanced construction methods for particular site condition.
- To identify the requisite hoisting and conveying machinery for the given situation.

COURSE OUTCOMES:

After completing this course, student will be able to perform:

CO1- Use relevant materials in advanced construction of structures.

CO2- Use relevant method of concreting and equipment according to type of construction

CO3- Apply advanced construction methods for given site condition.

CO4- Select suitable hoisting and conveying equipment for a given situation.

CO5- Identify advanced equipment required for a particular site condition.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning
CO1	3	3	2	2	2	2	1
CO2	3	3	2	2	2	2	1
CO3	3	3	2	2	2	2	1
CO4	3	3	2	2	2	2	1
CO5	3	3	2	2	2	2	1

Legend: High (3), Medium (2), Low (1) and No mapping (-)

DETAILED COURSE CONTENT

UNIT – I ADVANCED CONSTRUCTION MATERIALS

(9 periods)

- Fibres: Use and properties of steel, polypropylene, carbon and glass fibres.
- Plastics: Use and properties of PVC, RPVC, HDPE, FRP, GRP.
- Miscellaneous Materials: Properties and uses of acoustics materials, wall claddings, plaster boards, micro-silica, waterproofing materials, adhesives.
- Use of waste products and industrial by products in bricks, blocks, concrete and mortar.

UNIT– II ADVANCED CONCRETING METHODS AND EQUIPMENTS (12 periods)

- Ready Mix Concrete: Necessity and use of ready mix concrete. Products and equipments for ready mix concrete plant. Conveying of ready mix concrete, transit mixers.
- Vibrators for concrete consolidation: Internal, needle, surface, platform and form vibrators.
- Underwater Concreting: Procedure and equipments required for Tremie method, Dropbucket method. Properties, workability and water cement ratio of the concrete.
- Special concrete: procedure and uses of special concretes: Roller compacted concrete, Self-compacting concrete (SCC), Steel fibre reinforced concrete, Foam concrete, shotcreting.

UNIT– III ADVANCED TECHNOLOGY IN CONSTRUCTIONS (15 periods)

- Construction of bridges, flyovers and Tunnels: Equipments and machineries required for foundation and super structure i.e. Boom placer, Hydraulic rig, Slipform etc.
- Construction of multi-storeyed Building: Equipments and machinery required for construction of multi-storeyed building such as use of lifts, belt conveyers, pumping of concrete.
- Prefabricated construction: Methods of prefabrication, Plant fabrication and site fabrication, All prefabricated building elements such as wall panels, slab panels, beams, columns, door and window frames etc. Equipments and machineries used for placing and Jointing of prefabricated elements.
- Strengthening of embankments by soil reinforcing techniques using geo-synthetics

UNIT– IV HOISTING AND CONVEYING EQUIPMENTS (10 periods)

- Hoisting Equipments: Principles and working of Derrick-Pole, Gin Pole, Crane, Power driven scotch derrick crane, Hand operated crane, Locomotive crane, Tower crane, Lattice Girder, Winches, Elevators, ladders. Crawler cranes, Truck mounted cranes, Gantry cranes, Mast cranes.
- Conveying Equipments: Working of belt conveyers, types of belts and conveying mechanism. Capacity and use of dumpers, tractors and trucks.

UNIT– V MISCELLANEOUS MACHINERIES AND EQUIPMENTS (10 periods)

- Excavation Equipments: Use, working and output of following machinery – bull dozers, scrapers, graders, Clam Shell, trenching equipment, Tunnel boring machine, Wheel mounted belt loaders, power shovels, JCB, and drag lines.
- Compacting Equipments: Output of different types of rollers such as plain rollers, ship foot-ed rollers, vibratory, pneumatic rollers rammers.
- Miscellaneous Equipments: Working and selection of equipments: Pile driving equipments, Pile hammers, Hot mix bitumen plant, bitumen paver, grouting equipment, guniting equipments, floor polishing and cutting machine selection of

drilling pattern for blasting, Ben- tonite/mud slurry in drilling, Explosives for blasting, Dynamite, process of using explosives.

SUGGESTED LEARNING RESOURCES:

1. Sharma S C and Deodhar S V, Construction Engineering and Management, Khanna Book Publishing, New Delhi
2. Chudly, R., Construction Technology Vol. I to II, ELBS-Longman Group.
3. Peurifoy, R. L., Construction Planning Equipment and Methods, McGraw Hill Co. Ltd. New York.
4. Seetharaman, S., Construction Engineering and Management, Umesh Publication, New Delhi.
5. Sengupta, B. and Guha., Construction Management and Planning, McGraw Hill Education, New Delhi.
6. Smith, R. C., Materials of Construction, McGraw Hill Co. Ltd.
7. Satyanarayana, R Saxena, S. C., Construction Planning and Equipment, Standard Publication, New Delhi.
8. Rangawala, S. C., Construction of Structures and Management of works, Charotar Publication, Anand.
9. Ghose, D. N., Materials of Construction, McGraw Hill Publishing Co, New Delhi.

Course outcomes:

After completing this course, student will be able to:

- Use relevant materials in advanced construction of structures.
- Use relevant method of concreting and equipment according to type of construction.
- Apply advanced construction methods for given site condition.
- Select suitable hoisting and conveying equipment for a given situation.
- Identify advanced equipment required for a particular site condition

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	09	15
2	12	20
3	15	25
4	10	20
5	10	20
Total	56	100

THEORY	6.2 ENTREPRENEURSHIP AND START-UP	L	T	P
		2	-	-

COURSE LEARNING OBJECTIVES:

- Acquiring Entrepreneurial spirit and resourcefulness.
- Familiarization with various uses of human resource for earning dignified means of living.
- Understanding the concept and process of entrepreneurship - its contribution and role in the growth and development of individual and the nation.
- Acquiring entrepreneurial quality, competency, and motivation.
- Learning the process and skills of creation and management of entrepreneurial venture.

COURSE OUTCOMES

CO 1: Understand the basic of Entrepreneurship and Business Structures

CO 2: Planning and implementation of Business ideas

CO 3: Understanding Strategic Market Analysis

CO 4: Manage Organizational roles

CO 5: Understanding various Financial schemes

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	1	1	-	-	-	2	*	*
CO2	2	3	3	2	1	3	2	*	*
CO3	2	2	2	2	1	-	2	*	*
CO4	2	1	2	-	2	3	2	*	*
CO5	3	2	2	2	2	1	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED COURSE CONTENT

UNIT 1 - INTRODUCTION TO ENTREPRENEURSHIP AND START – UPS

(05 periods)

Concept of entrepreneurship - Importance, Myths about Entrepreneurship, Pros and Cons of Entrepreneurship, Process of Entrepreneurship, Competencies and

characteristics of an entrepreneur, Ethical Entrepreneurship, Entrepreneurial Values and Attitudes, Creativity, Innovation and entrepreneurship- Entrepreneurs - as problem solvers, Mindset of an employee and an entrepreneur, - Risk Taking- Concepts

UNIT 2 – BUSINESS IDEAS AND THEIR IMPLEMENTATION (06 periods)

Types of Business: Manufacturing, Trading and Services, Stakeholders: sellers, vendors and consumers and Competitors, E- commerce Business Models, business idea generation -Types of Resources - Human, Capital and Entrepreneurial tools and resources, etc., setting business goals- Patent, copyright and Intellectual property rights, Customer Relations and Vendor Management, -Business Ideas vs. Business Opportunities, Opportunity – SWOT ANALYSIS of a business idea - Business Failure – causes and remedies.- Types of business risks

UNIT 3 – IDEA TO START-UP (05 periods)

Market Analysis – Identifying the target market, Competition evaluation and Strategy Development, Marketing and accounting, An introduction to Start-up - Start-ups in India - Procedure for registration of Start-ups - Business Model- Business Plan - Case Studies - Opportunities and Challenges - Funding supports from Government Schemes -MUDRA, CM Yuva Udyami Scheme, PMEGP– Non-Government Schemes - CSR Fund - Angel Invitors, Venture Capitalist.

UNIT 4 – PRICING AND COST ANALYSIS (06 periods)

Types of Costs - Variable - Fixed- Operational Costs - Break Even Analysis - for single product or service, -financial Business Case Study, Understand the meaning and concept of the term Cash Inflow and Cash Outflow- Pricing- Calculate Per Unit Cost of a single product, , Understand the importance and preparation of Income Statement, Prepare a Cash Flow Projection- Factors affecting pricing.- GST.

UNIT 5 - BUSINESS PLAN PREPARATION (06 periods)

Feasibility Report – Technical analysis, financial analysis- Market Research- Concept, Importance and Process- tools for market research- Market Sensing and Testing, Marketing and Sales strategy, Digital marketing, Branding - Business name, logo, tag line, Promotion strategy, Business Plan Preparation, -Concept and Importance, Execution of Business Plan.

SUGGESTED LEARNING RESOURCES:

S. No.	Title of Book	Author	Publication
1.	The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company	Steve Blank and Bob Dorf	K & S Ranch ISBN – 978-0984999392
2.	Entrepreneurship Development (A new Venture creation)	Vasant Desai	Himalya Publication
3.	Entrepreneurship Development	Khanka S.S.	S Chand & Company Limited New Delhi
4.	Entrepreneurship Development	Gupta and Srinivsan	S Chand & Company Limited New Delhi
5	Demand: Creating What People Love Before They Know They Want It	Adrian J. Slywotzky with Karl Weber	Headline Book Publishing ISBN – 978-0755388974
6	The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses	Eric Ries	Penguin UK ISBN – 978-0670921607
7	The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business	Clayton M. Christensen	Harvard business ISBN: 978-142219602

SUGGESTED LEARNING RESOURCES:

1. G.K. Varshney, Fundamentals of Entrepreneurship, Sahitya Bhawan Publications, Agra., 2019.
2. H.Nandan, Fundamentals of Entrepreneurship, Prentice Hall India Learning Private Limited, Third Edition, 2013.
3. R.K. Singal, Entrepreneurship Development & Management, S K Kataria and Sons, 2013.

Web Reference: <https://ocw.mit.edu/courses/15-390-new-enterprises-spring-2013/resources/lecture-1/>

https://onlinecourses.nptel.ac.in/noc20_ge08/preview

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	05	20
2	06	20
3	05	20
4	06	20
5	06	20
Total	28	100

OE-2 THEORY	6.3 (a) RENEWABLE ENERGY TECHNOLOGY	L	T	P
		2	-	-

COURSE OBJECTIVES

- To understand present and future scenario of world energy use.
- To understand fundamentals of solar energy systems.
- To understand basics of wind energy
- To understand bio energy and its usage in different ways.
- To identify different available non-conventional energy sources

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Understand present and future energy scenario of the world.
- Understand various methods of solar energy harvesting.
- Identify various wind energy systems.
- Evaluate appropriate methods for Bio energy generations from various Bio wastes.
- Identify suitable energy sources for a location.

DETAILED COURSE CONTENT

UNIT-I: INTRODUCTION

(05 periods)

World Energy Use; Reserves of Energy Resources; Environmental Aspects of Energy Utilisation; Renewable Energy Scenario in India and around the World; Potentials; Achievements/ Applications; Economics of renewable energy systems.

UNIT-II: SOLAR ENERGY:

(06 periods)

Solar Radiation; Measurements of Solar Radiation; Flat Plate and Concentrating Collectors; Solar direct Thermal Applications; Solar thermal Power Generation Fundamentals of Solar Photo Voltaic Conversion; Solar Cells; Solar PV Power Generation; Solar PV Applications.

UNIT-III: WIND ENERGY:

(05 periods)

Wind Data and Energy Estimation; Types of Wind Energy Systems; Performance; Site Selection; Details of Wind Turbine Generator; Safety and Environmental Aspects.

UNIT-IV: BIO-ENERGY:

(06 periods)

Biomass direct combustion; Biomass gasifiers; Biogas plants; Digesters; Ethanol production; Bio diesel; Cogeneration; Biomass Applications.

UNIT-V: OTHER RENEWABLE ENERGY SOURCES:

(06 periods)

Other Renewable Energy Sources: Tidal energy; Wave Energy; Open and Closed OTEC Cycles; Small Hydro-Geothermal Energy; Hydrogen and Storage; Fuel Cell Systems; Hybrid Systems.

REFERENCE BOOKS:

1. O.P. Gupta, Energy Technology, Khanna Publishing House, Delhi (ed. 2018)
2. Renewable Energy Sources, Twidell, J.W. & Weir, A., EFN Spon Ltd., UK, 2006.
3. Solar Energy, Sukhatme. S.P., Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.
4. Renewable Energy, Power for a Sustainable Future, Godfrey Boyle, Oxford **University Press**, U.K., 1996.
5. Fundamental of Renewable Energy Sources, GN Tiwari and MK Ghoshal, Narosa, New Delhi, 2007.
6. Renewable Energy and Environment-A Policy Analysis for India, NH Ravindranath, UK Rao, B Natarajan, P Monga, Tata McGraw Hill.
7. Energy and The Environment, RA Ristinen and J J Kraushaar, Second Edition, John Willey & Sons, New York, 2006.
8. Renewable Energy Resources, JW Twidell and AD Weir, ELBS, 2006

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	05	20
2	06	20
3	05	20
4	06	20
5	06	20
Total	28	100

OE-2 THEORY	6.3 (b) ENERGY CONSERVATION AND AUDIT	L	T	P
		2	-	-

COURSE OBJECTIVES:

- To Identify demand supply gaps in present scenario.
- To understand conservations approaches to an industry.
- To draw the energy flow diagram of an industry.
- To identify energy wastage and suggest alternative methods.
- To understand the concepts energy audit.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Identify demand supply gaps in the present scenario.
- Understand the conservation approaches for an industry.
- Draw the energy flow diagram of and industry and identify waste stream.
- Identify energy wastage and suggest alternative methods.
- Evaluate the concepts of energy audit.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning
CO1	3	2	2	-	3	-	2
CO2	3	2	2	2	3	-	2
CO3	3	2	2	2	3	-	2
CO4	3	2	2	-	3	-	2
CO5	3	2	2	2	3	-	2

DETAILED COURSE CONTENT

UNIT 1- BASICS OF ENERGY

(06 periods)

Classification of energy- primary and secondary energy, commercial and non-commercial energy, non-renewable and renewable energy with special reference to solar energy, Capacity factor of solar and wind power generators. Global fuel reserve Energy scenario in India and state of U.P. Sector-wise energy consumption (domestic, industrial, agricultural

and other sectors), Impact of energy usage on climate Energy Conservation and EC Act 2001.

Introduction to energy management:

Energy conservation, energy efficiency and its need, Salient features of Energy Conservation Act 2001 & The Energy Conservation (Amendment) Act, 2010 and its importance. Prominent organizations at centre and state level responsible for its implementation, Standards and Labeling: Concept of star rating and its importance, Types of product available for star rating.

UNIT 2- ELECTRICAL SUPPLY SYSTEM AND MOTORS (07 periods)

Types of electrical supply system, Single line diagram, Losses in electrical power distribution system, Understanding Electricity Bill: Transformers Tariff structure, Components of power (kW, kVA and kVAR) and power factor, improvement of power factor, Concept of sanctioned load, maximum demand, contract demand and monthly minimum charges (MMC)

Transformers:

Introduction, Losses in transformer, transformer Loading, Tips for energy savings in transformers, Electric Motors Types of motors, Losses in induction motors Features and characteristics of energy efficient motors, Estimation of motor loading, Variation in efficiency and power factor with loading, Tips for energy savings in motors.

Energy Efficiency in Electrical Utilities

Pumps: Introduction to pump and its applications, Efficient pumping system operation, Energy efficiency in agriculture pumps, Tips for energy saving in pumps

Compressed Air System:

Types of air compressor and its applications, Leakage test, Energy saving opportunities in compressors. Energy Conservation in HVAC and Refrigeration System: Introduction, Concept of Energy Efficiency Ratio (EER), Energy saving opportunities in Heating, Ventilation and Air Conditioning (HVAC) and Refrigeration Systems.

UNIT 3- LIGHTING AND DG SYSTEMS (06 periods)

Lighting Systems: Basic definitions- Lux, lumen and efficacy, Types of different lamps and their features, Energy efficient practices in lighting.

DG Systems: Introduction, Energy efficiency opportunities in DG systems, Loading estimation Energy Efficiency in Thermal Utilities

Thermal Basics: Thermal energy, Energy content in fuels, Energy Units and its conversions in terms of Metric Tonne of Oil Equivalent (MTOE).

Energy Conservation in boilers and furnaces:

Introduction and types of boilers, Energy performance assessment of boilers, Concept of stoichiometric air and excess air for combustion, Energy conservation in boilers and furnaces, Do's and Don'ts for efficient use of boilers and furnaces.

Cooling Towers:

Basic concept of cooling towers, Tips for energy savings in cooling towers, Efficient Steam Utilization.

UNIT 4-ENERGY CONSERVATION BUILDING CODE (ECBC) (04 periods)

ECBC and its salient features, Tips for energy savings in buildings: New Buildings, Existing Buildings. Waste Heat Recovery and Co-Generation Concept, classification and benefits of waste heat recovery, Concept and types of co-generation system

UNIT 5-GENERAL ENERGY SAVING TIPS (05 periods)

Energy saving tips in: Lighting, Room Air Conditioner, Refrigerator, Water Heater, Computer, Fan, Heater, Blower and Washing Machine, Colour Television, Water Pump, Cooking, Transport, Energy Audit, Types and methodology, Energy audit instruments, Energy auditing reporting format

REFERENCE BOOKS:

- Electric Energy Generation, Utilization and Conservation Sivaganaraju, S Pearson, New Delhi, 2012
- Project Management, Prasanna Chandra, Tata Mcgraw Hill, New Delhi
- Energy Conservations in Buildings, O.P. Jakhar, Khanna Publishing House, New Delhi
- Financial Management, Prasanna Chandra Tata Mcgraw Hill, New Delhi.
- Energy management Handbook, Prasanna Chandra, Tata Mcgraw Hill, New Delhi.
- Energy Technology, O.P. Gupta, Khanna Publishing House, New Delhi (ed. 2018)
- E-books/e-tools to be used as recommended by AICTE/NITTTR, Chandigarh.
- Websites for Reference: <http://swayam.gov.in>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	20
2	07	25
3	06	20
4	04	15
5	05	20
Total	28	100

6.4	INDUSTRY INTERNSHIP OR MAJOR PROJECT	L	T	P
PRACTICAL		-	-	12

Course Objective:

Major projects for civil engineering diploma students are essential because it provides them advantage like apply theoretical knowledge to real-world problems, develop critical skills like problem-solving and teamwork, provide hands-on experience with tools and technologies, encourage innovation and creativity, prepare students for their careers by demonstrating initiative and independence, Familiarize students with industry standards.

Course Outcomes

After undergoing this subject, the student will be able to:

- Use effectively oral, written and visual communication
- Demonstrate skill and knowledge of current technological tools and techniques specific to the professional field of study.
- Identify, analyse and solve problems creatively through sustained critical investigation.
- Develop leadership abilities.
- Apply fundamental and disciplinary concepts and methods in ways appropriate to their areas of study.

Major projects are crucial for civil engineering diploma students for several reasons:

1. **Application of Knowledge:** They allow students to apply theoretical concepts learned in class to practical, real-world problems, reinforcing their understanding.
2. **Skill Development:** Projects help in developing essential skills such as problem-solving, critical thinking, teamwork, and project management, which are highly valued in the engineering industry.
3. **Hands-On Experience:** Students gain hands-on experience with tools, materials, and technologies used in mechanical engineering, which is invaluable for their future careers.
4. **Innovation and Creativity:** Working on projects encourages students to think creatively and come up with innovative solutions to engineering challenges.
5. **Career Preparation:** Completing projects demonstrates a student's ability to take initiative, work independently, and successfully complete tasks, making them more attractive to potential employers.
6. **Industry Standards:** Projects familiarize students with industry standards and practices, preparing them for professional work environments.
7. **Networking:** Collaborating on projects provides opportunities to build networks with peers, faculty, and industry professionals, which can be beneficial for future career prospects.

Note: The Project selected in the 5th semester will be continued in 6th Semester.

As a major project activity each student is supposed to study the operations at site and prepare a detail project report of the observations/processes/activities by him/her. The students should be guided by the respective subject teachers. Each teacher may guide a group of 4 to 5 students. The teachers along with field supervisors/engineers will conduct performance assessment of students. Criteria for assessment will be as follows:

S.NO.	CRITERIA	MARKS
1.	Attendance and Punctuality	40
2.	Project Progress Presentation-I	50
3.	Project Progress Presentation-II	50
4.	Project Model & final Presentation	90
5.	Report Writing	60
Total		240

8. GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 50 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

- i. 15 Marks for general behavior and discipline
(by HODs in consultation with all the teachers of the department)
- ii. 10 Marks for attendance as per following:
(by HODs in consultation with all the teachers of the department)
 - a) 75 - 80% 6 Marks
 - b) 80 - 85% 8 Marks
 - c) Above 85% 10Marks
- iii. 25 Marks maximum for Sports/NCC/Cultural/Co-curricular/ NSS activities as per following:
(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)
 - a) 25 - State/National Level participation
 - b) 20 - Participation in two of above activities
 - c) 15 - Inter-Polytechnic level participation

Note: There should be no marks for attendance in the internal sessional of different subjects.

9. RESOURCE REQUIREMENT

9.1 PHYSICAL RESOURCES

(A) Space requirement

Norms and standards laid down by All India Council for Technical Education (AICTE) are to be followed to work out space requirement in respect of class rooms, tutorial rooms, drawing halls, laboratories, space required for faculty, student amenities and residential area for staff and students.

(B) Laboratory requirement:

Following Laboratories are required for Diploma Program in Civil Engineering:

- Communication Laboratory
- Applied Physics Laboratory
- Applied Chemistry Laboratory
- Engineering Drawing
- Electrical Engineering Laboratory
- Applied Mechanics Laboratory
- Basics of IT/Computer Laboratory
- Carpentry Shop
- Painting and Polishing Shop
- Electrical Shop
- Welding Shop
- Fitting and Plumbing Shop
- Sheet Metal Shop
- Mason Shop
- Machine Shop
- Construction Material Testing
 - a. Concreter Laboratory
 - b. Roads and Solids Laboratory
- Survey Equipment and Stores
- Fluid Mechanics and Irrigation Laboratory
- Civil Engineering Fabrication and Erection Shop
- Environmental Engineering Laboratory , Energy Conservation Lab

9.2 EQUIPMENT REQUIRED FOR CIVIL ENGINEERING (EP&C)

Sr. No.	Description	Qty
CONSTRUCTION MATERIALS TESTING		
A. CONCRETE LABORATORY		
1.	Compression testing machine (100 T. Capacity)	1
2.	Vibration machine	1
3.	Electrically heated oven (Thermostatically controlled)	1
4.	Blaine Air permeability Apparatus (for testing fineness of cement)	2
5.	Vicat's Apparatus	4
6.	Le Chatelier's soundness apparatus (to determine quantity of free lime in cement)	2
7.	Slump Cone (to determine the workability of concrete)	2
8.	Compaction factor apparatus (to determine the workability of concrete)	1
9.	Vee-Bee apparatus (to determine the workability of concrete)	1
10.	Platform weighing machine	1
11.	Concrete cube moulds	12 each
12.	Concrete mixers	1
13.	Sieve shaker	1
14.	Set of sieves	2 Set
15.	Beam mould	2
16.	Impact testing machine	2
17.	Needle vibrator	1 Each
18.	Flakiness index apparatus	2
19.	Elongation index apparatus	2
20.	Bar bending and cutter apparatus	2 Set
21.	Bulk density apparatus	2
22.	Wire basket	4
23.	Riffle sampler	2
24.	Table vibrator	2
25.	Concrete test hammer	1
26.	Ultrasonic pulse velocity apparatus	1
B. ROADS AND SOILS LABORATORY		
1.	Ring and Ball apparatus (with heating mantle)	1
2.	CBR apparatus with loading machine	1
3.	Flash point and fire point apparatus (Cleaveland type)	1
4.	Los angles Abrasion testing machine apparatus	1

Sr. No.	Description	Qty
5.	Water bath (Thermostatically controlled)	1
6.	Aggregate impact value testing apparatus with automatic blow counter	2
7.	Penetration value apparatus with timer	1
8.	Viscometer Capillary type	1
9.	Ductility machine	1
10.	Direct shear test apparatus	1
11.	Drying oven(Thermostatically controlled)	1
12.	Electronic balance	1
13.	Standard penetration test equipment	1
14.	Soil exploration equipment (Augers etc)	1
15.	Sand replacement method apparatus	2
16.	Liquid limit and plastic limit apparatus	2 Each
17.	Compaction apparatus using light compaction (Proctor Test)	2
18.	Grain size distribution test apparatus (sieve set)	2 Set
19.	Sieve shaker	2
20.	Permeability apparatus	1
21.	Proctor penetrometer	1
22.	Core cutter apparatus	2
23.	Rapid moisture meter	2
24.	Pycnometer with burette	6
25.	Liquid limit apparatus (Cone penetrometer method)	2
SURVEY EQUIPMENT AND STORES		
1.	Plane Table with stand and accessories	16
2.	Dumpy level, quick setting level and engineers level i) Dumpy level - 8 ii) Quick setting level - 8 iii) Engineer' level - 1	17
3.	Transit theodolite (Vernier type)	12
4.	Prismatic compass	15
5.	Planimeter	5
6.	Leveling staves (All aluminum)	5
7.	Total Station	2
8.	Ranging rods	60
9.	Pentagraph	2
10.	Optical square	5
11.	Abney level	5

12.	Tangent clinometer (Indian Pattern)	5
13.	Mirror stereoscope	1
14.	Telescopic Alidade	2
15.	Prismatic binoculars	1
16.	Metric Chain/non-metrics	10
17.	Metallic taps/Fibre glass/Invar tape	20
18.	Tentage, camp equipment and other misc. items and instruments	L.S
19.	Modern survey equipment	L.S
20.	Theodolite (Digital) Distomat	1
21.	Electronics Distance Measurement (EDM)	1
22.	Total Station	1
23.	GPS Hands Instrument	1
FLUID MECHANICS AND IRRIGATION LABORATORY		
1.	Hydraulic Bench	2
2.	Impact of Jet apparatus	1
3.	Flow measurement apparatus by Venturimeter and Orificemeter	1
4.	Pipe Friction apparatus	1
5.	Orifice and Mouthpiece apparatus	1
6.	Bernoulli's Theorem apparatus	1
7.	Flow over a notch apparatus	1
8.	Losses in pipe bends apparatus	1
9.	Reynold's apparatus	1
10.	Working models of: - Pelton wheel Turbine - Francis - Reciprocating - Centrifugal pump - Hydraulic Ram - Kaplan turbine	1 Each
11.	Manometers of different types and pressure gauges like: - Piezometer - 6 - Differential Manometers (Double column type manometer) - 10 - Universal manometers (Single column type manometer) - 2 - Inclined tube manometer - 2 - Bourden pressure gauges - 2 - Compound Gauges (Vacuum and pressure gauge combined) - 2 This apparatus should be purchased along with hydraulic bench as the design of these apparatus depend upon the design of Hydraulic bench	24

12.	Current meter	1
13.	Centrifugal pump test Rig.	1
14.	Submergible pump set apparatus	1
15.	Misc. Tools etc.	L.S
CIVIL ENGINEERING FABRICATION AND ERECTION SHOP		
1.	Masonry erection tools, such as iron pans, trowels, plumb bobs, showels, sets pick axes, corner squares etc.	10
2.	Carpenter's tool such as tenon saw, planes screw drivers, chisel sets, sets marking gauges, pliers, hammers, augers, bevel squares, files, drills etc.	10
3.	Plumber tools, plumbing vice, die and tap sets, pipe wrenches of different sets sizes, pipe cutters, spanner sets, hammer plier.	5
4.	Centering, shuttering and scaffolding (for an ordinary residential building)	1 Set
5.	Pipes and pipe fittings, valves, gulley traps, GI grating, manhole, cover traps, WC pan with foot rest, flushing cistern, urinal pan with cistern, taps, wash basin, water meter etc.	L.S
6.	Hoisting and conveying equipment tripod, hoist, pulleys, ladders, ballis etc. Compressed air equipment with accessories - 1	L.S
7.	Steel fabrication equipment with fabricating small trusses, reinforcement cages, small girder, column beam connections, column truss connection	1 Set
8.	Floor grinding/polishing machine, spray guns etc.	L.S

Sr. No.	Description	Qty
ENVIRONMENTAL ENGINEERING LABORATORY		
1.	Lovibond comparator (for color determination	1
2.	Colorimeter (for color determination)	1
3.	Centrifuge	1
4.	Turbidimeter	1
5.	pH meter	1
6.	Jar test apparatus (Flocculator)	1
7.	Dissolved oxygen meter	1
8.	B.O.D incubator	1
9.	Water bath with digital controller	1
10.	Hot air oven	1
11.	Hot plate	2
12.	Bacteriological incubator	1
13.	Colony counter	1

14.	Water sampler	1
15.	Water analysis kit	1
16.	Water distills	1
17.	Conductivity meter	1
18.	Electronic balance	1
19.	Chemical Balance	1
20.	Inverted microscope	1
21.	Model of oxidation ditch	1
22.	Working model of Trickling Filter	1
23.	Misc. items like noise measurement apparatus etc.	L.S

NOTE:

In addition to the above, laboratories in respect of physics, chemistry, Computer Centre etc will be required for effective implementation of the course. Provision for photocopiers, PC facilities along with LCD Projection System etc. has also to be made.

9.3 Furniture Requirement

Norms and standards laid down by AICTE be followed for working out furniture requirement for this course.

9.4 Human Resources Development:

Weekly work schedule, annual work schedule, student teacher ratio for various group and class size, staffing pattern, work load norms, qualifications, experience and job description of teaching staff workshop staff and other administrative and supporting staff be worked out as per norms and standards laid down by the AICTE.

10. EVALUATION STRATEGY

INTRODUCTION

Evaluation plays an important role in the teaching-learning process. The major objective of any teaching- learning endeavour is to ensure the quality of the product which can be assessed through learner's evaluation.

The purpose of student evaluation is to determine the extent to which the general and the specific objectives of curriculum have been achieved. Student evaluation is also important from the point of view of ascertaining the quality of instructional processes and to get feedback for curriculum improvement. It helps the teachers in determining the level of appropriateness of teaching experiences provided to learners to meet their individual and professional needs. Evaluation also helps in diagnosing learning difficulties of the students. Evaluation is of two types: Formative and Summative (Internal and External Evaluation)

Formative Evaluation

It is an on-going evaluation process. Its purpose is to provide continuous and comprehensive feedback to students and teachers concerning teaching-learning process. It provides corrective steps to be taken to account for curricular as well as co-curricular aspects.

Summative Evaluation

It is carried out at the end of a unit of instruction like topic, subject, semester or year. The main purpose of summative evaluation is to measure achievement for assigning course grades, certification of students and ascertaining accountability of instructional process. The student evaluation has to be done in a comprehensive and systematic manner since any mistake or lacuna is likely to affect the future of students. In the present educational scenario in India, where summative evaluation plays an important role in educational process, there is a need to improve the standard of summative evaluation with a view to bring validity and reliability in the end-term examination system for achieving objectivity and efficiency in evaluation.

1. STUDENTS' EVALUATION AREAS

The student evaluation is carried out for the following areas:

1. Theory
2. Practical Work (Laboratory, Workshop, Field Exercises)
3. Project Work
4. Professional Industrial Training

A. Theory

Evaluation in theory aims at assessing students' understanding of concepts, principles and procedures related to a course/subject, and their ability to apply learnt principles and solve problems. The formative evaluation for theory subjects may be caused through sessional /class-tests, home-assignments, tutorial-work, seminars, and group discussions etc. For end-term evaluation of theory, the question paper may comprise of three sections.

Section-I

It should contain objective type items e.g. multiple choice, matching and completion type. Total weightage to Section-1 should be of the order of 20 percent of the total marks and no choice should be given in this section. The objective type items should be used to evaluate students' performance in knowledge, comprehension and at the most application domains only.

Section-II

It should contain short answer/completion items. The weightage to this section should be of the order of 40 percent of the total marks. Again, no choice should be given in section-II

Section-III

It may contain two to three essay type questions. Total weightage to this section should be of the order of 40 percent of the total marks. Some built-in, internal choice of about 50 percent of the questions set, can be given in this section

Table II : Suggested Weightage to be given to different ability levels

Abilities	Weightage to be assigned
Knowledge	10-30 percent
Comprehension	40-60 percent
Application	20-30 percent
Higher than application i.e., Analysis, Synthesis and Evaluation	Up to 10 percent

B. Practical Work

Evaluation of student's performance in practical work (Laboratory experiments, Workshop practical/field exercises) aims at assessing students' ability to apply or practice learnt concepts, principles and procedures, manipulative skills, ability to observe and record, ability to interpret and draw conclusions and work-related attitudes. Formative and summative evaluation may comprise of weightages to performance on task, quality of product, general behaviour and it should be followed by viva-voce.

C. Project Work

The purpose of evaluation of project work is to assess students' ability to apply, in an integrated manner, learnt knowledge and skills in solving real life problems, manipulative skills, ability to observe, record, creativity and communication skills. The formative and summative evaluation may comprise of weightage to nature of project, quality of product, quality of report and quality of presentation followed by viva-voce.

D. Professional Industrial Training

Evaluation of professional industrial training report and viva-voce/presentation aims at assessing students' understanding of materials, industrial processes, practices in the industry/field and their ability to engage in activities related to problem-solving in industrial setting as well as understanding of application of learnt knowledge and skills in real life situation. The formative and summative evaluation may comprise of weightages to performance in testing, general behaviour, quality of report and presentation during viva-voce.

11.RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION

This curriculum document is a Plan of Action and has been prepared based on exhaustive exercise of curriculum planning and design. The representative sample comprising selected senior personnel (lecturers and HODs) from various institutions and experts from industry/field have been involved in curriculum design process.

The document so prepared is now ready for its implementation. It is the faculty of polytechnics who have to play a vital role in planning instructional experiences for the courses in four different environments viz. class-room, laboratory, library and field and execute them in right perspective. It is emphasized that a proper mix of different teaching methods in all these places of instruction only can bring the changes in stipulated students' behaviour as in the curriculum document. It is important for the teachers to understand curriculum document holistically and further be aware of intricacies of teaching-learning process (T-L) for achieving curriculum objectives. Given below are certain suggestions which may help the teachers in planning and designing learning experiences effectively. These are indicative in nature and teachers using their creativity can further develop/refine them. The designers of the programme suggest every teacher to read them carefully, comprehend and start using them.

(A) Broad Suggestions:

1. Curriculum implementation takes place at programme, course and class-room level respectively and synchronization among them is required for its success. The first step towards achieving synchronization is to read curriculum document holistically and understand its rationale and philosophy.
2. An academic plan needs to be prepared and made available to all polytechnics well in advance. The principals have a great role to play in its dissemination and, percolation up to grass-root level. Polytechnics, in turn are supposed to prepare institutional academic plan.
3. HOD of every Programme Department along with HODs and in charges of other departments are required to prepare academic plan at department level referring to institutional academic plan.
4. All lecturers/Senior lecturers are required to prepare course level and class level lesson plans referring departmental academic plan.

(B) Course Level Suggestions

Teachers are educational managers at class room level and their success in achieving course level objectives lies in using course plan and their judicious execution which is very important for the success of programme by achieving its

objectives. Polytechnic teachers are required to plan various instructional experiences viz. theory lecture, expert lectures, lab/workshop practical's, guided library exercises, field visits, study tours, camps etc. In addition, they have to carry out progressive assessment of theory, assignments, library, practical and field experiences. Teachers are also required to do all these activities within a stipulated period of time. It is essential for them to use the given time judiciously by planning all above activities properly and ensure execution of the plan effectively.

Following is the gist of suggestions for subject teachers to carry out T-L process effectively:

1. Teachers are required to prepare a course plan, taking into account departmental academic plan, number of weeks available and courses to be taught.
2. Teachers are required to prepare lesson plan for every theory class. This plan may comprise of contents to be covered, learning material for execution of a lesson plan. They may follow steps for preparing lesson plan e.g., drawing attention, state instructional objectives, help in recalling pre-requisite knowledge, deliver planned subject content, check desired learning outcomes and reinforce learning etc.
3. Teachers are required to plan for expert lectures from field/industry. Necessary steps are to plan in advance, identify field experts, make correspondence to invite them, take necessary budgetary approval etc.
4. Teachers are required to plan for guided library exercises by identification of course specific experience requirement, setting time, assessment, etc. The assignments and seminars can be thought of as terminal outcome of library experiences.
5. Concept and content-based field visits may be planned and executed for such content of course which is abstract in nature and no other requisite resources are readily available in institute to impart them effectively.
6. There is a dire need for planning practical experiences in right perspective. These slots in a course are the avenues to use problem-based learning/activity learning/ experiential learning approach effectively. The development of lab instruction sheets for the course is a good beginning to provide lab experiences effectively.
7. Planning of progressive assessment encompasses periodical assessment in a semester, preparation of proper quality question paper, assessment of answer sheets immediately and giving constructive feedback to every student
8. The student-centered activities may be used to develop generic skills like task management, problem solving, managing self, collaborating with others etc.

9. Where ever possible, it is essential to use activity- based learning rather than relying on delivery based conventional teaching all the time.
10. Teachers may take initiative in establishing liaison with industries and field organizations for imparting field experiences to their students.
11. Students be made aware about issues related to ecology and environment, safety, concern for wastage of energy and other resources etc.
12. Students may be given relevant and well thought out project assignments, which are purposeful and develop practical skills. This will help students in developing creativity and confidence for their gainful employment.
13. A Project bank may be developed by the concerned department of the polytechnics in consultation with related Industry, research institutes and other relevant field organizations in the state.

12 - List of Participants/Experts

The following experts have participated/ contributed in workshop for Developing Curriculum Scheme /Competency Profile according to AICTE and NEP-2020, of Three Year Diploma course in CIVIL ENGINEERING (ENVIRONMENTAL & POLLUTION CONTROL) at IRDT Kanpur.

1. Sri Lokendra Narayan Tripathi, HOD Civil Engineering, Govt. Polytechnic, Kanpur.
2. Sri Imran Khan, Lecturer Civil Engineering, Govt. Polytechnic, Deeh sadar, Unnao.
3. Smt. Charu Bajpai, Lecturer Civil, Govt. Polytechnic, Sikandra, Kanpur Dehat.
4. Smt. Ruchi Singh, Lecturer Civil, Government Polytechnic, Kanpur.
5. Sri Ajeet Srivastava, Lecturer Civil, Government Polytechnic, Deeh Sadar, Unnao.

(ANNEXURE-I)

PROCEDURES / FORMATS FOR ORGANIZING INTERNSHIPS.

STUDENT INTERNSHIP PROGRAM APPLICATION

Complete and submit to the TPO/ Internship Program Coordinator.

1. Student Name:		Enroll. No.:	
2. Campus Address:		Phone:	
3. Home Address:		Phone:	
4. Student email address:			
5. Branch:		6. Internship Semester: _____	
7. Internship Preferences			
	Company/Industry	Core Area	Location
Preference-1			
Preference-2			
Preference-3			
Faculty mentor Signature: _____ Date_____.			
Student Signature: _____ Date_____.			
Signature confirms that the student agrees to the terms, conditions, and requirements of the Internship Program			

Signature with seal
HOD/Principal

(ANNEXURE-I)

REQUEST LETTER FROM INSTITUTE TO INTERNSHIP/INDUSTRIAL TRAINING PROVIDER

Ref. No.: _____

Date: _____

To,
The HR Manager/Training Coordinator
.....
.....

Subject: Request for Internship/Industrial Training for Diploma Students

Sir/Madam,

We are pleased to introduce....., a premier institution affiliated with Board of Technical Education, Uttar Pradesh, offering diploma programs in various diploma disciplines.

As a part of the curriculum, our students are required to undergo Internship/Industrial Training to gain practical exposure and enhance their technical competencies. Therefore, we kindly request your esteemed organization to provide Internship/Training opportunities to our students during the period from to

S. No.	Name	Enroll. No.	Semester/Year	Discipline

Yours sincerely,

(Head of Department/Principal)

PROFORMA FOR EVALUATION OF INTERNSHIP BY INDUSTRY

Student Name:Evaluation Date:

Industry Supervisor Name:

Company/Organization:

Title of the Project:

.....

Please evaluate your intern by indicating the frequency with which you observed the following behaviors:

Parameters	Max. Marks	Marks Given
Attendance and Punctuality	20	
Discipline and Professional Behavior	20	
Technical Knowledge and Understanding of Processes	30	
Practical Skills and Quality of Work	20	
Ability to Apply Theoretical Knowledge	20	
Problem Solving and Analytical Ability	10	
Communication and Interpersonal Skills	20	
Teamwork and Collaboration	10	
Internship Report/Documentation	20	
Presentation and Viva-Voce	30	
Total Marks	200	

Additional comments, if any:

Signature with seal of Industry supervisor
Manager

HR

INTERNSHIP REPORT

STUDENT'S DIARY/ DAILY LOG

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day to day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed after every day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor visiting the industry from time to time and got ratified on the day of his visit.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

- Regularity in maintenance of the diary.
- Adequacy & quality of information recorded.
- Drawings, sketches and data recorded.
- Thought process and recording techniques used.
- Organization of the information.

INTERNSHIP REPORT

After completion of Internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period. The student may contact Industrial Supervisor/ Faculty Mentor/TPO for assigning special topics and problems and should prepare the final report on the assigned topics. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The training report should be signed by the Internship Supervisor, TPO and Faculty Mentor. The Internship report will be evaluated on the basis of following criteria:

- i. Originality.
- ii. Adequacy and purposeful write-up.
- iii. Organization, format, drawings, sketches, style, language etc.
- iv. Variety and relevance of learning experience.
- v. Practical applications, relationships with basic theory and concepts taught in the course.

(ANNEXURE-II)

MONITORING & EVALUATION OF INTERNSHIP

The industrial training of the students will be evaluated in three stages:

1. Evaluation by Industry.
2. Evaluation by faculty supervisor of Industry.
3. Evaluation through seminar presentation/viva-voce at the Institute.

1. EVALUATION BY INDUSTRY

The industry will evaluate the students based on the Punctuality, eagerness to learn, Maintenance of Daily Diary and skill test in addition to any remarks.

2. MONITORING/ SURPRISE VISIT BY TPO/ STAFF/ FACULTY MENTOR

TPO/Staff/ Faculty Mentor of the institutes will make a surprise visit to the internship site, to check the student's presence physically, if the student is found absent without prior intimation to the T & P Cell, entire training will be cancelled. Students should inform the TPO, faculty mentor as well as the industry supervisor at least one day prior to availing leave by email. Students are eligible to avail 1-day leave in 4 weeks and 2 days leave in 6 weeks of the internship period apart from holidays and weekly offs.

3. EVALUATION THROUGH SEMINAR PRESENTATION/VIVA-VOCE AT THE INSTITUTE

The student will give a seminar based on his training report, before an expert committee constituted by the concerned department as per norms of the institute. The evaluation will be based on the following criteria:

- Quality of content presented.
- Proper planning for presentation.
- Effectiveness of presentation.
- Depth of knowledge and skills.
- Attendance record, daily diary, departmental reports shall also be analyzed along with the Internship Report.

Seminar presentation will enable sharing knowledge & experience amongst students & teachers and build communication skills and confidence in students.