NEP-2020 Aligned Curriculum for

Three Year (Six Semester) Diploma Programme in

CIVIL AND ENVIRONMENT ENGINEERING

For the State of Uttar Pradesh

Prepared by:

Curriculum Development Centre

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THIRD SEMESTER

FOURTH SEMESTER

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

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1. SALIENT FEATURES

1)	**Name of the Programme**	:	Diploma Programme in Civil & Environment Engineering
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 (6^{th} 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 in 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 & ENVIRONMENT ENGINEERING

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

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) *Surveyor/loss assessment/valuation of 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 & ENVIRONMENT ENGINEERING

At the end of the programme, a diploma holder in Civil & Environment 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 our 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. DERIVING CURRICULUM AREAS FROM LEARNING OUTCOMES OF THE PROGRAMME

The following curriculum area subjects have been derived from learning outcomes:

Sr. No.	Learning Outcomes	Curriculum Areas/Subjects
1.	Communicate effectively in English with others	- Communication Skills - Student Centered Activities (SCA)
2.	Apply basic principles of Mathematics and Science to solve engineering problems	- Applied Mathematics - Applied Physics - Applied Chemistry
3.	Prepare computerized reports, presentations using IT tools and computer application software	– Introduction to IT Systems
4.	Use cutting tools and tooling for fabrication of jobs by following safe practices during work	- General Workshop Practice - Basics of Mechanical and Electrical Engineering.
5.	Use appropriate procedures for preventing environmental pollution and energy conservation	- Environmental Studies
6.	Use basic concepts and principles of fluid mechanics as applied to civil engineering practices.	– Hydraulics
7.	Apply concepts of mechanics to solve Engineering problems	- Applied Mechanics - Structural Mechanics
8.	Carry out various types of surveying like leveling, plane tabling, theodolite surveying, and tachometry and contouring; and use modern surveying techniques like total station, remote sensing, GIS and GPS.	– Quantity Surveying and Valuation
9.	Select, Use and carry our testing of construction materials including eco-friendly and advanced materials as per their suitability and availability	– Construction Materials
10.	Supervise various building construction works from substructure to superstructure and their finishing operations.	- Building Construction - Building Drawings
11.	Prepare, read and interpret, component drawing, building drawings and layout	– Engineering Drawing

12.	Supervise production, placement and quality control of concrete operations.	– Concrete Technology
13.	Supervise construction of precast elements.	– Reinforced Cement Concrete Structures (RCC Structures)
14.	Carry out layout plan of water supply, sewerage and sanitary systems and monitor quality of water and waste water	– Water and Waste water Engineering
15.	Supervise constructional aspects pertaining to irrigation structures	– Irrigation Engineering
16.	Prepare, read and interpret public health and irrigation engineering drawings	– Waste Water and Irrigation Engineering Drawing
17.	Analyses and design simple structural elements of R.C.C.	– Reinforced Cement Concrete Structures (RCC Structures)
18.	Supervise constructional aspects pertaining to highway engineering	– Highway Engineering
19.	Prepare, read and interpret R.C.C. drawings	– RCC Drawing
20.	Prepare topographical plan of an area	– Surveying
21.	Use various computer software's in the field of Civil Engineering	- Computer Aided Drawing - Software Application in Civil Engineering
22.	Supervise constructional aspects pertaining to railways, bridges and tunnels	– Railways, Bridges and Tunnels
23.	Analyses, use and treat various types of soils for foundation purpose	– Soil Mechanics and Foundation Engineering
24.	Plan and execute given task/projects as a team member/ leader	– Project Work
25.	Analyses and design simple structural elements of steel	- Design of Steel Structure - Steel Structure Drawing
26.	Prepare material estimates as per CSR, Specifications, costing, valuation and tender documents as per given drawings and prepare bill of quantity of construction.	– Quantity Surveying and Valuation
27.	Apply basic principles of construction management techniques and accounts in Civil Engineering	– Construction Management, Accounts and Entrepreneurship Development
28.	Identify major sources of pollution and plan remedial measures for its control	– Environmental Management

29.	Plan and execute activities related to disaster management.	– Analysis of Structures
30.	Apply the knowledge and skills gained through various courses in solving live problems/projects in the field	– Project Work
31.	*Demonstrate appropriate values and attitude.*	– Student Centered Activities

6. 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

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

- Summer Internship-I (4 weeks) after IInd 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

6- STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN CIVIL & ENVIRONMENT ENGINEERING

NOTE: I & II Sem. is common to all engineering & technology branches and implemented from the session 2024-2025

3rd SEMESTER { CIVIL & ENVIRONMENT ENGINEERING }

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	
3.1	CONSTRUCTION MATERIALS	PROGRAM CORE (PRACTICUM/THEORY)	02	-	02	2+1=3		40	40	60	3	-	-	60	100
3.2	BASIC SURVEYING	PROGRAM CORE (THEORY)	01	-	-	1+0=1	40	-	40	60	3	-	-	60	100
3.3	BASIC SURVEYING LAB	PROGRAM CORE (PRACTICAL)	-	-	04	0+2=2	-	60	60	-	-	40	3	40	100
3.4	MECHANICS OF MATERIAL	PROGRAM CORE (THEORY)	02	-	-	2+0=2	40	-	40	60	3	-	-	60	100
3.5	MECHANICS OF MATERIAL LAB	PROGRAM CORE (PRACTICAL)	-	-	02	0+1=1	-	60	60	-	-	40	3	40	100
3.6	BUILDING CONSTRUCTION	PROGRAM CORE (PRACTICUM/THEORY)	02	-	02	2+1=3	40	-	40	60	3	-	-	60	100
3.7	BUILDING PLANNING AND DRAWING	PROGRAM CORE (PRACTICUM/PRACTICAL)	01	-	04	1+2=3	-	60	60	-	-	40	3	40	100
3.8	CONCRETE TECHNOLOGY	PROGRAM CORE (THEORY)	02	-	-	2+0=2	-	60	60	-	-	40	3	40	100
3.9	CONCRETE TECHNOLOGY LAB	PROGRAM CORE (PRACTICAL)	-	-	04	0+2=2	-	60	60	-	-	40	3	40	100
3.10	SUMMER INTERNSHIP-I (4 weeks after IInd sem.)	PRACTICAL	-	-	-	1	-	50*	50*	-	-	-	-	-	50*
#STUDENT CENTERED ACTIVITIES			-	-	08	-	-	50	50	-	-	-	-	-	50
Total			**10**	**-**	**26**	**20**	**120**	**440**	**560**	**240**	**-**	**200**	**-**	**440**	**1000**

1) Each period will be 60 minutes duration.
2) Each session will be of 16 weeks.
3) Effective teaching will be at least 14 weeks.

* Students will present a seminar on their summer internship along with certificate and project report.

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.

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN CIVIL & ENVIRONMENT ENGINEERING

4th SEMESTER { CIVIL & ENVIRONMENT ENGINEERING }

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	
4.1	HYDRAULICS	PROGRAM CORE (THEORY)	02	-	-	2+0=2	40	-	40	60	3	-	-	60	100
4.2	HYDRAULICS LAB	PROGRAM CORE (PRACTICAL)	-	-	02	0+1=1	-	60	60	-	-	40	3	40	100
4.3	ADVANCE SURVEYING	PROGRAM CORE (THEORY)	02	-	-	2+0=2	40	-	40	60	3	-	-	60	100
4.4	ADVANCE SURVEYING LAB	PROGRAM CORE (PRACTICAL)	-	-	04	0+2=2	-	60	60	-	-	40	3	40	100
4.5	THEORY OF STRUCTURE	PROGRAM CORE (THEORY)	02	01	-	3+0=3	40	-	40	60	3	-	-	60	100
4.6	DESIGN OF REINFORCED CEMENT CONCRETE STRUCTURES	PROGRAM CORE (THEORY)	02	01	-	3+0=3	40	-	40	60	3			60	100
4.7	REINFORCED CEMENT CONCRETE STRUCTURES DRAWING	PROGRAM CORE (PRACTICUM/PRACTICAL)	01	-	04	1+2=3		60	60	-	-	40	3	40	100
4.8	WATER RESOURCE ENGINEERING	PROGRAM CORE (THEORY)	02		-	2+0=2	40	-	40	60	3			60	100
4.9	PUBLIC HEALTH ENGINEERING	PROGRAM CORE (PRACTICUM/THEORY)	01	-	02	1+1=2		40	40	60	3	-	-	60	100
4.10	(Q) ESSENCE OF INDIAN KNOWLEDGE AND TRADITION	AUDIT COURSE	02	-	-	-	50*	-	50*	-	-	-	-	-	-
#STUDENT CENTERED ACTIVITIES			-	-	08	-	-	50	50	-	-	-	-	-	50
Total			**14**	**02**	**20**	**20**	**200**	**270**	**470**	**360**	**-**	**120**	**-**	**480**	**950**

Note -(Q) - It is compulsory to appear & to pass in examination, But marks will not be included for division and percentage of obtained marks.

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.

PRACTICUM: It means that the teacher supervise and involves students in practical application of previously studied theory.

SEMESTER-III

PRACTICUM/ THEORY	3.1 CONSTRUCTION MATERIALS	L	T	P
		2	-	2

COURSE OBJECTIVES:

Following are the objectives of this course:

- To learn about various construction materials, and understand their relevant characteristics.
- To be able to identify suitability of various materials for different construction purposes.
- To know about natural, artificial, and processed materials available for various purposes of construction activities.

COURSE OUTCOMES:

After completing this course, student will be able to:

- Identify relevant construction materials.
- Identify relevant natural construction materials.
- Select relevant artificial construction materials.
- Select relevant special type of construction materials.
- Identify and use of processed construction materials.

COURSE CONTENTS

Unit – I: Overview of Construction Materials (4 periods)

- Scope of construction materials in Building Construction, Transportation Engineering, Environmental Engineering, Irrigation Engineering (applications only).
- Selection of materials for different civil engineering structures on the basis of strength, durability, Eco friendly and economy.
- Broad classification of materials – Natural, Artificial, special, finishing and recycled.

Unit – II: Natural Construction Materials (6 periods)

- Requirements of good building stone; general characteristics of stone; quarrying and dressing methods and tools for stone.
- Classification of Rocks : Geological, Physical and chemical classification
- Structure of timber, general properties and uses of good timber, different methods of seasoning for preservation of timber, defects in timber, use of bamboo in construction.
- Asphalt, bitumen and tar used in construction, properties and uses.
- Types of Lime, Properties of lime and uses. Slacking of lime

- Properties of sand and uses
- Classification of aggregate according to size

Unit- III: Artificial Construction Materials (8 periods)

- Constituents of brick earth, Conventional / Traditional bricks, Modular and Standard bricks, Special bricks–fly ash bricks, Characteristics of good brick, Field tests on Bricks, Classification of burnt clay bricks and their suitability, Manufacturing process of burnt clay brick, fly ash bricks, Aerated concrete blocks(AAC).
- Flooring tiles – Types, uses

- Manufacturing process of Cement - dry and wet (only flow chart), types of cement and its uses. Field tests on cement.
- Pre-cast concrete blocks- hollow, solid, pavement blocks, and their uses.
- Plywood, particle board, Veneers, laminated board and their uses.
- Types of glass: soda lime glass, lead glass, borosilicate glass, Toughened glass, Reinforced glass, Fiber glass and their uses.
- Ferrous and non-ferrous metals and their uses.

Unit– IV: Special Construction Materials (4 periods)

- Types of material and suitability in construction works of following materials: Water proofing, Termite proofing; Thermal and sound insulating materials.
- Fibers and its Types –Jute, Glass, Plastic, Asbestos Fibers, (only uses).

Unit– V: Processed Construction Materials (6 periods)

- Constituents and uses of POP (Plaster of Paris), POP finishing boards, sizes and uses. Gypsum and Gypsum based material.
- Paints- whitewash, cement paint, Distempers, Oil Paints and Varnishes with their uses. (Situations where used).
- Industrial waste materials- Fly ash, Blast furnace slag, Granite and marble polishing waste and their uses.
- Agro waste materials - Rice husk, Bagasse, coir fibers and their uses.
- Special processed construction materials; Geo-synthetic, Ferro Crete, Artificial timber, artificial sand and their uses.

List of Recommended Books/References

1. Ghose, D. N., Construction Materials, Tata McGraw Hill, New Delhi.
2. S.K. Sharma, Civil Engineering Construction Materials, Khanna Publishing House, Delhi
3. Varghese, P.C. , Building Materials, PHI learning, New Delhi.

4. Rangwala, S.C., Engineering Materials, Charator publisher, Ahemdabad.
5. Somayaji, Shan, Civil Engineering Materials, Pearson education, New Delhi.
6. Rajput, R.K, Engineering Materials, S. Chand and Co., New Delhi.
7. Sood H., Laboratory Manual on Testing of Engineering Materials, New Age Publishers, New Delhi.
8. Sharma C. P., Engineering Materials, PHI Learning, New Delhi.
9. Duggal, S. K, Building Materials, New International, New Delhi.

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	4	15
2	6	20
3	8	30
4	4	15
5	6	20
Total	28	100

CONSTRUCTION MATERIALS LAB.

List of practical to be performed:

1. Identify various sizes of available coarse aggregates from sample of 10 kg in laboratory and prepare report (60,40, 20,10 mm)
2. Identify the available construction materials in the laboratory on the basis of their sources.
3. Prepare the lime putty by mixing lime (1 kg) with water in appropriate proportion and pre- pare report on slaking of lime.
4. Select first class, second class and third-class bricks from the stake of bricks and prepare report on the basis of its properties.
5. Measure dimensions of 10 bricks and find average dimension and weight. Perform field tests - dropping, striking and scratching by nail and correlate the results obtained.
6. Identify different types of flooring tiles such as vitrified tiles, ceramic tiles, glazed tiles, mosaic tiles, anti- skid tiles, chequered tiles, paving blocks and prepare report about the specifications.
7. Apply the relevant termite chemical on given damaged sample of timber.
8. Identify the type of glasses from the given samples.
9. To determine the Compressing Strength of Bricks, CLC and AAC blocks.
10. To determine the water absorption of bricks and efflorescence of bricks.
11. Construct a brick masonary 3D models of Flemish / English bonds
12. Construct a 3D models on sustainable construction practices.

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THEORY	3.2 BASIC SURVEYING	L	T	P
		1	-	-

COURSE OBJECTIVES:

Following are the objectives of this course:

- To understand types of surveying works required.
- To know the types of equipment and method to be used for different surveys.
- To know the use and operational details of various surveying equipment.

COURSE OUTCOMES:

After completing this course, student will be able to:

- Select the type of survey required for given situation.
- Compute area of open field using chain, tape and cross staff.
- Conduct traversing in the field using chain and compass.
- Use leveling instruments to determine reduced level for preparation of contour maps
- Use digital planimeter to calculate the areas.

COURSE CONTENTS

Unit – I Overview and Classification of Survey (2 periods)

- Survey- Purpose and Use.
- Types of surveying- Primary and Secondary, Classification: Plane, Geodetic, Cadastral, Hydro- graphic, Photogrammetry and Aerial.
- Principles of Surveying.
- Scales: Engineer's scale, Representative Fraction (RF) and diagonal scale.

Unit– II Chain Surveying (3 periods)

- Instruments used in chain survey: Types of Chains, Tapes, Arrow, Ranging rod, Line ranger, Off- set rod, Open cross staff, Optical square.
- Chain survey Station, Base line, Check line, Tie line, Offset, Tie station.
- Ranging: Direct and Indirect Ranging.
- Methods of Chaining, obstacles in chaining and Ranging
- Errors in length: Instrumental error, personal error, error due to natural cause, random error, Tape corrections.
- Principles of triangulation.
- Types of offsets: Perpendicular and Oblique.

- Conventional Signs, Recording of measurements in a field book.

Unit– III Compass Traverse Survey (3 periods)

- Compass Traversing- open, closed.
- Technical Terms: Geographic/ True Magnetic Meridians and Bearings, Whole Circle Bearing system and Reduced Bearing system and examples on conversion of given bearing to another bearing (from one form to another), Fore Bearing and Back Bearing, Calculation of internal and external angles from bearings at a station, Dip of Magnetic needle, Magnetic Declination.
- Components of Prismatic Compass and Surveyor compass and their Functions, Methods of using Prismatic Compass- Temporary adjustments and observing bearings.
- Local attraction, Methods of correction of observed bearings - Correction at station and cor rection to included angles.
- Methods of plotting a traverse and closing error, Graphical adjustment of closing error.

Unit– IV Levelling and Contouring (4 periods)

- Basic terminologies: Level surfaces, Horizontal and vertical surfaces, Datum, Bench Marks- GTS, Permanent, Arbitrary and Temporary, Reduced Level, Rise, Fall, Line of collimation, Station, Back sight, Fore sight, Intermediate sight, Change point, Height of instruments.
- Types of levels: Dumpy, Tilting, Auto level, Digital level, Components of Dumpy Level and its fundamental axes, Temporary and permanent adjustments of Level.
- Types of Leveling Staff: Self-reading staff and Target staff.
- Reduction of level by Line of collimation and Rise and Fall Method.
- Leveling Types: Simple, Differential, Fly, Profile and Reciprocal Levelling.
- Curvature and refraction correction.
- Contour, contour intervals, horizontal equivalent.
- Uses of contour maps, Characteristics of contours, Methods of Contouring: Direct and indirect.

Unit– V Measurement of Area and Volume (2 periods)

- Components and use of Digital planimeter.
- Measurement of area using digital planimeter.
- Measurement of volume of reservoir and earthwork calculation from contour map.

SUGGESTED LEARNING RESOURCES

1. Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying I, Laxmi Publications, New Delhi.
2. Basak, N. N., Surveying and Leveling, McGraw Hill Education, New Delhi.
3. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling volume I, Pune Vidyarthi Gruh Prakashan.
4. Duggal, S. K., Survey I, McGraw Hill Education, New Delhi.

5. Saikia, M D.; Das. B.M.; Das. M.M., Surveying, PHI Learning, New Delhi.
6. Subramanian, R., Fundamentals of Surveying and Levelling, Oxford University Press. New Delhi.
7. Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning New Delhi.
8. Bhavikatti, S. S., Surveying and Levelling, Volume 1, I. K. International, New Delhi.
9. Arora K R , Surveying Vol. I, Standard Book House.

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	2	10
2	3	25
3	3	25
4	4	25
5	2	15
Total	14	100

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PRACTICAL	3.3 BASIC SURVEYING LAB.	L	T	P
		-	-	4

LIST OF PRACTICAL TO BE PERFORMED

1. Measure distance between two survey stations using chain, tape and ranging rods when two stations are inter visible.
2. Undertake reciprocal ranging and measure the distance between two stations.
3. Determine area of open field using chain and cross staff survey.
4. Measure Fore Bearing and Back Bearing of survey lines of open traverse using Prismatic Compass.
5. Measure Fore Bearing and back bearing of a closed traverse of 5 or 6 sides and correct the bearings and included angles for the local attraction.
6. Undertake Survey Project with chain and compass for closed traverse for minimum 5 sides around a building **and** Plot the traverse on A1 size imperial drawing sheet for data collected in Survey Project mentioned in practical
7. Undertake simple leveling using dumpy level/ Auto level and leveling staff.
8. Undertake differential leveling and determine Reduced Levels by Height of instrument method and Rise and fall method using dumpy level/Auto Level and leveling staff and set up gradient.
9. Undertake fly leveling with double check using dumpy level/ Auto level and leveling staff.
10. Undertake Survey Project with Leveling instrument for Profile leveling and cross-sectioning for a road/canal/Railways length of 500 m with cross-section at 30 m interval.
11. Plot the L-section with minimum 3 cross-sections on A1 size imperial sheet for data collected in Survey Project mentioned in practical.
12. Undertake Survey Project for plotting contour map using block contouring method for a block of 150m x 150m with grid of 10m x 10m.
13. Plot the contours on A1 size imperial drawing sheet for data collected in
14. Survey Project mentioned in practical.

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THEORY	3.4 MECHANICS OF MATERIAL	L	T	P
		2	-	-

COURSE OBJECTIVES:

Following are the objectives of this course:

- To learn properties of area and structural material properties.
- To understand the concept of stress and strain.
- To calculate shear force, bending moment for different shapes of structural elements and corresponding stresses.
- To understand the concept of buckling loads for short and long columns.

COURSE OUTCOMES:

After competing this course, student will be able to:

- Articulate practical applications of moment of inertia of symmetrical and unsymmetrical structural sections.
- Analyse structural behaviour of materials under various loading conditions.
- Interpret shear force and bending moment diagrams for various types of beams and loading conditions.
- Determine the bending and shear stresses in beams under different loading conditions.
- Analyse the column for various loading and end conditions.

COURSE CONTENTS:

Unit-I Simple Stresses and Strains (6 periods)

- Properties of Materials, Classification of materials, elastic materials, plastic materials, ductile materials, brittle materials. Introduction to tensile test, compressive test, impact test, fatigue test, torsion test on metals.
- Concept of stress, normal and shear stresses, Concept of strain and deformation, longitudinal and transverse strain, poisson's ratio, volumetric strain, Hooke's law, modulii of elasticity and rigidity, Bulk modulus of elasticity, relationship between the elastic constants.
- Stresses and strains in bars subjected to tension and compression. Extension of uniform bar under its own weight, stress produced in compound and tapering bars due to axial load.
- Stress-strain diagram for mild steel and HYSD steel, proof stress, mechanical properties, factor of safety. Temperature stresses and strains

Unit-II Moment of Inertia (6 periods)

- Concept of moment of inertia and second moment of area and radius of gyration, theorems of parallel and perpendicular axis, second moment of area of common geometrical sections: rectangle, triangle, circle (without derivations).
- Second moment of area for L, T and I sections, section modulus.

Unit-III Shear Force and Bending Moment (6 periods)

- Concept of a beam and supports (Hinges, Roller and Fixed), types of beams: simply supported, cantilever, propped, over hang, fixed and continuous beams (only concept).
- Types of loads (dead load, live load, snow load, wind load seismic load as per IS Codes etc) and types of loading (point, uniformly distributed and uniformly varying loads)
- Concept of bending moment and shear force, sign conventions, Bending Moment and shear force diagrams for cantilever, simply supported and overhanging beams subjected to concentrated, uniformly distributed and varying loads
- Relationship between load, shear force and bending moment, point of maximum bending moment, and point of contraflexure.
- Fixed and continuous beams-simple numerical problems.

Unit-IV Bending and Shear Stresses in Beams (6 periods)

- Bending Stresses in Beams, Concept of pure/simple bending, Assumptions made in the theory of simple bending, derivation and application of bending equation to circular cross-section, I section, T&L sections only, Moment of resistance, Calculations of bending stresses
- Shear Stresses in Beams, Concept of shear stresses in beams, shear stress distribution in rectangular, circular I, T, L sections for beams

Unit-V Columns (4 periods)

- Theory of columns- long and short columns, slenderness ratio, Problem solving using Euler's and Rankine formula

Suggested learning resources:

1. Bedi D.S. , Strength of Materials, Khanna Publishing House, Delhi, Ed. 2018
2. Timoshenko, S., Strength of Materials, Vol. I, CBS, New Delhi.
3. Khurmi, R.S., Strength of Materials, S Chand and Co. Ltd. New Delhi.
4. Ramamurtham, S, Strength of Materials, Dhanpat Rai and sons, New Delhi.
5. Punmia B C, Strength of Materials, Laxmi Publications (p) Ltd. New Delhi.
6. Rattan S.S., Strength of Materials, McGraw Hill Education; New Delhi.

7. Bansal R K, Strength of Materials, Laxmi Publications.
8. Subramaniam R, Strength of Materials, Oxford University Press.

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

TopicNo.	TimeAllotted (Hrs)	MarksAllotted (%)
1	6	20
2	6	20
3	6	20
4	6	20
5	4	20
Total	28	100

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PRACTICAL	3.5 MECHANICS OF MATERIAL LAB.	L	T	P
		-	-	2

COURSE OBJECTIVES:

Following are the objectives of this course:

- To know the procedure for the conduct of tensile and compressive strength.
- To understand the concept of stress and strain through testing of different materials.
- To calculate shear force, bending moment and their corresponding stresses.
- To understand flexural strength and abrasive properties of floor tiles.

COURSE OUTCOMES:

After competing this course, student will be able to:

- Test different Civil engineering materials on Universal Testing Machine.
- Analyse structural behaviour of materials under various loading conditions.
- Interpret shear force and bending moment diagrams for various types of beam sections and different loading conditions.
- Determine bending and shear stresses in beams under different loading conditions.
- Calculate flexural strength of different types of floor tiles.

LIST OF PRACTICALS TO BE PERFORMED:

- Study and understand the use and components of Universal Testing Machine (UTM).
- Perform Tension test on mild steel as per IS:432(1) and compute value of young's modulus.
- Perform tension test on Tor steel as per IS:1608, IS:1139.
- Conduct compression test on sample test piece using Compression Testing Machine.
- Conduct Izod Impact test on three metals. e.g. mild steel/ brass/aluminum /copper /cast iron etc as per IS:1598.
- Conduct Charpy Impact test on three metals. e.g. mild steel/ brass/aluminum/ copper /cast iron etc as per IS:1757.
- Plot Shear force and Bending Moment diagrams for cantilever, simply supported beams.
- Plot Shear force and Bending Moment diagrams for overhanging beams for different types of loads including moment loading.

- Conduct Flexural test on timber beam on rectangular section in both orientation as per IS:1708, IS:2408.

SUGGESTED LEARNING RESOURCES:

1. Bedi D.S., Strength of Materials, Khanna Publishing House, New Delhi (Edition 2018)
2. Timoshenko, S., Strength of Materials, Vol. I, CBS, New Delhi.
3. Khurmi, R.S., Strength of Materials, S Chand and Co. Ltd. New Delhi.
4. Ramamurtham, S, Strength of Materials, Dhanpat Rai and sons, New Delhi.
5. Punmia B C, Strength of Materials, Laxmi Publications (p) Ltd. New Delhi.
6. Rattan S.S., Strength of Materials, McGraw Hill Education; New Delhi.
7. Bansal R K, Strength of Materials, Laxmi Publications.
8. Subramaniam R, Strength of Materials, Oxford University Press.

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PRACTICUM / THEORY	3.6 BUILDING CONSTRUCTION	L	T	P
		2	-	2

COURSE OBJECTIVES:

Following are the objectives of this course:

- To identify different components of building.
- To understand different types of foundation and their significance.
- To know different types of masonry and their construction.
- To highlight the importance of communications in building planning.

COURSE OUTCOMES:

After completing this course, student will be able to:

- Identify components of building structures.
- Propose suitable type of foundation for building structures.
- Select suitable type of masonry for building structures.
- Propose relevant means of communications for different types of buildings.
- Select relevant material for finishing works.

COURSE CONTENTS:

Unit – I: Overview of Building Components (4 periods)

- Classification of Buildings as per National Building Code Group A to I, As per Types of Constructions- Load Bearing Structure, Framed Structure, Composite Structure.
- Building Components - Functions of Building Components, Substructure– Foundation, Plinth.
- Superstructure – Walls, Partition wall, Cavity wall, Sill, Lintel, Doors and Windows, Floor, Mezzanine floor, Roof, Columns, Beams, Parapet.

Unit – II: Construction of Substructure (5 periods)

- Job Layout: Site Clearance, Layout for Load Bearing Structure and Framed Structure by Center Line and Face Line Method, Precautions.
- Earthwork: Excavation for Foundation, Timbering and Strutting, Earthwork for embankment, Material for plinth Filling, Tools and plants used for earthwork.
- Foundation: Functions of foundation, Types of foundation – Shallow Foundation, Stepped Footing, Wall Footing, Column Footing, Isolated and Combined Column Footing, Raft Foundation, Grillage Foundation. Deep Foundation - Pile Foundation, Well foundation and Caissons, Pumping Methods of Dewatering, Deep wells, Well points, Cofferdams (Introduction only).

Unit- III: Construction of Superstructure. (6 periods)

- **Stone Masonry:** Terms used in stone masonry- facing, backing, hearting, Through stone, corner stone, cornice. Types of stone masonry: Rubble masonry, Ashlar Masonry and their types. Joints in stone masonry and their purpose. Selection of Stone Masonry, Precautions to be taken in Stone Masonry Construction.

- **Brick masonry:** Terms used in brick masonry- header, stretcher, closer, quoins, course, face, back, hearting, bat bond, joints, lap, frog line, level and plumb. Bonds in brick masonary- header bond, stretcher bond, English bond and Flemish bond. Requirements of good brick masonry. Junctions in brick masonry and their purpose and procedure. Precautions to be observed in Brick Masonry Construction. Comparison between stone and Brick Mason- ry. Tools and plants required for construction of stone and brick masonry. Hollow concrete block masonry and composite masonry.
- **Scaffolding and Shoring:** Purpose, Types of Scaffolding, Process of Erection and Dismantling. Purpose and Types of Shoring, Underpinning. Formwork: Definition of Formwork, Requirements of Formwork, Materials used in Formwork, Types of Formwork for slabs, beams ,columns, stripping time for removal of formwork as per IS456

Unit– IV: Building Communication and Ventilation (7 periods)

- **Horizontal Communication: Doors** –Components of Doors, Full Paneled Doors, Partly Paneled and Glazed Doors, Flush Doors, Collapsible Doors, Rolling Shutters, Revolving Doors, Glazed Doors. Sizes of Door recommended by BIS.
- **Windows:** Component of windows, Types of Windows - Full Paneled, Partly Paneled and Glazed, wooden, Steel, Aluminum windows, Sliding Windows, Louvered Window, Bay win- dow, Corner window, clear-storey window, Gable and Dormer window, Skylight. Sizes of Windows recommended by BIS. Ventilators.
- Fixtures and fastenings for doors and windows- Material used and functions of Window Sill and Lintels, Shed / Chajja.
- **Vertical Communication:** Means of Vertical Communication- Stair Case, Ramps, Lift, Elevators and Escalators. Terms used in staircase-steps, tread, riser, nosing, soffit, waist slab, baluster, balustrade, scotia, hand rails, newel post, landing, headroom, winder. Types of stair- case (On the basis of shape): Straight, dog-legged, open well, Spiral, quarter turn, bifurcated, Three quarter turn and Half turn, (On the basis of Material): Stone, Brick, R.C.C., wooden and Metal.

Unit– V: Building Finishes (6 periods)

- **Floors and Roofs**: Types of Floor Finishes and its suitability- Kota, Marble, Granite, Ceramic Tiles, Vitrified, Chequered Tiles, Paver Blocks, Concrete Floors, wooden Flooring, Skirting and Dado. Process of Laying and Construction, Finishing and Polishing of Floors, Roofing Materials- RCC, Mangalore Tiles, AC Sheets, G.I. sheets, Corrugated G.I. Sheets, Plastic and Fibre Sheets. Types of Roof: Flat roof, Pitched Roof-King Post truss, Queen Post Truss, terms used in roofs.

- **Wall Finishes:** Plastering – Necessity of Plastering, Procedure of Plastering, Single Coat Plaster, Double Coat Plaster, Rough finish, Neeru Finishing and Plaster of Paris (POP). Special Plasters- Stucco plaster, sponge finish, pebble finish. Plaster Board and Wall Claddings. Pre- cautions to be taken in plastering, defects in plastering. Pointing – Necessity, Types of pointing and procedure of Pointing. Painting –Necessity, Surface Preparation for painting, Methods of Application.

SUGGESTED LEARNING RESOURCES:

1. S. P. Arora and Bindra., Building Construction, Dhanpat Rai Publication, Delhi.
2. Sushil Kumar., Building Construction, Standard Publication.
3. Rangawala, S. C., Building Construction, Charotar Publication, Anand.
4. Punmia B. C., and Jain A. K., Building Construction ,Firewall Media.
5. Sharma S. K., Building Construction, S. Chand and Co. Pvt. Ltd., New Delhi.
6. Janardan Zha , Building Construction, Khanna Publication.
7. Bhavikatti S. S., Building Construction, Vikas Publication House Pvt. Ltd., Delhi.
8. Mantri S., A to Z Building Construction, Satya Prakashan, New Delhi.

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

TopicNo.	TimeAllotted (Hrs)	MarksAllotted (%)
1	4	15
2	5	20
3	6	20
4	7	25
5	6	20
Total	28	100

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PRACTICUM / PRACTICAL	3.7 BUILDING PLANNING AND DRAWING	L	T	P
		1	-	4

COURSE OBJECTIVES:

Following are the objectives of this course:

- To learn basic principles of building planning and drawing.
- To know graphical representation of various components of buildings.
- To draw complete plan and elevation of a building.
- To learn basics of perspective drawings and Computer Aided Drawings.

COURSE OUTCOMES:

After completing this course, student will be able to:

1. Interpret the symbols, signs and conventions from the given drawing.
2. Prepare line plans of residential and public buildings using principles of planning.
3. Prepare submission and working drawing for the given requirement of Load Bearing Structure.
4. Prepare submission and working drawing using CAD for the given requirement of Framed Structure.
5. Draw two-point perspective drawing for given small objects.

COURSE CONTENTS:

Unit – I Planning of Building (4 periods)

- Conventions as per IS 962, symbols for different materials such as earthwork, brickwork, stonework, concrete, woodwork and glass.
- Graphical symbols for doors and windows, Abbreviations, symbols for sanitary and electrical installations.
- Principles of planning for Residential and Public building- Aspect, Prospect, Orientation, Grouping, Privacy, Elegance, Flexibility, Circulation, Furniture requirements, Sanitation, Economy.
- Space requirement and norms for minimum dimension of different units in the residential and public buildings as per IS 962.
- Rules and bye-laws of sanctioning authorities for construction work.

- Plot area, built up area, super built up area, plinth area, carpet area, floor area and FAR (Floor Area Ratio).

Unit– II (3 periods)

Drawing No. 1 : Details of spread footing foundations for a load bearing and non-load bearing wall for given thickness of walls with the help of given data or rule of the thumb, showing offsets, position of DPC. The details of the concrete and brick apron have to be shown in the drawing.

Drawing No. 2 : Plans of 'T' and Corner junction of walls of 1 Brick, 1-1/2 Brick and 2 brick thick in English bond.

Drawing No. 3 : Drawing plan, elevation of arches: circular arch, segmental arch

Unit– III (3 periods)

Drawing No. 4 : Elevation, sectional plan and sectional side elevation of flush door, fully glazed door, fully panelled door with wire gauge shutter, Partly panelled and partly glazed door.

Drawing No. 5 : Drawing plan, elevation of a small building by measurement and foundation detail and sectional elevation.

Drawing No. 6 : Drawing detailed working plan, elevation and section of a two rooms residential building from a given line plan or given data showing details of foundations, roof and parapet.

Unit– IV (2 periods)

Drawing No. 7 : Drawings of following floors:

1. Cement concrete floors at ground level and at first floor level.
2. Brick floors:
   a) Diagonal Bond
   b) Herring Bone Bond
3. Bonded cement concrete flooring/ Marble flooring/ Terrazzo flooring
4. Ceramic/vitrified tile flooring

Drawing No. 8 : Drawing of flat roof, showing the heat/thermal insulation provisions.

Unit– V (2 periods)

Drawing No. 9 : Drawing details of damp proofing arrangement of roofs and walls as per BIS Code. Show the rain water drainage arrangement also**.**

Drawing No 10: Drawing Damp Proofing details in basement of buildings**.**

SUGGESTED LEARNING RESOURCES:

1. Civil Engineering Drawing by RS Malik; Asia Publishing House
2. Civil Engineering Drawing by V.B.Sikka ; Katson Publishing, Ludhiana
3. Civil Engineering Drawing by NS Kumar ; IPH, New Delhi
4. Principles of Building Drawing by MG Shah and CM Kale; MacMillan, Delhi
5. Building Construction by Moorthy NRK
6. Civil Engg Drawing by Layal
7. Drawing and Design of Residential and Commercial Buildings by Zaidi, SKA and Siddiqui, Suhail; Standard Publishers and Distributors, Delhi.
8. National Building Code
9. Building Drawing by Mamta Kataria; North Publication, Jalandhar.

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	4	20
2	3	20
3	3	20
4	2	20
5	2	20
Total	14	100

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BUILDING PLANNING AND DRAWING LAB

COURSE OBJECTIVES:

Following are the objectives of this course:

- To learn the basic principles of building planning and drawing.
- To make graphical representation of various components of buildings.
- To draw complete plan and elevation of a building.
- To learn basics of perspective drawings and Computer Aided Drawings.

COURSE OUTCOMES:

After completing this course, student will be able to:

- Interpret the symbols, signs and conventions from the given drawing.
- Prepare line plans of residential and public buildings using principles of planning.
- Prepare working drawing for the given requirement of Load Bearing Structure.
- Prepare working drawing using CAD for the given requirement of Framed Structure.
- Draw two-point perspective drawing for given small objects.

List of Practical / Drawings to be completed:

1. Introduction to Computer Aided Drafting (2D) commands of any one software (Auto CAD, ProE, Solid works, Unigraphics etc.
   1.1 Concept of AutoCAD, Tool bars in CAD software, coordinate system, snap, grid, and ortho mode (Absolute, Relative and Polar), setting of units and layout.
   1.2 Drawing commands – point, line, arc, circle, ellipse,
   1.3 Editing commands – scale, erase, copy, stretch, lengthen and explode.
   1.4 Dimensioning and placing text in drawing area
   1.5 Sectioning and hatching
   1.6 Inquiry for different parameters of drawing entity
   1.7 Create layers within a drawing
   1.8 Specifying Geometrical Dimensioning & tolerance (GD&T) parameters in drawing
2. 2-D Plan of a Two-Room Building
3. Isometric Drawing by CAD using any part modeling Software (3D) Drawings of following on computer:

- Cone
- Cylinder
- Cube
- Spring
- Isometric view of objects

4. Draw submission drawing to the scale of 1:100, of (G+1) Framed Structure Residential Building (2BHK) with Flat Roof and staircase showing using CAD software.

   a) Developed plan

   b) Elevation.

   c) Section passing through Staircase, W.C. and Bath

   d) Foundation plan.

   e) Site plan (1:200), area statement, Schedule of openings and construction notes.

5. Draw working drawing to the scale of 1:100, of (G+1) Framed Structure Residential Building (2BHK) with Flat Roof and staircase showing using CAD software

   a) Foundation plan to the scale 1:50

   b) Detailed enlarged section of RCC column and footing with plinth filling.

   c) Detailed enlarged section of RCC Beam, Lintel and Chajjas.

   d) Detailed enlarged section of RCC staircase and slab.

6. Draw two point perspective drawing of small objects - steps, monuments, pedestals (any one) scale 1:50 using CAD software

   a) Draw plan, elevation, eye level, picture plane and vanishing points

   b) Draw perspective view.

SUGGESTED LEARNING RESOURCES:

1. Shah. M.G. Kale, CM, Patki, S.Y., Building Drawing, Mcgraw Hill Publishing
2. Malik and Mayo, Civil Engineering Drawing, Computech Publication Ltd
3. M. G. Shah and C. M. Kale, Principles of Perspective Drawing, Mcgraw Hill
4. Swamy, Kumara; Rao, N, Kameshwara, A ., Building Planning and Drawing, Charotar Publication, Anand.
5. Bhavikatti, S. S., Building Construction, Vikas Publication House Pvt. Ltd., Delhi.
6. Mantri, Sandip, A to Z Building Construction, Satya Prakashan, New Delhi.
7. Singh, Ajit, Working with Auto CAD 2000, Mcgraw Hill Publishing company Ltd.

8. Sane, Y.S., Planning and design of Building, Allied Publishers, New Delhi.

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THEORY	3.8 CONCRETE TECHNOLOGY	L	T	P
		2	-	-

COURSE OBJECTIVES:

Following are the objectives of this course:

- To know properties of cement, aggregate and water used in concrete.
- To understand different characteristics of concrete.
- To learn about role of admixtures in concrete.

COURSE OUTCOMES:

After completing this course, student will be able to:

- Use different types of cement and aggregates in concrete
- Prepare concrete of desired compressive strength.
- Prepare concrete of required specification.
- Maintain quality of concrete under different conditions.
- Apply relevant admixtures for concreting.

COURSE CONTENTS:

Unit – I Cement, Aggregates and Water (6 periods)

- Physical properties of OPC and PPC: fineness, standard consistency, setting time, soundness, compressive strength. Different grades of OPC and relevant BIS codes
- Testing of cement: Laboratory tests-fineness, standard consistency, setting time, soundness, compressive strength. Storage of cement and effect of storage on properties of cement.
- BIS Specifications and field applications of different types of cements: Rapid hardening, Low heat, Portland pozzolana, Sulphate resisting, Blast furnace slag, High Alumina and White cement.
- Aggregates: Requirements of good aggregate, Classification according to size and shape.
- Fine aggregates: Properties, size, specific gravity, bulk density, water absorption and bulking, fineness modulus and grading zone of sand, silt content and their specification as per IS 383. Concept of crushed Sand.
- Coarse aggregates: Properties, size, shape, surface texture, water absorption, soundness,

specific gravity and bulk density, fineness modulus of coarse aggregate, grading of coarse aggregates, crushing value, impact value and abrasion value of coarse aggregates with specification.

- Water: Quality of water, impurities in mixing water and permissible limits for solids as per IS: 456-2000

Unit– II Concrete (6 periods)

- Concrete: Different grades of concrete, provisions of IS 456.
- Duff Abraham water cement (w/c) ratio law, significance of w/c ratio, selection of w/c ratio for different grades, maximum w/c ratio for different grades of concrete for different expo- sure conditions as per IS 456.
- Properties of fresh concrete: Workability: Factors affecting workability of concrete. Determination of workability of concrete by slump cone, compaction factor, Vee-Bee Consistometer. Value of workability requirement for different types of concrete works. Segregation, bleeding and preventive measures.
- Properties of Hardened concrete: Strength, Durability, Impermeability.

Unit– III Concrete Mix Design and Testing of Concrete (4 periods)

- Concrete mix design: Objectives, methods of mix design, study of mix design as per IS 10262-2009 (only procedural steps).

- Testing of concrete, determination of compressive strength of concrete cubes at different ages, interpretation and co-relation of test results.
- Non- destructive testing of concrete: Rebound hammer test, working principle of rebound hammer and factor affecting the rebound index, Ultrasonic pulse velocity test as per IS13311 (part 1 and 2), Importance of NDT tests.

Unit– IV Quality Control of Concrete (6 periods)

- Concreting Operations: Storage, Batching, Mixing, Transportation, Placing, Compaction, Curing and Finishing of concrete.
- Joints in concrete construction: Types of joints, methods for joining old and new concrete, materials used for filling joints.
- Defects in Concrete: Identification of defects and methods of removing defects.

Unit– V Chemical Admixture, Special Concrete and Extreme Weather concreting (6 periods)

- Admixtures in concrete: Purpose, properties and application for different types of admixture such as accelerating admixtures, retarding admixtures, water reducing admixtures, air en- training admixtures and super plasticizers.
- Special Concrete: Properties, advantages and limitation of following types of Special concrete: Ready mix Concrete, Fiber Reinforced Concrete, High performance Concrete Self-compacting concrete and light weight concrete.

- Cold weather concreting: effect of cold weather on concrete, precautions to be taken while concreting in cold weather condition.
- Hot weather concreting: effect of hot weather on concrete, precautions to be taken while concreting in hot weather condition.
- Under water concrete

SUGGESTED LEARNING RESOURCES:

1. Gambhir, M.L., Concrete Technology, Tata McGraw Hill Publishing Co. Ltd., Delhi.
2. Shetty, M.S., Concrete Technology, S.Chand and Co.Pvt. Ltd.,Ram Nagar,Delhi.
3. Santhakumar, A. R., Concrete Technology, Oxford University Press, New Delhi.
4. Neville, A. M. and Brooks, J.J., Concrete Technology, Pearson Education Pvt. Ltd.
5. Neville, A. M., Concrete Technology, Pearson Education Pvt. Ltd., New Delhi.
6. Sood, H., Kulkarni P. D., Mittal L. N., Laboratory Manual in Concrete Technology, CBS Publishers, New Delhi.

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

TopicNo.	TimeAllotted (Hrs)	MarksAllotted(%)
1	6	20
2	6	20
3	4	20
4	6	20
5	6	20
Total	28	100

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PRACTICAL	3.9 CONCRETE TECHNOLOGY LAB.	L	T	P
		-	-	4

COURSE OBJECTIVES:

Following are the objectives of this course:

- To know properties of cement, aggregate and water used in concrete.
- To understand different characteristics of concrete.
- To learn about role of admixtures in concrete.

COURSE OUTCOMES:

After completing this course, student will be able to:

- Identify different types of cement by performing laboratory tests.
- Know the physical properties of fine and coarse aggregates.
- Prepare concrete of required specification.
- Maintain the quality of concrete applying scientific principles.
- Use relevant admixtures for improving the workability of concrete.

LIST OF PRACTICAL TO BE PERFORMED:

1	Determine fineness of cement by Blaine's air permeability apparatus Or by sieving.
2	Determine specific gravity, standard consistency, initial and final setting times of cement.
3	Determine compressive strength of cement.
4	Determine silt content in sand.
5	Determine bulking of sand.
6	Determine bulk density of fine and coarse aggregates.
7	Determine water absorption of fine and coarse aggregates.
8	Determine Fineness modulus of fine aggregate by sieve analysis.
9	Determine impact value of aggregate.
10	Determine crushing value of aggregate.
11	Determine abrasion value of aggregate.
12	Determine elongation and flakiness index of coarse aggregates
13	Determine workability of concrete by slump cone test.
14	Determine workability of concrete by compaction factor test.

15	To prepare concrete mix of a particular grade and determine compressive strength of concrete for 7 and 28 days.
16	Demonstration of NDT equipment's .

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SEMESTER-IV

THEORY	4.1 HYDRAULICS	L	T	P
		2	-	-

COURSE OBJECTIVES:

Following are the objectives of this course:

- To understand parameters associated with fluid flow and hydrostatic pressure.
- To know head loss and water hammer in fluid flowing through pipes.
- To learn different types of pumps and their uses.

COURSE OUTCOMES:

After competing this course, student will be able to:

- Measure pressure and determine total hydrostatic pressure for different conditions.
- Understand various parameters associated with fluid flow
- Determine head loss of fluid flow through pipes.
- Find the fluid flow parameters in open channels.
- Select relevant hydraulic pumps for different applications.

COURSE CONTENT:

Unit – I Pressure measurement and Hydrostatic pressure (6 periods)

- Technical terms used in Hydraulics–fluid, fluid mechanics, hydraulics, hydrostatics and hydrodynamics - ideal and real fluid, application of hydraulics.
- Physical properties of fluid – density-specific volume, specific gravity, surface tension, capillarity, viscosity-Newton's law of viscosity.
- Various types of pressure – Atmospheric Pressure, Gauge Pressure, Absolute Pressure, Vacuum Pressure. Concept of Pressure head and its unit, Pascal's law of fluid pressure and its uses.
- Measurement of differential Pressure by different methods.
- Variation of pressure with depth, Pressure diagram, hydrostatic pressure and center of pressure on immersed surfaces and on tank walls.
- Determination of total pressure and center of pressure on sides and bottom of water tanks, sides and bottom of tanks containing two liquids, vertical and inclined surface in contact with liquid on either side

Unit– II Fluid Flow Parameters (4 periods)

- Types of flow – Gravity and pressure flow, Laminar, Turbulent, Uniform, Non-uniform, Steady, Unsteady flow. Stream line, stream tube, streak line, path line

Reynolds number.

- Discharge and its unit, continuity equation of flow.
- Energy of flowing liquid: potential, kinetic and pressure energy.
- Bernoulli's theorem : statement, assumptions, equation. (Without proof of theorem)

Unit– III Flow through pipes (8 periods)

- Major head loss in pipe: Frictional loss and its computation by Darcy's Weisbach equation, Use of Moody's Diagram and Nomograms.
- Critical velocity and velocity distribution in a pipe for laminar flow
- Minor losses in pipe: loss at entrance, exit, sudden contraction, sudden enlargement and fittings.
- Flow through pipes in series, pipes in parallel and Dupuit's equation for equivalent pipe. Hydraulic gradient line and total energy line.
- Water hammer in pipes: Causes and Remedial measures.
- Discharge measuring device for pipe flow: Venturimeter - construction and working.
- Discharge measurement using Orifice, Hydraulic Coefficients of Orifice.

Unit– IV Flow through Open Channel (5 periods)

- Geometrical properties of channel section: Wetted area, wetted perimeter, hydraulic radius for rectangular and trapezoidal channel section.
- Determination of discharge by Chezy's equation and Manning's equation.
- Conditions for most economical rectangular and trapezoidal channel section.
- Discharge measuring devices: Triangular and rectangular Notches.
- Velocity measurement devices: current meter, floats and Pitot tube.
- Specific energy diagram, Froude's' Number, Hydraulic jump.

Unit– V Hydraulic Pumps (5 periods)

- Concept of pump, Types of pump - centrifugal, reciprocating, submersible.
- Centrifugal pump: components and working
- Reciprocating pump: single acting and double acting, components and working.
- Suction head, delivery head, static head, Manometric head
- Power of centrifugal pump.
- Selection and choice of pump.
- Introduction of Impulse and Reaction turbine.

SUGGESTED LEARNING RESOURCES:

1. Modi, P. N. and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.

2. S.S. Rattan, Fluid Mechanics & Hydraulic Machines, Khanna Book Publishing Co., New Delhi
3. Ramamrutham, and Narayan, R., Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat Rai Publishing, New Company Delhi.
4. Khurmi R S, Hydraulics, Fluid Mechanics, Hydraulic machines, S. Chand Publishers
5. Rajput, R K, Fluid Mechanics, S Chand, New Delhi.
6. Ojha, C S P, Berndtsson, R, and Chandramoulli P. N., Fluid Mechanics and Machinery, Oxford University Press, New Delhi.

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	6	20
2	4	15
3	8	25
4	5	20
5	5	20
Total	28	100

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PRACTICAL	4.2 HYDRAULICS LAB.	L	T	P
		-	-	2

COURSE OBJECTIVES:

Following are the objectives of this course:

- To understand parameters associated with fluid flow and hydrostatic pressure.
- To know head loss and water hammer in fluid flowing through pipes.
- To learn different types of pumps and their uses.

COURSE OUTCOMES:

After completing this course, student will be able to:

- Ensure pressure and determine total hydrostatic pressure for different conditions.
- Understand various parameters associated with fluid flow.
- Determine head loss of fluid flow through pipes.
- Find the fluid flow parameters in open channels.
- Select relevant hydraulic pumps for different applications.

LIST OF PRACTICALS TO BE PERFORMED:

1	Use piezometer to measure pressure at a given point.
2	Use U-tube differential manometer to measure pressure difference between two given points.
3	Use Reynold's apparatus to determine type of flow.
4	Use Bernoulli's apparatus to apply Bernoulli's theorem to get total energy line for a flow in a closed conduit of varying cross sections.
5	Determine minor losses in pipe fittings due to sudden contraction and sudden enlargement.
6	Calibrate Venturimeter to find out the discharge in a pipe.
7	Calibrate the Orifice to find out the discharge through a tank
8	Use Current meter to measure the velocity of flow of water in open channel.
9	Use Pitot tube to measure the velocity of flow of water in open channel.
10	Use Rectangular and triangular notch to measure the discharge through open channel.

SUGGESTED LEARNING RESOURCES:

1. Modi,P. N.and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.
2. S.S. Rattan, Fluid Mechanics and Hydraulic Machines, Khanna Publishing House, Delhi
3. Ramamrutham, and Narayan, R., Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat Rai Publishing Company, New Delhi.
4. Khurmi,R S, Hydraulics, Fluid Mechanics, Hydraulic machines, S Chand Publishers, New Del- hi.
5. Rajput, R K, Fluid Mechanics, S Chand, New Delhi.
6. Ojha, C S P, Berndtsson, R, and Chandramoulli P. N., Fluid Mechanics and Machinery, Oxford University Press, New Delhi.

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THEORY	4.3 ADVANCED SURVEYING	L	T	P
		2	-	-

COURSE OBJECTIVES:

Following are the objectives of this course:

- To know methods of plane surveying and Theodolite surveying and their uses
- To learn tachometric surveying and curve setting
- To understand the principles of Electronic Distance Measurement equipment and Total station and their use.
- To know the concept of remote sensing, GPS and GIS

COURSE OUTCOMES:

After completing this course, student will be able to:

- Prepare plans using Plane Table Surveys.
- Prepare plans using Theodolite surveys.
- Find distances and elevations using Tachometer.
- Prepare plans using Total Station instrument.
- Locate coordinates of stations using GPS.

COURSE CONTENT:

Unit – I Plane Table Surveying (4 periods)

- Principles of plane table survey.
- Accessories of plane table and their use, Telescopic alidade.
- Setting of plane table; Orientation of plane table - Back sighting and Magnetic meridian method, True Meridian Method.
- Methods of plane table surveys- Radiation, Intersection, Traversing and resection (Two point and Three point methods).
- Merits and demerits of plane table survey.

Unit– II Theodolite Surveying (6 periods)

- Types and uses of Theodolite, Components of transit Theodolite and their functions, Reading the Vernier of transit Theodolite.
- Technical terms- Swinging, Transiting, Face left, Face right.
- Fundamental axes of transit Theodolite and their relationship
- Temporary adjustment of transit Theodolite.

- Measurement of horizontal angle- Direct and Repetition method and reiteration methods.
- Measurement of magnetic bearing of a line, Prolonging and ranging a line, deflection angle.
- Measurement of vertical Angle.
- Theodolite traversing by Included angle method and Deflection angle method.
- Checks for open and closed traverse, Calculations of bearing from angles.
- Traverse computation-Latitude, Departure, Consecutive coordinates, Independent coordinates, balancing the traverse by Bowditch's rule and Transit rule, Gale's Traverse table computation.
- Errors and Precautions in theodolite surveying.

Unit– III Tacheometric surveying and Curve setting (6 periods)

- Principles of Tacheometry, Tacheometer and its component parts, Anallactic lens.
- Tacheometric formula for horizontal distance with telescope horizontal and staff vertical.
- Field method for determining constants of tacheometer, Determining horizontal and vertical distances with tacheometer by fixed hair method and staff held vertical, Limitations of tacheometry.
- Simple circular curve: Basic definitions, Designation of curves, Types of curves used in roads and railway alignments.
- Transition curves: Definition and requirement.
- Setting simple circular curve by offsets from long chord, Tangent and Rankine's method of deflection angles.
- Introduction of vertical circular curve.

Unit– IV Advanced surveying equipments (6 periods)

- Principle of Electronic Distance Meter (EDM), its component parts and their Functions, use of EDM.
- Use of micro optic Theodolite and Electronic Digital Theodolite.
- Use of Total Station, Use of function keys.
- Measurements of Horizontal angles, vertical angles, distances and coordinates using Total Station, Traversing, Profile Survey and Contouring with Total Station.

Unit– V Remote sensing, GPS and GIS (6 periods)

- Remote Sensing – Overview, Remote sensing system, Applications of remote sensing in Civil engineering, land use / Land cover, mapping, disaster management.

- Use of Global Positioning System (G.P.S.) instruments.
- Geographic Information System (GIS): Overview, Components, Applications, Software for GIS.
- Introduction to Drone Surveying.

SUGGESTED LEARNING RESOURCES:

1. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune Vidyarthi Gruh Prakashan, Pune.
2. Basak, N. N.,Surveying and Levelling, McGraw Hill Education (India) Pvt. Ltd.,Noida.
3. Duggal, S. K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.
4. Saikia, M D.; Das. B.M.; Das. M.M., Surveying PHI Learning Pvt. Ltd., New Delhi.
5. Subramanian, R., Surveying and Levelling, Oxford University Press. New Delhi.
6. Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying Vol. I and Surveying Vol. II, Laxmi Publications Pvt. Ltd., New Delhi.
7. Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning Pvt. Ltd., New Delhi.
8. Venkatramaiah, C, Textbook of Surveying, Universities Press, Hyderabad.
9. Anderson, James M and Mikhail, Edward M, Surveying theory and practice, Mc Graw Hill Ed- ucation, Noida.
10. De, Alak, Plane Surveying, S.Chand Publications, New Delhi.

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	4	20
2	6	20
3	6	20
4	6	20

5	6	20
Total	28	100

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PRACTICAL	4.4 ADVANCED SURVEYING LAB.	L	T	P
		-	-	4

COURSE OBJECTIVES:

Following are the objectives of this course:

- To know methods of plane surveying, Theodolite surveying and their uses.
- To learn tachometric surveying and curve setting.
- To understand the principles of Electronic Distance Measurement and Total station and their uses.
- To know the concept of Remote Sensing, GPS and GIS.

COURSE OUTCOMES:

After completing this course, student will be able to:

- Prepare plans using Plane Table Surveys.
- Prepare plans using Theodolite surveys.
- Find distances and elevations using Tachometer.
- Make measurements using Total Station.
- Locate coordinates of survey stations using GPS

LIST OF PRACTICALS TO BE PERFORMED

1.	Use plane table survey to prepare plans of a plot of seven sided closed traverse by Radiation Method.
2.	Use plane table survey to prepare plans, locate details by Intersection Method and resection method.(Two point problem & three point problem)
3.	Use plane table survey to prepare plans, locate details by Traversing Method.
4.	Use plane table survey to carry out Survey Project for closed traverse for minimum five sides around a building.
5.	Use transit theodolite to measure Horizontal and Vertical angle by Direct Method.
6.	Plot the traverse on A1 size imperial drawing sheet for the collected data from preceding Theodolite Survey Project.
7	Set out a circular curve by Rankine's Method of Deflection Angles.
8.	Use EDM to measure horizontal distance.
9.	Use Total station instrument to measure horizontal distances.
10.	Use Total station instrument to measure vertical angle.

11.	Use Total station instrument to carry out Survey Project for closed traverse for minimum five sides.
12.	Plot the traverse on A1 size imperial drawing sheet for the collected data from preceding Total Station Survey Project.
13.	Use GPS to locate the coordinates of a station.

SUGGESTED LEARNING RESOURCES

1. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune Vidyarthi Gruh Prakashan, Pune.
2. Basak, N. N.,Surveying and Levelling, McGraw Hill Education (India) Pvt. Ltd.,Noida.
3. Duggal, S. K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.
4. Saikia, M D.; Das. B.M.; Das. M.M., Surveying PHI Learning Pvt. Ltd., New Delhi.
5. Subramanian, R., Surveying and Levelling, Oxford University Press. New Delhi.
6. Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying Vol. I and Surveying Vol. II, Laxmi Publications Pvt. Ltd., New Delhi.
7. Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning Pvt. Ltd., New Delhi.
8. Venkatramaiah, C, Textbook of Surveying, Universities Press, Hyderabad.
9. Anderson, James M and Mikhail, Edward M, Surveying theory and practice, Mc Graw Hill Ed- ucation, Noida.
10. De, Alak, Plane Surveying, S.Chand Publications, New Delhi.

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THEORY	4.5 THEORY OF STRUCTURES	L	T	P
		2	1	-

COURSE OBJECTIVES:

Following are the objectives of this course:

- To learn concept of eccentric loading and stresses in vertical members like column, chimneys, dam
- To analyze beams using various methods like slope deflection, three moment, and moment distribution
- To understand different methods of finding axial forces in trusses.

COURSE OUTCOMES:

After competing this course, student will be able to:

- Analyze stresses induced in vertical member subjected to direct and bending loads.
- Analyze slope and Deflection in fixed and continuous beams.
- Analyze continuous beam under different loading conditions using the principles of Three Moments.
- Analyze continuous beam using Moment Distribution Method under different loading conditions.
- Evaluate axial forces in the members of simple truss.

COURSE CONTENT:

Unit – I Principal stress and strain **(6** periods)

- Stress on inclined planes, principal plane and principal stress in elements subjected to direct and shear stress and their combinations. Mohr Circle for calculation of stress on inclined planes and principal strain for above cases

Unit – II Combined Direct and Bending stress (6 periods)

- Eccentric loading middle third rule columns subjected to uni-axial and bi-axial eccentric loading. Dams- application of middle third rule for firing the base width calculation of stresses at the base of dam and stability of dam against overturning and sliding vertical structures like chimney subjected to movement due to wind forces.

Unit- III Strain Energy (6 periods)

- Strain energy stored in a member due to axial loading and bending. Strain energy stored by a beam due to uniform bending moment. Work done by a force on a member law of reciprocal deflection, Betti's law. The first theorem of castigliano. Deflection of truss joints.

Unit– IV Moment distribution method and Slope Deflection Method

(5 periods)

- Moment distribution method: Basic proposition relative stiffness, continuous beams with and without fixed ends. Sinking of support portal frames with and without sway (simple problem only)
- Slope Deflection Method : Basic concepts, stiffness of members with far end fixed or hinged. Development of slope deflection equations and their application to beam and frames.

Unit– V Simple trusses (5 periods)

- Types of trusses (Simple, Fink, compound fink, French truss, pratt truss, Howe truss, North-light truss, King post and Queen post truss)
- Calculate support reactions for trusses subjected to point loads at joints
- Calculate forces in members of truss using Method of joints and Method of sections.

SUGGESTED LEARNING RESOURCES:

1. Ramamrutham.S, Theory of structures, Dhanpatrai & Sons.
2. Khurmi, R. S. , Theory of Structures S. Chand and Co., New Delhi.
3. Bhavikatti, S S , Structural Analysis Vol-1, ,Vikas Publishing House Pvt Ltd.New Delhi.
4. Junnarkar, S. B. , Mechanics of structures, Volume-I and II Charotar Publishing House, Anand.
5. Pandit, G.S. and Gupta, S.P., Theory of Structures, Tata McGraw Hill, New Delhi.
6. Agor R, Structural Analysis, Khanna Publishing House, Delhi.

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

TopicNo.	TimeAllotted (Hrs)	MarksAllotted (%)
1	6	20
2	6	20
3	6	20
4	5	20
5	5	20
Total	28	100

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THEORY	4.6 DESIGN OF REINFORCED CEMENT CONCRETE STRUCTURES	L	T	P
		2	1	-

COURSE OBJECTIVES:

Following are the objectives of this course:

- To learn the concept of limit state design for tension and compression steel members.
- To learn the concept of limit state design of steel beams.
- To understand design of RCC elements.
- To know the design of short and long RCC columns.

COURSE OUTCOMES:

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

- Design of steel tension and compression member.
- Design of steel I and Channel sections.
- Design of singly and doubly reinforced RCC beam.
- Design of RCC beam for shear and development length.
- Design of short and long RCC columns.

COURSE CONTENT:

Unit – I Introduction (8 periods)

Concept of Reinforced Cement Concrete (RCC)

Reinforcement Materials: - Suitability of steel as reinforcing material
- Properties of mild steel, HYSD steel and TMT bars

Loading on structures as per IS: 875

Introduction to following methods of RCC design : Working stress method: Definition and basic assumptions Limit state method: Definition and basic assumptions

Working stress method: Shear and Development length Problems of singly, doubly and T beam analysis by Working stress method

Shear as per IS: 456-2000 by working stress method

i) Shear strength of concrete without shear reinforcement
ii) Maximum shear stress
iii) Shear reinforcement
iv) Development Length

Unit– II Concept of Limit State Method (8 periods)

Concept of Limit State Method:

- Definitions and assumptions made in limit state of collapse (flexure)
- Partial factor of safety for materials
- Partial factor of safety for loads
- Design loads
- Stress block, parameters

Unit– III Design of Reinforced Concrete Beams by Limit State Method (9 periods)

Singly Reinforced beam : Theory and design of singly reinforced beam by Limit State Method

Doubly Reinforced Beams : Theory and design of simply supported doubly reinforced rectangular beam by Limit State Method

Behavior of T beam, inverted T beam, isolated T beam and 'L' beams. Simple problems related to moment capacity.

Unit– IV Design of One way and Two way slab (9 periods)

One Way Slab: Theory and design of simply supported one way slab including sketches showing reinforcement details (plan and section) by Limit State Method.

Two Way Slab : Theory and design of two-way simply supported slab with corners free to lift, no provisions for torsional reinforcement by Limit State Method including sketches showing reinforcement details (plan and two sections)

Unit– V Design of axially loaded RCC Column and Pre-stressed Concrete (9 periods)

- Axially Loaded Column:
- Definition and classification of columns
- Effective length of column,
- Specifications for longitudinal and lateral reinforcement
- Design of axially loaded square, rectangular and circular short columns by Limit State Method including sketching of reinforcement(sectional elevation and plan)
- Pre-stressed Concrete:
- Concept of pre-stressed concrete
- Methods of pre-stressing: pre-tensioning and post-tensioning
- Advantages and disadvantages of pre-stressing
- Losses in pre-stress

SUGGESTED LEARNING RESOURCES:

- Shah, V. L., and Karve, S.R., Limit State Theory and Design of Reinforced Concrete Structures, Structures Publications, Pune,2014.
- Sinha N.C., and Roy S.K., Fundamentals of Reinforced Concrete, S. Chand & Co., New Delhi.
- Krishna Raju, and N. Pranesh, R.N., Reinforced Concrete Design Principles and Practice, New Age International, Mumbai.
- Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGraw Hill Publications, New Delhi.
- Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Pri- vate Limited, Delhi.

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

TopicNo.	TimeAllotted (Hrs)	MarksAllotted (%)
1	8	20
2	8	20
3	9	20
4	9	20
5	9	20
Total	42	100

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PRACTICUM / PRACTICAL	4.7 REINFORCED CEMENT CONCRETE STRUCTURES DRAWING	L	T	P
		1	-	4

COURSE OBJECTIVES:

Following are the objectives of this course:

- To learn the concept of limit state design of tension and compression steel members.
- To understand design of steel beams.
- To learn the concept of limit state design of RCC beams.
- To know the limit state design of RCC columns.

COURSE OUTCOMES:

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

- Design of steel tension and compression member.
- Design of steel beams including check for shear.
- Design of singly and doubly reinforced RCC beam.
- Design of shear reinforcement in RC beams.
- Design of RCC column as per IS 456.

LIST OF PRACTICAL TO BE PERFORMED:

RC Drawing:

1. Reinforcement details from the given data for the following structural elements with bar bending schedules
2. General instruction and rules, Drawing 1- lap, joint, development drawing: length, rings, hook etc.
3. Drawing No. 2: RC Slabs - One way slab, Two way slab and Cantilever Slab.
4. Drawing No.3: Beams - Singly and doubly reinforced rectangular beams and Cantilever beam (All beams with vertical stirrups), T Beam, Tapered Beam.
5. Drawing No.4: Columns and Footings – Square, Rectangular and Circular Columns with lateral ties and their isolated sloped column footings, column and beam junction
6. Drawing No. 5: Portal Frame – Three bay two storey RC portal frame with blow up of column beam junctions.

7. Drawing of cantilever retaining wall showing details of all the members and reinforcement.
8. Drawing of Intze type water tank showing details of all the members and reinforcement.

SUGGESTED LEARNING RESOURCES:

1. Shah, V. L., and Karve, S.R., Limit State Theory and Design of Reinforced Concrete Structures, Structures Publications, Pune,2014.
2. Sinha N.C., and Roy S.K., Fundamentals of Reinforced Concrete, S. Chand & Co., New Delhi.
3. Krishna Raju, and N.Pranesh, R.N., Reinforced Concrete Design Principles and Practice, New Age International, Mumbai.
4. Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGraw Hill Publications, New Delhi.
5. Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Pri- vate Limited, Delhi.

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

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THEORY	4.8 WATER RESOURCE ENGINEERING	L	T	P
		2	-	-

COURSE OBJECTIVES:

Following are the objectives of this course:

- To learn estimation of hydrological parameters.
- To understand water demand of crops and provisions to meet the same.
- To know planning of reservoirs and dams.
- To design irrigation projects, canals and other diversion works.

COURSE OUTCOMES:

After completing this course, student will be able to:

- Estimate hydrological parameters.
- Estimate crop water requirements of a command area and capacity of canals.
- Execute Minor and Micro Irrigation Schemes.
- Select the relevant Cross Drainage works for the specific site conditions.
- Design, construct and maintain simple irrigation regulatory structures.

COURSE CONTENT:

Unit – I Introduction to Hydrology (5 periods)

Hydrological Cycle : Rainfall, definition rain-gauges – automatic and non-automatic, methods of estimating average rainfall, Advantages of keeping rainfall records, (Arithmatic system); catchment area, runoff, factors affecting runoff, hydrograph, basic concept of unit hydrograph.

Unit– II Crop water requirement (6 periods)

- Principal crops in India and their water requirements, Crop seasons – Kharif and Rabi
- Soil water, soil crop and crop water relationships, Duty, Delta and Base Period, their relationship, Gross commanded area (GCA), culturable commanded area (CCA), Intensity of Irrigation, Paleo irrigation, Kor, Crop Ratio, Crop period, Base period, Duty, Delta. Relation between Duty-Delta and Base period.

- Definition of water logging – its causes and ill effects, detection, prevention and remedies, Surface and sub-surface drains and their layout.

Unit– III Methods of Irrigation (5 periods)

- Definition of irrigation, Necessity of irrigation, Role of Irrigation in country's economy. History of development of irrigation in India, Major, medium and minor irrigation projects of India.
- Flow irrigation - its advantages and limitations, Lift Irrigation – Tubewell, submersible and well irrigation advantages and disadvantages, Sprinkler irrigation conditions favourable and essential requirements for sprinkler irrigation, sprinkler system – classification and component parts, Drip irrigation, suitability of drip irrigation, layout, component parts, advantages
- Tubewell Irrigation comparison with canal irrigation, Tubewells, explanation of terms: water table, radius of influence, depression head, cone of depression, confined and unconfined aquifers. Types of tubewells (cavity type, strainer type and slotted type) and their choice
- Method of boring, installation of well assembly, development of well, pump selection and installation and maintenance, Water Harvesting Techniques: Need and requirement of various methods, Run-off from roof top and ground surface, construction of recharge pits and recharge wells and their maintenance.

Unit– IV Diversion Head Works & Canals (6 periods)

- Canals: Factors to be considered in Canal Alignment. Functions/Purpose of various components of Canal. Classification of Canals and their functions, sketches of different canal cross-sections, Various types of canal lining - their related advantages and disadvantages, sketches of different lined canal X-sections, Breaches – Causes, Method to plug canal breaches and their control, Maintenance of lined and unlined canals
- Canal Head Works and Regulatory Works : Choice of location of Canal Head Works, definition, object, general layout, functions of different parts of head works. Difference between weir and barrage Cross Drainage Works : Functions and necessity Cross Drainage Works, Types of Cross Drainage Works: aqueduct, super passage, level crossing, inlet and outlet, Sketches of the above cross drainage works .Introduction of Kennedy and lacy theory.
- Cross Drainage Works : Functions and necessity Cross Drainage Works, types of Cross Drainage Works: aqueduct, super passage, level crossing, inlet and outlet, Sketches of the above cross drainage works.

Unit– V Dams and Spillways and river training works (6 periods)

- Dams : Classification of dams; earthen dams - types, causes of failure; cross-section of homogeneous, zoned and diaphragm type earthen dams, method of construction. Gravity dams – types, cross-sections of a dam, method of construction, Concept of small and micro dams, Concept of spillways and energy dissipators.

- River Training Works : Various River Stages, Purpose/functions of River Training works, Meandering of rivers, Methods of river training, guide banks, Marginal Embankment, retired (levees) embankments, groynes and spurs, pitched island, cut-off

SUGGESTED LEARNING RESOURCES:

1. Punmia, B.C., Pande, B, Lal, Irrigation and Water Power Engineering, Laxmi Publications
2. Subramanayan, Engineering Hydrology, McGraw Hill.
3. Mutreja K N, Applied Hydrology, McGraw Hill
4. Sharma, R.K. and Sharma, T.K., Irrigation Engineering, S.Chand
5. Basak, N.N., Irrigation Engineering, McGraw Hill Education
6. Asawa, G.L., Irrigation and water resource Engineering, New Age
7. Dahigaonkar, J.G., Irrigation Engineering, Asian Book Pvt. Ltd., New Delhi.
8. Garg, S K, Irrigation and Hydraulic Structures, Khanna Publishers, Delhi.
9. Priyani V.B., Irrigation Engineering, Charotar Book Stall, Anand.

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

TopicNo.	TimeAllotted (Hrs)	MarksAllotted (%)
1	5	20
2	6	20
3	5	20
4	6	20
5	6	20
Total	28	100

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PRACTICUM / THEORY	4.9 PUBLIC HEALTH ENGINEERING	L	T	P
		1	-	2

COURSE OBJECTIVES:

Following are the objectives of this course:

- To learn the principles for identification of sources of surface and subsurface water
- To learn calculation of population and requirement of drinking water
- To understand the plotting of water supply scheme highlighting different features
- To know evaluation of characteristics and treatment of sewage.

COURSE OUTCOMES:

After competing this course, student will be able to:

- Know the procedure to identify the sources of surface and subsurface water
- Estimate the quantity of drinking water required for a population
- Draw labelled layout for water supply scheme.
- Device suitable water treatment technique.
- Evaluate the characteristics and suggest treatment of sewage.

COURSE CONTENT:

UNIT – I Sources, Demand and Quality of water (3 periods)

Water supply schemes - Objectives, components,

- Sources of water: Surface and Subsurface sources of water, Intake Structures, Definition and types, Factors governing the location of an intake structure, Types of intakes.
- Demand of water: Factors affecting rate of demand, Variations of water demands, Forecasting of population, Methods of forecasting of population, (Simple problems on forecasting of population), Design period, Estimating of quantity of water supply required for city or town.
- Quality of water**:** Need for analysis of water, Characteristics of water- Physical,

Chemical and Biological, Testing of water for Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride, Nitrogen and its compounds, Bacteriological tests, E coli, B coli index, MPN, Sampling of water, Water quality standards as per IS 10500.

UNIT - II Purification of water (3 periods)

- Purification of Water: Objectives of water treatment, Aeration- objects and methods of aeration, Plain sedimentation, Sedimentation with coagulation, principles of coagulation, types of coagulants, Jar Test, process of coagulation, types of sedimentation tanks, Clariflocculator.
- Filtration - mechanism of filtration, classification of filters: slow sand filter, rapid sand filter, pressure filter. Construction and working of slow sand filter and rapid sand filter, operational problems in filtration. Disinfection: Objects, methods of disinfection, Chlorination- Application of chlorine, forms of chlorination, types of chlorination practices, residual chlorine and its importance, Flow diagram of water treatment plants.
- Miscellaneous water Treatments: Introduction to water softening, Dechlorination and Defluoridation techniques.

UNIT III Conveyance and Distribution of water (2 periods)

- Conveyance: Types of Pipes used for conveyance of water, choice of pipe material, Types of joints & Types of valves- their use, location and function on a pipeline and other related appurtenances.
- Distribution of water: Methods of distribution of water- Gravity, pumping, and combined system, Service reservoirs - functions and types, Layouts of distribution of Water-Dead end system, grid iron system, circular system, radial system; their suitability, advantages and disadvantages.
- Laying of pipe, testing of pipe lines, Building water supply (Practical aspect only).

UNIT IV Domestic sewage and Sewerage System (3 periods)

- Introduction: Purpose of sanitation, Necessity of systematic collection and disposal of waste, Definition of terms in sanitary engineering, Collection and conveyance of sewage, Conservancy and water carriage systems, their advantages and Disadvantages (a) Surface drains (only sketches) : various types, suitability (b) Types of sewage: Domestic, industrial, storm water and its seasonal variation.
- Sewerage System : Types of sewerage systems, materials for sewers, their sizes and joints Appurtenance: Location, function and construction features. Manholes, drop manholes, tank hole, catch basin, inverted siphon, flushing tanks grease and oil traps, storm regulators, ventilating shafts.
- Laying and Construction of Sewers : Setting out/alignment of sewers, Excavations, checking the gradient with boning rods preparation of bedding, handling and jointing testing and back filling of sewers/pipes. Construction of surface drains and different sections required.

UNIT V Characteristics and treatment of Sewage (3 periods)

- Sewage Characteristics : Properties of sewage and IS standards for analysis of sewage, Physical, chemical and bacteriological parameters
- Natural Methods of Sewerage Disposal: General composition of sewage and disposal methods, Disposal by dilution, Self purification of stream, Disposal by land treatment, Nuisance due to disposal
- Sewage Treatment : Meaning and principle of primary and secondary treatment and activated sludge process their flow diagrams, Introduction and uses of screens, grit chambers, detritus tanks, skimming tanks, plain sedimentation tanks, primary clarifiers, secondary clarifiers, filters, control beds, intermittent sand filters, trickling filters, sludge treatment and disposal, oxidation ponds (Visit to a sewage treatment plant) Oxidation ditch, duckweed pond, Vermiculture
- Building Drainage : Aims of building drainage and its requirements, Different sanitary fittings and installations, Traps
- Introduction to smart water supply and waste water management : A field visit may be planned to explain and show the relevant things.

SUGGESTED LEARNING RESOURCES

1. Sharma S.C, Environmental Engineering, Khanna Publishing House, New Delhi
2. Garg, S.K., Environmental Engineering Vol. I and Vol. II, Khanna Publishers
3. Birdie, G. S. and Birdie, J. S.Water Supply and Sanitary Engineering, Dhanpat Rai
4. Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House, Delhi
5. Rao, C.S., Environmental Pollution Control Engineering, New Age International
6. Punmia, B C, Environmental Engineering, vol. I and II, Laxmi Publishers
7. Peavy H S, Rowe D R, and Tchobanoglous G, Environmental Engineering, McGraw
8. Basak N N, Environmental Engineering, McGraw Hill Publishers.

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

TopicNo.	Time Allotted (Hrs)	Marks Allotted (%)
1	3	20
2	3	20
3	2	20
4	3	20
5	3	20
Total	14	100

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PUBLIC HEALTH ENGINEERING LAB.

COURSE OBJECTIVES:

Following are the objectives of this course:

- To learn the tests for measuring quality of drinking water.
- To learn determination of BOD and COD requirement in sewage.
- To understand the plotting of water supply scheme highlighting different features.

COURSE OUTCOMES:

After competing this course, student will be able to:

- Perform various tests to assess quality of water.
- Estimate dissolved solids as per BIS codes.
- Measure BOD and COD of sewage sample.
- Draw line diagram of water pipeline system for a locality.

LIST OF PRACTICAL TO BE PERFORMED:

1	Determine pH value of given sample of water.
2	Determine the turbidity of the given sample of water.
3	Determine residual chlorine in a given sample of water.
4	Determine suspended, dissolved solids and total solids of given sample of water.
5	Determine the dissolved oxygen in a sample of water.
6	Determine the optimum dose of coagulant in a given raw water sample by jar test.
7	Determine B.O.D. of given sample of sewage.
8	Determine pH value of given sample of sewage.

9	Determine suspended solids dissolved and total solids for sample of sewage.
10	Determine the dissolved oxygen in the given sample of sewage.
11	Determine C.O.D. of given sample of sewage.
12	Prepare a report of a field visit to sewage treatment plant or water treatment plant

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AUDIT COURSE	4.10 ESSENCE OF INDIAN KNOWLEDGE AND TRADITION	L	T	P
		2	-	-

COURSE OBJECTIVE:

Understand the fundamental aspects of the Indian Knowledge System, its integration with modern science, principles of Yoga and holistic healthcare, and practical applications in contemporary contexts.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to demonstrate knowledge of the following topics:

- Overview, importance, and relevance of the Indian Knowledge System, including Vedas, Upavedas, Vedangas, and Upangas.
- Relevance of science and spirituality, and contributions of ancient Indian science and technology.
- Basic principles of Yoga, benefits of holistic healthcare, and integration with modern healthcare.
- Practical applications and case studies of the Indian Knowledge System's relevance today.

COURSE CONTENTS

Unit 1: Introduction to Indian Knowledge System (07 Periods)

Overview of Indian Knowledge System

- Importance and relevance
- Introduction to the Vedas
- Upavedas
- Vedangas
- Upangas

Unit 2: Modern Science and Indian Knowledge System (07Periods)

- Relevance of Science and Spirituality,
- Science and Technology in Ancient India,

Unit 3: Yoga and Holistic Healthcare (07 Periods)

- Basic principles of Yoga
- Benefits of holistic healthcare practices
- Integration with modern healthcare

Unit 4: Case Studies / Assignment (07 Periods)

- Practical Applications / Case studies demonstrating the relevance of Indian Knowledge System in modern times

SUGGESTED DISTRIBUTION OF MARKS

TopicNo.	TimeAllotted (Hrs)	MarksAllotted (%)
1	07	30
2	07	25
3	07	25
4	07	20
Total	28	100

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	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%

9. 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.

10. RESOURCE REQUIREMENT

10.1 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

10.2 EQUIPMENT REQUIRED FOR CIVIL & ENVIRONMENT ENGINEERING

Sr. No.	Description	Qty	
	CONSTRUCTION MATERIALS TESTING		
	A. CONCRETE LABORATORY		
	Compression testing machine (100 T. Capacity)	1	
	Vibration machine	1	
	Electrically heated oven (Thermostatically controlled)	1	
	Blaine Air permeability Apparatus (for testing fineness of cement)	2	
	Vicat's Apparatus	4	
	Le Chatelier's soundness apparatus (to determine quantity of free lime in cement)	2	
	Slump Cone (to determine the workability of concrete)	2	
	Compactation factor apparatus (to determine the workability of concrete)	1	
	Vee-Bee apparatus (to determine the workability of concrete)	1	
10.	Plateform 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		
	Ring and Ball apparatus (with heating mantle)	1	
	CBR apparatus with loading machine	1	
	Flash point and fire point apparatus (Cleaveland type)	1	
	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 burrette	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/Invartape	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.	Reyonold'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 pressuregauge 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.

10.3 Furniture Requirement

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

10.4 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.

11. 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.

- **STUDENTS' EVALUATION AREAS**

The student evaluation is carried out for the following areas:

- Theory
- Practical Work (Laboratory, Workshop, Field Exercises)
- Project Work
- 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.

12. 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' behavior 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- b a s e d 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.

13 - 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 & Environment Engineering at IRDT Kanpur.

1. Sri Ravi Sachan, HOD Civil, Government Polytechnic Lucknow.
2. Sri Vinod Kumar Dwivedi, Lecturer Civil Engineering Manyavar Kashiram Government Polytechnic, Kannauj
3. Sri Lokendra Narayan Tripathi, HOD Civil Engineering, Government Polytechnic, Kanpur
4. Sri Imran Khan, Lecturer Civil Engineering, Government Polytechnic, Deeh sadar,Unnao
5. Sri Ajeet Srivastava, Lecturer Civil, Government Polytechnic, Deeh Sadar, Unnao
6. Sri Anant Prakash, Lecturer Civil, Government Polytechnic, Bargad Chitrakoot.
7. Smt. Charu Bajpai, Lecturer Civil, Government Polytechnic, Sikandra, Kanpur Dehat
8. Smt. Ruchi Singh, Lecturer Civil, Government Polytechnic, Kanpur
9. Sri Piyush Kumar Malviya, Lecturer Civil, Government Polytechnic, Kanpur