SYLLABUS

FOR

DIPLOMA IN CIVIL ENGINEERING

(DIPLOMA COURSES IN ENGINEERING / TECHNOLOGY)

C23 REGULATION

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE

(AUTONOMOUS), MADURAI – 625 011

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE

(AUTONOMOUS), MADURAI - 625 011

DIPLOMA IN ENGINEERING AND TECHNOLOGY SYLLABUS (II & III YEAR)

C23 - REGULATION

(To be implemented for the students from the year 2023-2024 onwards)

Syllabus Committee

Chairperson

Tmt.V. Thenmozhi, M.E.,
Principal,
Tamilnadu Government Polytechnic College (Autonomous),
Madurai - 625 011.

Co-ordinator & Convener

Thiru.C. Arivazhagan, M.E.,

HoD/Civil,
Tamilnadu Government Polytechnic College (Autonomous),
Madurai - 625 011.

DIPLOMA IN CIVIL ENGINEERING (1010 & 3010)	
EXTERNAL MEMBERS	
Thiru M. Shanmugaraj, M.E., Lecturer (S.G-I)/Civil, VSVN Polytechnic College (Autonomous), Virudhunagar - 626 001.	**Thiru B. Venkatesh, M.E.,** Assistant Professor/Civil Alagappa Chettiar Government College of Engineering and Technology (Autonomous), Karaikudi - 630 003.
Thiru S. Vadivel Raja, M.E., Founder and Director of Keezhadi Structural Engineering Consultancy, Thirumalai Nagar, Thirupparankundram, Madurai - 625 005.	**Thiru M.S.M. Hussain, DCE, AMIE.,** Senior Section Engineer (Works), Southern Railway, Madurai - 625 016.
INTERNAL MEMBERS	
Thiru M. Shivasamy, M.Tech.,	Lecturer/Civil
Thiru R. Saravanakumar, M.E.,	Lecturer/Civil
Thiru S. Arunkumar, M.E.,	Lecturer/Civil
Thiru R. Sivasankar, M.E.,	Lecturer/Civil
Thiru M. Arjun, M.E.,	Lecturer/Civil

C23 REGULATION

Program Structure

Diploma in Civil Engineering

Program Outcomes (PO's)

POs are statements that describe what students are expected to know and be able to do upon graduating from the program. These relate to the skills, knowledge, analytical ability, attitude, and behavior that students acquire through the program.

The POs essentially indicate what the students can do from subject-wise knowledge acquired by them during the program. As such, POs define the professional profile of an engineering diploma graduate.

NBA has defined the following seven POs for an Engineering diploma graduate:

PO1: Basic and Discipline-specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and an engineering specialization to solve the engineering problems.

PO2: Problem analysis: Identify and analyse well-defined engineering problems using codified standard methods.

PO3: Design/ development of solutions: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

PO4: Engineering Tools, Experimentation, and Testing: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.

PO5: Engineering practices for society, sustainability and environment: Apply appropriate technology in the context of society, sustainability, environment and ethical practices.

PO6: Project Management: Use engineering management principles individually, as a team member or as a leader to manage projects and effectively communicate about well-defined engineering activities.

PO7: Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes.

Diploma in Civil Engineering

Credit Distribution

Semester	No of Courses	Periods	Credits
Semester I	8	640	20
Semester II	8	640	20
Semester III	8	640	21
Semester IV	7	640	20
Semester V	8	635*	21
Semester VI	3	660	18
Total			120

***Industrial Training during Summer vacation for Two Weeks has to be completed to earn the required two credits.**

Semester III

S.No.	Course Category	Course Type	Code	Course Title	L-T-P	Periods	Credit	End Exam
1	Program Core	Theory	10310	Mechanics of Materials	3-0-0	45	3	Theory
2	Program Core	Theory	10320	Construction Materials	3-0-0	45	3	Theory
3	Program Core	Practicum	10330	Surveying Practice	1-0-4	75	3	Practical
4	Program Core	Practicum	10340	Building Planning and Drawing	1-0-4	75	3	Practical
5	Program Core	Practicum	10350	Hydraulics	1-0-4	75	3	Practical
6	Program Core	Practicum	10360	Material Testing Lab	1-0-4	75	3	Practical
7	Open Elective	Advanced Skill Certification	10370	Advanced Skills Certification - 3	2-0-2	60	2	NA
8	Humanities & Social Science	Integrated Learning Experience	10380	Growth Lab	-	30	0	NA
9	Audit Course	Integrated Learning Experience	10390	Induction Program – II	-	16	0	-
10	Audit Course	Integrated Learning Experience	103A0	I&E/ Club Activity/ Community Initiatives	-	16	0	-
11	Audit Course	Integrated Learning Experience	103B0	Shop floor Immersion	-	6	0	
12	Audit Course	Integrated Learning Experience	103C0	Student-Led Initiative	-	24	0	-
13	Audit Course	Integrated Learning Experience	103D0	Emerging Technology Seminars	-	8	0	-
14	Audit Course	Integrated Learning Experience	103E0	Health & Wellness	0-0-2	30	1	-
				Total		580	21	

Note: Test & Revisions - 45 Periods | Library Hours - 15 Periods

Semester IV

S.No.	Course	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Theory	10410	Mechanics of Structures	3-0-0	45	3	Theory
2	Program Core	Theory	10420	Transportation Engineering	3-0-0	45	3	Theory
3	Program Core	Practicum	10430	Soil Mechanics and Foundation Engineering	2-0-2	60	3	Theory
4	Program Core	Practicum	10440	Concrete Technology	1-0-4	75	3	Practical
5	Engineering	Practicum	10450	Construction Practices	1-0-4	75	3	Practical
6	Program Core	Practicum	10460	Estimation and Costing	1-0-4	75	3	Practical
7	Open Elective	Advanced Skill Certification	10470	Advanced Skill Certification - 4	2-0-2	60	2	NA
8	Audit Course	Integrated Learning Experience	10480	I&E /Club Activity/Community	-	40	0	-
9	Audit Course	Integrated Learning Experience	10490	Shop Floor Immersion	-	8	0	
10	Audit Course	Integrated Learning Experience	104A0	Student Led Initiative	-	25	0	-
11	Audit Course	Integrated Learning Experience	104B0	Emerging technology seminars	-	12	0	-
12	Audit Course	Integrated Learning Experience	104C0	Health & Wellness	-	30	0	-
13	Audit Course	Integrated Learning Experience	104D0	Special Interest groups *(Placement training)*	-	30	0	-
			Total			580	20	

Note: Test & Revisions - 45 Periods | Library Hours - 15 Periods

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V

Semester V

S.No.	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Theory	10510	Design of RCC Structures (Limit State Method)	4-0-0	60	4	Theory
2	Program Elective	Theory		Elective-1	3-0-0	45	3	Theory
3	Program Core	Lab	10530	Computer Applications in Civil Engineering.	0-0-4	60	2	Practical
4	Program Core	Practicum	10540	Construction Management and Safety Practice	1-0-4	75	3	Practical
5	Program Core	Practicum	10550	Environmental Engineering	1-0-4	75	3	Practical
6	Program Core	Practicum	10560	Innovation and Startup	1-0-2	45	2	Project
7	Project/Internship	Internship	10570	Industrial Training* [Summer Vacation - 90 Hours]	-	-	2	Project
8	Open Elective	Advanced Skill Certification	10580	Advanced Skills Certification - 5	2-0-2	60	2	NA
9	Audit Course	Integrated Learning Experience	10590	Induction program III	-	40	0	-
10	Audit Course	Integrated Learning Experience	105A0	Student-Led Initiative	-	45	0	-
11	Audit Course	Integrated Learning Experience	105B0	Health & Wellness	-	30	0	-
12	Audit Course	Integrated Learning Experience	105C0	Special Interest Groups (Placement Training)	-	40	0	-
				Total		575	21	

Note: Test & Revisions - 45 Periods | Library Hours - 15 Periods / * Internship shall be offered in the summer break between 4th and 5th semester followed by a review and award of credits in the 5th semester.

Elective 1

S.No.	Course Category	Course Type	Code	Course Title
1	Program Elective	Theory	10521	Mechanical, Electrical, and Plumbing Services
2	Program Elective	Theory	10522	Irrigation and water resource engineering
3	Program Elective	Theory	10523	Defects in Building and Remedies
4	Program Elective	Theory	10524	Urban Planning and Development
5	Program Elective	Theory	10525	Building Bye Laws and Statutory drawings

Semester VI

S.No.	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Semester
1	Open Elective	Theory		Elective-2 (Pathway)	3-0-0	45	3	Theory
2	Open Elective	Practicum		Elective-3 (Specialisation)	1-0-4	75	3	Practical
3	Project/Internship	Project/Internship		In-house Project/Internship/Fellowship	-	540	12	Project
				Total		660	18	

Note:

*****Every student should select any one from the In-house Project or Internship or Fellowship. The guidelines given have to be followed.***

Elective 2 (Pathway)

S.No.	Course Category	Course Type	Code	Course Title
1	Elective | Higher Education	Theory	10611	Advanced Engineering Mathematics
2	Elective | Entrepreneurship	Theory	10612	Entrepreneurship
3	Elective | Technocrats	Theory	10613	Project Management
4	Elective | Technocrats	Theory	10614	Finance Fundamentals
5	Elective | Technologists	Theory	10615	Advanced Environmental Engineering
6	Elective | Technologists	Theory	10616	Advanced Concrete Technology
7	Elective | Technologists	Theory	10617	Advanced Transportation Engineering
8	Elective | Technologists	Theory	10618	Advanced Surveying

Elective 3 (Specialisation)

S.No.	Course Category	Course Type	Code	Course Title
1	Elective	Practicum	10621	Artificial Intelligence and Machine Language in Construction Management
2	Elective	Practicum	10622	Structural Detailing for RCC elements
3	Elective	Practicum	10623	Design and Drawing of Steel Elements

Project/Internship

S.No.	Course Category	Course Type	Code	Course Title
1	Project/Internship	Project/Internship	10631	Internship
2	Project/Internship	Project/Internship	10632	Fellowship
3	Project/Internship	Project/Internship	10633	In-house Project

C23 REGULATION

Program Structure

Diploma in Civil Engineering (Part Time)

Program Outcomes (PO's)

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PO2: Problem analysis: Identify and analyse well-defined engineering problems using codified standard methods.

PO3: Design/ development of solutions: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

PO4: Engineering Tools, Experimentation, and Testing: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.

PO5: Engineering practices for society, sustainability and environment: Apply appropriate technology in the context of society, sustainability, environment and ethical practices.

PO6: Project Management: Use engineering management principles individually, as a team member or as a leader to manage projects and effectively communicate about well-defined engineering activities.

PO7: Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes.

Diploma in Civil Engineering (Part Time)

Credit Distribution

Semester	No of Courses	Periods	Credits
Semester I	6	308	15
Semester II	6	300	15
Semester III	7	345	16
Semester IV	5	330	14
Semester V	6	345	15
Semester VI	5	315	13
Semester VII	6	300	17
Semester VIII	2	615	15
Total			120

Semester III

S.No.	Course Category	Course Type	Code	Course Title	L-T-P	Periods	Credit	End Exam
1	Program Core	Theory	10310	Mechanics of Materials	3-0-0	45	3	Theory
2	Program Core	Theory	10320	Construction Materials	3-0-0	45	3	Theory
3	Engineering Science	Lab	20070	Drafting Practices – 1	0-0-4	60	2	Practical
4	Basic Science	Practicum	20041	Applied Physics – 1	1-0-2	45	2	Practical
5	Basic Science	Practicum	20051	Applied Chemistry – 1	1-0-2	45	2	Practical
6	Basic Science	Practicum	20060	Basic Engineering Practices	1-0-2	45	2	Practical
7	Open Elective	Advanced Skill Certification	20090	Advanced Skills Certification - II	2-0-2	60	2	NA
				Total		345	16	

Semester IV

S.No.	Course	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Theory	10410	Mechanics of Structures	3-0-0	45	3	Theory
2	Program Core	Practicum	10330	Surveying Practice	1-0-4	75	3	Practical
3	Program Core	Practicum	10340	Building Planning and Drawing	1-0-4	75	3	Practical
4	Program Core	Practicum	10350	Hydraulics	1-0-4	75	3	Practical
5	Open Elective	Advanced Skill Certification	10370	Advanced Skill Certification - 3	2-0-2	60	2	NA
			Total			330	14	

Semester V

S.No.	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Theory	10420	Transportation Engineering	3-0-0	45	3	Theory
2	Program Core	Practicum	10360	Material Testing Lab	1-0-4	75	3	Practical
3	Program Core	Practicum	10430	Soil Mechanics and Foundation Engineering	2-0-2	60	3	Theory
4	Engineering Science	Practicum	10450	Construction Practices	1-0-4	75	3	Practical
5	Open Elective	Advanced Skill Certification	10470	Advanced Skills Certification - 4	2-0-2	60	2	NA
6	Audit Course	Integrated Learning Experience	103E0	Health & Wellness	0-0-2	30	1	-
				Total		345	15	

***Note: Health & Wellness Activities can be carried out day time**

Semester VI

S.No.	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Theory		Elective – 1	3-0-0	45	3	Theory
2	Program Core	Practicum	10440	Concrete Technology	1-0-4	75	3	Practical
3	Program Core	Lab	10530	Computer Applications in Civil Engineering	0-0-4	60	2	Practical
4	Program Core	Practicum	10460	Estimation and Costing	1-0-4	75	3	Practical
5	Open Elective	Advanced Skill Certification	10580	Advanced Skills Certification – 5	2-0-2	60	2	NA
				Total		315	13	

Semester VII

S.No.	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Exam
1	Program Core	Theory	10510	Design of RCC Structures (Limit State Method)	4-0-0	60	4	Theory
2	Open Elective	Theory		Electives – 2 (Pathway)	3-0-0	45	3	Theory
3	Program Core	Practicum	10540	Construction Management and Safety Practice	1-0-4	75	3	Practical
4	Program Core	Practicum	10550	Environmental Engineering	1-0-4	75	3	Practical
5	Humanities & Social Science	Practicum	10560	Innovation and Startup	1-0-2	45	2	Project
6	Project/Internship	Internship	10570	Industrial Training* [Summer Vacation – 90 Hours]	-	-	2	Project
				Total		300	17	

**Note: Innovation & Startup activities can be assigned during day time. Industrial Training report can be prepared based on their Industrial Activities*

Elective 1

S.No.	Course Category	Course Type	Code	Course Title
1	Program Elective	Theory	10521	Mechanical, Electrical, and Plumbing Services
2	Program Elective	Theory	10522	Irrigation and water resource engineering
3	Program Elective	Theory	10523	Defects in Building and Remedies
4	Program Elective	Theory	10524	Urban Planning and Development
5	Program Elective	Theory	10525	Building Bye Laws and Statutory drawings

Elective 2 (Pathway)

S.No.	Course Category	Course Type	Code	Course Title
1	Elective | Higher Education	Theory	10611	Advanced Engineering Mathematics
2	Elective | Entrepreneurship	Theory	10612	Entrepreneurship
3	Elective | Technocrats	Theory	10613	Project Management
4	Elective | Technocrats	Theory	10614	Finance Fundamentals
5	Elective | Technologists	Theory	10615	Advanced Environmental Engineering
6	Elective | Technologists	Theory	10616	Advanced Concrete Technology
7	Elective | Technologists	Theory	10617	Advanced Transportation Engineering
8	Elective | Technologists	Theory	10618	Advanced Surveying

Semester VIII

S.No.	Course Category	Course Type	Code	Course Title	L-T-P	Period	Credit	End Semester
1	Open Elective	Practicum		Elective-3 (Specialisation)	1-0-4	75	3	Practical
2	Project/Internship	Project/Internship		In-house Project/Internship/Fellowship	-	540*	12	Project
				Total		615	15	

Note: Project can be carried out in industry/Day Time

Project/Internship

S.No.	Course Category	Course Type	Code	Course Title
1	Project/Internship	Project/Internship	10631	Internship
2	Project/Internship	Project/Internship	10632	Fellowship
3	Project/Internship	Project/Internship	10633	In-house Project

Elective 3 (Specialisation)

S.No.	Course Category	Course Type	Code	Course Title
1	Elective	Practicum	10621	Artificial Intelligence and Machine Language in Construction Management
2	Elective	Practicum	10622	Structural Detailing for RCC elements
3	Elective	Practicum	10623	Design and Drawing of Steel Elements

III SEMESTER

10310	Mechanics of Materials	L	T	P	C
Theory		3	0	0	3

Introduction:

This is a fundamental subject which covers broad elements of engineering mechanics and strength of materials. Strength of materials, also known as mechanics of materials, is a branch of engineering that deals with the behavior of solid objects when acted upon by external forces. Because it deals with how objects deform under various types of loading, strength of materials is an essential topic for civil engineers. Study of this subject enables the student to distinguish between different types of stress and strain induced in a material, under the action of external forces. The student will be able learn to analyze simple structural elements for their design which they usually do in the professional life. Teachers while imparting instruction should stress on concepts and principles and to provide considerable practice in problem solving.

OBJECTIVES

- To understand the Stress, strain and elastic constants.
- To understand the nature of stresses induced in material under different types of loads.
- To plot the variation of shear force and bending moments over the beams under different types of loads.
- To study about geometrical properties of section and able to locate centroid and find out moment of Inertia.
- To understand the stresses in beams due to bending.
- To Analyze Pin jointed frames.

Course Outcomes:

After successful completion of this course the students should be able to	
CO1	Know about stresses and strain and its application in Engineering field.
CO2	Analyze the determinate beams and draw the SFD and BMD.
CO3	Understand about geometrical properties of sections.
CO4	Understand the stresses in beams.
CO5	Analyze pin jointed frames.

Pre-Requisites: Nil

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	-	2	-	3
CO2	3	3	2	-	2	-	3
CO3	3	3	2	-	2	-	3
CO4	3	3	2	-	2	-	3
CO5	3	3	2	-	2	-	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

This subject is introduced so that diploma holder in Civil Engineering may study the concepts and principles of mechanics of materials of various elements of building and are able to apply the knowledge gained through the subject for the design of simple and small components. Teacher should give simple exercises involving the applications of various concepts and principles being taught in the subject. Efforts should be made to prepare tutorial sheets on various topics and students should be encouraged/guided to solve the tutorial problems independently. Teacher may conduct weekly small quiz sessions to know the students' level of understanding and if need be, teacher may reinforce the concepts and principles related to mechanics of materials of elements/members of building components.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of two will be considered for the internal assessment of 15 Marks.

CA1 and CA2, Assessment test should be conducted for two units as below.

PART A (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write Five questions. Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 20 marks for the internal assessment.

Question Pattern:

Answer Ten questions by selecting two questions from each unit. Each question carries 10 marks each.

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

10310	Mechanics of Materials	L	T	P	C
Theory		3	0	0	3

Unit I	**SIMPLE STRESSES AND STRAINS**	
	1. INTRODUCTION TO STRESSES AND STRAINS Definitions of Force, Moment of force - Types of forces on structural members-Mechanical properties of materials –Rigidity, Elasticity, Plasticity, Compressibility, Hardness, Toughness, Stiffness, Brittleness, Ductility, Malleability, Creep, Fatigue, Tenacity, Durability- Definitions of stress and strain-Types of stresses, Tensile, Compressive and Shear stresses- Types of strains-Tensile, Compressive and Shear strains-Elongation and Contraction-Longitudinal and Lateral strains–Poisson's Ratio-Volumetric Strain-Simple problems in computation of stress, strain, Poisson's ratio. Hooke's law-Elastic Constants Definitions of: Young's Modulus of Elasticity–Shear modulus(or)Modulus of Rigidity-Bulk Modulus –Relationship between elastic constants (Derivations not necessary)-Simple problems.	9
Unit II	**SHEAR FORCE AND BENDING MOMENT IN BEAMS**	
	2.1 TYPES OF BEAMS AND LOADS Definition of a beam–Support conditions and diagrammatic representation – Types of supports-Types of beams based on support conditions–Diagrammatic representation of beams–Static equilibrium equations–Determinate and indeterminate beams- Load-Axial Loads-Transverse Loads-Types of loads (Concentrated, uniformly distributed and uniformly varying loads)- Diagrammatic representation of beams subjected to different types of loads. **2.2 SHEAR FORCE AND BENDING MOMENT** Definition of Shear force and Bending Moment–Conventional signs used for S.F. and B.M - SFD &BMD – variation of S.F and B.M of Cantilever beam subjected to point load at free end /UDL over entire span & simply supported beams subjected to central point load/ UDL over entire span and draw SFD&BMD. Numerical problems on variation of SF& BM for cantilever beams subjected to Point load (Maximum Three concentrated loads)/UDL over entire span / Combination of Point load (Maximum Three-point	9

	loads) with UDL over entire span /UDL over the half the length from fixed end only. For simply supported beams subjected to Central point load/Single eccentric point load / Two equal point loads at one-third points /UDL **over** entire span/Combination of central point load and UDL throughout the beam only.	
Unit III	**GEOMETRICAL PROPERTIES OF SECTIONS**	
	3.1 CENTROID Geometrical properties–Definitions and examples of Symmetrical and unsymmetrical section - Definitions of center of gravity and centroid – Centroid of Symmetrical shapes (square, rectangular, circular,) Numerical problems on determination of centroids of T Section and I Sections only. **3.2 MOMENT OF INERTIA** Definitions of: Inertia, Moment of Inertia, Polar moment of inertia, Radius of gyration, Section Modulus, Polar modulus-Parallel and perpendicular axes theorems (statement only) - Numerical problems on M.I about centroidal axis, Section modulus, Radius of gyration of square(solid/hollow), rectangular(solid/hollow) and circular sections(solid/hollow) (Derivation not required)–Numerical problems on M.I about centroidal axis of T Section and I Sections only.	9
Unit IV	**STRESSES IN BEAMS**	
	STRESSES IN BEAMS DUE TO BENDING Types of Bending stresses–Neutral axis–Theory of simple bending–Assumptions–Moment of resistance – Flexure/bending equation M / I = E / R = σ/y (Derivation not required)– Bending stress distribution –Curvature of beam–Position of N.A and centroidal axis–Stiffness equation–Flexural rigidity–Strength equation–Significance of Section modulus–Numerical Problem on simply supported beam with symmetrical loads only.	9
Unit V	**PIN JOINTED FRAMES**	
	ANALYSIS BY ANALYTICAL METHOD (METHOD OF JOINTS) Definitions of: Frame / Truss, Pin Joint, Nodes, Rafters, Ties, Struts, Slings-Determinate and indeterminate frames–Classification of frames-Perfect and imperfect frames–Deficient/unstable and redundant frames-Resolutions of force-Designation of forces-Nature of force in the frame-Identification of member with zero force in a determinate truss- Methods of	9

	analysis-Analytical methods-Method of Joints and Method of Sections (Description only) - Problems on Analysis of cantilever truss (with not more than eight members) with vertical nodal loads by method of joints only) and simply supported perfect frames(with not more than ten members) with vertical nodal loads (Symmetrical frame only) by method of joints only.	

Suggested student activities

1. Quiz.
2. Group discussion.
3. Seminar.
4. Surprise tests.
5. Laboratory tests on materials.
6. Class assignments.

Reference Books:

1. Dr B.C.Punmia,Textbook of Strength of materials, 9th edition, Lakshmi publications, 2018.
2. Er.R.K.Rajput, Textbook of Strength of materials, 6th edition, S. Chand publications, 2015.
3. Dr R.S.Khurmi & N.Khurmi,Textbook of Strength of materials,26th edition, S. Chand publications , 2018.
4. Ferdinand P. Beer, E. Russell Johnston, John T. Dewolf, David Mazurek, Statics and Mechanics of Materials, McGraw-Hill Education, 2010.

Web resources

1. https://nptel.ac.in/
2. https://ndl.iitkgp.ac.in
3. Stress and strain https://www.youtube.com/watch?v=KGCyT2oVa_A&list=PLd4YqEvwJs8YZ79RCYe3Cg6bljJv-nGB-
4. An introduction to stress and starin https://www.youtube.com/watch?v=aQf6Q8t1FQE
5. Stress strain curve https://www.youtube.com/watch?v=7OXQNv73qr4

6. SFD and BMD
   https://www.youtube.com/watch?v=UahfUvcS24o&list=PL4K9r9dYCOopLQIqfKO5haEkR1FKKVJdU
7. Understanding Shear Force and Bending Moment Diagrams
   https://www.youtube.com/watch?v=C-FEVzI8oe8
8. SFD and BMD of simply supported beam
   https://www.youtube.com/watch?v=J7nyhgiJFmQ
9. SFD and BMD of cantilever beam
   https://www.youtube.com/watch?v=zYJuYQwIcJs
10. How to find Centroid of an I– Section
    https://www.youtube.com/watch?v=v6VTMwxx4oA
11. M.I of T section
    https://www.youtube.com/watch?v=dbiPJ5qJ_EI
12. Understanding stresses in beams
    https://www.youtube.com/watch?v=f08Y39UiC-o
13. Understanding and Analysing Trusses
    https://www.youtube.com/watch?v=Hn_iozUo9m4
14. Method of joints
    https://www.youtube.com/watch?v=_rK02neOF18

10320	Construction Materials	L	T	P	C
Theory		3	0	0	3

Introduction:

In Civil Engineering construction field**,** building materials can generally be divided into two categories viz., natural and man-made construction materials. This Course is designed to understand various properties, Manufacturing process, characteristics and material suitability for different construction activities. Civil Engineers must know the quality, material standards and properties of materials used in any construction. Hence this course is designed as to provide in depth conceptual understanding about the various construction materials.

Course Objectives:

The objective of this course is to enable the student to

- Understand about Physical, Mechanical, Chemical and Thermal properties of construction materials.
- Understand about new and advanced construction materials available around the globe.
- Compare the suitability of materials for different construction purpose.
- Understand the importance of durability any construction materials.
- Understand about the raw materials and manufacturing process of various construction materials

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Select suitable materials for construction activities and can have required technical knowledge on the same.

CO2: Analyse the quality concern in the field of civil Engineering construction by adopting Suitable standards on materials.

CO3: Handle the construction project as supervisor/site Engineer/project engineer by having Overall technical knowledge on materials

CO4: Prepare detailed specifications about materials used in construction activities.

CO5: Do research and able to develop new, sustainable/improved material for the future Construction industry.

Pre-requisites:

Knowledge of basic Science and basic knowledge on materials.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	1	1	1	1	2
CO2	3	1	1	1	1	1	2
CO3	3	2	2	2	2	2	2
CO4	3	1	1	1	1	1	1
CO5	2	2	2	2	2	2	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- Since this course covers vast area, Teachers are expected to impart technical knowledge to the students about construction materials by screening the pictures /videos of various materials used in construction.
- Students shall be asked to visit various stores/dealers selling standard construction materials. (For better understanding about available market forms and cost of materials).
- Emphasis shall be given to understand durability and sustainability of materials used in construction
- Apart from syllabus content, Students shall be encouraged to learn about modern construction materials through online sources.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of two will be considered for the internal assessment of 15 Marks.

CA1 and CA2, Assessment test should be conducted for two units as below.

PART A (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write Five questions. Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 20 marks for the internal assessment.

Question Pattern:

Answer Ten questions by selecting two questions from each unit. Each question carries 10 marks each.

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

10320	Construction Materials	L	T	P	C
Theory		3	0	0	3

Unit I	Construction Materials and Properties	
	1.1 **Introduction** History of building materials-Conventional building materials-New and advanced materials -Eco friendly and green construction materials (Definition and any five materials)- Energy efficient and sustainable building materials (Definition and any five materials). **1.2 Properties of construction Materials** Density-Specific gravity - Porosity-Water absorption – Permeability - Chemical resistance-weathering resistance-Fire resistance-Thermal conductivity-Thermal expansion-sustainability to freezing and thawing - Durability-Factors affecting durability of building materials. **1.3. Aggregates** Classification of aggregates -Natural aggregates -Artificial aggregates - Light weight aggregates-Heavy weight aggregates-Recycling of aggregates. **1.4. Water** Requirements of water used in construction works-Effects of presence of Sulphates and chlorides in water-Permissible limits of deleterious materials as per Indian standard, IS456:2000.	9

Unit II	Bricks, Masonry blocks, Ceramic products, and Glass	
	2.1 Clay bricks Brick-Brick earth-Composition of good brick earth-Classification and grades of bricks as per BIS-Compressive Strength-Characteristics of good brick-Special types of brick and uses. **2.2. Masonry blocks** Masonry blocks-Constituents, Properties, Characteristics and uses of- Fly ash bricks- Solid blocks- Hollow blocks-AAC blocks. **2.3 Ceramic Products** Ceramic products- Properties, Characteristics and uses of Earthenware-Stoneware-Porcelain-Terracotta-Ceramic Tiles-Glazed Tiles-Thermal care tiles-Roof tiles. **2.4 Glass** Definition-Constituents of glass-Classification of glass-Size and thickness.	9

Unit III	Cementitious materials	
3.1 Cement Cement - Composition of Ordinary Portland cement-Portland Pozzolanic cement - Grades of cement-Water cement ratio-Hydration of cement- Setting of cement-Formation of Bogue's compounds. **3.2 Supplementary cementitious materials** Pozzolanic materials-Fly ash-Types-Ground Granulated blast furnace slag- Silica fume- Natural Pozzolanas. **3.3 Lime** Sources of lime-Classification of lime-Uses of lime-Slaking of lime-Lime Mortar -Lime putty-Uses. **3.4. Bituminous materials** Introduction-Bitumen-Tar-Asphalt-applications.		9
Unit IV	**Timber, mortar, Concrete, Protective materials and Coatings**	
4.1 Timber and wooden products Classification of Timber-Seasoning of Timber-Methods of seasoning- Defects in Timber-Preservation of Timber-Wood Products. **4.2 Mortar** Introduction-Classification-Characteristics of good mortar- mix ratios for different works-Grouting-Guniting. **4.3 Concrete** Concrete-Production- Mix Ratios-Mixing-Workability-Ready mix concrete— Strength of concrete - Non-destructive test on Concrete-Durability-factors affecting durability of concrete. **4.4 Protective & Insulating materials** Damp proof–Water proof-Termite proof –Pest control in buildings-Heat insulating materials-Sound insulating materials. **4.5 Paints and Varnishes** Introduction-Characteristics of ideal paint-Types of paints-Distemper- Varnishes.		9

Unit V	Metallic, Plastic and Composite materials	
5.1 Metals and composites Metals used in construction-Steel-Galvanised iron-Stainless steel -Pipes-Structural steel-Market forms of steel sections-cold formed Light gauge sections- Aluminium and Composites. **5.2 Plastics in construction** Plastics –Characteristics – plastic products-PVC pipes-UPVC Pipes, Doors and windows, Water tanks-CPVC-PVC materials used in water supply, sanitary and electricity plumbing- Standards as per BIS. **5.3 Roofing materials** Types of roofing materials- RCC-AC Sheets-G.I Sheets-Galvalume sheets-Insulated roofing sheets-False ceiling-Materials used for false ceiling. **5.4 Elevation and façade materials** Importance of facade design in architecture-Types of materials used--Insulated glass, Aluminium composite panels, Fibre cement, Wood Plastic composites, cladding- types		9
TOTAL PERIODS		**45**

Suggested List of Students Activity:

- For better understanding about various construction materials, Student shall actively visit Standard stores, and different ongoing construction sites.
- Web based learning is encouraged.

Reference Books:

1. S.C. Rangwala, “Engineering Materials”, 43rd Edition, Charotar Publishing House Pvt. Ltd, 2019.
2. P.C. Varghese, “Building Materials”, 2nd Edition, Prentice Hall of India Pvt Ltd, 2015.
3. S.K. Duggal, “Building Materials”, 3rd Edition, New Age International (P) Ltd, 2012

Web-based/Online Resources:

1. Evolution of construction and building materials: https://www.buildersmart.in/blogs/evolution-of-construction-and-building-materials
2. Green building materials: https://www.coa.gov.in/show_img.php?fid=137
3. Energy efficient building materials:https://archiroots.com/10-best-energy-efficient-building-materials/
4. National building code of india 2016 (NBC 2016) :https://www.bis.gov.in/standards/technical-department/national-building-code/

10330	Surveying Practice	L	T	P	C
Practicum		1	0	4	3

Introduction:

At the diploma level of Civil Engineering studies, students are expected to develop skills in managing sites, taking measurements, surveying and inspection. One of the main focuses of survey work is the development of townships, residential colonies, public buildings, and other structures. Hence, it is necessary to have a thorough knowledge of surveying principles and techniques such as chain surveying, compass surveying, levelling, Theodolite surveying, Tachometric surveying, and modern surveying. Teachers are expected to explain various concepts and principles by demonstrating the use of different equipment and conducting practical exercises in all types of surveying to benefit the students.

Course Objectives:

The objective of this course is to enable the student to

- Gain a foundational understanding of surveying by familiarizing with key concepts and surveying instruments.
- Study the principles of chain, compass, levelling, and contour surveying, and learn about the various types of levels and levelling methods.
- Expand knowledge to include Theodolite, Tachometry surveying, Trigonometrical levelling, and GPS.
- Discover the principles and applications of Total Station in civil engineering.

Course Outcomes:

After successful completion of this course, the students should be able to	
CO1	Explain the principle of chain surveying and perform the operations involved in chaining and describe the operations involved in compass surveying like taking bearings and calculation of included angles and traversing.
CO2	Explain the fundamental principles of levelling, tabulate the levelling field data, explain the computation of reduced levels, different types of levelling, and contour surveying.
CO3	Apply the knowledge of principles and purpose of theodolite surveying and trigonometrical levelling.
CO4	Apply the knowledge of principles and purpose of tacheometric surveying and areas and volumes.
CO5	Understand the principles and purpose of Total Station and GPS.

Pre-Requisites: Nil

CO-POs & PSOs Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	2	2	2	-	3
CO2	3	-	2	2	2	-	3
CO3	3	-	2	2	2	-	3
CO4	3	-	2	2	2	-	3
CO5	3	-	2	2	2	-	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- Teachers have the responsibility to provide theoretical knowledge on surveying equipment and its standard procedures. This will help students to understand the importance of each surveying equipment. Additionally, teachers should encourage students to practice using all surveying equipment.
- To ensure that learning is outcome and employability-based, a theory-demonstrate-practice-activity strategy can be implemented throughout the course. This approach will help students to better assimilate the knowledge they have acquired.
- Furthermore, teachers should encourage active participation from students in both theoretical and practical classes. This will help to increase their confidence in their learning abilities.

Assessment Methodology:

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	Cycle 1 Exercises & Two units	Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Internal Marks	40			
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal Assessment of 30 Marks.
- **The details of the documents to be prepared as per the instruction below.**
  Practical documents should be maintained for every exercise/experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	2
B	Tabulation/Observation	10
C	Graph/Sketch/Calculation	15
D	Result	3
E	Written Test	20
TOTAL		50
F	Practical Documents (As per the portions)	10
		60

- Written Test for theory portions should be conducted for 20 Marks as per the question pattern below.

Question pattern – Written Test Theory

Description		Marks	
Part – A	10 MCQ Questions	10 X 1 Mark	10 Marks
Part – B	One 10 Marks Question out of 3 Questions	1 X 10 Marks	10 Marks
TOTAL			20 Marks

- **CA 3:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	10
B	Tabulation/Observation	20
C	Graph/Sketch /Calculation	20
D	Result	10
E	Written Test	30
F	Viva Voce	10
	TOTAL	100

Note: For the written test 30 MCQ or 15 x 2 marks or 10 x 3 Marks or 6 x 5 marks or 3 x 10 Marks questions or combination of any types given above shall be asked from the theory portions.

10330	Surveying Practice	L	T	P	C
Practicum		1	0	4	3

Unit I	CHAIN & COMPASS SURVEYING	
	1.1 Introduction Definition of surveying - object of surveying - Division of surveying - Surveying Units and its conversion. **1.2 Chain surveying**: Ranging – Types - Direct and Indirect ranging - Survey stations- types - Baseline - Check line - Tie line - Chain triangulation - Offsets - Types. **1.3 Compass Surveying** Compass- Types – Purpose – Whole Circle Bearing and Reduced Bearing- Fore and Back bearing - Magnetic dip and Declination – Meridian - Types - Bearing – Types - Open and closed traverse. **Exercises:** 1) Study of FMB sketch/Land documents and instruments used for chain surveying. (Not for examination) 2) Determine the distance between two ground stations with the help of a chain. (Direct ranging) 3) Calculate the area bounded by the given points by chain triangulation. 4) Find the included angle of the given closed traverse by using a compass (Minimum 5 stations).	3 3 3 3 3
Unit II	LEVELLING & CONTOURING	
	2.1 Levelling Levelling - Temporary adjustment – Terms used in Levelling - Back Sight - Fore sight - Intermediate sight - Changepoint -Benchmark – Types - field book – Methods of Reduction of levels - Height of collimation - Rise and Fall method. **2.2 Contour Surveying:** Definition - Contour - Contouring - Contour interval – horizontal equivalent- Characteristics of Contours - Contour Gradient – interpolation of contours - Uses of Contour plan and Map	3

	Exercises: 5) Determine the elevations of given points (Minimum 6 points) by conducting fly levelling with Height of collimation method. 6) Determine the elevations of given points (Minimum 6 points) by conducting fly levelling with Rise and fall method. 7) Conduct a block contouring survey in the given irregular field and plot the contour lines. (Not for examination)	3 3 6
Unit III	THEODOLITE SURVEYING &TRIGONOMETRICAL LEVELLING	
	3.1 Theodolite surveying Theodolite – Types - Transit and non-Transit - Vernier and Micrometer - Technical terms used - Temporary adjustments - Fundamental lines - Interrelationships –Horizontal angle determination by repetition method and reiteration method - Latitude and Departure - Consecutive coordinates - Independent coordinates. **3.2 Trigonometrical Levelling** Definition - Uses - Finding elevation of objects - Base accessible - Base inaccessible - Single plane method (No derivation) - Double plane method. (No derivation) **Exercises:** 8) Determination of distance between two points when their bases are accessible, using Theodolite – Measuring Horizontal angles by repetition method and distances from a Theodolite station. 9) Determination of distance between two points when their bases are inaccessible, using Theodolite – Measuring Horizontal angles by reiteration method from a baseline. 10) Determine the elevation of an object when the base is accessible by trigonometrical levelling. 11) Determine the elevation of an object when the base is inaccessible by single plane method.	3 3 3 3 3
Unit IV	TACHEOMETRIC SURVEYING & AREAS AND VOLUMES	
	4.1 Tacheometry Instrument used – System of Tacheometry - stadia and tangential - Fixed hair method and movable hair method - Tacheometric Constants -	3

	Anallactic lens (No Proof) – Uses - Distance and elevation formulae for horizontal and inclined line of sight (No derivation) - Uses of tacheometry. **4.2 Areas and volumes** Methods of determining areas and volumes - Mid ordinate rule - Average ordinate rule - Trapezoidal rule - Simpson's rule - One-level section and two-level section. **Exercises:** 12) Determine the constants of the given tacheometer. 13) Determine the gradient between two points by stadia tacheometry. 14) Calculate the area of the given irregular field by using the Trapezoidal rule. 15) Calculate the area of a given irregular field by using Simpson's rule.	3 3 3 3
Unit V	MODERN SURVEYING	
	5.1 Total station Introduction – components parts – accessories used –Summary of total station characteristics –Features of total station- applications of total station - Instrument preparation and setting. **5.2 Global Positioning System** Introduction - Maps - Types of maps - Various satellites used in GPS – Fundamentals of GPS - Handheld GPS - Differential GPS - Applications of GPS in Civil Engineering field. **Exercises:** 16) Determine the Horizontal distance, slope distance, height, and horizontal and vertical angle of given points using Total Station. (Minimum 5 points) 17) Find the coordinates of closed traverse stations using the Total Station and determine the area of the traverse. 18) Determine the area of a field/ Land/College campus etc. using Total Station. **(Not for examination)**	3 3 3 6
TOTAL PERIODS		75

List of Suggested Student Activities:

- Collect the information on survey instruments available in the market with specifications.
- Watch educational videos on various surveying methods to understand the concepts.
- Visit any construction site and make a report on different types of conventional and modern surveying equipment used.
- Perform reconnaissance survey for alignment of road.
- Additional surveying practices can be undertaken on the campus itself.

Reference Books:

1. S. K. Duggal, Surveying Vol 1& 2, 5th edition& 4th edition, McGraw-Hill, 2019 & 2017.
2. S.S. Bhavikatti, Surveying and Levelling Vol I& II, 1st2nd edition, I K International Publishing House Pvt. Ltd, 2019
3. B.C. Punmia , Ashok Kumar Jain, Arun Kumar Jain , Surveying Volume I & II, 17th edition, Laxmi Publications, 2016 & 2023

Website references:

1. https://ndl.iitkgp.ac.in/
2. https://nptel.ac.in/
3. https://www.youtube.com/@iit
4. https://www.nptelvideos.com/

LIST OF EQUIPMENTS (for a batch of 30 students):

S. No.	List of Equipment required	Quantity Required
1.	Chain with arrows	6 Nos.
2.	Ranging Rod	30 Nos.
3	Cross Staff	6 Nos.
4.	Tape	6 Nos.
5.	Prismatic Compass with Stand	6 Nos.
6.	Dumpy Level with tripod	6 Nos.
7.	Levelling staff	10 Nos.
8.	Theodolite with tripod	6 Nos.
9.	Total Station with all accessories	3 Nos.

10340	Building Planning and Drawing	L	T	P	C
Practicum		1	0	4	3

Introduction

Drawing is the language of engineers. Engineering is incomplete without a thorough knowledge of drawing. A Civil Engineering diploma holder must be capable of sketching detailed constructional drawing of various components of building for the purpose of communication with the draftsman. Planning of small buildings, developing a line plan, dimensioning, key plan, drainage plan should be a part of curriculum. The diploma engineer must be conversant with reading and interpretation of drawings for execution of work.

Course Objectives:

1. Impart basic knowledge and principles of building planning and drawing
2. Impart the knowledge of 2D building drawings required for various civil engineering applications.
3. Enable the students to prepare and submission of building drawings and service plans

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Understand the basic principles and terminology of building planning and drawing.
CO2: Prepare a detailed Computer Aided Drawing of residential buildings.
CO3: Prepare a detailed Computer Aided Drawing for of public buildings.
CO4: Prepare a detailed Computer Aided Drawing of Industrial buildings.

Pre-requisites:

1. Basic Drawing Skills
2. Understanding of Geometry
3. Spatial Visualization Ability
4. Computer Literacy
5. Enough knowledge in Drafting Practice Subject which is available in II Semester

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2			3			
CO2	2			3			
CO3	2			3			
CO4	2			3			

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

1. Start by introducing the importance of building drawing in architecture, engineering, and design.
2. Explain basic terminology such as elevation, plan, section, perspective, etc.
3. Provide examples of famous architectural drawings and discuss their significance.
4. Encourage students to continue practicing and refining their drawing skills even after the course ends.
5. Provide resources for further self-study and exploration in building drawing and related fields.

Assessment Methodology:

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	CA2	CA3	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	Cycle 1 Exercises & Two units	Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted	15	15	10	60
Marks	30		10	60
Internal Marks	40			
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal Assessment of 30 Marks.
- **The details of the documents to be prepared as per the instruction below.**
  Practical documents should be maintained for every exercise / experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	2
B	Free Hand Sketch	10
C	Execution/Printout	25
D	Result	3
E	Written Test	10
TOTAL		50
F	Practical Documents (As per the portions)	10
		60

- Written Test for theory portions should be conducted for 10 Marks (10 MCQ).
- **CA 3:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 15 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	10
B	Free Hand Sketch	20
C	Execution/Printout	20
D	Result	10
E	Written Test	30
F	Viva Voce	10
	TOTAL	100

Note: For the written test 30 MCQ or 15 x 2 marks or 10 x 3 Marks or 6 x 5 marks or 3 x 10 Marks questions or combination of any types given above shall be asked from the theory portions.

10340	Building Planning and Drawing	L	T	P	C
Practicum		1	0	4	3

Note: All the drawings should be created using CAD Software and the printout should be submitted for evaluation

Unit I	Introduction to building Drawing	
Theory		3
Basic principle of building drawing-General – Conventions- Title block- Scales- Line work- Lettering -Symbols – Abbreviations-Conventional signs for materials like bricks, stone, concrete, wood, glass, earth, steel - water supply and sanitary fixtures like tap, wash basin, sink, W.C pan (Indian and European type), shower, flush tank.- Electrical installations like one way switch, Two way switch, Distribution Board, Socket, Ceiling fan, LCD bulb, Fluorescent Lamp, Bell-Doors-Windows-Furniture's-Structural Elements like steel bars, stirrups		
Practical		
1. Sketch the Conventional signs for different construction materials		3
2. Sketch the Conventional signs for different water supply and sanitary fixtures		3
3. Draw the Conventional signs for Door, window and furniture items		3

Unit II	PLANNING OF RESIDENTIAL BUILDING	
Theory		4
Types of residential buildings- Usual Requirements-Types of Rooms – Minimum Size requirement for each type of rooms - Furniture arrangement in each room-Position of stairs / lifts- Position of Doors/ Windows House drainage and Sanitary fittings – Sump/Water tanks -Plumbing Pipes		
Practical		
4. Preparation of plan, section and elevation of a single storey House with single bed room and attached bathroom with R.C.C. flat roof (load bearing structure)		6
5. Preparation of plan, section and elevation of a single storey Two BHK house with RCC flat roof (Framed structure)		6
6. Preparation of approval drawing for Two BHK Residential building with RCC flat roof. (Not for Examination)		6

Unit III	PLANNING OF PUBLIC BUILDING	
Theory		4
Types of public buildings - Miscellaneous public buildings - Usual requirements- General requirements of Public Buildings -Landscape architecture		
Practical		
7.	Preparation of plan, section and elevation of a single storey Primary health centre for rural area with R.C.C flat roof. (Framed structure)	6
8.	Preparation of plan, section and elevation of a Single storied Primary School building with R.C.C flat roof (Framed structure)	6
9.	Preparation of plan, section and elevation of a Single storied Library building with R.C.C flat roof (Framed structure)	6
Unit IV	**PLANNING OF INDUSTRIAL BUILDING**	
Theory		4
Planning aspects - Requirements of industrial units - Sheets for pitched roof coverings – Rolling Shutters - Ramps- Stores- Public Toilets/ Bath rooms- Dining / Resting halls- Ventilation and Lighting		
Practical		
10.	Draw the elevation of a King post roof truss	5
11.	Preparation of plan, section and elevation of a small workshop with north light steel roof truss (6 to 10m Span) over R.C.C. Columns.	5
12.	Preparation of plan, section and elevation of a Small Pre-Engineered building.	5
	TOTAL PERIODS	**75**

Suggested List of Students Activity:

1. Visit architectural sites or use reference images to sketch building facades, architectural details, and urban landscapes, focusing on observation and capturing proportions and details.
2. Present drawings to the class and participate in critique sessions, providing feedback on peers' work and receiving constructive criticism on their own drawings.
3. Analyze and critique architectural drawings from historical and contemporary architects, discussing design principles, drawing techniques, and communication strategies.

4. Assign design projects where students create building drawings for specific scenarios or client requirements, incorporating elements such as site analysis, program development, and conceptual design sketches.
5. Organize group projects where students collaborate to create complex building drawings, simulating real-world teamwork and coordination in architectural practice.

Reference Books:

1. National Building code of India 2023
2. B.P.Verma ,Civil Engineering Drawing and house planning 13th edition, Khanna Publishers, 2023.
3. S.C.Rangwala, Civil Engineering Drawing, 3rd Edition, Charotar Publication, 2017.

Web-based/Online Resources:

1. http://ndl.iitkgp.ac.in/he_document/bharat_skills/bharat_skills/01_0853?e=2|building%20planning%20and%20drawing
2. http://ndl.iitkgp.ac.in/he_document/bharat_skills/bharat_skills/01_0910?e=18|bond%20building%20drawing%20polytechnic%20engineering
3. http://ndl.iitkgp.ac.in/he_document/bharat_skills/bharat_skills/01_0844?e=6|bond%20building%20drawing%20polytechnic%20engineering

LIST OF EQUIPMENTS (for a batch of 30 students):

S.No.	List of Equipment's required	Quantity Required
1	Computers	30 Nos.
2	Laser printer	2 Nos.
3	CAD software	30 Users

10350	Hydraulics	L	T	P	C
Practicum		1	0	4	3

Introduction:

Hydraulics which is also meant by Mechanics of Fluids helps in solving problems in the field of Civil, Environmental, Transportation, Mechanical, Metallurgical Engineering. The subject deals with basic concepts and principles in hydro-statics, hydro - kinematics and hydro-dynamics and their application in solving fluid flow problems. The subject is also designed to study the practical applications of fluid flow problems.

Course Objectives:

The objectives of the course are to enable the students to

- Understand parameters associated with fluid flow and hydrostatic pressure.
- Understand types of forces, energy and application of Bernoulli's theorem.
- Know the different types of Orifices and Mouth pieces and their practical applications.
- Know the different types of pipes in parallel flow / series flow connected to the reservoirs.
- State the different losses of head of flowing liquids in pipes and their equations.
- Know the different types of Notches and their Practical applications.
- Learn the construction details, specifications and efficiencies of Reciprocating Pumps and Centrifugal Pumps.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Define Parameters associated with fluid flow and hydrostatic pressure, types of flow, total energy and total head, Bernoulli's theorem. Determine the co-efficient of discharges of orifice meter, Venturimeter.

CO2: Describe about the different types of Orifices and Mouthpieces and their practical applications and determine the co-efficient of discharges of Orifice, mouthpiece.

CO3: Describe the losses of heads in pipes, major losses, minor losses, pipes in parallel flow / series flow connected to the reservoirs, determine the friction factor of the pipe.

CO4: Describe the different types of Notches and their Practical applications and coefficient of discharges for different notches.

CO5: Classify various types of pumps, Describe the advantages, working principles, construction details, specifications and efficiencies of Reciprocating Pumps and Centrifugal Pumps and Draw the characteristic curves for centrifugal and Reciprocating pumps.

Pre-requisites:

Knowledge of fluids.

CO/PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	3	1	2	2
CO2	3	2	1	3	1	2	2
CO3	3	2	1	3	1	2	2
CO4	3	2	1	3	1	2	2
CO5	3	2	1	3	1	2	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- It is advised that teachers take steps to pique pupils' attention and boost their learning confidence.
- To help students learn and appreciate numerous concepts and principles in each area, teachers should provide examples from daily life, realistic situations, and real-world engineering and technological applications.
- The demonstration can make the subject exciting and foster in the students a scientific mindset. Student activities should be planned on all the topics.
- Throughout the course, a theory-demonstrate-practice-activity strategy may be used to ensure that learning is outcome - and employability-based.
- Do not let students work on an activity or an experiment with the expected outcome, rather allow students to be honest about whatever the results of the experiment are. If the results are different from the expectations, students should do an analysis where they could be the source of error, if any.

Assessment Methodology:

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	Cycle 1 Exercises & Two units	Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Internal Marks	40			
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal Assessment of 30 Marks.
- **The details of the documents to be prepared as per the instruction below.**
  Practical documents should be maintained for every exercise/experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	2
B	Tabulation/Observation	10
C	Graph/Sketch/Calculation	15
D	Result	3
E	Written Test	20
TOTAL		50
F	Practical Documents (As per the portions)	10
		60

- Written Test for theory portions should be conducted for 20 Marks as per the question pattern below.

Question pattern – Written Test Theory

Description		Marks	
Part – A	10 MCQ Questions	10 X 1 Mark	10 Marks
Part – B	One 10 Marks Question out of 3 Questions	1 X 10 Marks	10 Marks
TOTAL			20 Marks

- **CA 3:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	10
B	Tabulation/Observation	20
C	Graph/Sketch /Calculation	20
D	Result	10
E	Written Test	30
F	Viva Voce	10
	TOTAL	100

Note: For the written test 30 MCQ or 15 x 2 marks or 10 x 3 Marks or 6 x 5 marks or 3 x 10 Marks questions or combination of any types given above shall be asked from the theory portions.

10350	Hydraulics	L	T	P	C
Practicum		1	0	4	3

Unit I	**INTRODUCTION**	
	1.1 FLUID PROPERTIES & MEASUREMENT OF PRESSURE Hydraulics - Definition - Fluids - Properties of fluids - Types of pressures - Static pressure, Atmospheric pressure, Gauge pressure, Vacuum pressure and Absolute Pressure-Measurement of Pressure-Simple Mercury Barometer - Piezometer Tube-Simple U-Tube Manometer-Differential Manometer.	**3**
	1.2 FLOW OF FLUIDS Types of Flow - Energy possessed by a Fluid Body - Potential Energy and Potential Head - Pressure Energy and Pressure Head - Kinetic Energy and Kinetic Head - Total Energy and Total Head - Bernoulli's Theorem (No proof) - Venturimeter - Orificemeter	
	Practical exercises:	
	1. Study of Manometers and Pressure Gauges. (Not for Exam)	**4**
	2. Verification of Bernoulli's Theorem.	**4**
	3. Flow through Venturimeter - Determination of Co-efficient of Discharge.	**4**
	4. Flow through Orificemeter – Determination of Co-efficient of Discharge.	**4**
Unit II	**FLOW THROUGH ORIFICES AND MOUTH PIECES**	
	Definitions - Types of orifices - Vena contracta - Hydraulic coefficients C_d, C_v and C_c - Formula - Large orifice - Definition - Discharge formula - Practical applications of orifices - Types of mouth pieces-External and internal mouth pieces-Discharge formula.	**3**
	Practical exercises:	
	5. Flow through orifice - Determination of Co-efficient of Discharge by Time Fall-Head method.	**4**
	6. Flow through orifice - Determination of Co-efficient of Discharge by Constant head method.	**4**
	7. Flow through external cylindrical mouth piece - Determination of Co-efficient of Discharge by Timing fall in head method.	**4**
	8. Flow through external cylindrical mouth piece - Determination of Co-efficient of Discharge by Constant head method.	**4**

Unit III	**FLOW THROUGH PIPES**	
	Definition of pipe-Losses of head in pipes - Major losses - Minor losses - Sudden enlargement, sudden contraction, obstruction in pipes (No proof) - Energy/Head losses off lowing fluid due to friction – Darcy's equation – Chezy's equation (No derivation) - pipes in parallel flow / series flow connected to a reservoir.	**3**
	Practical exercises:	
	9. Determination of friction factor for the given GI pipe.	**4**
Unit IV	**FLOW THROUGH NOTCHES AND WEIRS**	
	Definitions-Types of notches - Rectangular, Triangular and Trapezoidal Notches-Formula (No derivation)-Comparison of V-Notch and Rectangular Notch-Weir - definition - classifications of weirs-comparison of Weirs and Notches.	**3**
	Practical exercises:	
	10. Determination of Co-efficient of Discharge for Rectangular Notch.	**4**
	11. Determination of Co-efficient of Discharge for Triangular Notch.	**4**
	12. Determination of Co-efficient of Discharge for Trapezoidal notch.	**4**
Unit V	**PUMPS**	
	Pumps - Definition - Classification of pumps - Reciprocating pump - Construction Detail and Working Principle - Types - Single Acting and Double Acting - Slip - Air Vessels - Discharge and Efficiency - Centrifugal pump - Advantages and Disadvantages over a Reciprocating pump - Layout - Construction Details - Priming of Centrifugal Pump - Construction and Working of the Pump - Classification - Functions of Foot Valve, Delivery Valve and Non - Return Valve - Fundamental Equation of Centrifugal Pump - Characteristics of a Centrifugal Pump - Discharge, Power and Efficiency.	**3**
	Practical exercises:	
	13. Prepare a Layout and indicate the construction parts of a Reciprocating pump / Centrifugal pump.(Not for Exam)	**4**
	14. Reciprocating pump - To draw characteristic curves and determine the efficiency.	**4**
	15. Centrifugal Pump - To draw characteristic curves and determine the efficiency.	**4**
	TOTAL PERIODS	**75**

Suggested list of student activity:

- Explore and investigate the different types of fluids and provide real-time examples of each.
- Presentation by students on major and minor losses of flow through pipes.
- Seminar on the classification of pumps based on their working principle, design, and applications
- Periodic class quizzes conducted on a weekly/fortnightly based on the course
- Micro project that shall be an extension of any practical lab exercise to real-world application

Reference Books

1. R.K. Bansal, Fluid Mechanics,2nd Edition, Laxmi Publications,2020,
2. John. M. Cimbala Yunus A. Cengel ,Fluid Mechanics: Fundamentals and Applications, 4th Edition,
   McGraw-Hill,2019
3. S.Ramamrtham-Hydraulic Fluid Mechanics and Fluid Machines, , 9th Edition,DhanpatRai & Sons,2014.

Web-based/Online Resources

1. https://youtu.be/OfViSGNSf4o?si=921H2Aqvt8xhiVZV
2. https://youtu.be/ikt-MxC3_1o?si=kitMRCScKWAQ4n2-
3. https://youtu.be/95vwYGJ3E48?si=LLB51FVO8VFa16MG
4. https://youtu.be/kcPawgvFehI?si=XsUjJ3wZ9YLKWyej
5. https://youtu.be/wdjmQ3JoP34?si=AKglGUnVZ6jHD3zC
6. https://youtu.be/dHSb0Z80O4I?si=GVA5lsmS_jwRH20x
7. https://youtu.be/mqaUXV0kAGs?si=ohIydr-jjRgsm2sO
8. https://youtu.be/nLtnJ6DCpok?si=1JJ6_pYyeAa-FPci
9. https://youtu.be/TgD3nEO1iCA?si=xUdoTsbCepyY_tBd
10. https://youtu.be/zwSWHrVBQls?si=KP5KyL-jIjDWEUeD

LIST OF EQUIPMENTS (for a batch of 30 students):

S. No.	List of Equipment's required	Quantity Required
1.	Bernoulli's theorem apparatus (closed circuit)	1No.
2.	Venturimeter and Orifice meter apparatus (closed circuit) With all accessories (Combined or Individual)	1No.
3.	Pipe Friction apparatus (closed circuit) with all accessories	1No.
4.	Orifice and Mouth piece apparatus (closed circuit) with all Accessories (Combined or Individual)	1No.
5.	Notch apparatus (closed circuit) with all accessories	1No.
6.	Reciprocating Pump Testing Rig with all accessories	1No.
7.	Centrifugal Pump Testing Rig with all accessories	1No.

10360	Material Testing Lab	L	T	P	C
Practicum		1	0	4	3

Introduction:

- Civil Engineering diploma holders have to supervise construction of various types of civil works involving, the use of various materials like stones, bricks and tiles, cement and cement-based products, lime, timber and wood-based products, paints and varnishes, metals and other miscellaneous materials.
- The students shall acquire knowledge regarding the characteristics, uses and availability of various building materials and skills in conducting tests as per BIS as well as international standards to determine the suitability of materials for various construction purposes.
- Strength and durability are the main parameter for any construction material. This Laboratory experiments provide a hands-on experience with the testing of civil Engineering materials such as cement, steel, Timber, non-ferrous materials, ceramic materials, fine and coarse aggregates used in construction activities. Tensile, Compressive, shear and flexural strength are main strength parameter for any construction material. Water absorption characteristic of materials also an important parameter in strength and durability point of view.

Course Objectives:

- This course is designed to conduct standard tests on various construction materials and specimens as per the Indian standard (IS code) and ASTM standards.
- Since the materials used in construction shall withstand all loads acting on it throughout the life of the structure and durable.
- Hence the students are expected to learn and have to perform Hands on training through laboratory practice.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Conduct appropriate test on materials such as Tension, Compression, Torsion, Flexure, impact, Hardness and Shear strength

CO2: Act as a quality controlling engineer in civil Engineering construction field.

CO3: Conduct various tests on cement (binding material) and aggregates (Fine and Coarse Aggregates)

CO4: Prepare various specimen for Conducting quality control tests.

CO5: Follow the procedure and Standards laid down by Indian standards and ASTM standard testing procedure of civil Engineering materials and acceptable parameters.

Pre-requisites:

Basic knowledge on Civil Engineering Construction Materials

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	1	1	1	1	1
CO2	3	3	1	1	1	1	1
CO3	3	2	2	2	2	2	2
CO4	3	1	1	1	1	1	1
CO5	3	3	3	3	3	3	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- Teachers shall deliver theoretical knowledge on each test and standard procedures to perform the test for better understanding and importance of the particular Test on materials.
- Teachers shall Inculcate students on preparing specimen / samples as per the standard procedure and the same shall be demonstrated.

Assessment Methodology:

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	Cycle 1 Exercises & First Unit	Cycle 2 Exercises & Second Unit	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Internal Marks	40			
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal Assessment of 30 Marks.
- **The details of the documents to be prepared as per the instruction below.**
  Practical documents should be maintained for every exercise/experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	2
B	Tabulation/Observation	10
C	Graph/Sketch/Calculation	15
D	Result	3
E	Written Test	20
TOTAL		50
F	Practical Documents (As per the portions)	10
		60

- Written Test for theory portions should be conducted for 20 Marks as per the question pattern below.

Question pattern – Written Test Theory

Description		Marks	
Part – A	10 MCQ Questions	10 X 1 Mark	10 Marks
Part – B	One 10 Marks Question out of 3 Questions	1 X 10 Marks	10 Marks
TOTAL			20 Marks

- **CA 3:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	10
B	Tabulation/Observation	20
C	Graph/Sketch /Calculation	20
D	Result	10
E	Written Test	30
F	Viva Voce	10
	TOTAL	100

Note: For the written test 30 MCQ or 15 x 2 marks or 10 x 3 Marks or 6 x 5 marks or 3 x 10 Marks questions or combination of any types given above shall be asked from the theory portions.

10360	Material Testing Lab	L	T	P	C
Practicum		1	-	4	3

THEORY

UNIT-I	CONSTURCTION MATERIALS-INTRODUCTION	
Introduction to Strength and durability of materials- Direct Tensile strength -stress strain relation for ductile materials-Direct Compressive Strength-Flexural Strength-Deflection of beams-Bending Compression-Bending tension-split tensile strength-Torsional strength- shear strength-impact strength-Hardness of materials.		7

UNIT-II	CONSTRUCTION MATERIALS -PROPERTIES	
Cement -types of cement- water cement ratio-consistency-Fineness of cement-Initial setting time and final setting time-Bulk Density-Specific gravity- Importance of Crushing value of aggregates-Impact value- Attrition and abrasive value of aggregates- Water absorption of construction materials- Effect / Impact of water absorption-Elongation index-flakiness index and angularity index of aggregates.		8

PRACTICAL EXERCISES

Practical Exercises. — 60

1. Conducting Tensile test on mild steel /Deformed bars and determining yield strength and finding important parameters.
2. Conducting compression test and determining direct compressive strength on (i) Wooden cube (ii) Brick/ Fly ash brick (iii) Masonry block (iv) Paver blocks (Any two shall be given in Examination).
3. Conducting double shear test on Mild steel bar and finding the shear value.
4. Conducting Torsion test on Steel bar and finding its Modulus of rigidity.
5. Conducting an Impact test on brittle and ductile material by performing Izod/Charpy tests.
6. Conducting Hardness test and finding Brinel's / Rockwell's hardness number on (i) Mild steel (ii) Brass (iii) Aluminium
7. Conducting deflection test on simply supported beams and finding its Young's modulus value on (i)Wood and (ii)Steel.
8. Conducting flexure test on tiles.

9. Conducting fineness test on cement by Sieve analysis (OR) Blain's Air permeability apparatus. 10. Conduct Water absorption test on (i) Brick/Fly ash brick (ii) Coarse aggregates. 11. Determination of bulk density and Specific gravity of (i) Fine aggregate and (ii) Coarse aggregate. 12. Conducting attrition test on coarse aggregate by Deval's (OR) Los Angeles method. 13. Conducting abrasion test on aggregate by Dorry's method. 14. Conducting Crushing test on coarse aggregate and finding the crushing value of aggregate. 15. Conducting Impact test on coarse aggregate and finding the impact value of the aggregates. 16. Determination of Elongation Index, Flakiness index and angularity number of aggregates.	
TOTAL PERIODS	**75**

Suggested List of Students Activity:

Student shall prepare specimen / sample of the construction material as per the testing standards and procedure.

Reference Books:

1. M.S.Shetty, Concrete technology, Theory and Practice, 7th Edition, S. Chand & Company Pvt. Ltd, ,2013.
2. Indian Standard, IS 383:2016, Coarse and Fine aggregates for concrete-specification.
3. Indian Standard, IS 456:2000, Plain and Reinforced cement concrete.
4. Indian Standard, IS 2386(part-1) :1963, Methods of test for aggregates for concrete.
5. Indian Standard, IS 2386(part-3) :1963, Methods of test for aggregates for concrete.

Web-based/Online Resources:

1. American Society for testing and Materials(ASTM) standards
   https://www3.epa.gov/hudson/pdf/sedc_2004-2005_append.pdf

2. Bureau of Indian standards
   https://www.services.bis.gov.in/php/BIS_2.0/dgdashboard/Published_Standards_new/revised_standards

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

- Universal testing machine (UTM)-Capacity 400 KN and above capacity with accessories with double shear arrangement-1No.
- Compression Testing Machine (CTM)1000 KN and above capacity-1No.
- Torsion testing Machine-1No.
- Impact Testing machine for Izod /Charpy test--1No.
- Rockwell cum Brinell harness testing machine-1No.
- Floor type deflection test arrangements magnetic stand, deflection gauge, weights and Beams made up of different materials (steel and wood)-1No.
- Weighing balances with required capacity and accuracy--1No.
- Sieve sets for Cement IS sieve No.9 (90 Micron) made up of brass with 20cm dia. -1No.
- Blains Air permeability apparatus - 1No.
- Deval's attrition testing Machine / Los Angeles abrasion testing machine--1No.
- Dorry's abrasion testing machine--1No.
- Metal Containers of 1lit,3 lit,5 lit,10 lit and 20 lit capacity-1No.
- Aggregate impact testing machine-1No.
- Aggregate crushing value apparatus-1No.
- Flexural Testing Machine for Tiles - 1 No.

IV SEMESTER

10410	Mechanics of Structures	L	T	P	C
Theory		3	0	0	3

Introduction:

Mechanics of structures is a fundamental subject in Civil engineering that deals with understanding the behavior of structures under various loads. It forms the backbone of designing safe and efficient structures. Study of structural behaviour, analysis and design is a principal part of civil engineering courses and is essential for professional accreditation. This subject enhances the structural analytical ability of the students. This subject is conceptual applications of principles of mechanics of rigid and deformable bodies in Engineering, helps in determining statics response of statically determinate and indeterminate structures. This course has been designed for Diploma civil engineering students or those interested in developing a deeper understanding of introductory structural analysis concepts and methods. The lectures cover the essential concepts and methods of structural analysis and provide examples demonstrating their applications.

Course Objectives:

On completion of the course, the students will be able to:

- Define and describe the basic concept and principle of structure Analysis.
- Analyze determinate and indeterminate structures using various methods.
- Gain a solid understanding of how structures behave Under various loads.
- To understand the different techniques for analysis of structures.
- Identify different types of structural elements and their behaviour.
- Ability to distinguish between determinate and indeterminate structures.
- Ability to compute and draw normal, shear force and bending moment diagrams for beams and frames.
- Apply knowledge of mathematics and Engineering in calculating slope and Deflections of beams.
- Understand the buckling behaviour of column subjected to axial loads .

Course Outcomes:

On successful completion of this course, the student will be able to	
CO1	Determine the of Slope and Deflection of Determinate beams by area moment method
CO2	Analyse Fixed beams by Area-Moment method and draw SFD, BMD.
CO3	Analyse Continuous beams by Theorem of Three moments and draw SFD, BMD
CO4	Analyse Portal frames by Moment Distribution Method and Draw SFD, BMD.
CO5	Define the different types of Columns and finding critical loads of Columns.

Pre-requisites: Mechanics of Materials, Engineering Mechanics.

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	1	2	3	2
CO2	3	3	2	1	2	3	2
CO3	3	3	2	1	2	3	2
CO4	3	3	2	1	2	3	2
CO5	3	3	2	1	2	3	2

Legend:3-HighCorrelation,2-MediumCorrelation,1-LowCorrelation

Instructional Strategy:

This subject is introduced so that diploma holder in Civil Engineering may appreciate the concepts and principles of mechanics for understanding the behavior of structures under various types of loads and are able to apply the knowledge gained through the subject for the design of simple and small components. Teacher should give simple exercises involving the applications of various concepts and principles being taught in the subject. Efforts should be made to prepare tutorial sheets on various topics and students should be encouraged/guided to solve the tutorial problems independently. Teacher may conduct weekly small quiz sessions to know the students' level of understanding and if need be, teacher may reinforce the concepts and principles related to mechanics of structures elements/members of building components.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of two will be considered for the internal assessment of 15 Marks.

CA1 and CA2, Assessment test should be conducted for two units as below.

PART A (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write Five questions. Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 20 marks for the internal assessment.

Question Pattern:

Answer Ten questions by selecting two questions from each unit. Each question carries 10 marks each. Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

10410	Mechanics of Structures	L	T	P	C
Theory		3	0	0	3

UNIT I	**SLOPE AND DEFLECTION OF BEAMS**	
	Deflected shapes / Elastic curves of beams with different support conditions –Definition of Slope and Deflection- Flexural rigidity and Stiffness of beams- Mohr's Theorems – Area Moment method for slope and deflection of beams – Derivation of expressions for maximum slope and maximum deflection of standard cases by area moment method for cantilever and simply supported beams subjected to symmetrical UDL& point loads. Numerical problems on determination of slopes and deflections at salient points of Cantilever Beam subjected to point load (point load at free end, point load away from free end (maximum two point loads), UDL throughout the beam, UDL over the half length from fixed end and Combination of single point load and UDL throughout the beam only- Determination of slopes and deflections at salient points of Simply supported beams with central point load, Two equal point loads at one third points, UDL throughout the beam and Combination of central point load and UDL throughout the beam only from first principles and by using formulae.	9
UNIT II	**FIXED BEAMS–AREA MOMENT METHOD**	
	Introduction to fixed beam - Advantages –Degree of indeterminacy of fixed beam- Sagging and Hogging bending moments- Points of Contra flexure. – Determination of fixing end (support) moments (FEM) by Area Moment method– Bending moment diagram (BMD)-Free BMD –Fixed BMD - Derivation of Expression for fixed end moment subjected to concentrated load at mid span, Single eccentric point load, UDL throughout the beams. Numerical Problems for Fixed beams subjected to concentrated load at mid span, Single eccentric point load, Two equal point loads at one third points, udl throughout the beams, Combination of central point load and udl throughout the beam only. Drawing SF and BM diagrams for Fixed beams with supports at the same level (sinking of supports or supports at different levels are not included)	9

UNIT III	**CONTINUOUS BEAMS–THEOREM OF THREE MOMENTS METHOD**	
	Introduction to continuous beams-Advantages–Deflected shapes of continuous beam-Degree of indeterminacy of continuous beams with respect to number of spans and types of supports –Simple/ Fixed supports of beams-General methods of analysis of Indeterminate structures – Clapeyron's theorem of three moments–Application of Clapeyron's theorem of three moments for the following cases–Numerical Problems on Two span beams with both ends simply supported –Two span beams with one end fixed and the other end simply supported -Sketching of SFD and BMD for all the above cases.	9
UNIT IV	**PORTAL FRAMES – MOMENT DISTRIBUTION METHOD**	
	Introduction to moment distribution method- Carry over moment-Carryover factor and Stiffness factor (Derivation not required)-Distribution moment-Distribution factor—Stiffness Ratio or Relative Stiffness- Concept of distribution of un balanced moments at joints - Sign conventions, Definition of Frames– Types–Bays and Story - Sketches of Single/Multi Story Frames, Single/Multi Bay Frames- Portal Frame– Sway and Non- sway Frames- Deflected shapes of Portal frames under different loading / support conditions- Numerical problems on Non sway (Symmetrical) Portal Frames for Joint moments by Moment Distribution Method and drawing BMD only.	9
UNIT V	**COLUMNS AND STRUTS**	
	Columns and Struts–Definition–Short and Long columns–End conditions – Equivalent length / Effective length– Slenderness ratio – Axially loaded short column - Axially loaded long column – Euler's theory of long columns-Assumptions – Expression for Critical load on Columns with standard end conditions-Limitations of Euler's formula – Modes of failure of column-Buckling of column-Buckling load-crushing load-safe load- Factor of Safety–Expression of Rankine's formula for Crippling load of Columns - Simple problems on circular column, Hollow circular column, Rectangular column, Single I section without cover plate only.	9
	TOTAL PERIODS	**45**

Suggested student activities

1. Quiz.
2. Group discussion.
3. Seminar.
4. Surprise tests.
5. Class assignments.

Reference Books:

1. S.Ramamrutham,"Theory of structures",9th Edition, Dhanpat Rai Publications, 2014.
2. Bhavikatti S.S,Structural Analysis-Vol.1,4th Edition, Vikas Publishing House Pvt.Ltd.,NewDelhi-4, 2011.
3. Bhavikatti S.S,Structural Analysis-Vol.2,4th Edition, Vikas Publishing House Pvt.Ltd.,NewDelhi-4, 2011.
4. Devdas Menon, Structural Analysis, 3rd edition, Narosa Publishing House, 2023.

Web-based/Online Resources:

1. SLOPE AND DEFLECTION OF BEAMS: https://youtu.be/U0uj67OwF4U?si=pxxtxfYoxP4Of3xc
2. FIXED BEAMS–AREA MOMENT METHOD: https://youtu.be/0ilvT8x01wI?si=57CGtfvWi5LO2CZk
3. CONTINUOU SBEAMS–THEOREM OF THREE MOMENTS METHOD: https://youtu.be/pk6z6STv_uw?si=TnKEFKJDaNoFv5hT
4. MOMENT DISTRIBUTION METHOD: https://youtu.be/xSDpRiTaoLg?si=ySvDfTcGq0GXQL0h
5. COLUMNS AND STRUTS: https://youtu.be/hwpGAxa8UoI?si=vMGt1P20H_hTL4DO

10420	Transportation Engineering	L	T	P	C
Theory		3	0	0	3

Introduction:

Construction of roads is one of the areas in which diploma holders in Civil Engineering get employment. These diploma holders are responsible for construction and maintenance of highways. Basic concepts of road geometrics, surveys and plans, road materials, construction of rigid and flexible pavements find place in this course.

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

Course Objectives:

The objective of this course is to

- Make the students learn the basics of transportation engineering.
- Get knowledge about the various types of roadways and its geometric design.
- Acquire knowledge about railways, rail components and its uses.
- Know the various types of stations, signalling and interlocking in railways.
- Study the general aspects of airport and harbour planning and design aspects.

Course Outcomes:

On successful completion of this course, the student will be able to	
CO1	Understand the importance of roads, the development of roads, the classification of roads, highway pavements, and geometrical design.
CO2	Attain knowledge on highway alignment, road machineries and construction of different types of Roads.
CO3	Understand the components of railway and methods of laying the rails.
CO4	Describe the Railway fixtures, Types of stations, Signalling and Control of movement of trains.
CO5	Illustrate the general aspects of airport and harbour engineering.

Pre-requisites:

Knowledge of basic highway, railway, airport and harbour components.

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	3	3	1	3	2
CO2	3	2	2	3	3	3	3
CO3	3	1	2	1	3	1	1
CO4	3	2	3	3	2	1	2
CO5	3	1	1	1	1	3	3

Legend:*3-HighCorrelation,2-MediumCorrelation,1-LowCorrelation*

Instructional Strategy:

- It is advised that teachers take steps to pique pupils' attention and boost their learning confidence.
- To help students learn and appreciate numerous concepts and principles in each area, teachers should provide examples from daily life, realistic situations, and real-world engineering and technological applications.
- The demonstration can make the subject exciting and foster in the students a scientific mindset. Student activities should be planned on all the topics.
- Throughout the course, a theory-demonstrate-practice-activity strategy may be used to ensure that learning is outcome and employability-based.
- Do not let students work on an activity or an experiment with the expected outcome, rather allow students to be honest about whatever the results of the experiment are. If the results are different from the expectations, students should do an analysis where they could be the source of error, if any.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of two will be considered for the internal assessment of 15 Marks.

CA1 and CA2, Assessment test should be conducted for two units as below.

PART A (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write Five questions. Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 20 marks for the internal assessment.

Question Pattern:

Answer Ten questions by selecting two questions from each unit. Each question carries 10 marks each.

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

10420	Transportation Engineering	L	T	P	C
Theory		3	0	0	3

Unit I	HIGHWAY ENGINEERING	
	1.1 General-Development of Roads in India-Modes of transportation-Advantages of Roads –Requirements of an ideal road–Indian Road Congress-Classifications of Highways - Highway Pavements-Objectives-Types of Pavements–Flexible and Rigid Pavements-Comparative study of Flexible and Rigid pavements. **1.2** Road structure- Right of way– Width of formation-Road Camber - Super Elevation-Sight distances–Road gradient-Road Curves-Horizontal curves-Vertical curves-Types-Widening of pavement on horizontal curves.	10

Unit II	ROAD ALIGNMENT AND CLASSIFICATION	
	2.1 Principles for ideal highway alignment-Factors affecting highway alignment-Excavating Equipments - Tractor, Bulldozer, Grader, Scraper, Asphalt recycling equipment, Motor graders - Compaction Equipments. **2.2** Water Bound Macadam roads, Bituminous Roads, cement concrete roads (Construction with sketches, Advantages and Disadvantages for these roads) - Surface dressing of Bituminous Roads-Types. Defects in Flexible and Rigid Pavements (Types only).	09

Unit III	RAILWAY ENGINEERING	
	3.1 Introduction to Railways - Classifications of Indian Railways – Rail Gauges–Requirements of an ideal rail-Types of rail sections - Coning of wheels- Creep of rails – Causes and prevention of creep- Ballast-Functions of Ballast-Requirements of ballast – Materials used as ballast. **3.2** Functions of Sleepers-Types of sleepers – Requirements of sleepers – Sleeper Density-Rail Joints-Types-Rail Fastenings-Fish plates - Fish Bolts-Spikes–Chairs and Keys-Bearing Plates-Blocks-Elastic Fastenings-Anchors and anti-creepers.	10

Unit IV	RAILWAY ENGINEERING (Contd.)	
4.1 Definition of station -Types of stations -Platforms–Passenger and Goods platforms - Definition of Yard–Types of yard-Level Crossings-Engine Shed-Triangles-Turntable-Traversers-Scotch Block-Buffer stops- Fouling marks. **4.2** Points and crossings-Turnouts-Right hand and left-hand turn outs-Crossings-Types of crossings - Objects of signalling –Types of signalling based on functions and location-Principles of interlocking.		08
Unit V	**AIRPORT AND HARBOUR ENGINEERING**	
5.1 Airport classification –airport planning: objectives, components, layout characteristics, - orientation of Runways and correction factors for runway as per ICAO stipulations, parking-wind rose diagram. **5.2** Harbour, port, satellite port, docks, waves and tides-planning of harbours: requirements, classification, location - harbour layout and terminal facilities-coastal structures: piers, break waters, wharves, jetties, quays, spring fenders, dolphins and floating landing stage.		08
	TOTAL PERIODS	**45**

Suggested List of Students Activities:

- Presentation/Seminars by students on any recent technological developments in Highway Engineering.
- Periodic class quizzes conducted on a weekly/fortnightly based on the course.
- Prepare Models of road geometric structures, points and crossing in railways etc.
- Visit nearby road construction activities, Railway stations, Airports and Harbours.

Reference Books

1. S.K. Khanna and C.E.G Justo, "Highway Engineering",10th edition, Nem Chand and Bros Publisher, Roorkee, 2017.
2. Rangwala, "Highway Engineering" ,11th Edition, Charotar Publishing House Pvt. Ltd.,2017.
3. Rangwala, "Railway Engineering", 27th edition, Charotar Publishing House Pvt. Ltd.,2017.

Web-based/online resources:

1. Highway engineering: https://youtu.be/3oNa9Z94Hiw?si=KaE7Cu7w6SvwVdek
2. https://www.digimat.in/nptel/courses/video/105107220/L04.html
3. Railway Engineering: https://youtu.be/37WMS483T7Y?si=0qkDRyZj6WeaTCcE
4. https://youtu.be/SC5GIAHuCQY?si=HhOK_zuWdM-SV_el
5. https://youtu.be/NznOF2ukTy4?si=URsRhChYEfpBCCn5
6. Airport and harbour engineering: https://youtu.be/3YY9FUVtG-4?si=QjwhILSWM-APJl7V

10430	Soil Mechanics and Foundation Engineering	L	T	P	C
Practicum		2	0	2	3

INTRODUCTION

Diploma holders in Civil Engineering are required to supervise the construction of roads and pavements, dams, embankments, and other Civil Engineering structures. As such, the knowledge of basic soil engineering is a pre-requisite for these engineers for effective discharge of their duties. This necessitates the introduction of Soil mechanics and foundation Engineering subject in the curriculum for Diploma Course in Civil Engineering. The subject covers only such topics which will enable the diploma engineers to identify and classify the different types of soils, their selection and proper use in the field for various types of engineering structures. The emphasis will be more on teaching practical aspects rather than theoretical concepts.

Course Objectives:

- To impart knowledge about the index and Engineering properties of soil along with soil classification
- To impart knowledge about the methods of determination of soil properties.
- To determine the permeability and shear strength of soil.
- To know the various methods of compaction, consolidation and determination of field density of soil.
- To evaluate bearing capacity of soil and design the appropriate type of foundation based on the determined bearing capacity.
- To know about the various soil sampling and soil stabilization techniques.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Identify and classify various types of soils. Interpret the physical properties of soil related to given Construction activities.

CO2: To understand and apply the concept of engineering properties of soil such as permeability and shear strength for the foundation analysis.

CO3: Apply the theory of compaction and consolidation for reduction in voids volume for the given field problems.

CO4: Determine the bearing capacity of the soil and design foundations for various structures.

CO5: To identify the appropriate soil sampling technique for obtaining the different soil samples and propose suitable soil stabilization techniques for improving the engineering properties of the soil

Pre-requisites:

Knowledge of Basics of soil properties and test methods

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	1	3	2	2	2
CO2	3	1	1	2	2	2	2
CO3	3	1	1	2	2	2	2
CO4	3	1	1	2	2	2	2
CO5	3	1	1	2	2	2	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

The teacher while imparting instructions are expected to lay greater emphasis on the practical aspects rather than theory. To bring clarity regarding concepts and principles involved, teachers should organize demonstrations in the laboratories and fields. Efforts should be made in the practical classes that students perform practical exercises individually.

Assessment Methodology:

	Continuous Assessment (40 marks)			**End Semester Examination (60 marks)**
	CA1	**CA2**	**CA3**	
Mode	Written Test Theory & Practical Test	Written Test Theory & Practical Test	Written Test	Written Examination
Portion	Two Units & Cycle 1 exercises	Another Two Units & Cycle 2 exercises	Complete Theory Portions	Complete Theory Portions
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Internal Marks	40			
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:** The written (2 Periods) & practical (1 Period) test should be conducted as per the scheme of evaluation given below.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	2
B	Tabulation/Observation/Graph/ Sketch/Calculation	15
C	Result	3
D	Written Test	30
TOTAL		50
E	Practical Documents (As per the portions)	10
		60

Written test should be conducted for 30 Marks for two units (3 X 10 Marks = 30 Marks). Six questions will be asked, students should write three questions. Each unit three questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

- **The details of the practical documents to be prepared as per the instruction below.**
  The observation and calculations should be completed on the day of practice.
  The same shall be evaluated for 10 marks on the day or next day of practice before commencement of the next exercise.
  This documentation can be carried out in a separate notebook / printed manual / file. The reading and calculations and graph should be written by the student manually.
  The evaluated practical document should be submitted for the Practical Test (CA1 & CA2).
  The detailed date of the practices and its evaluations should be maintained in the course logbook. The log book and the practical documents should be submitted for the verification by the Flying Squad and DOTE Official.
- **CA3:** Model examination should be conducted for complete theory portions as per the end semester question pattern. The marks awarded should be converted to 10 marks for the internal assessment.

Question Pattern:

Answer Ten questions by selecting two questions from each unit. Each question carries 10 marks each.

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

10430	Soil Mechanics and Foundation Engineering	L	T	P	C
Practicum		2	0	2	3

Unit I	**SOIL PROPERTIES AND ITS CLASSIFICATION**	
Introduction to Soil Mechanics-Origin of soil, Three phase diagram - Definitions-Cohesive soil, Cohesion less soil, Void ratio, porosity, degree of saturation, water content, specific gravity of soil grains, unit weights, density index and interrelationship of different parameters (Only formula) - Simple problems - BIS soil classification. **Practical**		6
1.	Determination of Specific gravity of sand	2
2.	To determine the moisture content of a given sample of soil	2
3.	Calculate Voids ratio and porosity of sand (If specific gravity, moisture content and degree of saturation value is given)	2
4.	Determine Grain size distribution of given soil sample by Sieve analysis	2
5.	Determination of liquid limit and Plastic limit of the given soil sample	3
Unit II	**PERMEABILITY, TOTAL STRESS AND SHEAR STRENGTH OF SOIL**	
Permeability -Definition, Factors affecting permeability, Determination of coefficient of permeability (Constant head and falling head method - Procedure only)-Darcy's law-Differentiate Darcy velocity and seepage velocity - Definition and Significance of total stress, effective stress, Pore water pressure, Capillary phenomena& quick sand condition - Shear Strength -Definition, Factors affecting shear strength of soil- Test on shear strength of soils (Name and uses only) **Practical**		6
6.	Determination of shear strength of sandy soil by direct shear.	3
7.	Determination of shear strength of clay soil by Unconfined Compression Test.	2
Unit III	**CONSOLIDATION AND COMPACTION**	
Consolidation-Definition, Factors affecting Consolidation - Compaction – Definition, Factors affecting compaction, Compaction Curve - Field methods of compaction - rolling, ramming and vibration. Suitability of different types of rollers - smooth wheel roller, sheep foot roller, pneumatic tyred roller. CBR Test. **Practical**		6
8.	Determination of field density of soil by sand replacement method **(OR)** Core cutter method.	3

9.	Determination of field density & optimum moisture content using Proctor compaction test **(OR)** Modified proctor compaction test	3
10.	Determination of CBR value of the given soil sample.	3
Unit IV	**TYPES OF FOUNDATION AND BEARING CAPACITY OF SOIL**	
Types of foundation- Suitability and application of different types of foundation-Shallow and Deep foundation- Definition and significance of Bearing capacity, ultimate bearing capacity - Net safe bearing capacity and safe bearing capacity- Terzaghi's theory - assumption and Equation of bearing capacity for different footings (only formula) - Factors affecting bearing capacity of soil. Effect of water table on bearing capacity-Deep foundation-Pile, pile groups and sheet piles- Negative skin friction- Bearing capacity for pile foundation (Formula only) **Practical**		6
11.	Using Standard penetration test, Identify various types of soil in Different layer and prepare detailed report (Demonstration with models / video / Field visit)	2
Unit V	**SOIL SAMPLING & STABILIZATION**	
Sampling and types of samplers, undisturbed, disturbed and representative samples- Area ratio, recovery ratio of samples - Materials used in soil stabilization-Geo-materials, Synthetic, natural polymers, Cement, Lime & Fly ash. Different methods of soil stabilization - Deep Mixing Method, Grouting Method, Mechanical Stabilization of Soil. **Practical**		6
12.	Using Auger boring (or) Any boring method, Identify various types of soil in Different layer.	3
TOTAL PERIODS		**60**

Suggested List of Students Activity:

- Visit any two-construction site, Examine different types of soil and its properties. Finally the test results are compared with BIS standard.
- Visit any two-construction site, examine bearing capacity of soil using SPT/Pile load test
- Visit any one construction site, Examine suitable methods of soil stabilization / ground improvement techniques

Reference Books:

1. Braja M Das, "Principles of Geotechnical Engineering", 8th Edition, Cengage Learning India Private Limited, 2014.

2. Venkatramaiah, C., "Geotechnical Engineering", 4th Revised Edition, New Age International (P) Limited, Publishers, , 2012.

3. Punmia, B.C., "Soil Mechanics and Foundations", 16th Edition, Laxmi Publications Pvt. Ltd. New Delhi, 2017.

4. Gopal Ranjan and A.S.R Rao, Basic and applied soil mechanics, Third edition, 2016

5. R. D Holtz, Thomas C. Sheahan, and William D. Kovacs, An Introduction to Geotechnical Engineering, Pearson Publications, 2nd edition, 2010

6. Joseph E. Bowles, Foundation analysis and design, Mc-Graw Hill Education, 5th edition, 1995

Web-based/Online Resources:

1. Video films on Geo-technical Laboratory Practices by Vinod Kumar; NITTTR, Chandigarh
2. e-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh
3. https://swayam.gov.in
4. https://nptel.ac.in/courses/105/103/105103097
5. https://nptel.ac.in/courses/105106142
6. https://nptel.ac.in/courses/105101160
7. http://law.resource.org/pub/in/bis/S03
8. https://www.astm.org/standards/geotechnical-engineering-standards

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

S.No.	Description	Number required
1	Pycnometer	6 nos.
2	Hot air oven with all accessories such as Glass cup, Desiccators, etc.,	1No
3	Weighing balance 100kg,1kg	Each 1 No.
4	Sieve test for fine aggregate made of brace 200mm dia complete set.	2 Sets
5	Sieve test for coarse aggregate made of brass 200mm dia complete set	2 Sets
6	Liquid limit and plastic limit devices with all accessories	Each 2 Nos.
7	Direct shear machine with complete accessories	1No.
8	Proctor's compaction test **(OR)** Modified proctor compaction test apparatus with all accessories	2Nos.
9	Sand replacement test Apparatus(OR)core cutter Devices with all accessories with all accessories	1No.
10	Auger boring (or) Any boring -Soil sampling Apparatus with all accessories	1 No.
11	Unconfined compression testing apparatus with complete accessories	1 No.
12	California Bearing Ratio Test apparatus with complete accessories	1 No.

10440	Concrete Technology	L	T	P	C
Practicum		1	0	4	3

Introduction:

Concrete is the most widely used building material. It is versatile, has desirable engineering properties, can be moulded into any shape. The knowledge of concrete's-controlled production, maintenance and testing is vital for a designer to ensure its optimal use. The need for better understanding of the behavior of concrete, especially in challenging environmental conditions, requires sound knowledge of material selection, mix proportioning, and quality control methods.

Course Objectives:

On successful completion of this course, the students will be able to:

- Understand the properties and strength of cement and aggregates.
- Investigate the properties of cement and aggregate by conducting laboratory test.
- Determine the properties and strength of fresh and hardened concrete
- Design the mix proportioning of concrete.
- Describe the Manufacture of concrete, Form work and Quality control.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1 Explain the properties of cement, types and grades.

CO2 Explain the properties and classification of aggregate, water.

CO3 Describe the grades of concrete and properties of fresh and hardened concrete.

CO4 Understand the concept of mix design and evaluate their strength.

CO5 Understand the manufacturing process of concrete, form work and quality control.

Pre-Requisites:

Basic Science, Physical properties of various materials and their behavior.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	2	1	1	2
CO2	3	2	2	2	1	1	2
CO3	3	3	3	2	2	2	2
CO4	3	2	3	2	1	1	1
CO5	3	2	2	2	2	2	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- The course content shall be delivered through lectures, PowerPoint presentations, and videos demonstrations and field visits
- The Activity criteria shall be conducted / executed by the student to be submitted to the faculty.
- The PRACTICE (Performance criteria) shall be conducted by the student and Report of work done to be submitted at the end of each session to the faculty.

Assessment Methodology:

	Continuous Assessment (40 marks)			**End Semester Examination (60 marks)**
	CA1	**CA2**	**CA3**	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	Cycle 1 Exercises & Two units	Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to Marks	15	15	10	60
Marks	30		10	60
Internal Marks	40			
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal Assessment of 30 Marks.
- **The details of the documents to be prepared as per the instruction below.**
  Practical documents should be maintained for every exercise/experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	2
B	Tabulation/Observation	10
C	Graph/Sketch/Calculation	15
D	Result	3
E	Written Test	20
TOTAL		50
F	Practical Documents (As per the portions)	10
		60

- Written Test for theory portions should be conducted for 20 Marks as per the question pattern below.

Question pattern – Written Test Theory

Description		Marks	
Part – A	10 MCQ Questions	10 X 1 Mark	10 Marks
Part – B	One 10 Marks Question out of 3 Questions	1 X 10 Marks	10 Marks
TOTAL			20 Marks

- **CA 3:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	10
B	Tabulation/Observation	20
C	Graph/Sketch /Calculation	20
D	Result	10
E	Written Test	30
F	Viva Voce	10
	TOTAL	100

Note: For the written test 30 MCQ or 15 x 2 marks or 10 x 3 Marks or 6 x 5 marks or 3 x 10 Marks questions or combination of any types given above shall be asked from the theory portions.

10440	Concrete Technology	L	T	P	C
Practicum		1	0	4	3

Unit I	CEMENT	
	1.1 Chemical constituents: Bogue's compound & their properties-hydration of cement-Physical and chemical Properties of OPC cement-IS requirements of OPC & PPC.	6
	1.2 Laboratory tests: Fineness, Standard Consistency, Setting Time, Soundness, Compressive Strength - Different Grades of OPC-Storing of cement.	
	Exercises:	
	1) Determination of normal consistency and initial setting time of the given cement.	3
	2) Determination of soundness of cement by Le Chatelier's method	3
	3) Determination of Compressive Strength of cement.	3
Unit II	AGGREGATES AND WATER	
	2.1 Aggregates: Classification According to Size and Shapes	1
	2.2 Fine Aggregates: Properties- Size- Specific Gravity- Bulk Density-Water Absorption- Bulking-Fineness Modulus, Grading Zone of Sand, Silt content- Concept of Crushed Sand- Requirements of good aggregate.	2
	2.3 Coarse Aggregates: Properties- Size- Shape- Surface texture-Water Absorption- Soundness - Specific Gravity - Bulk Densit y-Fineness Modulus of Coarse Aggregate-Grading of Coarse Aggregates- Crushing Value- Impact Value- Abrasion Value-Requirements of good aggregate.	2
	2.4 Water: Quality of Water- Impurities in Mixing water and Permissible Limits for Solids as per IS 456:2000.	1
	Exercises:	
	1) Determination of silt content in sand	3
	2) Determination of bulking of River sand / M-sand	3
	3) Determination of fineness modulus of fine /coarse aggregate by sieve analysis.	3

Unit III	CONCRETE AND ITS PROPERTIES	
	3.1 Grades of concrete Different Grades of Concrete- Provisions of IS 456-Effect of Water Cement Ratio on Concrete- Duff Abram Water Cement(w/c) Ratio Law- Significance of w/c Ratio- Selection of w/c Ratio for Different Grades	3
	3.2 Properties of Fresh Concrete Workability-Factors affecting Workability of Concrete-Workability Requirement for different types of Concrete Works- Segregation, Bleeding, honey combing and Preventive Measures	2
	3.3 Properties of Hardened Concrete Strength, Durability, Impermeability of concrete	1
	Exercises: 1) Determination of workability of concrete by slump cone test. 2) Determination of workability of concrete by compaction factor test. 3) Determination of workability by Vee - Bee Consistometer Test.	3 3 3
Unit IV	CONCRETE MIX DESIGN AND TESTING	
	Concrete Mix Design Concept of mix design- Factors influencing the choice of mix proportions-Methods of Mix Design- Procedural Steps of Mix Design as per IS-10262:2019- Illustrative Example for Concrete Mix Design as per IS 10262:2019-Sampling and Acceptance criteria.	9
	Exercises: 1) Determination of compressive strength on concrete cubes 2) Non-Destructive Testing of Concrete-Rebound Hammer Test	3 3

Unit V	MANUFACTURE OF CONCRETE AND QUALITY CONTROL	
	5.1 Manufacture of concrete Concreting Operations - Batching - Mixing - Transportation, Placing, Compaction, Finishing, Curing.	3
	5.2 Formwork for concreting-Types of formwork for Beams, Slabs and Columns - Materials used for Formwork-Requirements of a Good Formwork - Stripping time for Removal of Form work as per IS:456-2000. Introduction of System Formworks.	3
	5.3 Quality Control of Concrete Necessity of supervision-Errors in concrete construction-Check list before commencing concreting.	3
	Exercises: 1) Determination of consistency of fresh concrete by flow table test.	3
	2) Determination of carbonation depth on concrete.	3
	TOTAL PERIODS	75

List of Suggested Student Activities:

- Conduct field test on cement
- Compare properties of Manufactured sand with Natural River sand
- Study on Recycled coarse aggregate and prepare a report
- Visit the construction site and study the concrete operations and prepare a report
- Conduct a site visit to RMC plant /Cement plant and prepare a report.

Reference Books

1. M.S.Shetty, Concrete Technology (Theory and Practice),8th Edition, S.Chand & Company Ltd, 2018.

2. M L Gambhir, Concrete Technology,5th Edition, McGraw Hill Education,2017.

3. S.S.Bhavikatti, Concrete Technology, 1st Edition, Dream Tech Press, 2019

Web-based/Online Resources:

1. https://archive.nptel.ac.in/courses/105/102/105102012/
2. https://www.youtube.com/watch?v=cx5gPKp9QEc&list=PLbMVogVj5nJQU7M0LdA77p_XaaWBJniNc
3. https://www.youtube.com/watch?v=gySKrFFswWE&list=PLwOk-xIeY47meXa-poHe6Iy_q-urnNv1e

LIST OF EQUIPMENTS (for a batch of 30 students):

S. No.	List of Equipment required	Quantity Required
1.	Weigh balance-digital up to 10kg capacity with 1gm accuracy battery backup with 8 hours	1 no.
2.	Le Chatelier apparatus	1 no.
3.	Compression testing machine,1000 kN capacity	1 no.
4.	Cement mortar cube mould of size 70.6mm - 3 nos.	3 nos.
5.	Sieve test for coarse aggregate made of brass 200mm dia complete set	2 sets
6.	Sieve test for fine aggregate made of brass 200mm dia complete set	2 sets
7.	Slump cone apparatus	2 nos.
8.	Compaction factor apparatus	1 no.
9.	Vee Bee Consistometer	1 no.
10.	Cement mortar cube mould of size 150mm- 3 nos.	3 nos.
11.	Flow table test apparatus for concrete	1 no.
12.	Cement mortar cube vibrator machine	1 no.

10450	Construction Practices	L	T	P	C
Practicum		1	0	4	3

Introduction:

Building Construction is a core subject in Civil Engineering, which deals with the construction processes of substructure, superstructure, Building finishes and maintenance of buildings. This course essentially imparts the knowledge of construction technology along with the processes involved in it and various construction equipment used for effective execution of various construction activities. This knowledge shall be used for effective and efficient up keeping of building after construction. This will enable the students to undertake the activities in comparatively shorter period of time.

Course Objectives:

The objective of this course is to enable the student to

- Describe the different types of foundations and set out foundation in the field for spread footing and column footing for a building
- Describe the classification of stone masonry & brick masonry. To know the different types of doors, windows, lintels & stairs.
- Describe the types of floors and roofs.
- Describe the different methods of pointing, plastering and termite proofing.
- Describe procedure of colour washing, white washing, painting and varnishing.
- Learn cutting, hooking, cranking of specimen reinforcement bar and arrangement of reinforcement for a lintel cum sunshade, one way roof slab, beam, and column with footing.
- Apply two or more coats of selected paint on the prepared base of a given wall surface.
- Apply termite chemical on given damaged sample of timber.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Recommend suitable type of foundation and set out in the field.

CO2: Identify suitable type of superstructure and recommend the appropriate construction techniques to be used.

CO3: Identify doors, windows, ventilators types, applying suitable methods of water proofing & Damp proofing

CO4: Recommend suitable stair, flooring, & roof for different buildings

CO5: Apply selected paints on wall surface and apply anti-termite chemical on damaged timber

Pre-requisites:

Basic Science, Basic Mathematics, Physical properties of various materials

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	2	1	1	2
CO2	3	2	2	2	1	1	2
CO3	3	2	2	2	1	1	2
CO4	3	2	3	2	1	1	2
CO5	3	2	2	2	1	1	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

NOTE 1: The course content shall be delivered through lectures, PowerPoint presentations, video demonstrations and field visits

NOTE 2: The Activity criteria shall be conducted / executed by the student to be submitted to the faculty.

NOTE 3: The PRACTICE (Performance criteria) shall be conducted by the student and observations and report to be submitted at the end of each session to the faculty.

Assessment Methodology:

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	Cycle 1 Exercises & Two units	Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to Marks	15	15	10	60
Marks	30		10	60
Internal Marks	40			
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal Assessment of 30 Marks.
- **The details of the documents to be prepared as per the instruction below.**
  Practical documents should be maintained for every exercise/experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	2
B	Tabulation/Observation	10
C	Graph/Sketch/Calculation	15
D	Result	3
E	Written Test	20
TOTAL		50
F	Practical Documents (As per the portions)	10
		60

- Written Test for theory portions should be conducted for 20 Marks as per the question pattern below.

Question pattern – Written Test Theory

Description		Marks	
Part – A	10 MCQ Questions	10 X 1 Mark	10 Marks
Part – B	One 10 Marks Question out of 3 Questions	1 X 10 Marks	10 Marks
TOTAL			20 Marks

- **CA 3:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	10
B	Tabulation/Observation	20
C	Graph/Sketch /Calculation	20
D	Result	10
E	Written Test	30
F	Viva Voce	10
	TOTAL	100

Note: For the written test 30 MCQ or 15 x 2 marks or 10 x 3 Marks or 6 x 5 marks or 3 x 10 Marks questions or combination of any types given above shall be asked from the theory portions.

10450	Construction Practices	L	T	P	C
Practicum		1	0	4	3

UNIT-I	
Theory Portion / Introduction	
1.1 INTRODUCTION TO STRUCTURES Permanent and temporary structures - Life of structures - Sub structure -super structure - load bearing structure - framed structure - concept of framed structure - advantages of framed structure. **1.2 FOUNDATION** Definition - objectives of foundation - Bearing capacity of soil – Definition - maximum/ultimate and safe bearing capacity - Bearing capacity of different types of soils - Requirements of a good foundation - Types of foundations - - Deep foundation: Pile, Types of piles- Causes of failure of foundation - Remedial measures	3
1.3 Practical Exercises 1.Prepare and develop a centre line plan, foundation Plan and set out spread footing in the field for the given line sketch of a building 2.Prepare and develop a centre line plan, foundation Plan and set out the layout of columns and footing in the field for the given line sketch of a building (Framed structure). 3.Study of Safe bearing capacity of soil by standard penetration test (SPT).	12
UNIT-II	
Theory Portion / Introduction	
2.1 STONE MASONRY Definition - Common terms used -Classification of stone masonry - Rubble masonry - Ashlar masonry - points to be considered in the construction of stone masonry - Tools used (Names only). **2.2 BRICK MASONRY** Definition - Common terms used -Bond - Types Header, stretcher, English bond & Flemish bond –Features-Comparison-Points to be considered in the construction of brick masonry - Defects in brick masonry	3

2.3 Practical Exercises 4.Arrangement of bricks using English bond in one brick thick wall and half brick thick for right angled corner. 5.Arrangement of bricks using English bond in one brick thick wall and half brick thick for Tee junction. 6.Arrangement of bricks using English bond in one brick thick wall and two brick thick wall square pillars.	12
UNIT-III	
Theory Portion / Introduction	
3.1 WATER PROOFING AND DAMP PROOFING Dampness - Causes of dampness - Effects of dampness – Damp proofing - Damp proof courses (DPC) - Water proofing coats for sump / overhead tank wall - Methods of grouting. **3.2 DOORS, WINDOWS AND VENTILATORS** Standard sizes of doors and windows - Location of doors and windows - Different materials used - Doors Component parts -Types – Windows- Types -Ventilators – Definition, purpose-Types. **3.3 BLOCK MASONRY CONSTRUCTIONS** Types of cement blocks-Consideration for use of hollow concrete blocks-Laying of hollow blocks-Compound walls in Block work.	**3**
3.4 Practical Exercises 7.Construct masonry wall by using concrete hollow blocks/cement blocks/model wooden bricks of 1 m height. 8.Cutting, hooking, cranking of specimen reinforcement bar and arrangement of reinforcement for a Lintel cum sunshade. 9.Apply two or more coats of Water proofing coats for sump / overhead tank wall on the prepared base of a given wall surface for the area of 1m x 1m using suitable brush/ rollers adopting safe practices.	**12**
UNIT-IV	
Theory Portion / Introduction	
4.1 STAIRS Definition - Terms used - Location of stair- types **4.2 FLOORS AND FLOORING** Floors - Definition - Types - Materials used - Selection of flooring.	**3**

4.3 ROOFS Definition - Types of roofs - Technical terms – Types of trusses.	
4.4 Practical Exercises 10.Cutting, hooking, cranking of specimen reinforcement bar and arrangement of reinforcement for a one-way roof slab. 11.Cutting, hooking, cranking of specimen reinforcement bar and arrangement of reinforcement for singly reinforced Beam. 12. Cutting, hooking, cranking of specimen reinforcement bar and arrangement of reinforcement for a Column and footing.	**12**
UNIT-V	
Theory Portion / Introduction	
5.1 WEATHERING COURSE Weathering course - Purpose - Laying Procedure. **5.2 POINTING** Objectives - Mortar for pointing - Types of pointing **5.3 PLASTERING** Definitions - Objectives - Methods of plastering - Defects in plastering. **5.4 WHITE WASHING, COLOUR WASHING, DISTEMPERING, PAINTING & VARNISHING** White washing - preparation and application - Colour washing - Distempering - process and application - Painting - preparation and application. **5.5 ANTI-TERMITE TREATMENT** Definition - objectives and uses - Methods of termite treatment.	**3**
5.6 Practical Exercises 13. Apply two or more coats of selected paint on the prepared base of a given wall surface for the area of 1m x 1m using suitable brush/ rollers adopting safe practices. 14. Plastering with cement mortar on the prepared base of a given wall surface for the area of 1m x 1m adopting safe practices. 15. Apply the relevant termite chemical on given damaged sample of timber.	**12**
TOTAL PERIODS	**75**

Suggested List of Students Activity:

- Prepare a report on stabilized mud block and porotherm block masonry construction.
- Study and present the standard size of doors, windows& ventilators for different types of buildings
- Study the suitability of staircases, ramps, elevators and escalators in different types of buildings.
- Study and present advanced surface finishing textures and its suitability
- Study and present advanced water proofing techniques and painting
- Visit a construction site and prepare a report of laying (before, during and after) floor finishes and roofing work

Reference Books:

1. Duggal, S.K, Building Materials, 5th Edition, New Age International (P) Limited Publishers, Jan 2019,

2. Peter A. Claisse, Civil Engineering Materials, 1st Edition, Butterworth- Heinemann, 2016,

3. Kathryn E. Schulte Grahame, Steven W. Cranford, Craig M. Shillaber, and Matthew J. Eckelman, Essentials of Civil Engineering Materials, 1st Edition, Cognella Academic Publishing, San Diego, 2020.

Web-based/Online Resources:

1. www.nptel.ac.in
2. http://thebooksout.com/downloads/%20%20of%20building%20materials%20bc%20punmia%20%20ebook
3. https://sites.google.com/a/mitr.iitm.ac.in/iitmcivil/ce2330

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

S.No.	List of Equipments	Quantity Required
1.	Pegs, thread, Hammer, Measuring tape, Lime powder	As required
2.	Steel rods, spirit level, straightedge, Trowel, string, plumb bob	As required
3.	Consumables like Bricks, steel rods, string, etc	As required
4.	Consumables like Water proof paints, anti-Termite chemical	1 litre each

10460	Estimation and Costing	L	T	P	C
Practicum		1	0	4	3

Introduction:

Students enrolled in the Civil Engineering diploma program are expected to acquire essential skills and knowledge in estimation and costing, critical for managing construction sites and overseeing development projects such as townships, residential colonies, and public buildings. Proficiency in estimation and costing involves a comprehensive understanding of various concepts, principles, and methodologies utilized in the construction industry. Throughout the course, teachers will utilize a combination of lectures, demonstrations, hands-on practical sessions, and field visits to facilitate learning and comprehension of estimation and costing principles. Emphasis will be placed on developing critical thinking, problem-solving, and decision-making skills essential for successful careers in the construction industry.

Course Objectives:

The objective of this course is to enable the student to:

- Understand the fundamental ideas behind estimation and costing in construction projects.
- Recognize the different methods used for estimating construction costs.
- Prepare effective budget planning for construction projects.
- Expertise in preparation of reports and writing specifications for proposed works
- Prepare bill of quantities for proposed works

Course Outcomes:

On successful completion of this course, the student will be able to

CO1 Understand the procedure of approximate estimate for various construction projects.

CO2 Understand rate analysis for various items of works using Standard data and Schedule of Rates.

CO3 Write Technical reports on the proposed projects

CO4 Write specification for various items of work.

CO5 Prepare detailed estimate of quantities of various items of works.

Pre-requisites:

Knowledge of specification, dimensions, units, conversions, masonry, Construction materials.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2					3
CO2	3	2					3
CO3	3	1				2	3
CO4	3	1				2	3
CO5	3	2					3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- The teachers are expected to drive the attention of the students to improve the student's learning ability.
- Assist the students in learning and appreciating the concepts and objectives of estimating and cost analysis of the projects they come across.
- Making the students expertise in the subject by arranging suitable activities for all the topics.
- Activity based demonstration for better understanding.
- Guide the students to correct work on an activity where there could be source of errors.

Assessment Methodology:

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	Cycle 1 Exercises & Two units	Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Internal Marks	40			
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal Assessment of 30 Marks.
- **The details of the documents to be prepared as per the instruction below.**
  Practical documents should be maintained for every exercise/experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	2
B	Tabulation/Observation	10
C	Graph/Sketch/Calculation	15
D	Result	3
E	Written Test	20
TOTAL		50
F	Practical Documents (As per the portions)	10
		60

- Written Test for theory portions should be conducted for 20 Marks as per the question pattern below. The marks scored will be converted to 15 Marks for internal assessment.

Question pattern – Written Test Theory

Description		Marks	
Part – A	10 MCQ Questions	10 X 1 Mark	10 Marks
Part – B	One 10 Marks Question out of 3 Questions	1 X 10 Marks	10 Marks
TOTAL			20 Marks

- **CA 3:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	10
B	Tabulation/Observation	20
C	Graph/Sketch /Calculation	20
D	Result	10
E	Written Test	30
F	Viva Voce	10
	TOTAL	100

Note: For the written test 30 MCQ or 15 x 2 marks or 10 x 3 Marks or 6 x 5 marks or 3 x 10 Marks questions or combination of any types given above shall be asked from the theory portions.

10460	Estimation and Costing	L	T	P	C
Practicum		1	0	4	3

UNIT I	**INTRODUCTION**	
1	**1.1 ESTIMATE:** Estimation–Definition of Estimate–Principles of estimation- Approximate estimate–Detailed estimate -Main estimate - Revised estimate–Supplementary estimate–Subestimate–Annual maintenance estimate–Repair estimate–Complete estimate. **1.2 APPROXIMATE ESTIMATES:** Necessity–Types–Plinth area method–Cubical content method–Service unit method – Typical Bay method. **Practical exercises**: 1. Prepare approximate cost for a proposed building comparing the cost of an existing one and considering the cost of escalation in materials and labour by Plinth area method. 2. Prepare approximate cost for a proposed building comparing the cost of an existing one and considering the cost of escalation in materials and labour by cubical content method. 3. Prepare approximate cost for a proposed building comparing the cost of an existing one and considering the cost of escalation in materials and labour by Service Unit Method.	**3** **4** **4** **4**
UNIT II	**MEASUREMENTS & MATERIAL REQUIREMENTS, PREPARATION OF DATA**	
2	**2.1 MEASUREMENTS & MATERIAL REQUIREMENTS:** Units of measurements for works and materials – Degree of accuracy in measurements -Deduction for openings in masonry, plastering and white washing area–Painting co-efficient–out turn of works-working out of materials requirements — cement, sand, bricks, aggregates etc. based on thumb rules for different works. **2.2 PREPARATION OF DATA** Data–Types–Main and sub data–Observed data–lead statement-Schedule of rates – Standard data book – Sundries – Lump sum provision – Preparation of data using standard data and schedule of rates.	**3**

	Practical exercises: 4.Prepare the list of items to be executed with units for detailed estimate of a given structure from the given drawing. 5. Prepare data for the given items of work (Brick and stone masonry/Plain cement concrete in foundation/ Wall plastering etc.) with necessary sub data.	**4** **4**
UNIT III	**SPECIFICATION AND REPORT WRITING**	
3	**3.1 SPECIFICATION** Specification — Necessity — Types of specifications — Essential requirements of specifications – Specification for various materials like Cement, Sand, Brick, Timber, Reinforcement Steel, Stone Aggregate, Water- Specifications for various items of works — General Specifications for a building - Culvert - Concrete Roads. **3.2 REPORT WRITING:** Report writing– Definition – Necessity of report- Points to be considered while writing a report- Documents to accompany the report. **Practical exercises** 6.Prepare a report on market rates for given material, labour wages hire charges of tools &equipment required to construct the given structure. 7. Prepare detailed Specification for Earthwork, Foundation concrete, R.C.C in Beam, R.C.C in Slab and Column.	**3** **4** **4**
UNIT IV	**TRADE SYSTEM**	
4	**4. TRADESYSTEM:** Introduction - Taking off Quantities: Systems – Trade system – Group system — Methods — Long wall and Short wall method — Centre line method–Preparation of data–Lump sum provision and contingencies –Quantity surveyor–Duties–Essential Qualities. **Practical exercises** 8.Prepare detailed estimate for the given set of drawings using standard measurement sheet for load bearing residential structure using description of item from 1BHK building. 9.Prepare detailed estimate for the quantity of items of work from the given set	**3** **4** **4**

	of drawings using standard measurement sheet for RCC framed structure using description of item 1BHK building. 10.Prepare detailed estimate for the given Septic tank with dispersion trench or soak pit.	**4**
UNIT V	**GROUP SYSTEM**	
5	**5. GROUP SYSTEM:** Advantages of group system–Taking off and Recording Dimensions–Squaring Dimensions- Abstracting or Working up—Billing—Abbreviations. – Dimension paper–Dimensioning, Dimension, Squaring, Descriptive column – Cancellation of Dimensions – Descriptions–Spacing of Dimensions– Order of taking off–Squaring the Dimensions-Method of Squaring – Checking the Squaring – Casting up the dimensions – Function of the Abstract–Order in th Advanced Surveying e Abstract–Preparing the abstract –Casting and reducing the Abstract – Method of writing Bill –Checking the Bill. **Practical exercises** 11.Prepare detailed estimate for brick work for the given set of drawings using standard measurement sheet for load bearing residential structure (1BHK building). 12.Prepare detailed estimate for RCC for the given set of drawing using standard measurement sheet (1BHK building) 13.Prepare bar bending schedule for the given two way slab. 14.Prepare bar bending schedule for the given square column and square footing. 15.Prepare bar bending schedule for the given singly reinforced and doubly reinforced beams.	**3** **4** **4** **4** **4** **4**
TOTAL PERIODS		**75**

Suggested List of Students Activity:

1. **Site visits:** Organize visits to construction sites where students can observe different measurement methods, preparation of estimates and BOQ .
2. **Guest lecturers:** Invite industry professionals such as quantity surveyors, cost engineers, or project managers to deliver topics related to estimation and costing in construction projects.

Reference Books

1. B.N. Dutta, Estimating and Costing in Civil Engineering, 28th edition , CBS Publishers and distributors Pvt. Ltd., 30 December 2020

2. M. Chakraborti, Estimating, Costing, Specification and Valuation in Civil Engineering, 24th Edition, M.K. Publishers and distributors Pvt Ltd., 2010

3. Rangwala, Estimating, Costing and Valuation, 17th edition , Charotar Publishing House Pvt. Ltd., 1 January 2017

Web-based/Online Resources:

1. Estimation of Building - https://www.youtube.com/watch?v=lOUt8b-PzuU
2. How To Prepare Construction Cost Estimation Format In Excel For Projects - https://www.youtube.com/watch?v=iRFjOwaMYdA
3. How To Calculate Material Cost - https://www.youtube.com/watch?v=HpNLucXrc54
4. Estimation using Center Line Method - https://www.youtube.com/watch?v=grJ8YLOk8kI
5. Numerical on Bar Bending Schedule of Beam - https://www.youtube.com/watch?v=ckRMZbzBDG4
6. How to Take-off and Use - https://www.youtube.com/watch?v=qmde_pRAjpM

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)
As required

V SEMESTER

10510	Design of RCC Structures (Limit State Method)	L	T	P	C
Theory		4	0	0	4

Introduction:

This is a core subject which covers broad elements of RCC design of various structural elements. Diploma holders in Civil Engineering will be required to supervise RCC construction. They may also be required to design simple structural elements and make changes in design depending upon the availability of materials (bars of different diameters).

This subject thus deals with elementary design principles of structural elements as per Indian Standard practice IS:456 - 2000 by limit state method.

Course Objectives:

The objectives of the course are to enable the students to

- Analyse and design of simple RCC elements like singly, doubly reinforced rectangular beams, and singly reinforced simply supported T-beams for flexure and shear.
- Design One way/ Two way simply supported slabs.
- Design Axially loaded Columns and Footings.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Demonstrate the basic concepts of reinforced cement concrete and the design of beams for flexure.

CO2: Describe the design of rectangular beams for shear and designing of staircase.

CO3: Analyse the T- beams and continuous beams and design for flexure.

CO4: Design the one-way and two way slabs.

CO5: Explain the design of columns and column footings.

Pre - requisites:

Mechanics of Materials and Mechanics of Structures.

CO/PO Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	-	2	-	3
CO2	3	3	2	-	2	-	3
CO3	3	3	2	-	2	-	3
CO4	3	3	2	-	2	-	3
CO5	3	3	2	-	2	-	3

Legend: 3 - High Correlation, 2 - Medium Correlation, 1 - Low Correlation

Instructional Strategy

- This subject is introduced so that diploma holder in Civil Engineering may appreciate the concepts and principles of RCC structural elements of buildings and are able to apply the knowledge gained through the subjects of mechanics of materials and mechanics of structures. The design of simple structural elements like beams, slabs, column and footings will be explained to the students to expose them in the field.
- Teacher should give simple exercises involving the applications of various concepts and principles being taught in the subject.
- Efforts should be made to prepare tutorial sheets on various topics and students should be encouraged/guided to solve the tutorial problems independently and visit to local construction site to understand the behaviour and uses of structural elements.
- Teacher may conduct weekly small quiz sessions to know the students' level of understanding.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of two will be considered for the internal assessment of 15 Marks.

CA1 and CA2, Assessment test should be conducted for two units as below.

PART A (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write Five questions. Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 20 marks for the internal assessment.

Question Pattern:

Answer Ten questions by selecting two questions from each unit. Each question carries 10 marks each.

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

10510	Design of RCC Structures (Limit State Method)	L	T	P	C
Theory		4	0	0	4

UNIT I	INTRODUCTION TO REINFORCED CEMENT CONCRETE STRUCTURES	
	1.1 INTRODUCTION TO LIMIT STATE METHOD OF DESIGN IN REINFORCED CEMENT CONCRETE Reinforced Cement Concrete Materials used in R.C.C and their basic requirement- Purpose of providing reinforcement-Different types and grades of cement and steel - Characteristic strength and grades of concrete as per IS 456 - 2000. Limit State Method - Concept -Advantages- Different limit states Characteristic strength and design strength of materials - Characteristic loads and design loads - Partial safety factors for loads and material strength - Limit state of collapse in flexure - Assumptions -Limiting values of neutral axis of singly reinforced section for different grades of steel - Problems of Moment of resistance of singly and doubly reinforced rectangular sections only. **1.2 DESIGN OF RECTANGULAR BEAMS FOR FLEXURE** Design requirements-Effective spans of cantilever and simply supported beams - Breadth and depth requirements of beams - Control of deflection - Minimum depth requirement for stiffness- Minimum concrete cover to reinforcement steel for durability and fire resistance - Minimum and maximum areas/ spacing for main reinforcement and side face reinforcement as per IS 456 -2000- Development Length - Anchorage values of bends and hooks - Curtailment of reinforcements- Design bending moments - Design of singly and doubly reinforced rectangular beams (Cantilevers and Simply supported beams carrying udl only)- Problems.	**12**

UNIT II	**DESIGN OF RECTANGULAR BEAMS FOR FLEXURE AND SHEAR**	
	2.1 DESIGN OF BEAMS FOR SHEAR Limit state of collapse in shear - Design shear strength of concrete - Design shear strengths of vertical / inclined stirrups and bent up bars - Principle of shear design - Critical sections for shear- S.F Coefficients specified by IS:456- 2000 - Nominal shear stress - Minimum shear reinforcement - Design of vertical stirrups for rectangular beams by using limit state method. **2.2 PLANNING OF STAIRCASE** Types of stairs – Effective span of stairs as per IS code – Classification based on structural behaviour –standard dimensions- Planning of dog legged staircase.	**12**
UNIT III	**DESIGN OF T-BEAMS AND CONTINUOUS BEAMS**	
	3.1 DESIGN OF T-BEAMS FOR FLEXURE Cross sections of Tee and L-beams- Effective width of flange- Neutral Axis and M.R of Singly Reinforced T-Sections- Design of singly reinforced T-beams for flexure-Problems on Simply supported T-beams carrying udl only. **3.2 DESIGN OF CONTINUOUS BEAMS FOR FLEXURE** Methods of analysis of continuous beams- Effective Span- Arrangement of Loading for Critical Bending Moments- B.M coefficients specified by IS:456-2000-Design of rectangular continuous beams (Singly Reinforced) using B.M. coefficients (equal spans &u.d.l only) for sagging and hogging moments.	**12**
UNIT IV	**DESIGN OF SLABS**	
	4.1 DESIGN OF ONE WAY SLABS Classification of Slabs Effective spans - Loads (DL and IL) on floor/roof slabs and stairs (IS:875-1987) - Strength and Stiffness requirements - Minimum and maximum permitted size, spacing and	**12**

	area of main and secondary reinforcements as per IS 456 - 2000- Cover requirement to reinforcements in slabs- Design of cantilever/simply supported one way slabs by limit state method - Check for shear and stiffness. **4.2 DESIGN OF TWO WAY SLABS** Introduction -Effective spans -Thickness of slab for strength and stiffness requirements - Middle and Edge strips - B.M coefficients as per IS:456 for Simply supported and Continuous slabs - Design of simply supported two way slabs.	
UNIT V	**DESIGN OF R.C.C. COLUMNS AND COLUMN FOOTINGS**	
	5.1 DESIGN OF R.C.C COLUMNS Limit state of collapse in compression - Assumptions - Limiting strength of short axially loaded compression members - Effective length of compression members - Slenderness limits for columns - Classification of columns -Minimum eccentricity for column loads - Longitudinal and Transverse reinforcement requirements as per IS 456-2000 - Cover requirement - Design of axially loaded short columns with lateral ties. **5.2 DESIGN OF COLUMN FOOTING** Basic requirements of Footings-Types of R.C footings - Minimum depth below GL- Footings with uniform thickness and varying thickness (sloped footing) – Critical sections for BM, Transverse/Punching Shears – Minimum reinforcement - Development length, Anchorage, Cover, Minimum edge thickness requirements as per IS 456- 2000 – Design of Isolated square and rectangular footings with uniform thickness only. Numerical Problems either on (i) Designing Size of Footing and Area of tension steel for flexure only for the given Column load and SBC of soil, or on (ii) Checking the footing for Punching shear and Transverse shear only, for the given sizes and other required details of the footing.	**12**
	TOTAL PERIODS	**60**

Suggested List of Students Activities:

- Visits to nearby construction site and study about
  - (i) Foundation and Footings
  - (ii) Column reinforcements
  - (iii) Grade beam and lintel level beam reinforcement arrangements
  - (iv) Reinforcement details for beams and slabs
- Study the bar bending details of structural drawings.
- Learning the reinforcement arrangements given in SP-34 (Hand book on concrete reinforcement and detailing)

Reference Books

1. B.C.Punmia "Limit state Design of Reinforced concrete"revised edition, Lakshmi publications, Delhi, 2016
2. P.C.Varghese "Limit state design of reinforced concrete", 2nd edition PHI Learning Pvt. Ltd, 2008
3. S.S.Bhavikatti "Design of RCC and structural elements", 1st edition, New age International Publications, 2016
4. Ashok K Jain, Reinforced Concrete: Limit State Design, 7th edition, Nem Chand & Brothers, 2012.
5. IS 456 -2000, IS 875-1987, IS 800-2007 , BIS.

Web - based/Online Resources

1.Limit state method	:	https://youtu.be/jhVh4qNa_x8?si=YNSfiPtXo1DDZANC
2.Analysis of singly reinforced beams	:	https://youtu.be/o4-EAjGhzSw?si=lID2GPM_ZcvIqx3e
3.Design of flanged beams in flexure	:	https://youtu.be/BOtUb1yk8sI?si=RSfF6k9F_SHnZium
4.Design of slabs	:	https://youtu.be/TQLehidE6Hc?si=eTEtZDufiXFmvp9-
5.Design of columns	:	https://youtu.be/n-D56dTyiyk?si=SGY0E46YRd1LZucG

10521	Mechanical, Electrical and Plumbing services	L	T	P	C
Theory		3	0	0	3

Introduction:

- Diploma holders in Civil Engineering are expected to coordinate with Mechanical, Electrical and Plumbing works in a structure while construction.
- Apart from Civil Engineering, some of the topics dealing with HVAC, Electrical and Plumbing are discussed in this subject to impart theoretical knowledge to the students.

Course Objectives:

The objectives of the course are to enable the students to

- Understand Mechanical systems encompass heating, ventilation, and air conditioning (HVAC), ensuring indoor comfort and air quality.
- Know about Electrical systems for designing power distribution, lighting, and security systems, ensuring a safe and efficient electrical supply.
- Study the Plumbing systems incorporated water supply, drainage, and fire protection systems, ensuring proper sanitation and safety measures.
- Calculate Heat load, Electrical panel schedule and assigning size of a pipe.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Describe the MEP services and its importance

CO2: Encompass the heating, ventilation, and air conditioning (HVAC) systems

CO3: Explain the aspect of installation of electrical wiring, lighting, power distribution, and safety systems.

CO4: Ilustrate the Plumbing system including water supply, drainage, sewage, and firefighting systems.

CO5: Calculate the Heat load for HVAC, Electrical panel schedule and assigning size of a pipe used in plumbing

Pre - requisites:

Environmental Engineering

CO/PO Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	-	3	3	2	1
CO2	2	2	-	3	3	2	1
CO3	2	2	-	3	3	2	1
CO4	2	2	-	3	3	2	1
CO5	2	2	-	3	3	2	1

Legend: 3 - High Correlation, 2 - Medium Correlation, 1 - Low Correlation

Instructional Strategy

- This subject introduced to the Diploma students to expose the MEP (Mechanical, Electrical, and Plumbing) works that will be installed in a building for effective functioning of various services.
- Nowadays, the diploma Engineers also expected to carried out these works during construction with the help of other services personnel. Hence this subject gains importance now to learn the basics of MEP.
- Faculty should give simple exercises involving the applications of various concepts and principles being taught in the subject.
- Efforts should be made to prepare tutorial sheets on various topics and students should be encouraged / guided to solve the tutorial problems independently and visit to local construction site to understand the behaviour and uses of MEP.

Faculty may conduct weekly small quiz sessions in every week to know the students' level of understanding.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of two will be considered for the internal assessment of 15 Marks.

CA1 and CA2, Assessment test should be conducted for two units as below.

PART A (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write Five questions. Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 20 marks for the internal assessment.

Question Pattern:

Answer Ten questions by selecting two questions from each unit. Each question carries 10 marks each.

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

10521	Mechanical, Electrical and Plumbing services	L	T	P	C
Theory		3	0	0	3

UNIT I	**INTRODUCTION TO MEP**	
	Introduction to MEP – MEP services - Scope, Importance and future application – Types of building - Introduction to AutoCAD, Revit software and other software's – Study of building components.	6
UNIT II	**HVAC SYSTEM DESIGN**	
	Introduction to HVAC- scope, importance and future- functions of HVAC systems – heating – ventilation and air-conditioning – Codes and standards – ASHRAE, ISHRAE, IMC- Ducts and its types, Duct fittings, Flexible ducts etc. Duct elbows selections, Vanes, dampers and their importance - Duct designing methods (manual calculations) using Equal friction/Velocity reduction method-Pipe sizing methods- Chilled water pipe sizing, Pump size – Introduction to Software's – MACQUAY, HAP, Trane Trace 700.	9
UNIT III	**ELECTRICAL SYSTEM DESIGN**	
	Introduction to Electrical system-Symbols-NEC codes-Types and selection of wiring systems, wires and cables - Lighting, power circuit - Types of Light fittings and power sockets- wiring diagrams- sensors and applications-Conduit Layout Design, Lighting and Power load estimation - Load balancing-Types and selection of Circuit Breakers and underground cables- UPS & Inverters- Fire protection and Alarm System - Earthing and lightning protection system- Introduction to software – Electrical system drafting (CAD) and modeling(Revit), Comcheck, Visual, Dialux.	9
UNIT IV	**PLUMBING SYSTEM DESIGN**	
	Fundamentals of plumbing system - fixtures, faucets & fixture fittings – IPC code and symbols - External & internal water supply and return system –Sanitary drainage system - vent pipe system - Storm water drainage system – Gas line - Fire Fighting Systems – Fire Extinguisher and Sprinkler System – Dry & Wet Riser Systems – Pipe selection and Sizing.	9

UNIT V	Calculation for HVAC, Electrical and Plumbing	
	HVAC Heat Dissipation – Internal Heat Load – External Heat Load – Temperature differential – outside temperature – Inside temperature - Heat load calculation for a building. **ELECTRICAL for a building** Lighting, ceiling fan, receptacles watts - Panel schedules for a building. **PLUMBING** Velocity pressure - Pipe selection and Sizing for a building.	12
	TOTAL PERIODS	45

Suggested List of Students Activities:

1. Visit to nearby construction site and study about
   (i) HVAC
   (ii) Electrical works
   (iii) Plumbing works
2. Study the MEP drawings.
3. Do MEP design for a small building.

Reference Books

1. Walter T. Grondzik, Alison G. Kwok and Benjamin Stein," Mechanical and Electrical Equipment for Buildings" 11th edition, Wiley Publisher, 2009
2. A K Mittal," Electrical and Mechanical Services in High Rise Buildings" 2nd edition, CBS Publishers & Distributors, 2015
3. Allan R. Hambley," Electrical Engineering: Principles & Applications", 6th edition, Pearson Education India, 2016

Web - based/Online Resources

1. https://www.youtube.com/watch?v=zjfLuiMk16g
2. https://www.youtube.com/watch?v=FwGay2rhEFQ
3. https://www.youtube.com/watch?v=NcvwKxKzzmw
4. https://www.youtube.com/watch?v=bsdt310LESw

5. https://www.youtube.com/watch?v=Y3wLzo-nIX4
6. https://www.youtube.com/watch?app=desktop&v=lgX9SH297qM&t=192s
7. https://www.youtube.com/watch?v=6Z5ymsIdkh0
8. https://www.youtube.com/watch?v=sDxX89JZJdU

10522	Irrigation and Water Resources Engineering	L	T	P	C
Theory		3	0	0	3

Introduction:

Diploma holders in civil engineering have to supervise the construction, repair and maintenance of canals, head works, cross drainage works, regulatory and other works. Some of diploma holders are involved in practice of irrigation by different methods and for preventing water logging. This subject imparts knowledge regarding basics of Irrigation, Methods of Irrigation, soil water plant relationship, Crop water Requirement, Hydrology, Ground water, constructional features of head works, cross drainage works, causes and prevention of water logging.

Course Objectives:

The objectives of the course are to enable the students to

- Understand the concept of necessity of irrigation in India
- Recognize different crops and their water requirements
- Know about rainfall and runoff
- Understand the components of hydrological cycle and hydrograph.
- Understand the occurrence of ground water and ground water exploration methods.
- Know about measurement of rainfall and read rain gauges and hydrographs
- Monitor construction and maintenance work of canal and canal linings
- Supervise maintenance and construction work of canal head works and cross regulators

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Describe the different methods to increase the yield of Crops, various methods of irrigation and their suitability.

CO2: Explain the soil-water plant relationship, water requirements of crops and cropping pattern in India.

CO3: Explain the concept of Hydrology, measurement of rain gauge, ground water resources and measurement of yield of well,

CO4: Design the different hydraulics structures like dams, spillways, weir and barrages and the maintenance concepts.

CO5: Describe about the construction and maintenance work of canal and canal linings, canal head works and cross regulators

Pre-requisites: Nil

CO/PO Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	1	2	2	2
CO2	3	3	1	1	2	2	2
CO3	3	3	1	1	2	2	2
CO4	3	2	1	1	2	2	1
CO5	3	2	3	1	2	2	1

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- It is advised that teachers take steps to pique pupils' attention and boost their learning confidence.
- To help students learn and appreciate numerous concepts and principles in each area, teachers should provide examples from daily life, realistic situations, and real-world engineering and technological applications.
- The demonstration can make the subject exciting and foster in the students a scientific mindset. Student activities should be planned on all the topics.
- Throughout the course, a theory-demonstrate-practice-activity strategy may be used to ensure that learning is outcome and employability-based.
- Do not let students work on an activity or an experiment with the expected outcome, rather allow students to be honest about whatever the results of the experiment are. If the results are different from the expectations, students should do an analysis where they could be the source of error, if any.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of two will be considered for the internal assessment of 15 Marks.

CA1 and CA2, Assessment test should be conducted for two units as below.

PART A (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write Five questions. Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 20 marks for the internal assessment.

Question Pattern:

Answer Ten questions by selecting two questions from each unit. Each question carries 10 marks each.

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

10522	Irrigation and Water Resources Engineering	L	T	P	C
Theory		3	0	0	3

UNIT I	**IRRIGATION AND ITS METHODS**	
	1.1 INTRODUCTION Definition of Irrigation – Water resources in India – Necessity - Benefits of Irrigation – Ill-effects of Irrigation – Types of Irrigation - Command area development - Impact of irrigation on environment **1.2 METHODS OF IRRIGATION** Function of Irrigation water – Standards of Irrigation water - Methods of applying water to crops – Surface irrigation - Uncontrolled flooding – Free flooding – Contour Laterals – Border strip method – Check flooding – Basin flooding – Zig-Zag method – Furrow method – Contour farming – Sub-Surface Irrigation – Micro irrigation - Drip Irrigation – Sprinkler irrigation.	**3** **6**
UNIT II	**SOIL WATER PLANT RELATIONSHIP AND WATER REQUIREMENTS OF CROPS**	
	2.1 SOIL - WATER PLANT RELATIONSHIP Soil-water plant relationship - Soil moisture content - Depth of soil water available to plants - Infiltration - Permanent and Ultimate Wilting point – Soil Fertility. **2.2 WATER REQUIREMENTS OF CROPS** Depth and Frequencies of Irrigation - Duty and Delta of water - Factors affecting duty - Problems - Command area and Intensity of Irrigation - Consumptive use of water and Evapo-Transpiration - Irrigation Efficiencies - Problems - Crops and crop seasons in India - Cropping pattern - Crop Rotation - Assessment of Irrigation water.	**3** **6**
UNIT III	**HYDROLOGY AND GROUND WATER**	
	3.1 HYDROLOGY Introduction - Definition -Application of Hydrology in engineering - Hydrological cycle - Precipitation - forms of Precipitation - measurements of rain fall - Rain gauge - Types of rain gauges - Rain gauge network -	**6**

	Mean rainfall over a drainage Basin - Methods - Radar and Satellite Measurements of rainfall and runoff -Estimation of runoff - Losses - Hydrograph - Unit Hydrograph - Uses **3.2 GROUND WATER** Ground water resources- Zones of Ground water-Aquifer - Types- Terms used -porosity, permeability, yield, specific yield, specific retention, coefficient of storage, specific capacity - Measurement of yield of well - Pumping test- Recuperation test- Ground water exploration.	**3**
UNIT IV	**DAMS SPILLWAYS AND DIVERSION HEAD WORKS**	
	4.1 DAMS AND SPILLWAYS Classification of Dams – Comparison of Earthen and Gravity Dams - Earthen Dams – Components and their function, typical cross section - Types of failures of earthen dams and remedial measures - Gravity Dams - Typical cross section - Drainage gallery – Spillways –Definition, function, location and components –Types. **4.2 DIVERSION HEAD WORKS** Diversion Head Works - Components, layout, function and types - canal head regulator, silt excluders and silt ejectors. Barrages – components and their function - Difference between weir and barrage.	**6** **3**
UNIT V	**IRRIGATION CHANNELS CROSS DRAINAGE WORKS AND CANAL REGULATION WORKS**	
	5.1 DESIGN OF IRRIGATION CHANNEL Canals - Classification of canals - Design of the most economical canal section – Comparison of Kennedy's silt theory and Lacey's regime theory - Canal lining – Definition - Types and advantages of canal lining - Properties of good canal lining material – Water Logging – Causes of Water-Logging – Remedial Measures. **5.2 CROSS DRAINAGE WORKS AND CANAL REGULATION WORKS** Cross Drainage Works (CD Works) – Types of CD works – Canal Fall – Canal Escapes – Cross regulator and Distributary head regulator - Canal Outlet.	**6** **3**
	TOTAL PERIODS	**45**

Suggested List of Students Activities:

- Presentation/Seminars by students on any recent technological developments based on the Irrigation
- Periodic class quizzes conducted on a weekly/fortnightly based on the course
- Prepare Models of dams/ spillways
- Compare various irrigation methods and identify the suitable irrigation method for the various crops.
- Presentation/Seminars by students on the necessities of cross drainage works and canal regulation work

Reference Books

1. Santhosh Kumar Garg, Hydrology and water resources engineering, 25th edition, khanna publishers, Delhi, 2018
2. K.Subramanya, Engineering hydrology, 5th edition, Tata McGraw-Hill publishing company ltd., New Delhi, 2020.
3. B.C. Punmia, Ashok Kumar Jain ,Arun Kumar Jain ,Pande Brij Basi Lal ,Introductory Irrigation Engineering, 17th edition, Laxmi Publication, Delhi, 2021

Web-based/Online Resources

1. Introduction -https://youtu.be/ibzY0LjHu38
2. Soil Water - https://youtu.be/mg6UoXcBkyA
3. Crop Water Requirements - https://youtu.be/e7pckUDQ9oI
4. Evapo-transpiration - https://youtu.be/tSA18XoqMVQ
5. Irrigation Efficiencies - https://youtu.be/rZ4c-nB0ukQ
6. Sprinkler Irrigation - https://youtu.be/tZ1K3PFF0NU
7. Drip Irrigation - https://youtu.be/aMPRw71MIyw

10523	Defects in Building and Remedies	L	T	P	C
Theory		3	0	0	3

Introduction: This course is framed to offer an inclusive introduction to the field of Construction and Maintenance of Civil Engineering Infrastructure to catering essential knowledge through various sub-disciplines with in this field. It is tailored to meet the educational requirements typically outlined in the syllabus for diploma studies in Civil Engineering. A diploma holder in Civil Engineering is expected to acquire the knowledge and training to supervise and construct the building and to detect the defects in building and remedies. They should also be aware of the maintenance of building in effective manner.

Course Objectives:

The objective of this course is to enable the students to,

- Classify the type of cracks.
- Understand the causes of cracks in building.
- Know the methods of maintenance of building.
- Examine the defects in building and
- Study the assessment methodology of damaged building.
- Choose the suitable repairing materials required for damaged building.
- Understand the methods and inspection technique required for damaged building.
- Have knowledge of repair and strengthening of RCC members.

Course Outcomes:

After successful completion of this course, the students should be able to		
CO1	:	Detect the reason for cracks and method of maintenance required in building.
CO2	:	Observe the defects in building and their assessment methodology.
CO3	:	Select the suitable repairing materials needed for damaged building.
CO4	:	Examine the methods and inspection technique required for damaged building.
CO5	:	Be familiar with repair and strengthening of RCC members.

Pre-requisites: Construction Materials and Practice.

CO/PO Mapping:

CO /PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	1	2	3	1	3
CO2	3	1	1	2	3	1	3
CO3	3	1	1	2	3	1	3
CO4	3	1	1	2	3	1	3
CO5	3	1	1	2	3	1	3

Legend:3-HighCorrelation,2-MediumCorrelation,1-LowCorrelation

Instructional Strategy:

- Engage and Motivate: Teachers should actively engage students to boost their learning confidence.
- Real – world Relevance: Teachers are expected to physically show various causes of development of cracks while imparting the instructions. Students should be encouraged to collect the various reasons for the development of cracks and failure of RCC structure.
- Interactive Learning: Teachers are expected to organize demonstration and field visits to show about the various operations involved in the repair and rehabilitation of RCC structures.
- Application – Based Learning: Throughout the course, a theory demonstrates – practice – activity strategy may be used to ensure the outcome of the learning is employability-based one.
- Simulation and Real–World Practice: In addition to the theoretical instructions, different activities pertaining to the simulated Environment, transition in to real – world scenarios, when possible, like expect lectures, seminars, visits to Construction plant may also be organized.
- Encourage Critical Analysis: Foster an environment where students can understand the experiment outcomes and infer the potential sources of error in case of any discrepancies.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of two will be considered for the internal assessment of 15 Marks.

CA1 and CA2, Assessment test should be conducted for two units as below.

PART A (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write Five questions. Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 20 marks for the internal assessment.

Question Pattern:

Answer Ten questions by selecting two questions from each unit. Each question carries 10 marks each.

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

10523	Defects in Building and Remedies	L	T	P	C
Theory		3	0	0	3

UNIT I	CRACKS IN BUILDINGS AND MAINTENANCE	
Cracks – Definition - Reasons for cracks in concrete - Classification of cracks – Wall cracks - Microcracks - Macrocracks – Plastic shrinkage cracks – Plastic settlement cracks – Drying Settlement cracks – Foundation settlement Cracks - Thermal cracks – Map cracks due to alkali aggregate reaction – Longitudinal cracks due to corrosion – Transverse cracks due to loading – Shear cracks due to loading. Maintenance – Definition – Objective of maintenance – Maintenance Services – Safety of Buildings – Classification of Maintenance – Names only.		9

UNIT II	DEFECTS IN BUILDING AND THEIR ASSESSMENT	
Defects – Definition - Damage assessment procedure - Visual observation - Sketches of typical defects found by visual inspection - Testing of concrete - Quality Control tests - Slump tests - Compression test - Non-destructive test - Rebound / Schmidt hammer test - Ultrasonic Pulse Velocity Test - Acoustic Emission Test - Cover thickness survey - Rapid Chloride Permeability Test –Sorptivity Test - Core sampling and testing – Precautions during core drilling.		9

UNIT III	METHODS AND INSPECTION TECHNIQUES	
Inspection – Definition - First Survey - Second Survey - Carbonation test - Corrosion of reinforcing bars - Assessment of cracks - Assessment of evidence of water leakage - Deterioration of concrete strength - Assessment of a large deflection - Assessment of surface deterioration - Third Survey - Corrosion of beam – Cracking - Water leakage.		9

UNIT IV	REPAIRING MATERIALS FOR RCC MEMBERS	
Repair – Definition - Repair materials - Criteria for selection of repair materials - Methodology for selection of repair materials - Material properties - Factors affecting the selection of a repair material - Essential parameters for repair materials - Classification of repair materials - Patch repairing - Cement patching mortar and concrete - Polymer concrete and mortar - Epoxy resin mortar and concrete - Quick setting compounds –		9

Ferrocement – SIFLON – SIMCON – Grouts – Shotcrete - Bonding agents.		
UNIT V	**REPAIR AND STRENGTHENING OF RCC MEMBERS**	
Rehabilitation – Retrofitting – Definition - Crack injection repair to concrete structures - Epoxy resins - Polyurethane resins – Jacketing - Plate bonding - Strengthening of foundation - Techniques to restore original strength of Columns, Beam and Slabs – Stitching - Repair procedure for corrosion damaged elements - Treatment of distressed floor in Toilets / Kitchen - Strengthening solution using FRP Plates.		9
TOTAL PERIODS		**45**

Suggested List of Students Activity (Ungraded):

- Prepare a report of a field visit to nearby construction site.
- Prepare a report of a field visit to nearby damaged building.
- Study the development of cracks in the existing building and prepare the report.
- Study the causes of collapse of existing building and prepare the report.
- Periodic class quizzes conducted on a weekly/fortnightly based on the course.

Reference Books:

1. R.N. Raikar, Learning from Failures, Dhanpatrai& Sons, New Delhi, 2008.
2. K.S. Jagadish, B.Reddy, V. Venkatarama & Rao, K.S. Nanjunda, Alternative Building Materials and Technologies, New Age Publisher, New Delhi, 2007.
3. Dr.S. Thirugnanasambandam, Building repairs and maintenance, Annamalai University, Tamil Nadu, 2023

Web-based/Online Resources:

1. https://www.academia.edu/33846701/General_Building_Defects_Causes_Symptoms and Remedial Work
2. https://www.irjet.net/archives/V6/i3/IRJET-V6I31180.pdf
3. https://www.bd.gov.hk/en/safety-inspection/building-safety/index_bsi_defects.html.

10524	Urban Planning and Development	L	T	P	C
Theory		3	0	0	3

Introduction:

Urban planning and development also known as town planning, city planning, regional planning, or rural planning in specific contexts, is a technical and political process that focuses on the development and design of land use and the built environment. Urban planning focuses on the physical layout of cities, including buildings, roads, parks, and public spaces. It considers how different activities (residential, commercial, industrial) are distributed within the urban area. Urban planning aims to enhance the quality of life for residents by addressing social needs and equity.In the late 20th century, the concept of sustainable development gained prominence. It aims to meet present needs without compromising the ability of future generations to meet their own needs.

Course Objectives:

The objective of this course is to enable the student to

- Introduce to Urban Planning and Development and Understand the basic terms & Principles of Town Planning.
- Gain Knowledge about housing agencies.
- Familiarize students with the Master plan and Deplaning.
- Understand the basic functions of Traffic Management.
- Get Awareness of advancements in town planning.

Course Outcomes:

On Successful Completion of this Course, The Student will be able to	
CO1	Understand the principles of town planning and surveys.
CO2	Explain the requirements of housing and slum clearance.
CO3	Prepare master plan and re planning of existing towns.
CO4	Understand the requirements and types of urban roads and traffic management.
CO5	Describe the various policies and schemes of town planning and sustainable development planning.

Pre-requisites:

Knowledge of basic Science

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	3	-	2	3	3
CO2	3	-	2	2	-	-	3
CO3	3	2	3	-	2	3	2
CO4	2	2	2	2	-	2	2
CO5	2	-	3	-	-	3	2

Legend:3-HighCorrelation,2-MediumCorrelation,1-LowCorrelation

Instructional Strategy

- It is advised that teachers take steps to pique pupils' attention and boost their learning confidence.
- To help students learn and appreciate numerous concepts and principles in each area, teachers should provide examples from daily life, realistic situations, and real-world engineering and technological applications.

- The demonstration can make the subject exciting and foster in the students a scientific mindset. Student activities should be planned on all the topics.
- Throughout the course, a theory-demonstrate-practice-activity strategy may be used to ensure that learning is outcome and employability-based.
- Do not let students work on an activity or an experiment with the expected outcome, rather allow students to be honest about whatever the results of the experiment are. If the results are different from the expectations, students should do an analysis where they could be the source of error, if any.

Assessment Methodology:

	Continuous Assessment (40 marks)				**End Semester Examination (60 marks)**
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of two will be considered for the internal assessment of 15 Marks.

CA1 and CA2, Assessment test should be conducted for two units as below.

PART A (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write Five questions. Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 20 marks for the internal assessment.

Question Pattern:

Answer Ten questions by selecting two questions from each unit. Each question carries 10 marks each.

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

10524	Urban Planning and Development	L	T	P	C
Theory		3	0	0	3

UNIT I	TOWN PLANNING PRINCIPLES	
	1.1 General - Evolution of planning - Objects of town planning — Economic justification for town planning - Principles of Town planning - Necessity of town planning – Types of Urban Planning **1.2** Surveys – Zoning - Origin of towns - Growth of towns — Stages in town development - Distribution of land - Forms of planning - Site for an ideal town - Requirements of new towns - Planning of a modern town - Cost of Town planning - Present position of Town Planning in India.	8

UNIT II	HOUSING AND SLUMS	
	2.1 HOUSING General - Importance of housing - Demand for houses - Building site - Requirements of residential buildings -Classification of residential buildings - Design of residential areas - Rural Housing - Agencies for housing -Investment in housing - HUDCO – CIDCO - Housing problems in India. **2.2 SLUMS** General - Causes of slums - Characteristics of slums - Effects of slums - Slum clearance - Problems in removing slums - Resources for slum clearance Programmes - The Indian slums.	10

UNIT III	MASTER PLAN AND RE-PLANNING OF EXISTING TOWNS	
	3.1 MASTER PLAN General – Objects – Necessity - Factors to be considered - Data to be collected - Drawings to be prepared - Features of master plan- Planning standards – Report – Stages of preparation – Method of Execution - Conclusion. **3.2 RE-PLANNING** General - Objects of re-planning – Analyzing the defects of existing towns- Urban renewal projects- merging of suburban areas– Decentralization - Satellite Towns – Smart cities Planning- definition and features.	10

UNIT IV	URBAN ROADS AND TRAFFIC MANAGEMENT	
4.1 URBAN ROADS General - Objects - Requirements of good city road – Factors to be considered - Classification of urban roads - Types of street systems - Through and By-pass roads - Outer and inner ring roads - Expressways -Freeways - Precincts - Road aesthetics. **4.2 TRAFFIC MANAGEMENT** General - Object – Traffic survey - Traffic congestion – Traffic control - Traffic diversion - Road junction - Parking - Traffic capacity of road - One way traffic - Road traffic problems - Use of islands and flyovers at crossings - causes of road accidents - Traffic signal - Road sign -Road marking.		10
UNIT V	**BUILDING BYE LAWS & SUSTAINABLE PLANNING**	
5.1 BUILDING BYE LAWS General-Objects of bye-laws- Importance of bye-laws – Function of local authority – Plot coverage –Set back- Floor space index- Development control rules –General rules of metropolitan Area –CMDA rules – Tamil Nadu Combined Development and Building Rules - 2019. **5.2 SUSTAINABLE PLANNING** Urban Development Missions in India - Sustainable Planning Techniques - Social Infrastructure - Green Buildings - Sustainable Building Planning - Urban Planning Using Remote Sensing - Industrial Corridors.		07
TOTAL PERIODS		**45**

Suggested List of Students Activities:

- Presentation/Seminars by students on any recent technological developments in Urban Planning and Development
- Periodic class quizzes conducted on a weekly/fortnightly based on the course.
- Presentation/Seminars by students on the Urban Development Missions in Ind

Reference Books:

1. K.S. Rangwala and P.S. Rangwala, “Town Planning”, Charotar Publishing House,15th Edition,1999.
2. Tumlin Jeffrey, "Sustainable Transportation Planning Tools for Creating Vibrant Healthy and Resilient Communities", John Wiley and Sons, 2012.
3. National Building Code of India- Part-III. (2005).

Web-based/Online Resource

1. TOWN PLANNING PRINCIPLES: https://youtu.be/6N-1KWw0-mQ?si=cwka_pup7-BZAyU0
2. HOUSING AND SLUMS: https://youtu.be/JRx6RapPJIs?si=OY9ZjXPAwm0zDUK7
3. MASTER PLAN AND RE-PLANNINGEXISTINGTOWNS: https://youtu.be/KXaWHd34jPY?si=SaXVbl8oPqOR0CSN
4. URBAN ROADS AND TRAFFIC MANAGEMENT https://youtu.be/RmtdMBpb6PA?si=0rOXjKhJuQUFYgkg
5. SUSTAINABLE IN TOWN PLANNING https://youtu.be/XE_2DBCAOh0?si=qNXnaWtOeJukkeWY

10525	Building Bye-Laws and Statutory Drawings	L	T	P	C
Theory		3	0	0	3

Introduction:

This course provides an in-depth understanding of building bye-laws, regulations, codes, statutory drawings, Vaastu that govern the construction and maintenance of buildings. Students will learn about the legal framework, safety standards, and environmental considerations involved in building design and construction.

Course Objectives:

- Understand the fundamental principles of bye-laws in India.
- Explore the legal framework governing construction practices, including permit procedures and regulatory compliance.
- Gain insight into the role of regulatory bodies and their enforcement mechanisms in ensuring building safety and sustainability.
- Learn to interpret and apply structural design standards, fire safety regulations, and environmental considerations in building projects.
- Develop practical skills for navigating the complexities of building bye-laws through case studies and real-world scenarios.
- Acquire knowledge of ethical and professional responsibilities in upholding building regulations and safety standards.

Course Outcomes:

On successful completion of this course, the student will be able to

- CO1: Understand the fundamental principles of building bye-laws in India.
- CO2: Interpret and to follow relevant building regulations, including permit procedures and compliance standards during on-site practice. Evaluate building plans and designs to ensure compliance with legal and regulatory requirements.
- CO3: Analyse structural design principles, fire safety regulations, and environmental considerations in building projects.
- CO4: Demonstrate proficiency in drafting statutory drawings and documentation required for building permits. Contribute positively to the development of safe, sustainable, and compliant built environments.
- CO5: Understand the principles of Vaastu science and can apply it accordingly as per necessity.

Pre-requisites:

Knowledge of the basic Science, Engineering graphics

CO/PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	2	2	2	1	2
CO2	2	3	3	3	3	1	2
CO3	2	3	3	1	3	-	3
CO4	3	2	2	2	1	-	2
CO5	3	1	1	2	1	-	1

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- To engage the students by explaining basic concepts applied in our daily life and real-world applications.
- To make the students understand the views by the use of 3D drawings and realistic approach.
- To explain about the laws and principles through real life situations to the students.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of two will be considered for the internal assessment of 15 Marks.

CA1 and CA2, Assessment test should be conducted for two units as below.

PART A (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write Five questions. Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 20 marks for the internal assessment.

Question Pattern:

Answer Ten questions by selecting two questions from each unit. Each question carries 10 marks each.

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

10525	Building Bye-Laws and Statutory Drawings	L	T	P	C
Theory		3	0	0	3

Unit I	Introduction to Building Bye laws	
1.1 Introduction – Scope and Applicability of bye-laws –Definition of terms –Role of regulatory bodies (BIS) and local authorities - Classification of buildings - Residential, commercial, industrial, and institutional buildings. 1.2 Special regulations for heritage structures and earthquake-prone areas - Written permission for development of land (layout) - Competent authority for approval.		8

Unit II	Legal Framework and Compliance	
2.1 Legal Framework Overview - Regulatory Bodies Role - Building Classification Systems - Types of Occupancies - Understanding Zoning Laws - Urban Planning Fundamentals – Development Authorities Functions - Compliance Importance. 2.2 Rules for obtaining building permission as per National Building Code - Submission of Building Plans -Application Process - Plan Scrutiny - Compliance Check - Approval Process - Issuance of Building Permission - Inspection and Monitoring – Completion Certificate - Occupancy Certificate - stability certificate for commercial and institutional buildings - Renewal and Amendments.		10

Unit III	Safety and Structural Regulations	
3.1 Structural design principles and standards - Compliance requirements for earthquake-resistant buildings - Standards for parts of building such as basement, wall, floor, roof, parapet, chimney - Exit requirements - Types of exits - Number and size of exits - Arrangements of exits - Passenger elevators or lifts. 3.2 Fire safety regulations and prevention measures - Fire resistance ratings for building materials - Fire resistance of a building including its structural and non-structural elements - Emergency evacuation procedures - fire safety equipment.		8

Unit IV	Statutory Drawings	
4.1 Importance and purpose of statutory drawings - Overview of regulatory approval process - Types of statutory drawings - Site Plans - layout, dimensions, setbacks and site features - Floor Plans- layout of interior spaces, dimensions, room names -		10

Elevations - exterior views of the building, material specifications -Sections - vertical views showing building components and heights. 4.2 Development of Site plan - Site survey and data collection - Plotting site boundaries, contours, and utilities - Creating a comprehensive site plan with all necessary details - List of forms required for Approval as per NBC (Names only).		
Unit V	**Building Planning as per Vaastu Science**	
5.1 Definition - Importance of Vaastu - Five Elements and Directions - Concept of Pancha Bhutas (Five Elements) - Influence of directional energies - Significance of cardinal directions (North, South, East, West) - Site Selection and Evaluation - Criteria for selecting a suitable site. 5.2 Remedies for site defects and imbalances - Building Layout and Orientation - Principles of building orientation - Ideal placement of rooms, entrances, and utilities - Designing according to Vaastu - Vaastu Remedies and Corrections - Implementation of Vaastu in existing buildings.		9
TOTAL PERIODS		**45**

Suggested List of Students Activity:

- Students have to submit a report after visiting a local building approval authority such as Town and Country Planning office.
- Students have to visit an Architect's office and prepare a report from the learning.
- Students have to develop a comprehensive checklist of building bylaws at national, state, and local levels.
- Students have to identify and map zoning regulations and land use classifications in urban areas.
- Students have to analyse the layout, orientation and design elements of building related to Vaastu principles and discuss the effectiveness of Vaastu based design.
- Students have to prepare a building plan for a congested area in their locality by applying bye-laws and Vaastu sciences after doing site survey.

Reference Books:

1. National Building code Volume 1, Third Revision, Bureau of Indian Standards, 2016
2. National Building code Volume 2, Third Revision, Bureau of Indian Standards, 2016
3. Tamil Nadu Combined Development and Building Rules, Government of Tamil Nadu, 2019

Web-based/Online Resources:

1. https://www.youtube.com/watch?v=Dpy40oDxtfw&list=PLjAhkhzIQqze_YT8wtZJXVE8DlXFdlo-W&index=17
2. https://www.youtube.com/watch?v=XQHBLcnS-r0&list=PLjAhkhzIQqze_YT8wtZJXVE8DlXFdlo-W&index=5
3. https://www.youtube.com/watch?v=ufg47bzzobI&t=54s
4. https://www.youtube.com/watch?v=9_UIJOkwFog

10530	Computer Applications in Civil Engineering	L	T	P	C
Practical		0	0	4	2

Introduction

Computers play a very vital role in present day life, more so, in all the professional life of engineers. In order to enable the students use the computers effectively in problem solving, this course offers various engineering applications of computers in civil engineering.

Course Objectives

- To provide hands-on experience for the students with software in structural analysis, design and estimating.
- To enable the students to do the practical problems by using the available application software packages.
- To impart the knowledge of 3D building modelling.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Prepare the estimation sheet and design data using Electronics Spread sheet.

CO2: Carry out the analysis and design of structures using available software.

CO3: Develop detailed 3D drawing of building.

Pre-requisites

- Students should have enough knowledge in Mechanics of Structures, Estimation and Costing, Design of RCC Structures subjects.

CO/PO Mapping

CO / PO	PO1		PO2	PO3	PO4	PO5	PO6	PO7
CO1	1				3			1
CO2				2	3			1
CO3					3			1

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- Align the lab activities with the overall course curriculum, ensuring that each lab session complements the theoretical concepts taught in lectures.
- Define clear objectives for each lab session.
- Provide step-by-step tutorials and hands-on practice sessions to familiarize students with available softwares.
- Regularly update lab materials, incorporate new technologies and software tools, and adapt teaching strategies based on student needs and industry trends.

Assessment Methodology:

	Continuous Assessment (40 marks)			**End Semester Examination (60 marks)**
	CA1	**CA2**	**CA3**	
Mode	Practical Test	Practical Test	Practical Document	Practical Examination
Portion	First Cycle / 50 % Exercises	Second Cycle / Another 50 % Exercises	All Exercises	All Exercises
Duration	3 Periods	3 Periods	Regularly	3 Hours
Exam Marks	60	60	Each Practical 10 Marks	100
Converted to	15	15	10	60
Marks	30		10	60
Tentative Schedule	7th Week	14th Week	15th Week	

Note:

- **CA1** and **CA2:** All the exercises/experiments as per the portions mentioned above should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded will be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal Assessment of 30 Marks.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	5
B	Free Hand Sketch	25
C	Execution/Printout and Result	30
TOTAL		60

- **CA 3:** Practical document should be maintained for every exercise immediately after completion of the practice. The same should be evaluated for 10 Marks. The total marks awarded should be converted to 10 Marks for the internal assessment. The practical document should be submitted for the Practical Test and End Semester Examination with a bonafide certificate.
- **The details of the documents to be prepared as per the instruction below.**

  The exercise should be completed on the day of practice.

  The same shall be evaluated for 10 marks on the day or next day of practice before commencement of the next exercise.

  This documentation can be carried out in a separate notebook / file. The procedure and sketch should be written by the student manually.

  The detailed date of the practices and its evaluations should be maintained in the course logbook. The log book and the practical documents should be submitted for the verification by the Flying Squad and DOTE Official.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	10
B	Free Hand Sketch	30
C	Execution/Printout	40
D	Result	10
E	Viva Voce	10
TOTAL		**100**

10530	Computer Applications in Civil Engineering	L	T	P	C
Practical		0	0	4	2

Part A	**ELECTRONIC SPREAD SHEET USING SOFTWARE**	
1.	Prepare the Estimate and Abstract sheet with given data (provide all the measurement details) and calculate the quantity and Total Amount using formula bar.	4
2.	Calculate Effective depth “d” and Area of Steel “Ast” using Formula Bar for given singly reinforced section.	4
3.	Finding centre of gravity; I_{xx} and I_{YY} of I, L, T and channel sections.	4
4.	Calculate Area and Elongation using formula bar	4
Part B	**ANALYSIS OF RCC STRUCTURES**	
Note:	Analyse the Structure using any one of the available Software Packages- STAAD.Pro, SAP, etabs, Tekla, Cads3d etc.)	
5.	Carryout the analysis of Continuous Beam (End supports as fixed/pinned/overhanging) with given size.	6 6
6.	Carryout the analysis of Portal Frame structure with given size	8
7.	Carryout the analysis of king post roof truss	8
8.	Carry out the analysis and design of 1 BHK residential house with given structure	
Part C	**DRAFTING OF RCC STRUCTURES**	
Note:	Draw the Structure using any one of the available 3D drafting Software Packages – Autodesk Revit Architecture, ArchiCAD, Autodesk Civil3D, Sketchup etc..)	
9.	Preparation of plan, section and elevation of a House with single bed room and attached bathroom with R.C.C. flat roof (Framed structure)	8
10.	Preparation of plan, section and elevation of a Single storied School building with R.C.C flat roof (Framed structure)	8
	TOTAL PERIODS	**60**

Suggested List of Students Activity

- Task students with creating complex 3D models of civil engineering structures using advanced features in software
- Assign exercises where students model and analyze complex structures, considering material properties, boundary conditions, and loading scenarios.
- Explore advanced BIM concepts using software

Reference books

1. T.S. Sharma, Staad Pro V8i for Beginners with Indian Examples, 1st edition, Notion Press, 2014
2. Linkan Sagar, Revit 2019 Architecture Training Guide, 1st Edition, BPB PUBLICATIONS, 2018
3. R.K. Anand, Computer Application in Civil Engineering, 1st Edition, Vayu Education of India, 2013.

Web-based/Online Resources:

1. https://youtu.be/zR4fndvVEFU?si=bv7LZ1VW-NWH3hbw
2. https://youtu.be/w5-Qx61s-eA?si=0cMNNyD9Cqrxshep
3. https://youtu.be/qNm_6inyqQc?si=nm74Dg5Z5niJHz-J
4. https://youtu.be/aa4tqsCbtjU?si=-dDFWP1FIBsSxC5K

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

S.No.	List of the Equipments	Quantity Required
1	Computers	30 Nos.
2	Suitable Software for Electronic Spread Sheet	30 Users
3	Suitable Structural Analysis Software	30 Users
4	Suitable 3D drafting Software	30 Users

10540	Construction Management and Safety Practice	L	T	P	C
Practicum		1	0	4	3

Course Description:

This course combines essential aspects of construction management and safety practices to equip students with the skills needed for successful careers in the construction industry. Students learn project management fundamentals such as planning, scheduling, resource management, and budgeting, alongside estimation and costing techniques crucial for overseeing development projects. Microsoft Project is a powerful project management software that will be introduced to students as a tool for planning, scheduling, and managing construction projects effectively. In parallel, emphasis is placed on safety practices, covering occupational health and safety regulations, hazard identification, risk assessment, and emergency response protocols.

Course Objectives:

The objective of this course is to enable the student to:

- Describe the importance of construction Management
- Carryout the Feasibility study of a project
- Understand contract documents and different types of contract.
- Prepare construction scheduling and resource management.
- Describe the aspects of inspection and quality control methods
- Describe the labour laws and legislation.
- Know about the safety practices followed in construction project.

Course Outcomes:

After successful completion of this course the students should be able to

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

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

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

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

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

Pre-requisites: NIL

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3				1	2	3
CO2	3				1	2	3
CO3	3	1	1	2	1	2	3
CO4	3			2	1	2	3
CO5	3	1	1	2	1	2	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- Employ strategies to capture students' interest and enhance their confidence in learning.
- Use real-life examples, case studies, and practical scenarios to illustrate concepts and principles, fostering relevance and applicability.
- Emphasize learning outcomes and employability skills throughout the course, ensuring that students acquire the knowledge and competencies essential for success in the construction industry.
- Create a supportive environment where students are encouraged to question, explore, and critically evaluate their findings, fostering a scientific mindset and problem-solving skills.
- Promote an environment where students feel comfortable exploring outcomes that may differ from their expectations

Assessment Methodology:

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	Cycle 1 Exercises & Two units	Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Internal Marks	40			
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal Assessment of 30 Marks.
- **The details of the documents to be prepared as per the instruction below.**
  Practical documents should be maintained for every exercise/experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	2
B	Tabulation/Observation	10
C	Graph/Sketch/Calculation	15
D	Result	3
E	Written Test	20
TOTAL		50
F	Practical Documents (As per the portions)	10
		60

- Written Test for theory portions should be conducted for 20 Marks as per the question pattern below.

Question pattern – Written Test Theory

Description		Marks	
Part – A	10 MCQ Questions	10 X 1 Mark	10 Marks
Part – B	One 10 Marks Question out of 3 Questions	1 X 10 Marks	10 Marks
TOTAL			20 Marks

- **CA 3:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	10
B	Tabulation/Observation	20
C	Graph/Sketch /Calculation	20
D	Result	10
E	Written Test	30
F	Viva Voce	10
	TOTAL	100

Note: For the written test 30 MCQ or 15 x 2 marks or 10 x 3 Marks or 6 x 5 marks or 3 x 10 Marks questions or combination of any types given above shall be asked from the theory portions.

10540	Construction Management and Safety Practice	L	T	P	C
Practicum		1	0	4	3

THEORY		PERIODS
UNIT-I	**1.1 CONSTRUCTION SECTOR IN INDIA** Construction Management – Definition – Need – Scope-Role of government and private construction agencies—Types of construction sectors – Construction practice :- the owner, consultant, and contractor -Duties and responsibilities – List of various stages of a construction project. **1.2 FEASIBILITY STUDY AND PLANNING OF CIVIL ENGINEERING PROJECT** Feasibility– Technical feasibility, Financial feasibility ,Ecological feasibility, Resource feasibility - Economical Analysis – Objectives of planning–Administrative approval–Technical sanction.	3
UNIT -II	**2.1 CONTRACT MANAGEMENT** Types of contracts - Contract documents - Tender notice — Types – Earnest Money Deposit (EMD) and Security Deposits (SD) - Scrutiny and acceptance of a tender - Contract agreement —Work order — Subcontract-Rights and duties of sub-contractor. **2.2 CONSTRUCTION ORGANISATIONS AND DEPARTMENTAL PROCEDURE** Forms of business organizations -Decentralization -Percentage completion report - Organization of P.W.D.- Accounting procedure (administrative sanctions, technical sanctions, payment of bills) – Imprest and Temporary accounts – Cash book - Works register — Importance of M-book and its entries— Nominal Muster Roll (N.M.R)— Daily Labour Reports (D.L.R)	3

UNIT -III	**3.1 SCHEDULING AND TIME MANAGEMENT** Definition — uses and advantages – Classification of Schedules – Methods of scheduling — Activity— Event— Dummies— Rules for developing networks –Fulkerson's rule for numbering the events - Critical Path Method Critical and Subcritical paths– Critical and Non critical activities/events–Significance of critical path. **3.2 RESOURCE MANAGEMENT** Definition –Need for resource management—Optimum utilization of resources - Resource planning – Resource levelling and its objectives –Construction planning–Crashing –Need for crashing an activity– Methods and tips for crashing– Time Vs Cost optimization curve – Cost slope and its significance in crashing.	**3**
UNIT -IV	**4.1 QUALITY MANAGEMENT AND CONSTRUCTION DISPUTES** Importance of quality – Elements of quality – Quality assurance techniques (inspection, testing, sampling) – Construction Disputes - Introduction—Development of disputes—Categories of disputes—Modes of settlements-Arbitration. **4.2 CONSTRUCTION LABOUR AND LEGISTATION:** Need for legislation-Payment of wages Act – Factories Act—Contract labour (Regulation and abolition) Act–Employees Provident Fund (EPF)Act.	**3**
Unit -V	**5.1 SAFETY IN CONSTRUCTION:** Importance of safety –Causes of accidents – Role of various parties (designer / employer /worker) in safety management – Benefits – Approaches to improve safety in construction **5.2 ETHICS IN ENGINEERING** Human values - Definition of Ethics - Engineering ethics - Engineering as a profession - Qualities of professional - Professional institutions - Code of ethics - Major ethical issues - Ethical judgement - Engineering and management decision - Value based ethics.	**3**

PRACTICAL EXERCISES		
1	Problems to find EST, EFT, LST, LFT using MS Project and Excel.	6
2	Preparation of Key Plan, Job Layout using BIM tool like Revit/Sketchup/AutoCAD.	6
3	Problems on PERT network – TE, TL and slack using MS Project and Excel.	6
4	Problems to find Standard deviation and Variance using MS Project and Excel.	6
5	Writing M- book using MS Excel	6
6	Prepare comparative statements in selecting tender using MS Excel.	6
7	Calculate man hours for construction activity and link with scheduling.	6
8	Site visit and prepare safety checklist for construction activity.	6
9	MS project – CPM	6
10	MS project – PERT Analysis	6
TOTAL PERIODS		**75**

Suggested List of Students Activity:

- **Site visits:** Organize visits to construction sites where students can observe safety practices.
- **Guest lecturers:** Invite professionals from the construction industry, including project managers, safety officers, and engineers, to speak to the class. They can share their experiences, insights, and best practices in construction management and safety.

Reference Books:

1. K.K. Chitkara, Construction Project Management, McGraw Hill Education, 26 October 2010
2. Kumar Neeraj Jha, Construction Project Management, 2nd Edition, Pearson Education India, 1 January 2015
3. S.K. Bhattacharjee, Safety Management in Construction (Principles and Practices, 1st edition, Khanna Publishers, 2011

Web-based/Online Resources:

1. Significance and objectives of Construction management : https://www.youtube.com/watch?v=olvs23_VaT0&list=PLm_MSClsnwm8ZfOLmf8XJqE3rVe8BByzl&index=2
2. Network Terminology : https://www.youtube.com/watch?v=K6VvMVTh4iU&list=PLm_MSClsnwm8ZfOLmf8XJqE3rVe8BByzl&index=9
3. Common causes of accidents on construction sites : https://www.youtube.com/watch?v=ZdeetmkhpKs&list=PLm_MSClsnwm8ZfOLmf8XJqE3rVe8BByzl&index=21
4. Concept of Quality Control & Inspection: https://www.youtube.com/watch?v=nM_dS4tobQs&list=PLm_MSClsnwm8ZfOLmf8XJqE3rVe8BByzl&index=22
5. Need for Legislation and Importance of Labour Laws and Principles: https://www.youtube.com/watch?v=WK8hSg_653I&list=PLm_MSClsnwm8ZfOLmf8XJqE3rVe8BByzl&index=23
6. Construction site safety rules: https://www.youtube.com/watch?v=YLH-Ih8omjI
7. Professional Ethics: https://www.youtube.com/watch?v=5LiRgVVqsg0

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

S.No	List of Equipments	Quantity Required
1	Computers	30 Nos.
2	Laser Printers	3 Nos
3	CAD Software	30 Users
4	Suitable software for Electronic Spread Sheet	30 Users
5	Suitable Project Management Software	30 Users

10550	Environmental Engineering	L	T	P	C
Practicum		1	0	4	3

Introduction:

Diploma holders in Civil Engineering are expected to supervise construction of water supply and waste water treatment works. They are also responsible for waste disposal activities. This subject aims at imparting skills for preparing water supply and waste water engineering related drawings and for execution of the prepared drawings in the field.

In addition, Civil Engineering diploma holders must have knowledge on different types of environmental aspects in order to maintain the ecological balance and to control the various forms of pollution during the different infrastructure developmental activities. They should also be aware of the environmental laws for effectively combating environmental pollution.

Course Objectives:

The objectives of the course is to enable the students to

- Know the procedure of estimating water requirements for a water supply scheme.
- Select suitable sources of water supply and pipe materials.
- Determine the quality of water by various testing procedures and compare with different standards of drinking water.
- Understand the methods of purification of water.
- Understand the systems of distribution for a water supply scheme.
- Understand the basic facts of sanitary engineering, the methods of collection and conveyance of sewage.
- Understand the primary and secondary treatment of sewage and disposal.
- Know the methods of disposal of sludge and solid wastes.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Describe the process in water supply scheme, types of pipes, pipe joints, laying & testing of pipes for the conveyance of water supply, physical, chemical & biological test on the water samples, standards of drinking water.

CO2: Analyze the process of primary, secondary & tertiary treatment of water and their transmission along with disinfection, softening of water.

CO3: Plan and design the water distribution networks, Layouts of different Distribution networks suitable for appropriate location, Systems of Water Supply

CO4: Plan and design the sewerage systems, Characterization of Sewage, select the appropriate appurtenances in the sewerage systems.

CO5: Describe the process of Primary Treatment of Sewage such as Screening, Grit Chamber, Skimming Tank, Sedimentation, and Coagulation of Sewage.

Pre-requisites: Knowledge of basic Science

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	3	3	2	2
CO2	3	2	1	3	3	2	2
CO3	3	2	3	3	3	2	2
CO4	3	2	3	3	3	2	2
CO5	3	2	1	3	3	2	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- It is advised that teachers take steps to pique pupils' attention and boost their learning confidence.
- To help students learn and appreciate numerous concepts and principles in each area, teachers should provide examples from daily life, realistic situations, and real-world engineering and technological applications.
- The demonstration can make the subject exciting and foster in the students a scientific mindset. Student activities should be planned on all the topics.
- Throughout the course, a theory-demonstrate-practice-activity strategy may be used to ensure that learning is outcome - and employability-based.
- Do not let students work on an activity or an experiment with the expected outcome, rather allow students to be honest about whatever the results of the experiment are. If the results are different from the expectations, students should do an analysis where they could be the source of error, if any.

Assessment Methodology:

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	Cycle 1 Exercises & Two units	Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Internal Marks	40			
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal Assessment of 30 Marks.
- **The details of the documents to be prepared as per the instruction below.**
  Practical documents should be maintained for every exercise/experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	2
B	Tabulation/Observation	10
C	Graph/Sketch/Calculation	15
D	Result	3
E	Written Test	20
TOTAL		50
F	Practical Documents (As per the portions)	10
		60

- Written Test for theory portions should be conducted for 20 Marks as per the question pattern below.

Question pattern – Written Test Theory

Description		Marks	
Part – A	10 MCQ Questions	10 X 1 Mark	10 Marks
Part – B	One 10 Marks Question out of 3 Questions	1 X 10 Marks	10 Marks
TOTAL			20 Marks

- **CA 3:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	10
B	Tabulation/Observation	20
C	Graph/Sketch /Calculation	20
D	Result	10
E	Written Test	30
F	Viva Voce	10
	TOTAL	100

Note: For the written test 30 MCQ or 15 x 2 marks or 10 x 3 Marks or 6 x 5 marks or 3 x 10 Marks questions or combination of any types given above shall be asked from the theory portions.

10550	Environmental Engineering	L	T	P	C
Practicum		1	0	4	3

UNIT I	**QUANTITY AND QUALITY OF WATER**	
	Water Supply–Flow Chart of a Water Supply Scheme - Need for Protected Water Supply - Types of Demand-Per Capita Demand - Sources of Water—Surface Sources—Underground Water Sources - Intakes - Types of Intakes - Pipes for Conveyance of Water - Cast Iron, G.I., Cement Concrete, R.C.C., Hume and PVC Pipes - Pipe Joints - Laying and Testing of Pipe Lines. Impurities in Water - Testing of Water - Collection of Water Sample - Physical, Chemical, Bacteriological Tests - Standards of Drinking Water - Water Borne Diseases and their Causes.	**3**
	Practical exercises:	
	1. Estimation of pH, TDS and Hardness of water sample	**4**
	2. Estimation of Sulphate content from the Collected water samples from sources.	**4**
	3. Determine the dissolved oxygen in the given sample of water.	**4**
	4. Determine the chloride content in the given sample of water by silver Nitrate titration method.	**4**
UNIT II	**TREATMENT OF WATER**	
	Objective of water treatment - Flow Diagram of a Treatment Plant-functions of units - Sedimentation–Types of Sedimentation Tank–principle of Coagulation–flocculation-Usual Coagulants–feeding of coagulants - mixing devices - Jar test.	**3**
	Practical exercises:	
	5. Determine the optimum dose of coagulant in a given raw water sample by jar test.	**4**
	6. Prepare a report along with photo copies of a field visit to water treatment plant. (Not for Exam)	**12**
UNIT III	**DISTRIBUTION SYSTEM**	
	Distribution System - Gravity System, Pumping System, Combined System - Systems of Water Supply - Continuous and Intermittent Supply of Water-Layouts of Distribution-Dead End, Grid Iron, Radial and Circular Systems.	**3**
	Practical exercises:	
	7. Study of various pipe fitting used in water supply (with actual models displayed onboard). (Not for Exam)	**4**

UNIT IV	**SANITARY ENGINEERING**	
	Sanitation - Systems of Sanitation - Variation in Rate of Flow of Sewage - Estimation of storm water - Minimum Size of Sewer—Shapes of Sewer (names only) – Materials used for Sewer-Joints in Sewer Line–Ventilation of Sewers-Cleaning of Sewers. Sewer Appurtenances Manhole-Lamp Hole-Catch Basin-Street-Inlet-Grease and Oil Trap - Flushing Tanks - Drainage Arrangements in Buildings - Sanitary Fittings - Sewage Pumps Necessity - Types of Sewage Pumps (names only).	**3**
	Practical exercises:	
	8. Study of various sanitary wares. (Not for Exam)	**4**
	9. Making a bathroom connection from an existing water supply main (making indents, drawing a neat sketch of the connection with details).	**4**
	10. Making suction and delivery pipe connections to a centrifugal pump (making indents, drawing a neat sketch of the connection with details).	**4**
UNIT V	**PRIMARY TREATMENT OF SEWAGE**	
	Introduction-Flow Diagram of Sewage Treatment plant –Screens – Grit Chamber – Skimming Tank – plain sedimentation tank-Primary clarifiers - Secondary clarifiers – coagulation of sewage.	**3**
	Practical exercises:	
	11. Prepare a report along with photo copies of a field visit to sewage treatment plant. (Not for Exam)	**12**
	TOTAL PERIODS	**75**

Suggested List of Students Activities:

- Choose any one study area and estimate the quantity of water required to meet the demand.
- Design and build a physical model of a water treatment plant.
- Group discussion about the distribution network and various layouts of distribution.
- Identify the suitable appurtenances for the appropriate location in the water distribution network system.
- Demonstrate and discussion on the process of coagulation and flocculation.
- Periodic class quizzes conducted on a weekly/fortnightly based on the course
- Case study on the quality standards of drinking water in your locality

Reference Books:

1. A.K. Jain, Environmental Engineering, 1st Edition, Khanna Publishers, 2022.
2. G.S. Birdie and J.S.Birdie, Water Supply and Sanitary Engineering, 9th Edition, Dhanpat Rai Publishers, 2014.
3. S.K. Husain, Textbook of Water Supply and Sanitary Engineering, 3rd Edition, CBS Publishers, 2018.
4. Santhosh Kumar Garg, Water Supply Engineering, 37th Edition, Khanna Publishers.
5. Santhosh Kumar Garg, Sewage disposal and air pollution engineering, 43rd edition, Khanna Publishers.

Web resources

1. https://archive.nptel.ac.in/courses/105/105/105105201/
2. https://youtube.com/playlist?list=PL1BFC82F3A63B4172&si=wJVMJip1kcMrhm9s

LIST OF EQUIPMENTS (for a batch of 30 students):

S. No	Name of the equipment	Numbers required
1.	Spectrophotometer	1No.
2.	Jar Test Apparatus	1No.
3.	Turbidity Meter	1No.
4.	Dissolved Oxygen Meter	1No.
5.	Drying Oven	1No.
6.	Analytical Balance	1No.
7.	Dessicator	1No.
8.	Dishtongs	1No.
9.	Evaporating Dish	1No.
10.	Filter Membrane	1No.
11.	Vacuum Pump	1No.
12.	Crucible	1No.
13.	Whatt Man Filter Paper	Required Nos.
14.	Wash Bottle	2 Nos.
15.	Pipette, Burette, Funnel, Conical Flask, Beaker, Bunsen Burner, Stand, Wire Gauge, Filter Paper	As Required
16.	Pipe Fitting used in Water Supply	As Required
17.	Sanitary Ware Specials	As Required
18.	Specials of Bathroom Connections	As Required
19.	pH Tester	1 No.
20.	TDS testing device	1 No.
21.	Necessary reagents and Chemicals	As Required
22.	Necessary Sample Preparation Utilities	As Required
23.	Centrifugal Pump (0.5 HP)	1 No.

10560	Innovation & Startup	L	T	P	C
Practicum		1	0	2	2

Introduction

The integration of Innovation and Start-ups concept within the syllabus is testament to the forward-thinking nature of educational institutions. By introducing this concept, students are provided with a solid foundation upon which they can build their skills in Innovation and Start-ups. This course can bridge the gap between theory and practice. It allows students to apply the knowledge they have acquired in a real-world context, thereby enhancing their understanding and retention of the above concept. This experimental learning approach not only fosters a deeper level of engagement but also trains student with practical skills necessary to navigate the complexities of the business world. This also empowers students to become an Innovator or Entrepreneur. With necessary tools and knowledge, educational institutions are preparing the next generation of entrepreneurs to tackle the challenges and opportunities that lie ahead. This syllabus will explore the different facets of innovation, including its importance, types and strategies for fostering a culture of innovation within organizations

Course Objectives

The objective of this course is to enable the students

- To understand the concept of Innovation and Start-ups.
- To acquire knowledge of Prototype development, IPR, Patents and Copyrights.
- To have practical experience in preparing Business plan for Start-ups.
- To visit the existing nearby industry to prepare a project report about the present challenges of that industry.
- To know the different funding supports available from Government and Non-Government schemes for Start-ups.

Course Outcomes

After successful completion of this course, the students should be able to

CO 1: Differentiate between Innovation and Start-ups

CO 2: Explain the importance of IPR, Patents and Copyrights.

CO 3: Describe the methodology to be adopted for preparing the Business Plan

CO 4: Gain practical experience by Industrial training and visiting the nearby industry

Co 5: Explore and identify various funding facilities available from Government and Non-Government Schemes for Start-ups

Pre-requisites:

There are no specific prerequisites for this course, although a basic understanding of business and technology concepts would be beneficial.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	-	1	-	2	3	3
CO2	-	-	1	-	2	3	3
CO3	-	-	1	-	2	3	3
CO4	-	-	1	-	2	3	3
CO5	-	-	1	-	2	3	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Assessment Methodology:

	Continuous Assessment (40 marks)			**End Semester Examination (60 marks)**
	CA1	**CA2**	**CA3**	
Mode	Class Assessment (Unit I, II & Unit III)	Seminar Presentations (Unit IV)	Submission of Industry Visit Project Report (Unit V)	Practical Examination (Project)
Duration	2 Periods	---	---	3 hours
Exam Marks	50	20	30	100
Converted to	10	10	20	60
Marks	**10**	**10**	**20**	**60**

Continuous Assessment - 40 marks

S. No	Description	Marks
CA 1	**Class Assessment (50 marks) - Unit – I,II & III** Written Examination - Theory Questions 10 questions out of 15 questions (10 x 3 marks :30 marks) 4 questions out of 6 questions (4 x 5 marks : 20 marks)	10 marks
CA 2	**Seminar Presentations (20 marks- each topic carries 10 marks) - Unit IV** Students should present any two topics with PPTs	10 marks
CA 3	Submission of Industry Visit Project Report - **(30 marks) - Unit V**	20 marks
	Total	**40 marks**

10560	Innovation & Startup	L	T	P	C
Practicum		1	0	2	2

UNIT I	INTRODUCTION TO INNOVATION	
An Introduction to Innovation and Creativity- Innovation in current Environment - Types of Innovation - Challenges of Innovation - Steps of Innovation Management - Divergent v/s Convergent thinking - Design thinking and Entrepreneurship.		6

UNIT II	INCUBATION CLUBS, IPR, PATENTS AND COPYRIGHTS	
Idea Generation - Incubation Clubs - Prototype Development - Marketing of Innovation - Management of Innovation - Creation of IPR -Types of IPR - Patents and Copyrights - Patents in India - Technological and Non-Technological Innovation Process.		6

UNIT III	GOVERNMENT AND NON-GOVERNMENT FUNDING SCHEMES FOR START-UPS	
An introduction to Start-up - Start-ups in India - Procedure for registration of Start-ups - Business Model- Business Plan - Case Studies - Opportunities and Challenges - Funding supports from Government Schemes -MUDRA, TANSEED, NEEDS, PMEGP, UYEGP – Non-Government Schemes - CSR Fund - Angel Investors - Venture Capitalist.		6

UNIT IV	SEMINAR PRESENTATIONS	
All the students have to select a minimum of 2 topics from the list given below. They are expected to collect the resources with the help of faculty assigned to them to prepare PPTs for presentation 1. Idea Generation. 2. Innovation Management. 3. Product Development. 4. Business Model Innovation. 5. Organizational Culture and Change Management. 6. Leadership and Innovation. 7. Barriers to Innovation.		9

10560	Innovation & Startup	L	T	P	C
Practicum		1	0	2	2

8. Innovation Marketing. 9. E-Commerce success stories (any one). 10. Role of Start-ups in Higher Education. 11. Professional Networking in Building Brands. 12. How to start a start-up in India.	
UNIT V	**EXPOSURE TO INDUSTRY**
All the students should visit and study the nearby industries, incubation centres, start-ups etc., and select any one to prepare a project report which covers the Name of the Industry/Organization, Introduction of the Industry, Type of the Industry, Scope of the Industry, Plant Layout and Location, Details of Plant and Machineries, Process flow chart, Manufacturing Methods, Process of Manufacturing, Product Manufacturing, Quality Control, Marketing, Product selling - Conclusion.	**18**
TOTAL PERIODS	**45**

End Semester Examination - Project Exam

Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Chairman Board of Examinations.

Detailed Allocation of Marks

S. No	Description	Marks
Part A	Written Examination – Unit –I, II & III Theory Questions	45
i)	10 questions out of 15 questions (10 x 3 marks = 30 marks)	
ii)	3 questions either or pattern (3 x 5 marks = 15 marks)	
Part B i)	Presentation of Industry Visit Project Report	25
ii)	Interaction and Evaluation	30
	TOTAL	**100**

10570	Industrial Training	Summer Vacation	C
Internship			2

Introduction

Industrial training is a crucial component of the diploma engineering curriculum, designed to bridge the gap between theoretical knowledge and practical application. Typically conducted during vacation periods, this two-week training program provides students with hands-on experience in their respective engineering fields. The primary objectives are to enhance practical skills, familiarize students with industry standards, and prepare them for future employment.

Two-week industrial training during vacation periods is an invaluable part of diploma engineering education. It not only equips students with practical skills but also provides a comprehensive understanding of the industry, preparing them for successful engineering careers.

Objectives

1. Practical Exposure: Students gain direct exposure to real-world engineering practices, tools, and technologies.
2. Skill Enhancement: The training helps in developing technical and soft skills that are essential for professional growth.
3. Industry Insight: Students learn about the working environment, operational procedures, and challenges faced by industries.
4. Professional Networking: The training offers opportunities to interact with industry professionals, which can be beneficial for career prospects.
5. Application of Knowledge: It allows students to apply classroom knowledge to solve practical problems, enhancing their understanding and retention of engineering concepts.

Structure of the Training Program

- Orientation: Introduction to the company, its operations, and safety protocols.
- Project Assignment: Students are assigned specific projects or tasks relevant to their field of study.
- Supervision and Mentorship: Industry professionals guide and mentor students throughout the training.

- Skill Development Workshops: Sessions on technical skills, software tools, and industry best practices.
- Assessment and Feedback: Performance evaluations and constructive feedback to help students improve.

Benefits for Students

- Enhanced Employability: Practical experience makes students more attractive to potential employers.
- Confidence Building: Working in a real-world setting boosts confidence and professional demeanor.
- Clarified Career Goals: Exposure to various roles and responsibilities helps students define their career paths.

Course Outcomes

CO 1: Demonstrate proficiency in using industrial machinery, tools, and software.

CO 2: Able to identify, analyze, and solve engineering problems using industry-standard methods and practices.

CO 3: Gain a comprehensive understanding of industrial manufacturing processes, quality control, and safety practices.

CO 4: Exhibit improved communication, teamwork, and professional behavior in an industrial setting.

CO 5: Apply theoretical concepts learned in their coursework to practical engineering tasks and projects.

Duties Responsibilities of the Faculty Mentor.

One faculty mentor should be assigned for every 30 students by the HOD / Principal. Faculty mentors shall play a crucial role in overseeing and guiding students during their industrial training program in Diploma engineering.

Pre-Training Responsibilities:

1. Orientation and Preparation:
    - Conduct orientation sessions to familiarize students with the objectives, expectations, and guidelines of the industrial training program.

- Assist students in understanding the importance of industrial training in their academic and professional development.

2. Placement Coordination:
    - Collaborate with the placement cell or industry liaison office to secure suitable training placements for students that align with their academic specialization and career interests.
    - Facilitate communication between the institution and host organizations to ensure smooth coordination of training arrangements.
3. Training Plan Development:
    - Help students develop a detailed training plan outlining learning objectives, tasks, and expected outcomes for the training period.
    - Guide students in setting SMART (Specific, Measurable, Achievable, Relevant, Time-bound) goals for their training experience.

During Training Responsibilities:

4. Monitoring and Support:
    - Regularly monitor the progress of students during their industrial training. Maintain communication with both students and industry supervisors to track performance and address any issues that may arise.
    - Provide ongoing support and guidance to students, offering advice on technical challenges, professional conduct, and workplace etiquette.
5. Technical Guidance:
    - Offer technical guidance and mentorship related to the specific engineering discipline or specialization of the students. Help them apply theoretical knowledge to practical situations encountered in the industry.
6. Problem-Solving Assistance:
    - Assist students in overcoming obstacles or challenges encountered during their training. Encourage them to develop problem-solving skills and resilience in real-world engineering scenarios.
7. Feedback and Evaluation:
    - Provide constructive feedback on students' performance based on reports, assessments, and observations gathered from industry supervisors.
    - Evaluate students' achievements in relation to their training objectives and competencies developed during the program.

Post-Training Responsibilities:

8. Reflection and Debriefing:
    - Conduct debriefing sessions with students to reflect on their training experiences, discuss lessons learned, and identify areas for further improvement.
    - Help students articulate their learning outcomes and how these experiences contribute to their professional growth.
9. Documentation and Reporting:
    - Ensure comprehensive documentation of students' training activities, achievements, and feedback received from industry supervisors.
    - Prepare reports summarizing students' performance and submit these to relevant departments or committees for review and assessment.
10. Career Counseling:
    - Provide career guidance and counseling to students based on their industrial training experiences. Assist them in leveraging these experiences for future job applications or further academic pursuits.
11. Continuous Improvement:
    - Collaborate with industry partners to continuously improve the quality and relevance of the industrial training program.
    - Incorporate feedback from students and industry supervisors to enhance the effectiveness of future training placements.

By fulfilling these duties and responsibilities, faculty mentors contribute significantly to the overall educational experience and professional development of Diploma engineering students during their industrial training program.

Instructions to the students

Before Starting Industrial Training:

1. **Orientation and Preparation:**
    - Attend orientation sessions conducted by the institution or faculty mentors to understand the objectives, expectations, and guidelines of the industrial training program.
    - Familiarize yourself with the specific policies, procedures, and safety regulations of the host organization where you will be undergoing training.

2. Setting Goals:
    - Set clear and specific goals for your industrial training period. Define what skills, knowledge, and experiences you aim to gain during this time.
    - Discuss your goals with your faculty mentor and seek their guidance in developing a training plan that aligns with your career aspirations.
3. Professional Attire and Conduct:
    - Dress appropriately and professionally according to the standards of the industry and host organization.
    - Maintain a positive attitude, demonstrate punctuality, and adhere to workplace etiquette and norms.

During Industrial Training:

4. Learning and Engagement:
    - Actively engage in all assigned tasks and projects. Seek opportunities to learn new skills and technologies relevant to your field of study.
    - Take initiative in asking questions, seeking clarification, and participating in discussions with supervisors and colleagues.
5. Adaptability and Flexibility:
    - Adapt to the work environment and demonstrate flexibility in handling various responsibilities and challenges that arise during your training.
    - Be open to different roles and tasks assigned to you, as this will broaden your experience and skill set.
6. Professionalism and Communication:
    - Communicate effectively with supervisors, colleagues, and clients as required. Practice clear and concise verbal and written communication.
    - Demonstrate professionalism in all interactions, respecting confidentiality, and adhering to company policies and procedures.
7. Safety and Compliance:
    - Prioritize safety at all times. Familiarize yourself with safety protocols, procedures, and emergency exits in the workplace.
    - Follow all safety guidelines and regulations to ensure your well-being and that of others around you.

After Completing Industrial Training:

8. Reflection and Documentation:
    - Reflect on your training experience. Evaluate what you have learned, the challenges you faced, and how you have grown professionally.
    - Maintain a journal or log documenting your daily activities, achievements, and lessons learned during the training period.
9. Feedback and Evaluation:
    - Seek feedback from your industry supervisor and faculty mentor on your performance and areas for improvement.
    - Use constructive feedback to enhance your skills and competencies for future career opportunities.
10. Career Planning:
    - Use your industrial training experience to inform your career planning and decision-making process.
    - Discuss your career goals and aspirations with your faculty mentor or career counselor for guidance on next steps after completing your diploma.

By following these instructions, Diploma engineering students can make the most of their industrial training experience, gain valuable insights into their chosen field, and prepare themselves effectively for future professional endeavors.

Attendance Certification

Every student has to get their attendance certified by the industrial supervisor in the prescribed form supplied to them. Students have also to put their signature on the form and submit it to the institution faculty mentor.

Training Reports

The students have to prepare reports: The report in the form of a diary to be submitted to the concerned faculty mentor of the institution. This will be reviewed while awarding Internal assessment.

Industrial Training Diary

Students are required to maintain the record of day-to-day work done. Such a record is called Industrial training Diary. Students have to write this report regularly. All days for the week should be accounted for clearly giving attendance particulars (Presence,

absence, Leave, Holidays etc.). The concern of the Industrial supervisor is to periodically check these progress reports.

In addition to the diary, students are required to submit a comprehensive report on training with details of the organisation where the training was undergone after attestation by the supervisors. The comprehensive report should incorporate study of plant / product / process / construction along with intensive in-depth study on any one of the topics such as processes, methods, tooling, construction and equipment, highlighting aspects of quality, productivity and system. The comprehensive report should be completed in the last week of Industrial training. Any data, drawings etc. should be incorporated with the consent of the Organisation.

Scheme of Evaluation

Internal Assessment

Students should be assessed for 40 Marks by industry supervisor and polytechnic faculty mentor for the Internal Assessment.

Sl. No.	Description	Marks
A	Punctuality and regularity. (Attendance)	10
B	Level / proficiency of practical skills acquired. Initiative in learning / working at site	10
C	Ability to solve practical problems. Sense of responsibility	10
D	Report and Presentation - Self-expression / communication skills. Interpersonal skills / Human Relation.	10
Total		40

End Semester Examination - Project Exam

Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Chairman Board of Examinations after the completion of industrial training. The marks scored will be converted to 60 marks for the End Semester Examination.

Sl. No.	Description	Marks
A	Daily Activity Report and Attendance certificate.	20
B	Comprehensive report on Internship, Relevant Internship Certificate from the concerned department.	30
C	Presentation by the student at the end of the Internship.	30
D	Viva Voce	20
Total		100

VI SEMESTER

10611	Advanced Engineering Mathematics	L	T	P	C
Theory		3	0	0	3

Introduction

Mathematics is essential for engineering students to understand core engineering subjects. It provides the framework for engineers to solve problems in engineering domains. This course is designed to bridge the gap between diploma mathematics and B.E/B.Tech mathematics in matrix algebra, differential calculus, vector calculus, differential equations, and Laplace transforms.

Course Objectives

The objective of this course is to enable the students to

1. Understand the concepts of eigen-values and eigen-vectors of matrices.
2. Learn the notation of partial differentiation and determine the extremities of functions of two variables.
3. Acquire knowledge in vector calculus which is significantly used to solve engineering problems.
4. Formulate and solve differential equations.
5. Understand Laplace transformation and its engineering applications.

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Find eigenvalues and corresponding eigenvectors of a square matrix.

CO2: Apply the knowledge of partial differentiation to evaluate Jacobian and extremities of two variable functions.

CO3: Evaluate the gradient of a scalar field and the divergence and curl of vector fields.

CO4: Solve ordinary differential equations using various techniques.

CO5: Use Laplace transforms to solve first-order ordinary differential equations.

Pre-requisites

Matrices, Determinants, Differentiation, Integration and Vector Algebra.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	1	1	1	3
CO2	3	3	2	1	1	1	3
CO3	3	3	2	1	1	1	3
CO4	3	3	2	1	1	1	3
CO5	3	3	2	1	1	1	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- A theory-demonstrate-practice-activity strategy may be used to ensure that learning is outcome-based.
- All demonstrations/Hands-on practices might be under a simulated environment.
- Use an inducto-deductive approach to achieve the desired learning objectives.
- Use open-ended questions to nurture the problem-solving and reasoning skills among students.
- Support and guide the students for self-study.
- State the need for mathematics with engineering studies and provide real-life examples.

Assessment Methodology:

	Continuous Assessment (40 marks)				**End Semester Examination (60 marks)**
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of two will be considered for the internal assessment of 15 Marks.

CA1 and CA2, Assessment test should be conducted for two units as below.

PART A (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write Five questions. Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The answer scripts of every student (online / offline) for this assessment should be kept for records and future verification. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 20 marks for the internal assessment.

Question Pattern:

Answer Ten questions by selecting two questions from each unit. Each question carries 10 marks each.

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

10611	Advanced Engineering Mathematics	L	T	P	C
Theory		3	0	0	3

Unit I	**EIGENVALUES AND EIGENVECTORS**	
Characteristic equation – Eigen-values of 2×2 and 3×3 real matrices – Eigen-vectors of 2×2 real matrices – Properties of eigen-values (excluding proof) – Cayley-Hamilton theorem (excluding proof) – Simple problems.		7
Unit II	**FUNCTIONS OF SEVERAL VARIABLES**	
Partial derivatives of two variable and three variable functions (up to second order) – Homogeneous functions and Euler's theorem (excluding proof) – Jacobian matrix and determinant – Maxima and minima of functions of two variables – Simple problems.		7
Unit III	**VECTOR CALCULUS**	
Scalar field and Vector field – Vector differential operator – Gradient of a scalar field – Directional derivative – Divergence and curl of a vector field (excluding properties) – Solenoidal and irrotational vector fields – Simple problems.		7
Unit IV	**DIFFERENTIAL EQUATIONS**	
Differential equation – Formation – Order and degree – Solution of a differential equation – Equations of first order and first degree – Variable separable method – Leibnitz's Linear equations – Second order equations of the form $(aD^2 + bD + c)y = e^{nx}$ where a, b, c and n are constants and the auxiliary equation $am^2 + bm + c = 0$ has only real roots) – Complementary function – Particular integral – General solution – Simple problems.		7
Unit V	**LAPLACE TRANSFORMS**	
Definition of Laplace transform – Laplace transforms of standard functions - Linearity and change of scale property (excluding proofs) – First shifting property – Laplace transforms of derivatives – Properties (excluding proofs) – Inverse Laplace transforms – Properties (excluding proofs) – Solving first order ordinary differential equation using Laplace transforms – Simple problems.		7
	Revision + Test	10
	TOTAL PERIODS	**45**

Suggested list of Students Activity,

- Demonstrate the applications of eigen-values in stability analysis, decouple of three-phase systems and vibration analysis.
- Demonstrate maxima and minima of two variable functions using GeoGebra graphing calculator.
- Demonstrate solenoidal vector field and irrotational vector field using engineering applications.
- Demonstrate the applications of differential equations in solving engineering problems.
- Presentation /Seminars by students.
- Quizzes.

Reference Books:

1. John Bird, Higher Engineering Mathematics, Routledge, 9th Edition, 2021.
2. Grewal, B.S, Higher Engineering Mathematics, Khanna Publishers, 42nd Edition, 2012.
3. Arumugam, S, Thangapandi Isaac, A, & Somasundaram, A., Differential Equations and Applications, Yes Dee Publishing Pvt. Ltd., 2020.
4. Duraipandian, P, & Kayalal Pachaiyappa, Vector Analysis, S Chand and Company Limited, 2014.
5. Narayanan, S, & Manicavachagom Pillai T.K., Calculus Volume I and II, Viswanathan Publishers Pvt. Ltd., 2007.

Web Reference

1. https://www.khanacademy.org/math/
2. https://www.mathportal.org/
3. https://openstax.org/subjects/math/
4. https://www.mathhelp.com/
5. https://www.geogebra.org/
6. https://www.desmos.com/
7. https://phet.colorado.edu/

END SEMESTER QUESTION PATTERN - Theory Exam

Duration: 3 Hours. **Maximum Marks: 100**

Note: Answer Ten questions by selecting Two questions from each unit. Each question carries 10 marks.

Instruction to the question setters.

Each unit should have four questions. Each question carries 10 Marks. Each question may have two subdivisions only.

10612	Entrepreneurship	L	T	P	C
Theory		3	0	0	3

Introduction

Development of a diploma curriculum is a dynamic process responsive to the society and reflecting the needs and aspirations of its learners. Fast changing society deserves changes in educational curriculum particularly to establish relevance to emerging socio-economic environments; to ensure equity of opportunity and participation and finally promote concern for excellence. In this context the course on entrepreneurship and start-ups aims at instilling and stimulating human urge for excellence by realizing individual potential for generating and putting to use the inputs relevant to social prosperity and thereby ensuring good means of living for every individual, providing jobs and developing the Indian economy.

Course Objectives

After completing this subject, the student will be able to

- Acquire entrepreneurial spirit and resourcefulness
- Familiarize Acquire knowledge about the business idea and product selection
- Analyze the banking and financial institutions
- Understand the pricing policy and cost analysis
- Get knowledge about the business plan preparation

Course Outcomes

CO1: Explain the process of entrepreneurship

CO2: Analyse the importance of generation of ideas and product selection

CO3: Familiarization of various financial and non-financial schemes

CO4: Acquire various cost components to arrive pricing of the product

CO5: Learn the preparation of project feasibility report

Pre-requisites

Knowledge of basics of Engineering and Industrial engineering

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	-	-	-	3	1	3
CO2	-	-	-	-	3	3	3
CO3	-	-	-	1	-	3	2
CO4	-	1	3	3	2	3	2
CO5	-	2	3	3	3	3	3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- Engage and Motivate: Instructors should actively engage students to boost their learning confidence.
- Real-World Relevance: Incorporate relatable, real-life examples and applications to help students understand and appreciate course concepts.
- Interactive Learning: Utilize demonstrations and plan interactive student activities for an engaging learning experience.
- Application-Based Learning: Employ a theory-demonstrate-practice- activity strategy throughout the course to ensure outcome-driven learning and employability.
- Simulation and Real-World Practice: Conduct demonstrations and hands-on activities in a simulated environment, transitioning to real- world scenarios when possible.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of two will be considered for the internal assessment of 15 Marks.

CA1 and CA2, Assessment test should be conducted for two units as below.

PART A (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write Five questions. Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The answer scripts of every student (online / offline) for this assessment should be kept for records and future verification. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 20 marks for the internal assessment.

Question Pattern:

Answer Ten questions by selecting two questions from each unit. Each question carries 10 marks each.

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

10612	Entrepreneurship	L	T	P	C
Theory		3	0	0	3

Unit I	Entrepreneurship – Introduction and Process	
Concept of entrepreneurship - Importance, Myths about Entrepreneurship, Pros and Cons of Entrepreneurship, Process of Entrepreneurship, , Competencies and characteristics of an entrepreneur -, Ethical Entrepreneurship, Entrepreneurial Values and Attitudes, Creativity, Innovation and entrepreneurship- Entrepreneurs - as problem solvers, Mindset of an employee and an entrepreneur, - Risk Taking-Concepts		7
Unit II	**Business Idea**	
Types of Business: Manufacturing, Trading and Services, Stakeholders: sellers, vendors and consumers and Competitors, E- commerce Business Models, business idea generation -Types of Resources - Human, Capital and Entrepreneurial tools and resources, etc.,- setting business goals- Patent, copyright and Intellectual property rights, Customer Relations and Vendor Management, -Business Ideas vs. Business Opportunities, Opportunity – SWOT ANALYSIS of a business idea - Business Failure – causes and remedies.- Types of business risks,		7
Unit III	**Banking**	
Size and capital-based classification of business enterprises- Role of financial institutions, Role of Government policy, Entrepreneurial support systems, Incentive schemes of State and Central governments.		7
Unit IV	**Pricing and Cost Analysis**	
Types of Costs - Variable - Fixed- Operational Costs - Break Even Analysis - for single product or service, -financial Business Case Study, Understand the meaning and concept of the term Cash Inflow and Cash Outflow- Pricing- Calculate Per Unit Cost of a single product, Understand the importance and preparation of Income Statement, Prepare a Cash Flow Projection- Factors affecting pricing. - GST.		7
Unit V	**Business Plan Preparation**	
Feasibility Report – Technical analysis, financial analysis- Market Research - Concept, Importance and Process- tools for market research- Market Sensing and Testing, Marketing and Sales strategy, Digital marketing, Branding - Business name, logo, tag line, Promotion strategy, Business Plan Preparation, -Concept and Importance, Execution of Business Plan.		7
	Revision + Test	10
	TOTAL PERIODS	**45**

Suggested list of Students Activity.

1. Students can explore app development or web design. They'll learn about technology, user experience, and marketing.
2. Hosting events, workshops, or conferences allows students to practice project management, networking, and marketing skills.
3. Encourage students to address social or environmental issues through innovative business solutions. This fosters empathy and creativity.
4. Part of entrepreneurship clubs or organizations provides networking opportunities, mentorship, and exposure to real-world challenges.
5. Competitions like business plan contests or pitch events allow students to showcase their ideas and receive feedback.
6. Students can create and sell handmade crafts, artwork, or other products. This teaches them about production, pricing, and customer relations.
7. Students can provide consulting services in areas they're knowledgeable about, such as social media marketing or financial planning.
8. Encourage students to create and manage their own small business or offer freelance services. This hands-on experience helps them understand various aspects of entrepreneurship.

Text and Reference Books:

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

Web Reference:

- https://ocw.mit.edu/courses/15-390-new-enterprises-spring-2013/resources/lecture-1/
- https://onlinecourses.nptel.ac.in/noc20_ge08/preview

END SEMESTER QUESTION PATTERN - Theory Exam

Duration: 3 Hours. **Maximum Marks: 100**

Note: Answer Ten questions by selecting Two questions from each unit. Each question carries 10 marks.

Instruction to the question setters.

Each unit should have four questions. Each question carries 10 Marks. Each question may have two subdivisions only.

10613	Project Management	L	T	P	C
Theory		3	0	0	3

Introduction

Project management is the systematic application of knowledge, skills, tools, and techniques to project activities to meet specific project requirements. It involves planning, organizing, and managing resources to achieve project goals within defined scope, time, and budget constraints. Project management encompasses several key processes and phases, including initiation, planning, execution, monitoring and controlling, and closing. It is essential across various industries to ensure projects are completed successfully, efficiently, and effectively, aligning with organizational objectives and stakeholder expectations. Project managers play a crucial role in leading teams, managing risks, ensuring quality, and communicating with stakeholders to drive project success.

Course Objectives

The objectives of this course are to enable the students to,

- Understand the concept, characteristics and elements of projects.
- Understand the stages in project life cycle.
- Appreciate the need for project portfolio management system.
- Know the considerations in choosing appropriate project management structure.
- Understand the components of techno-economic feasibility studies.
- Know about the detailed project report
- Learn about project constraints.
- Understand the techniques of evaluation.
- Get insight into the social cost benefit analysis method.
- Know how to construct project networks using pert and cpm.
- Learn how to crash project networks
- Understand the meaning of project appraisal.
- Understand the meaning of project audits.
- Know the qualities of an effective project manager.
- Understand the stages in the Team Development model.

Course Outcomes

After completing this course, the students will be able to,

CO 1: Explain the principles of Project Management

CO 2: Create and manage project schedules.

CO 3: Create structure and manage the project commitments.

CO 4: Acquire to Gain enterprise support.

CO 5: Prepare a Detailed Project Report (DPR).

Pre-requisites

Basic Knowledge.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	-	-	3	1
CO2	3	-	-	-	1	3	1
CO3	3	-	-	1	1	3	1
CO4	3	-	-	-	1	3	1
CO5	3	-	-	1	1	3	1

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- It is advised that teachers take steps to pique pupils' attention and boost their curiosity to learn.
- Implement task-based learning activities where students work on specific tasks or projects.
- Incorporate technology tools and resources, such as online platforms, interactive multimedia, and virtual communication tools, to enhance engagement and provide additional practice opportunities.
- All demonstrations/Hand-on practices may be followed in the real environment as far as possible.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of two will be considered for the internal assessment of 15 Marks.

CA1 and CA2, Assessment test should be conducted for two units as below.

PART A (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write Five questions. Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The answer scripts of every student (online / offline) for this assessment should be kept for records and future verification. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 20 marks for the internal assessment.

Question Pattern:

Answer Ten questions by selecting two questions from each unit. Each question carries 10 marks each.

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

10613	Project Management	L	T	P	C
Theory		3	0	0	3

Unit I	Project Management – An Overview, Project Portfolio Management System and Structure, Steps in Defining Project and Project Delays	
Project – Classification – Importance of Project Management – An Integrated Approach – Project Portfolio Management System – The Need – Choosing the appropriate Project Management Structure: Organizational considerations and project considerations – steps in defining the project – project Rollup – Process breakdown structure – Responsibility Matrices – External causes of delay and internal constraints.		7
Unit II	**Various Stages and Components of Project Feasibility Studies, Phases of a Project, Stages in Project Life Cycle and Project Constraints**	
Project feasibility studies - Opportunity studies, General opportunity studies, specific opportunity studies, pre-feasibility studies, functional studies or support studies, feasibility study – components of project feasibility studies – Managing Project resources flow – project planning to project completion: Pre-investment phase, Investment Phase and operational phase – Project Life Cycle – Project constraints.		7
Unit III	**Project Evaluation under Certainty and Uncertainty, Project Evaluation, Commercial and Social Cost Benefit Analysis**	
Project Evaluation under certainty - Net Present Value (Problems - Case Study), Benefit Cost Ratio, Internal Rate of Return, Urgency, Payback Period, ARR – Project Evaluation under uncertainty – Methodology for project evaluation – Commercial vs. National Profitability – Social Cost Benefit Analysis, Commercial or National Profitability, social or national profitability.		7
Unit IV	**Developing Project Network using PERT and CPM, Project Appraisal and Control Process.**	
Developing a Project Plan - Developing the Project Network – Constructing a Project Network (Problems) – PERT – CPM – Crashing of Project Network (Problems - Case Study) – Resource Leveling and Resource Allocation – how to avoid cost and time overruns – Steps in Project Appraisal Process – Project Control Process – Control Issues – Project Audits – the Project Audit Process – project closure – team, team member and project manager evaluations.		7

Unit V	Project Managing Versus Leading of Project, Qualities of Project Manager and Managing Project Teams, Team Building Models and Performance Teams and Team Pitfalls.	
Managing versus leading a project - managing project stakeholders – social network building (Including management by wandering around) – qualities of an effective project manager – managing project teams – Five Stage Team Development Model – Situational factors affecting team development – project team pitfalls.		7
	Revision + Test	10
	TOTAL PERIODS	**45**

Suggested list of Students Activity,

Project Simulation and Role-Playing:

- Activity: Participate in simulated project scenarios where students take on different roles within a project team (e.g., project manager, team member, stakeholder).
- Purpose: This helps students understand the dynamics of project management, including leadership, communication, and team collaboration.

Case Study Analysis:

- Activity: Analyze real-world case studies of successful and failed projects.
- Purpose: This activity enables students to apply theoretical knowledge to practical situations, identify best practices, and learn from the challenges and solutions implemented in real projects.

Project Plan Development:

- Activity: Develop a comprehensive project plan for a hypothetical or real project, including scope, schedule, budget, risk management, and quality management plans.
- Purpose: This allows students to practice creating detailed and structured project plans, honing their skills in planning and organizing project activities.

Group Project:

- Activity: Work in teams to manage a project from initiation to closure, simulating a real project environment.
- Purpose: Group projects help students learn how to work collaboratively, manage group dynamics, and apply project management tools and techniques in a team setting.

Project Management Software Training:

- Activity: Gain hands-on experience with project management software such as Microsoft Project, Asana, or Trello.
- Purpose: This activity equips students with practical skills in using technology to plan, track, and manage project tasks and resources efficiently.

Reference Books:

1. Clifford F. Gray and Erik W. Larson, Project Management – The Managerial Process, Tata Mcgraw Hill.
2. Dragan Z. Milosevic, Project Management Toolbox: Tools and Techniques for The Practicing Project Manager,
3. Gopalakrishnan, P/ Ramamoorthy, V E, Textbook of Project Management, Macmillan India. Ltd.
4. Harold Kerzner, Project Management: A Systems Approach to Planning, Scheduling, And Controlling, Eighth Edition, John Wiley & Sons
5. Jason Charvat, Project Management Methodologies: Selecting, Implementing, And Supporting Methodologies and Processes For Projects, John Wiley & Sons
6. Kevin Forsberg, Ph.D, Hal Mooz, Visualizing Project Management: A Model For Business And Technical Success, Second Edition, PMP and Howard Cotterman, John Wiley & Sons.

Web Reference

1. https://youtu.be/pc9nvBsXsuM
2. NPTEL Courses
3. https://youtu.be/PqQqTAu_FiM

END SEMESTER QUESTION PATTERN - Theory Exam

Duration: 3 Hours. **Maximum Marks: 100**

Note: Answer Ten questions by selecting Two questions from each unit. Each question carries 10 marks.

Instruction to the question setters.

Each unit should have four questions. Each question carries 10 Marks. Each question may have two subdivisions only.

10614	Finance Fundamentals	L	T	P	C
Theory		3	0	0	3

Introduction

This course gives a deep insight into the finance fundamentals such as money management and the process of acquiring needed funds. It also encompasses the oversight, creation, and study of money, banking, credit, investments, assets, liabilities that make up financial systems and improves overall financial literacy.

Course Objectives

The objective of this course is to

1. Identify different ways to save money for future
2. Understand various techniques to raise capital
3. Get acquainted with the essential terminologies used in finance language
4. Get exposed to different types of budgeting
5. Instill the concept of costing and its impact on profitability

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Manage financial resources effectively to achieve personal goals

CO2: Explain the procedure for Business Funding

CO3: Exhibit financial literacy through the usage of different terminologies appropriate to the context

CO4: Differentiate the types of budgeting and allocate the resources

CO5: Apply the idea of marginal costing in decision making

Pre-requisites

Knowledge of basic mathematics

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	-	1	-	2
CO2	3	-	-	-	1	-	2
CO3	3	-	-	-	1	-	2
CO4	3	-	-	-	1	-	2
CO5	3		-	-	1	-	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- Engage and Motivate: Instructors should actively engage students to boost their learning confidence.
- Real-World Relevance: Incorporate relatable, real-life examples and applications to help students understand and appreciate course concepts.
- Interactive Learning: Utilize demonstrations and plan interactive student activities for an engaging learning experience.
- Application-Based Learning: Employ a theory-demonstrate-practice- activity strategy throughout the course to ensure outcome-driven learning and employability.
- Simulation and Real-World Practice: Conduct demonstrations and hands-on activities in a simulated environment, transitioning to real- world scenarios when possible.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of two will be considered for the internal assessment of 15 Marks.

CA1 and CA2, Assessment test should be conducted for two units as below.

PART A (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write Five questions. Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The answer scripts of every student (online / offline) for this assessment should be kept for records and future verification. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 20 marks for the internal assessment.

Question Pattern:

Answer Ten questions by selecting two questions from each unit. Each question carries 10 marks each.

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

10614	Finance Fundamentals	L	T	P	C
Theory		3	0	0	3

UNIT I	Personal Finance	
Personal Finance – Meaning, Objectives and advantages – Individual Perspective – Family Perspective – Time Value of Money – Personal Savings: Meaning, Different modes of Saving – Bank Deposit, Online Investments, Insurance, Stocks, Gold, Real Estate – Returns Vs Risk – Financial Discipline – Setting Alerts for commitments (With Real time Examples).		7
UNIT II	**Business Funding**	
Sources: Personal Savings – Borrowings - Venture Capital – Venture Capital Process – Commercial Banks – Government Grants and Scheme.		7
UNIT III	**Finance language**	
Capital – Drawing – Income – Expenditure – Revenue Vs Capital Items – Assets – Fixed Assets – Current Assets – Fictitious Assets – Liabilities – Long-term Liabilities – Current Liabilities – Internal Liabilities – External Liabilities – Shareholders fund: Equity Share capital, Preference Share Capital, Reserve & Surplus – Borrowings: Debentures, Bank Loan, Other Loan – Depreciation – Reserve Vs Provision.		7
UNIT IV	**Budgeting**	
Budgetary Control – Meaning – Preparation of various budgets – Purchase budget – Sales Budget – Production budget – Cash Budget – Flexible budgets. (With Problems)		7
UNIT V	**Marginal Costing**	
Marginal Costing – Meaning – Marginal Costing Vs Absorption Costing – Concepts of Variable Cost, Fixed Cost and Contribution – PV Ratio – Break Even Point – Margin of Safety – Key Factor – Application of Marginal Costing in decision making – Make or Buy – Shutdown or Continue – Exploring New Markets (With Problems)		7
	Revision + Test	10
	TOTAL PERIODS	**45**

Suggested list of Students Activity,

Financial Statement Analysis:

- Activity: Analyze and interpret financial statements, including balance sheets, income statements, and cash flow statements of different companies.
- Purpose: This activity helps students understand the financial health and performance of organizations, developing skills in financial analysis and critical thinking.

Investment Portfolio Management:

- Activity: Create and manage a simulated investment portfolio, making decisions on asset allocation, stock selection, and diversification.
- Purpose: This allows students to apply theoretical concepts in a practical setting, learning how to evaluate investment opportunities and manage financial risk.

Case Study Analysis:

- Activity: Examine real-world case studies involving financial decisions made by companies, such as capital budgeting, mergers and acquisitions, and financial restructuring.
- Purpose: Case studies provide insights into the application of finance principles in business scenarios, enhancing problem-solving and decision-making skills.

Classroom Discussions and Debates:

- Activity: Participate in discussions and debates on current financial issues, market trends, and economic policies.
- Purpose: Engaging in discussions helps students stay informed about the latest developments in finance, develop their communication skills, and form well-rounded opinions on financial matters.

Reference Books:

1. Banking Theory, Law & Practice - Dr.L. Natarajan, Margham Publications.
2. Corporate Accounting by T.S. Reddy and Dr.A. Murthy, Margham Publications.
3. Management Accounting by T.S. Reddy and Dr.Y. Hariprasd Reddy, Margham Publications.
4. Cost Accounting by T.S. Reddy and Dr.Y. Hariprasd Reddy, Margham Publications.

END SEMESTER QUESTION PATTERN - Theory Exam

Duration: 3 Hours. **Maximum Marks: 100**

Note: Answer Ten questions by selecting Two questions from each unit. Each question carries 10 marks.

Instruction to the question setters.

Each unit should have four questions. Each question carries 10 Marks. Each question may have two subdivisions only.

10615	Advanced Environmental Engineering	L	T	P	C
Theory		3	0	0	3

Introduction:

- Diploma holders in Civil Engineering are expected to be responsible for Water Quality Assessment, Pollution and Polluting Agents, Treatment of Sludge, Waste Management etc..
- Apart from basics of Environmental Engineering, some of the advanced topics dealing with the Environmental Engineering are discussed in this subject.

Course Objectives:

The objective of the course is to enable the students to

- Know the procedure of process of filtration and disinfection of water in water supply scheme.
- Plan and design the flowchart of water treatment process based on the source of water.
- Know the pipe appurtenances required for water supply scheme.
- Understand the purpose of water management.
- Understand the various secondary treatment of sewage.
- Know the methods of disposal of sludge and solid wastes.
- Identify the various types of pollution and their prevention.
- Create awareness about environmental impact assessment.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Explain the process of filtration, disinfection and softening of water.

CO2: Describe the procedure of collection of waste water survey, and study the various pipe appurtenances. Describe conservation and management of water resources.

CO3: Explain the various secondary treatment technologies and miscellaneous treatment of waste water such as chlorination, Imhoff tank and oxidation pond etc.

CO4: Identify the various types of pollution and their prevention along with various methods of solid waste management.

CO5: Create awareness about Environmental Impact Assessment.

Pre - requisites:

Knowledge of Basic Environmental Engineering.

CO/PO Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	1	3	1	2
CO2	3	2	1	1	3	1	2
CO3	3	2	1	1	3	1	2
CO4	3	2	1	1	3	1	2
CO5	3	2	2	1	3	2	2

Legend: 3 - High Correlation, 2 - Medium Correlation, 1 - Low Correlation

Instructional Strategy

- It is advised that teachers take steps to pique pupils' attention and boost their learning confidence.
- To help students learn and appreciate numerous concepts and principles in each area, teachers should provide examples from daily life, realistic situations, and real - world engineering and technological applications.
- The demonstration can make the subject exciting and foster in the students a scientific mindset. Student activities should be planned on all the topics.
- Throughout the course, a theory - demonstrate - practice - activity strategy may be used to ensure that learning is outcome - and employability - based.
- Do not let students work on an activity or an experiment with the expected outcome, rather allow students to be honest about whatever the results of the experiment are. If the results are different from the expectations, students should do an analysis where they could be the source of error, if any.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

- **CA1 and CA2:** Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of two will be considered for the internal assessment of 15 Marks.

  CA1 and CA2, Assessment test should be conducted for two units as below.

  PART A (5 X 10 Marks = 50 Marks).

  Eight questions will be asked, students should write Five questions. Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.
- **CA3:** 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.
- **CA4:** Model examination should be conducted as per the end semester question pattern. The marks should be converted to 20 marks for the internal assessment.

Question Pattern:

- Answer Ten questions by selecting two questions from each unit. Each question carries 10 marks each.
- Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

10615	Advanced Environmental Engineering	L	T	P	C
Theory		3	0	0	3

UNIT I	**FILTRATION, DISINFECTION AND SOFTENING OF WATER**	
	1.1 FILTRATION OF WATER Theory of filtration - sand filters - Types - Slow Sand Filter - Rapid Sand Filter - comparison of slow sand and rapid sand filter - Pressure Filter.	**3**
	1.2 DISINFECTION OF WATER Necessity of Disinfection - Types of disinfection - Minor methods of Disinfection - Chlorination - Action of chlorine - Application of chlorine - Forms of Chlorination.	**3**
	1.3 WATER SOFTENING Water Softening – Necessity of Water Softening – Hardness – Types of Hardness - Effects of Hardness - Removal of Hardness (names only) - Miscellaneous Water treatment (names only) – Mineral water – Requirements - Treatment Process - Reverse Osmosis (RO).	**3**
UNIT II	**WATER WASTE SURVEYS, PIPE APPURTENANCES AND WATER MANAGEMENT**	
	2.1 WATER WASTE SURVEYS Wastage of water - Water waste surveys - Permissible wastage of water - Preventive measures - Water waste test - Maintenance of distribution system.	**3**
	2.2 PIPE APPURTENANCES Necessity - Air valves - Bib cocks - Fire hydrants - Reflux valves - Scour valves - Sluice valves - Stop cocks - water meters	**3**
	2.3 WATER MANAGEMENT Introduction of water management - Measures for reshaping local water balance - Uses and resources.	**3**
UNIT III	**SECONDARY TREATMENT, MISCELLANEOUS METHODS AND SLUDGE DISPOSAL**	
	3.1 SECONDARY TREATMENT OF SEWAGE Filters - Types - Contact beds - Intermittent sand filters - Trickling Filters - Activated Sludge Process (ASP) - Advantages and Disadvantage of ASP - Comparison of ASP versus Trickling filters.	**3**

	3.2 MISCELLANEOUS METHODS OF SEWAGE TREATMENT General - Cesspool - Chlorination of sewage - Imhoff tanks - Oxidation ponds - Septic tanks - Soak pit - Dispersion Trenches - Waste from fertilizer factories. **3.3 SLUDGE DISPOSAL** Sludge digestion- Sludge digestion tank- Methods of disposal of digested sludge-Dewatering, Drying and disposal of sludge by drying beds-Methods of dewatering of sludge - Disposal of dewatered sludge- Disposal by dumping into the Sea- Burial Trenches- Incineration - Lagoons for disposal of raw sludge.	**3** **3**
UNIT IV	**ENVIRONMENTAL POLLUTION AND SOLID WASTE MANAGEMENT**	
	4.1 ENVIRONMENTAL POLLUTION Environment – Definition - Water pollution - Sources of water pollution - Effects of water pollution - Control of water pollution - soil pollution - Sources of soil pollution - Effects of soil pollution - Control of soil pollution - Noise pollution - Sources of noise pollution - Effects of noise pollution - Control of noise pollution - Air pollution - Sources of air pollution - Effects of air pollution on human beings, plants, animals, materials - air pollution control equipment - Control devices for particulate contaminants - Environmental degradation - Ozone layer depletion. **4.2 SOLID WASTE MANAGEMENT** Solid Waste Disposal – Necessity – Method of Solid Waste Disposal - dumping, sanitary landfill, composting - Energy from waste.	**6** **3**
UNIT V	**ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL POISONING**	
	5.1 ENVIRONMENTAL IMPACT ASSESSMENT Environmental impact assessment (EIA) - Methodology of EIA - Organizing the job - Performing the assessment - Preparation of Environmental Impact Statement(EIS) - review of EIS - Environmental risk assessment - limitation of EIA. **5.2 ENVIRONMENTAL POISONING** Cadium poisoning - Sources and Effects - Mercury poisoning - Sources and Effects - Trace metal poisoning - Definition - Sources and Effects.	**6** **3**
	TOTAL PERIODS	**45**

Suggested List of Students Activities:

- Prepare Models of rapid sand filtration process
- Compare various disinfection methods and identify the suitable disinfection method for the water from various sources.
- Identify the suitable appurtenances for the appropriate location in the water distribution network system.
- Demonstrate the process of Trickling Filters and Activated Sludge Process (ASP).
- Collect the details about the air pollution/noise pollution in the various industries and prepare the report.
- Visit any one solid waste disposal site and prepare the activities involved in the disposal.
- Case study about Environmental Impact Assessment for any one of the project .

Reference Books

1. A.K. Chatterjee, Water Supply, Waste Disposal and Environmental Engineering, 8th Edition, Khanne Publishers, 2006.
2. M.P. Poonia, S.C. Sharma, Santhosh kumar, Environmental Engineering, 2nd Edition, Khanna Publishers, 2023.
3. S.C. Rangwala, Water Supply and Sanitary Engineering,29th Edition, Charotar Publishing House, 2016.
4. Santhosh Kumar Garg, Water Supply Engineering, 37th Edition, Khanna Publishers.
5. Santhosh Kumar Garg, Sewage disposal and air pollution engineering, 43rd edition, Khanna Publishers.

Web - based/Online Resources

1. https://nptel.ac.in/courses/105107207
2. https://archive.nptel.ac.in/courses/124/107/124107160/

10616	Advanced Concrete Technology	L	T	P	C
Theory		3	0	0	3

Introduction:

Concrete is the material of choice when strength, durability, impermeability, fire resistance, and abrasion resistance are necessary. A deep understanding of concrete technology requires fundamental concepts, material characteristics and related laboratory experiments on concrete and its ingredients. It incorporates the latest Indian standard specifications and codes regulating concrete construction. The properties of concrete and its constituent materials and the role of various admixtures are the factors in modifying these properties to suit specific requirements.

The behaviour of concrete with respect to long-term drying shrinkage, plastic shrinkage, special concrete like FRC Polymer concrete is some of the areas in order to have better understanding of the complex behaviour of concrete. In addition to this, it explores the methods to repair and rehabilitation of structures already constructed

Course Objectives:

The objective of this course is to enable the students to

- Understand the theoretical concept of Concrete material which includes Cement and admixtures.
- Learn durability to resist cracks, weathering and chemical attack.
- Comprehend the properties of Fresh Concrete in special Environments
- Know various types of special concretes & its application.
- Understand repair materials and their applications

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Understand the process of Hydration of cement & compounds.

CO2: Apply relevant admixtures for concreting.

CO3: Gain the knowledge on durability, impermeability and corrosion.

CO4: Understand the concept of underwater construction, hot and cold weather concreting.

CO5: Describe the concept of various special concretes.

Pre-requisites:

Knowledge of basic Science and concrete ingredients, Manufacturing, & testing of concrete

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	1	1	1	1
CO2	3	3	2	1	2	1	2
CO3	3	3	3	2	3	2	3
CO4	3	3	2	2	2	2	2
CO5	3	3	2	1	2	1	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

NOTE 1: The course content shall be delivered through lectures, PowerPoint presentations, video demonstrations and field visits

NOTE 2: The Activity criteria shall be conducted / executed by the student and to be submitted to the faculty

Assessment Methodology:

	Continuous Assessment (40 marks)				**End Semester Examination (60 marks)**
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of two will be considered for the internal assessment of 15 Marks.

CA1 and CA2, Assessment test should be conducted for two units as below.

PART A (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write Five questions. Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 20 marks for the internal assessment.

Question Pattern:

Answer Ten questions by selecting two questions from each unit. Each question carries 10 marks each.

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

10616	Advanced Concrete Technology	L	T	P	C
Theory		3	0	0	3

UNIT I	CEMENT CHEMISTRY	
Chemical composition-Bogue's Compounds-Oxide composition &Compound Composition-Hydration of cement-Heat of hydration-Heat evolution pattern & peaks-Calcium silicate hydrates-Calcium Hydroxide-Calcium Aluminate Hydrate-Interfacial Transition zone - Water requirement for hydration-Composition of cement paste at different stages of hydration.		9

Unit II	ADMIXTURES AND ITS CLASSIFICATIONS	
2.1 Admixtures Definition-Purposes-classification. **2.2** Chemical Admixtures-Plasticizers-basic products-Action of plasticizers, Super plasticizers-classification, -effect of super plasticizers-compatibility of plasticizer with cement- Marsh cone Test-Retarders-applications-retarding materials-retarding plasticizers, Accelerators-applications-accelerating plasticizers-Air-entraining admixture-advantages-air entraining agents-effect of air entrainment on properties of concrete. **2.3** Mineral admixtures-Pozzolana Materials-Advantages-Fly ash-effect of fly ash on fresh concrete and hardened concrete, Ground granulated blast furnace slag (GGBS)-performance of GGBS in fresh and hardened concrete. Silica fumes- available forms-influence on fresh and hardened concrete.		9

UNIT III	DURABILITY, PERMEABILITY AND CORROSION	
3.1 Durability and Permeability Durability-Definition and significance- Cracking-Types and causes of cracks in concrete-Factors contributing to cracks in concrete-Plastic shrinkage cracks-Bleeding-Drying Shrinkage-Sulphate attack - Freezing and Thawing-Methods of controlling sulphate attack-Carbonation-Rate of carbonation-Alkali-silica reaction. Permeability-permeability of cement paste and concrete-causes for higher permeability.		9

3.2 Corrosion Corrosion of reinforcement-Factors influencing corrosion-Damages caused by corrosion-Preventive measures.		
UNIT IV	**CONCRETE STRUCTURES IN SPECIAL ENVIRONMENTS**	
4.1 Underwater Construction Methods-Tremie and grouting method-Precautions required during underwater concreting. **4.2 Cold Weather concreting** Effect of cold weather on Concrete-Precautions to be Taken while Concreting in Cold Weather Conditions. **4.3 Hot Weather Concreting** Effect of hot weather on concrete-Precautions to be taken while Concreting in Hot Weather Conditions.		9
UNIT V	**SPECIAL CONCRETE**	
5.1 Light weight concrete Ingredients-Natural aggregate-Artificial aggregate-Factors influencing the strength and density of light weight concrete-Properties of light weight concrete. **5.2 Fibre reinforced concrete** Fibres used-Factors effecting properties-volume of fibers-aspect ratio-orientation-workability and compaction of concrete-size of coarse aggregates-applications. **5.3 Polymer concrete** List of polymers-type of polymer concrete-Polymer impregnated concrete-properties and applications. **5.4 Self-compacting concrete** Requirements for SCC - Advantages - Test methods (names only).		9
TOTAL PERIODS		**45**

Suggested List of Students Activity:

1. Study on Natural fibres and artificial fibres and prepare a report.
2. Conduct market analysis on chemical admixtures and compare.
3. Compare the special concrete with conventional concrete and prepare report.
4. Conduct Marsh cone Test to infer compatibility of super plasticizers and cement.
5. List the cracks in concrete in a building and remedies.

Reference Books:

1. M.S. Shetty, Concrete Technology (Theory and Practice),8th Edition, S. Chand & Company Ltd, 2018
2. A.R. Santhakumar, Concrete Technology ,2nd Edition, Oxford University Press,2018
3. A.M. Neville, & J.J. Brooks, Concrete Technology,2nd Edition, Pearson Education, 2019

Web-based/Online Resources:

1. https://www.youtube.com/watch?v=SdWh05agJtg
2. https://www.youtube.com/watch?v=dgjZEI9PXCs
3. https://www.youtube.com/watch?v=rJSxTY6u9NU&list=PLyqSpQzTE6M82k6diJ8LXu58vSMAiM-WP

10617	Advanced Transportation Engineering	L	T	P	C
Theory		3	0	0	3

Introduction:

Advanced Transportation Engineering is a specialized field that delves into the intricate aspects of transportation systems. It aims to provide an overview about the highway with respect to planning, design, construction and maintenance as per IRC standards, specifications and methods. The key topics in this subject include Pavement Analysis and Design, Traffic Engineering, Mass transit system and bridge engineering.

Course Objectives:

The objective of this course is to

- Introduce the students with the practice of transportation engineering which focuses on highway, traffic and bridge engineering.
- Get Exposure to pavement evaluation in transportation engineering.
- Introduce recent advancements in the field of mass transit and road safety.
- Acquire knowledge in traffic engineering and management.
- Get adequate knowledge in various bridge structures.

Course Outcomes:

On successful completion of this course, the student will be able to	
CO1	Understand the properties and use of various materials and construction.
CO2	Attain knowledge in evaluation and maintenance of pavements.
CO3	Attain basic understanding on traffic engineering design, operation and management.
CO4	Understand basics of mass transit and its policies and road safety.
CO5	Illustrate the various types of bridges and its components used for transportation.

Pre-requisites:

Knowledge of basic highway and traffic engineering.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	2	1	3	3
CO2	3	2	3	2	1	3	2
CO3	3	3	3	3	1	3	3
CO4	3	2	2	2	1	3	3
CO5	3	2	3	2	1	2	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy

- It is advised that teachers take steps to pique pupils' attention and boost their learning confidence.
- To help students learn and appreciate numerous concepts and principles in each area, teachers should provide examples from daily life, realistic situations, and real-world engineering and technological applications.
- The demonstration can make the subject exciting and foster in the students a scientific mindset. Student activities should be planned on all the topics.
- Throughout the course, a theory-demonstrate-practice-activity strategy may be used to ensure that learning is outcome and employability-based.
- Do not let students work on an activity or an experiment with the expected outcome, rather allow students to be honest about whatever the results of the experiment are. If the results are different from the expectations, students should do an analysis where they could be the source of error, if any.

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	**CA4**	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of two will be considered for the internal assessment of 15 Marks.

CA1 and CA2, Assessment test should be conducted for two units as below.

PART A (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write Five questions. Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 20 marks for the internal assessment.

Question Pattern:

Answer Ten questions by selecting two questions from each unit. Each question carries 10 marks each.

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

10617	Advanced Transportation Engineering	L	T	P	C
Theory		3	0	0	3

UNIT I	PAVEMENT MATERIALS AND CONSTRUCTION	
Aggregates- requirements, properties and testing of aggregates - Subgrade-significance and functions, Evaluation of soil strength-CBR and plate load test, preparation of subgrade-Bitumen and Tar -Tests on bitumen: Penetration test, Viscosity test, Ductility test, Softening point test, Specific gravity test, Flash and Fire point test-Bituminous emulsions and Cutback.		9
UNIT II	**PAVEMENT EVALUATION AND MAINTENANCE**	
Pavement evaluation –Causes of distress in rigid and flexible pavements – Evaluation based on surface appearance: cracks, patches and pot holes, undulations, ravelling, roughness, skid resistance-Structural evaluation by Deflection measurements – Pavement Serviceability Index-Pavement maintenance (IRC Recommendations only).		9
UNIT III	**TRAFFIC ENGINEERING**	
Conventional and modern methods of traffic survey – Volume, Capacity and Density-Headway concepts and applications- speed and delay-origin and destination-Level of Services (LoS)-Parking facilities (on street, off street)-At grade intersection (rotary, channelization, traffic signal control)- Grade separated intersection and its types -Traffic sign and its types-Road Arboriculture.		9
UNIT IV	**MASS TRANSIT SYSTEM AND ROAD SAFETY SYSTEM**	
Various modes of mass transit and its Role - Urban transport system- NUTP and JNNURM- Unified Transport Authorities (UMTA and CUMTA) -Intelligent Transportation System (role in Traffic management and its advantages)-Applications of IoT in Transportation-Causes of accidents (human, vehicle, road factors)-Black spot - Black route - Road safety audit (elements and its need).		9
UNIT V	**BRIDGE ENGINEERING**	
Bridge: Definition-Components of Bridge-Selection of type of bridge-scour-afflux-economic span-waterway-Factors governing the ideal site for bridge-Functions of foundation-Types of bridge foundations-Coffer dam and its types-classification of bridges (based on purpose and materials)-abutments-piers-wing walls-Continuous bridge, Cantilever bridge, Arch bridge, Suspension bridge.		9
TOTAL PERIODS		**45**

Suggested List of Students Activities:

- Presentation/Seminars by students on any recent technological developments in Highway Engineering.
- Periodic class quizzes conducted on a weekly/fortnightly based on the course.
- Prepare Models of Traffic signs, pavements, road intersections, bridges etc.
- Visit nearby road construction activities, traffic signals, Bridges.

Reference Books:

1. S.K. Khanna and C.E.G Justo, "Highway Engineering",10th edition, Nem Chand and Bros Publisher, Roorkee, 2017.
2. Rangwala, "Highway Engineering" ,11th Edition, Charotar Publishing House Pvt. Ltd.,2017.
3. L R Kadiyali, "Transportation Engineering", 1st edition, Charotar Publishing House Pvt. Ltd.,2019.

Web-based/online resources:

1. Pavement Materials: https://youtu.be/3oNa9Z94Hiw?si=KaE7Cu7w6SvwVdek
2. Pavement Design: https://youtu.be/5DGYmSXXStg?si=umVV7FDl6D2YtI01
3. https://youtu.be/oju-XCy-MJU?si=43SHkPRIgr0wh4sd
4. Traffic Engineering: https://youtu.be/4ej1XkAvzhc?si=uMzVhFt7rpseA9Wu
5. Mass Transit System: https://youtu.be/O9OR-IpX32I?si=Sn7uw3bF_o89BPKM
6. Bridge Engineering: https://youtu.be/RB2k5hSYO3U?si=7B0sA6N36OOjDh8T

10618	Advanced Surveying	L	T	P	C
Theory		3	0	0	3

Introduction:

Advanced surveying techniques encompass a diverse array of methods and technologies employed to accurately measure, map, and analyze the Earth's surface and its features. These techniques often go beyond traditional surveying methods, incorporating cutting-edge technologies and sophisticated methodologies to achieve precise and comprehensive results. One facet of advanced surveying involves the utilization of satellite-based positioning systems such as GPS (Global Positioning System), GNSS (Global Navigation Satellite System), and GIS (Geographic Information System). These systems enable surveyors to determine precise coordinates of points on the Earth's surface, facilitating accurate mapping, navigation, and geospatial analysis. Overall, advanced surveying plays a pivotal role in various fields including urban planning, civil engineering, environmental management, disaster response, and natural resource exploration. By harnessing the power of advanced technologies and methodologies, surveyors can generate precise geospatial data essential for informed decision-making, sustainable development, and effective resource management.

Course Objectives:

The object of this course is to enable the students to

- Introduce to Engineering Survey and make them Understand the basic terms & principles of Surveys.
- Gain Knowledge on Modern surveying Instruments.
- Learn the Hydrographic and Astronomical Surveying.
- Gain the Knowledge of Remote Sensing.
- Attain the Knowledge of Photogrammetry.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1 Understand the Engineering Survey basic terms and principles.

CO2 Gain Knowledge about Modern surveying Instruments.

CO3 Understand the Hydrographic and Astronomical Surveying

CO4 Understand the Knowledge of Remote Sensing.

CO5 Understand the Knowledge of Photogrammetry.

Pre-requisites:

Knowledge of basic Surveying

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	3	-	2	3	3
CO2	3	-	2	2	-	-	3
CO3	3	2	3	-	2	3	2
CO4	3	2	2	2	-	2	2
CO5	3	-	3	-	-	3	2

Legend:3-HighCorrelation,2-MediumCorrelation,1-LowCorrelation

Assessment Methodology:

	Continuous Assessment (40 marks)				End Semester Examination (60 marks)
	CA1	CA2	CA3	CA4	
Mode	Written test (Two units)	Written test (Another Two units)	Quiz MCQ (Online / Offline)	Model Examination	Written Examination
Duration	2 Periods	2 Periods	1 Hour	3 Hours	3 Hours
Exam Marks	50	50	60	100	100
Converted to	15	15	5	20	60
Marks	15		5	20	60
Tentative Schedule	6th Week	12th Week	13-14th Week	16th Week	

CA1 and CA2: Assessment written test should be conducted for 50 Marks for two units. The marks scored will be converted to 15 Marks. Best of two will be considered for the internal assessment of 15 Marks.

CA1 and CA2, Assessment test should be conducted for two units as below.

PART A (5 X 10 Marks = 50 Marks).

Eight questions will be asked, students should write Five questions. Each unit Four questions can be asked. Each question may have subdivisions. Maximum two subdivisions shall be permitted.

CA3: 60 MCQ can be asked by covering the entire portion. It may be conducted by Online / Offline. The marks scored should be converted to 5 marks for the internal assessment.

CA4: Model examination should be conducted as per the end semester question pattern. The marks should be converted to 20 marks for the internal assessment.

Question Pattern:

Answer Ten questions by selecting two questions from each unit. Each question carries 10 marks each.

Four questions will be asked from every unit, students should write any two questions. The question may have two subdivisions only.

10618	Advanced Surveying	L	T	P	C
Theory		3	0	0	3

UNIT I	ENGINEERING SURVEYS	
1.1 Reconnaissance, preliminary and location surveys for engineering projects - Lay out - Setting out works - Route Surveys for highways, railways and waterways 1.2 Horizontal and vertical curves - Simple curves - Setting with chain and tapes, Tangential angles by theodolite, double theodolite - Setting out by offsets and angles - Vertical curves - Mine Surveying - instruments - Tunnels - Correlation of underground and surface surveys – Shafts.		9

UNIT II	MODERN SURVEYING INSTRUMENTS	
2.1 Electronic Theodolites - component parts -set up- working principles – temporary adjustments - Total stations - uses-component parts - EDM, Electronic field book - Advantages – Parts and accessories - working principle – Observables – Errors - COGO functions – Field procedure and applications. 2.2 GPS: Advantages - System components– receiver components and antenna – Planning and data acquisition – Data processing - Errors in GPS – Field procedure and applications. Geographical information systems (GIS) - map definitions, map projections data entryimportance, use and application of GIS in Civil Engineering.		10

UNIT III	HYDROGRAPHIC AND ASTRONOMICAL SURVEYING	
3.1 Hydrographic Surveying - Tides - MSL - Sounding methods - Location of soundings and methods - Three point problem (Lehmann's Method, Bessels Method, Mechanical Method) - Strength of fix - Sextants and station pointer - River surveys - Measurement of current and discharge - Celestial sphere. 3.2 Astronomical terms and definitions - Motion of sun and stars - Apparent altitude and corrections - Celestial co-ordinate systems - Different time systems - use of Nautical almanac - Star constellations .		8

UNIT IV	INTRODUCTION TO REMOTE SENSING	
4.1 Remote sensing - Introduction and applications in Civil Engineering– components of RS – History of Remote Sensing – Merits and demerits of data collation between conventional and remote sensing methods. 4.2 Electromagnetic Spectrum-Standard atmospheric profile –interaction of radiation with atmosphere – Scattering, absorption and refraction -Spectral		10

Signature concepts – Typical spectral reflectance curves for vegetation, soil and water -Classification of remote sensors.	
UNIT V	**INTRODUCTION TO PHOTOGRAMMETRY**
5.1 Principles - Stereoscopic depth perception – aerial photo-aerial camera -Scale – overlaps – stereoscopy – concepts – viewing and measuring system – principle of floating mark 5.2 Methods of parallax measurement – vertical photographs – geometry, scale, parallax equations, Planimetric mapping – Tilted photograph – Geometry, Coordinate system, Scale, Planimetric mapping.	8
TOTAL PERIODS	45

List of Suggested Student Activities:

- Collect the information on survey instruments available in the market with specifications.
- Watch educational videos on various advanced surveying methods to understand the concepts.

Text /Reference:

1. Dr. B. C. Punmia, Ashok K. Jain and Arun K Jain, Surveying Vol. I & II, 6th Edition, Lakshmi Publications Pvt Ltd, New Delhi, Sixteenth Edition, 2016.
2. K. R. Arora, Surveying Vol I & II, 12th Edition ,Standard Book house, 2013.
3. C. Venkatramaiah, Textbook of Surveying, 2nd Edition, Universities Press, 2011.

Web-based/Online Resource

1. Setting out of simple curve - https://www.youtube.com/watch?v=am3MYbQApz8
2. EDM - https://www.youtube.com/watch?v=HImugNxfDhU
3. HYDROGRAPHIC SURVEYING - https://www.youtube.com/watch?v=ZkZbVOdaXHs
4. GIS - https://www.youtube.com/watch?v=rEzgU6Ds_5c
5. REMOTE SENSING AND GIS - https://www.youtube.com/watch?v=Cy2Oy9iJTbY
6. TYPES OF PHOTOGRAMMETRY - https://www.youtube.com/watch?v=VliVvNrV_vU

10621	Artificial Intelligence and Machine Language in Construction Management	L	T	P	C
Practicum		1	0	4	3

Course Description:

This course explores the transformative impact of Artificial Intelligence (AI) and Machine Learning (ML) on construction management. It aims to equip students with the knowledge and skills needed to leverage AI and ML technologies to optimize construction processes, improve project outcomes, and enhance decision-making. Through a combination of theoretical understanding and practical application, students will learn how to implement these advanced technologies in real-world construction scenarios. The course aims to bridge the gap between advanced technology and practical construction management, preparing students to lead the future of the construction industry with cutting-edge AI and ML capabilities.

Course Objectives:

The objective of this course is to enable the students to:

- Understand the fundamental concepts of AI and ML.
- Explore the applications of AI and ML in the construction industry.
- Analyze the benefits and challenges of integrating AI and ML in construction management.
- Develop practical skills in using AI and ML tools for construction project planning, scheduling, and risk management.
- Evaluate case studies of AI and ML implementations in construction projects.

Course Outcomes:

After successful completion of this course the students should be able to	
CO1	Demonstrate an understanding of AI and ML principles and their relevance to construction management.
CO2	Apply AI and ML techniques to solve complex problems in construction projects.
CO3	Analyze and interpret data to make informed decisions in construction management.
CO4	Develop AI-driven solutions to enhance efficiency, safety, and quality in construction.
CO5	Critically assess the impact of AI and ML on the construction industry and anticipate future trends.

Pre-requisites: NIL

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	2	1		3
31CO2	3	2	1	2	1		3
CO3	3	2	1	2	1		3
CO4	3	2	1	2	1		3
CO5	3	2	1	2	1		3

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- Lecture
- Presentation
- Demonstration
- Discussion

Assessment Methodology:

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	Cycle 1 Exercises & Two units	Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Internal Marks	40			
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal Assessment of 30 Marks.
- **The details of the documents to be prepared as per the instruction below.**
  Practical documents should be maintained for every exercise/experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	2
B	Tabulation/Observation	10
C	Graph/Sketch/Calculation	15
D	Result	3
E	Written Test	20
TOTAL		50
F	Practical Documents (As per the portions)	10
		60

- Written Test for theory portions should be conducted for 20 Marks as per the question pattern below.

Question pattern – Written Test Theory

Description		Marks	
Part – A	10 MCQ Questions	10 X 1 Mark	10 Marks
Part – B	One 10 Marks Question out of 3 Questions	1 X 10 Marks	10 Marks
TOTAL			20 Marks

- **CA 3:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	10
B	Tabulation/Observation	20
C	Graph/Sketch /Calculation	20
D	Result	10
E	Written Test	30
F	Viva Voce	10
	TOTAL	100

Note: For the written test 30 MCQ or 15 x 2 marks or 10 x 3 Marks or 6 x 5 marks or 3 x 10 Marks questions or combination of any types given above shall be asked from the theory portions.

10621	Artificial Intelligence and Machine Language in Construction Management	L	T	P	C
Practicum		1	0	4	3

UNIT I	**PYTHON PROGRAMMING**	
	Variables, Data types, Control flow statements: if, looping statements (for and while); Functions; Creation, manipulation, and common operations: Lists, Tuples, Dictionaries and Sets: Fundamental Python Libraries for Data Scientists: Numpy, Scikit Learn, Pandas, Matplotlib.	**5**
UNIT II	**MACHINE LEARNING**	
	Introduction to Machine Learning: ML Types, Regression: Linear Regression; Classification: K-Nearest Neighbour (KNN), and Decision Tree - Unsupervised algorithm: K-Means algorithm; Dimensionality Reduction – Principal Component Analysis (PCA) Algorithm	**5**
UNIT III	**ARTIFICIAL INTELLIGENCE**	
	Multi-Layer Perceptron, Artificial Neural Network, Introduction to generative AI, Prompt Engineering - Introduction to AI in Civil Engineering, Use of AI in Smart Construction Equipment.	**5**
	PRACTICAL EXERCISES	
1	Sample programs using conditional and looping statements	**5**
2	Sample Programs for List, Array, Dictionary and Set	**4**
3	Data Manipulation with Pandas; Sample programs to pre-process and visualize data.	**4**
4	ML - Estimation of the cost of a construction project using linear regression	**4**
5	ML - Prediction of Labour requirement for a project using KNN	**4**
6	ML - Prediction of salaries of the employee in a construction site using decision tree	**4**

7	ML - Concrete strength prediction using Random Forest Regression	**4**
8	ML – Using K Means clustering to improve construction project efficiency	**4**
9	ML - Perform univariate and multivariate time series forecasting	**4**
10	ML - Prediction of Material requirement for a project.	**4**
11	ML - Estimation of time overruns in a project using ANN	**4**
	TOTAL PERIODS	**75**

Suggested List of Students Activity:

1. Tracking worker movements and safety compliance using ML
2. Weather related delays using ML algorithm.
3. Minimising material cost and resource optimization in the Construction fields.
4. Develop AI systems to monitor safety compliance on construction sites.
5. Analyse historical data to predict risks using ML Algorithms.

Reference Books:

1.Limao Zhang, YuePan, Xianguo Wu, Miroslaw J. Skibniewski, Artificial Intelligence in Construction Engineering and Management, Springer, 2024.

2. Vagelis Plevris, Afaq Ahmad, Nikos D. Lagaros, Artificial intelligence and Machine Learning Techniques for Civil Engineering, 1st Edition, IGI Global, 17th March 2023.

3. Jonathan S Walker, Machine Learning for Beginners, 1st edition , Jw Choices, 31st January 2023.

Web-based/Online Resources:

1. Suggested Journals : Journal of Computing in Civil Engineering (ASCE)

2.https://www.constructiondive.com/for live construction news updation

3. Learning Path: "AI and Machine Learning Foundations" from coursera.

4. AI tools – Copilot.ai,Bard.ai,Chatgpt.ai etc.

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

Computers- 30

Softwares used:

- Pycharm
- Anaconda python
- Data set: Kaggle ,Github ,data.gov etc

10622	Structural Detailing for RCC Elements	L	T	P	C
Practicum		1	0	4	3

Introduction:

This is a core subject which covers broad elements of RCC detailing. This is an important subject that deals with the detailing of RCC structural elements. Diploma holders in Civil Engineering will be required to supervise the civil works with structural drawings. They may also be required to design and detail simple structural elements, make changes in detailing and drafting procedure depending upon the availability of materials (bars of different diameters). This subject thus deals with elementary detailing principles as per IS code of practice IS: 456 - 2000 by limit state method.

Course Objectives:

The objectives of the course are to enable the students to

- Create detailing and drafting of simple RCC elements like singly, doubly reinforced rectangular beams for flexure and shear.
- Prepare detailing and drafting of one-way slab / Two-way slabs.
- Prepare detailing and drafting of axially loaded columns and footings.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Prepare detailing and drafting of RCC elements like singly and doubly reinforced rectangular simply supported beams and singly reinforced cantilever beams for flexure and shear.

CO2: Prepare detailing and drafting of one-way slab / Two-way slabs.

CO3: Prepare detailing and drafting of axially loaded columns and footings.

Pre-requisites: Design of R.C.C Structures

CO/PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	-	2	-	3
CO2	3	3	2	-	2	-	3
CO3	3	3	2	-	2	-	3

Legend:3-HighCorrelation,2-MediumCorrelation,1-LowCorrelation

Instructional Strategy

- This subject is introduced so that diploma holder in Civil Engineering may appreciate the concepts and principles of RCC structural elements of buildings and are able to apply the knowledge gained through the subjects of mechanics of materials and mechanics of structures. The detailing of simple structural elements like beams, slabs, column and footings will be demonstrated to the students to prepare them to work in the field.
- Teacher should give simple exercises involving the applications of various concepts and principles being taught in the subject.
- Efforts should be made to prepare tutorial sheets on various topics and students should be encouraged/guided to solve the tutorial problems independently and a visit to local construction site is encouraged to make the students understand the behavior and uses of structural elements.
- Teacher may conduct weekly small quiz sessions to know the students' level of understanding.

Assessment Methodology:

	Continuous Assessment (40 marks)			End Semester Examination (60 marks)
	CA1	**CA2**	**CA3**	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	Cycle 1 Exercises & Two units	Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Internal Marks	40			
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal Assessment of 30 Marks.
- **The details of the documents to be prepared as per the instruction below.**
  Practical documents should be maintained for every exercise/experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	2
B	Tabulation/Observation	10
C	Graph/Sketch/Calculation	15
D	Result	3
E	Written Test	20
TOTAL		50
F	Practical Documents (As per the portions)	10
		60

- Written Test for theory portions should be conducted for 20 Marks as per the question pattern below.

Question pattern – Written Test Theory

Description		Marks	
Part – A	10 MCQ Questions	10 X 1 Mark	10 Marks
Part – B	One 10 Marks Question out of 3 Questions	1 X 10 Marks	10 Marks
TOTAL			20 Marks

- **CA 3:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	10
B	Tabulation/Observation	20
C	Graph/Sketch /Calculation	20
D	Result	10
E	Written Test	30
F	Viva Voce	10
	TOTAL	100

Note: For the written test 30 MCQ or 15 x 2 marks or 10 x 3 Marks or 6 x 5 marks or 3 x 10 Marks questions or combination of any types given above shall be asked from the theory portions.

10622	Structural Detailing for RCC Elements	L	T	P	C
Practicum		1	0	4	3

UNIT I	**DETAILING OF SIMPLY SUPPORTED, SINGLY AND DOUBLY REINFORCED BEAMS AND CANTILEVER BEAMS AS PER IS 456- 2000**	
	Concept of Reinforced Cement Concrete (RCC)– Types of Reinforcement Materials-Suitability of steel as reinforcing material-Properties of mild steel, HYSD steel and TMT bars-Loading on structures as per IS:875 -Development of stress in reinforcement-Curtailment of reinforcements -Detailing and drafting Concept of simply supported singly and doubly reinforced beams and cantilever beams as per IS 456-2000 and SP-34.	5
	Practical exercises:	5
	1. Detailing and Drafting of Singly Reinforced / Doubly Reinforced simply supported beam as per codal provisions.	5
	2. Detailing and Drafting of cantilever beam as per codal provisions.	
	3. Detailing and drafting of continuous beam with different end conditions as per codal provisions.	5
UNIT II	**DETAILING OF ONE WAY, TWO WAY AND CONTINUOUS SLABS AS PER IS 456 - 2000**	
	Requirements governing slab reinforcements and detailing of slabs as per IS 456-2000 and SP 34.	5
	-Detailing and drafting of one-way, two-way slab (Corners are not held down and corners held down) - Tension and Torsion reinforcement requirements.	5
	Practical exercises:	
	4. Detailing and drafting of one-way slab as per codal provisions.	5
	5. Detailing and drafting of two-way slab as per codal provisions- Corners are not held down (All the Four edges discontinuous case)	5
	6. Detailing and drafting of two-way slab as per codal provisions corners held down (All the Four edges discontinuous case)	5
	7. Detailing and drafting of one-way Continuous slab as per codal provisions.	5
	8. Detailing and drafting of two-way Continuous slab as per codal provisions.	

UNIT III	DETAILING OF COLUMNS AND FOOTING AS PER IS 456- 2000	
	Requirements governing longitudinal and transverse reinforcement of column and its arrangements as per IS 456-2000 and SP 34 - detailing and drafting of axially loaded short columns for reinforcement distributed equally on two/four sides and footing as per IS code.	5
	Practical exercises:	
	9. Detailing and drafting of square column as per codal provisions.	5
	10. Detailing and drafting of rectangular column as per codal provisions.	5
	11. Detailing and drafting of isolated square footing as per codal provisions.	5
	12. Detailing and drafting of isolated rectangular footing as per codal provisions.	5
TOTAL PERIODS		**75**

Suggested List of Students Activities:

Visits to nearby construction site and study about

- Foundation and Footings
- Column reinforcements
- Grade beam and lintel level beam reinforcement arrangements
- Reinforcement details for beams and slabs
- Study the bar bending details of structural drawings.
- Learning the reinforcement arrangements given in SP- 34 (Hand book on concrete reinforcement and detailing)

Reference Books

1. B.C. Punmia “Limit state Design of Reinforced concrete” revised edition, Lakshmi publications, Delhi, 2016
2. P.C. Varghese “Limit state design of reinforced concrete”, 2nd edition PHI Learning Pvt. Ltd, 2008
3. S.S. Bhavikatti “Design of RCC and structural elements”, 1st edition, New age International Publications, 2016
4. IS 456 -2000, IS 875-1987, IS 800-2007, SP 34-1987.

Web-based/Online Resources

1. https://nptel.ac.in/
2. https://ndl.iitkgp.ac.in
3. Limit state method : https://youtu.be/jhVh4qNa_x8?si=YNSfiPtXo1DDZANC
4. Analysis of singly reinforced beams : https://youtu.be/o4-EAjGhzSw?si=llD2GPM_ZcvIqx3e
5. Design of flanged beams in flexure : https://youtu.be/BOtUb1yk8sI?si=RSfF6k9F_SHnZium
6. Design of slabs : https://youtu.be/TQLehidE6Hc?si=eTEtZDufiXFmvp9-
7. Design of columns : https://youtu.be/n-D56dTyiyk?si=SGY0E46YRd1LZucG

LIST OF EQUIPMENTS (for a batch of 30 students):

S.No.	List of Equipment's required	Quantity Required
1	Computers	30 Nos.
2	Laser printer	2 Nos.
3	CAD software	30 Users

10623	Design and Drawing of Steel Elements	L	T	P	C
Practicum		1	0	4	3

Introduction:

A steel structure, a metal structure is made of structural steel components connected to each other to carry loads and provide rigidity. The subject deals with the basic concepts and principles, their application in drafting and detailing tension members, compression members and connections. Construction.

Course Objectives:

The objective of the course is to enable the students to

- Understand the importance of various types of steel in construction.
- Know the use of steel code and steel tables for the design of steel structural members.
- Study about the various types of connection for steel members and its importance.
- Assess the detailing and drafting of beam, tension member, compression member and various types of connections.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Understand the application of IS code of practice for the design of steel structural elements.

CO2: Understand the detailing and drafting of Compression members.

CO3: Understand the detailing and drafting of Tension members.

CO4: Understand the detailing and drafting of Beams.

CO5: Understand the detailing and drafting of welded and bolted connections.

Pre-requisites: Properties of Steel, Types and Shapes Steel Elements.

CO/PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	2	1	2	2
CO2	3	2	1	2	1	2	2
CO3	3	2	1	2	1	2	2
CO4	3	2	1	2	1	2	2
CO5	3	2	1	2	1	2	2

Legend: 3-High Correlation, 2-Medium Correlation, 1-Low Correlation

Instructional Strategy:

- To help the students to learn and appreciate the concepts in drafting and detailing the members and connections.
- Theory- demonstrate- practice – activity may be used to ensure that learning is outcome- and employability based.
- Visits to different construction activities has to be planned on all the topics.

Assessment Methodology:

	Continuous Assessment (40 marks)			**End Semester Examination (60 marks)**
	CA1	**CA2**	**CA3**	
Mode	Practical & Written Test	Practical & Written Test	Practical Test	Practical Examination
Portion	Cycle 1 Exercises & Two units	Cycle 2 Exercises & another two units	All Exercises	All Exercises
Duration	3 Periods	3 Periods	3 Hours	3 hours
Exam Marks	60	60	100	100
Converted to	15	15	10	60
Marks	30		10	60
Internal Marks	40			
Tentative Schedule	7th Week	14th Week	16th Week	

Note:

- **CA1 and CA2:** All the exercises/experiments should be completed as per the portions above and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation as below. The marks awarded shall be converted to 15 Marks for each assessment test. Addition of CA1 and CA2 will be considered for the internal Assessment of 30 Marks.
- **The details of the documents to be prepared as per the instruction below.**
  Practical documents should be maintained for every exercise/experiment immediately after completion of the practice. The practical document should be submitted for the practical test. The same should be evaluated for 10 Marks for each exercise/experiment. The total marks awarded should be converted to 10 Marks for the practical test as per the scheme of evaluation as below.

SCHEME OF EVALUATION

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	2
B	Tabulation/Observation	10
C	Graph/Sketch/Calculation	15
D	Result	3
E	Written Test	20
TOTAL		50
F	Practical Documents (As per the portions)	10
		60

- Written Test for theory portions should be conducted for 20 Marks as per the question pattern below.

Question pattern – Written Test Theory

Description		Marks	
Part – A	10 MCQ Questions	10 X 1 Mark	10 Marks
Part – B	One 10 Marks Question out of 3 Questions	1 X 10 Marks	10 Marks
TOTAL			20 Marks

- **CA 3:** All the exercises/experiments should be completed and kept for the practical test. The students shall be permitted to select any one by lot for the test. The practical test should be conducted as per the scheme of evaluation below. After completion of all the exercises the practical test should be conducted as per End Semester Examination question pattern scheme of evaluation. The marks awarded should be converted to 10 Marks for the internal assessment.

SCHEME OF EVALUATION

Model Practical Examination and End Semester Examination - Practical Exam

PART	DESCRIPTION	MARKS
A	Aim and Apparatus Required	10
B	Tabulation/Observation	20
C	Graph/Sketch /Calculation	20
D	Result	10
E	Written Test	30
F	Viva Voce	10
	TOTAL	100

Note: For the written test 30 MCQ or 15 x 2 marks or 10 x 3 Marks or 6 x 5 marks or 3 x 10 Marks questions or combination of any types given above shall be asked from the theory portions.

10623	Design and Drawing of Steel Elements	L	T	P	C
Practicum		1	0	4	3

UNIT I	**SIMPLE CONNECTION-BOLTED AND WELDED CONNECTION**	
	Introduction -Bolted connection-types of bolts-Types of bolted joints-lap and butt joint-main plate, cover plate, packing plate, tack bolts-Patterns of bolted joints-chain, Staggered, diamond-IS 800 2007 Specifications for bolted joints-Diameter of bolts, pitch, Gauge, edge distance, end distance.	3
	Welded connection-Types of weld-fillet weld, butt weld or groove, plug weld, slot weld, Spot weld-IS 800 2007 Specifications for welded joint-size, effective throat thickness, Effective length, overlap-intermittent weld.	
	Practical exercises:	4
	1. Detailing and drafting of double cover butt joint with packing plate and bolt arranged in diamond pattern.	4
	2. Detailing and drafting of end connection of ISA tie member with gusset plate by fillet weld.	4
	3. Detailing and drafting of end connection of Channel tie member with gusset plate by slot weld and plug weld.	
UNIT II	**TENSION MEMBERS**	
	Tension members-types of tension members-Net sectional area- Types of failure-yielding failure, rupture failure and block shear failure-Lug Angle-Splice.	3
	Practical exercises:	
	4. Draw the block shear failure of angle tie member connected to gusset plate by a) Single bolted connection. b) Double bolted connection.	4
	5. Detailing and drafting of Channel tension member connected to gusset plate using lug angle by bolted connection.	4
	6. Detailing and drafting of tension member consisting of two angles placed back-to-back connected to gusset plate using lug angle by bolted connection.	4

UNIT III	**COMPRESSION MEMBERS**	
	Introduction-Compression members- effective length-slenderness ratio-Design of simple compression member-Built-up column-Lacing-Batten-IS 800 2007 provision for built-up column-Splice.	3
	Practical exercises:	
	7. Detailing and drafting of built-up column of two channels face-to-face connected by single lacing	4
	8. Detailing and drafting of built-up column of two channels back-to-back connected by double lacing.	4
	9. Detailing and drafting of built-up column of two channels face-to-face connected by battens.	4
UNIT IV	**BEAMS**	
	Beams-Laterally supported and laterally unsupported beams-Design of simple steel beam-Plate girder.	3
	Practical exercises:	
	10. Detailing and drafting of laterally unsupported beam.	4
	11. Detailing and drafting of laterally supported beam.	4
	12. Detailing and drafting of plate girder.	4
UNIT V	**ROOF TRUSS**	
	Truss-Components of truss-Types of truss-Pratt truss, Warren truss, Fink truss, King post truss, Queen post truss, Howe truss, North light roof truss	3
	13. Detailing and drafting of Pratt truss	4
	14. Detailing and drafting of Fink truss	4
	15. Detailing and drafting of North light roof truss	4
	TOTAL PERIODS	**75**

Suggested List of Students Activity:

- Seminar on the different types of steel, joints and application.
- Periodic quizzes based on the topic.
- Industrial visit to know about the real- world application.

Reference Books

1. Duggal S.K., Design of Steel Structures, 3rd edition, Tata McGraw Hill, Publishing Co. Ltd., New Delhi, 2019
2. Bhavikatti S.S, Design of Steel Structures,5th edition, Ik International Publishing House, New Delhi, 2017.
3. Jack C. McCormac and Stephen F Csernak, Structural Steel Design,5th edition Pearson Education Limited, 2011
4. Subramanian N, Design of Steel structures - Limit state method, 2nd edition, Oxford University Press, 2016.

Web-based/Online Resources:

1. Nptel-Design of steel structures.
   https://archive.nptel.ac.in/courses/105/105/105105162/
2. http://ecoursesonline.iasri.res.in/course/view.php?id=64
3. Institute For Steel Development And Growth (INSDAG) Materials.
   https://www.steel-insdag.org/teaching-resource-materials

Equipment / Facilities required to conduct the Practical Course. (Batch Strength: 30 Students)

S.No.	List of Equipment's required	Quantity Required
1	Computers	30 Nos.
2	Laser printer	2 Nos.
3	CAD software	30 Users

10631	Internship	Periods	C
Project		520	12

Introduction

Internships in educational institutions are designed to provide students with practical experience in their field of study and to bridge the gap between academic knowledge and professional practice.

Objectives

After completing Internship, Interns will be able to,

- Apply the theoretical knowledge and skill during performance of the tasks assigned in internship.
- Demonstrate soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship.
- Document the Use case on the assigned Task.
- Apply theoretical knowledge gained in the classroom to real-world practical applications.
- Gain hands-on experience in the industrial practices.
- Develop essential skills such as communication, organization, teamwork, and problem-solving.
- Enhance specific skills related to the intern's area of focus.
- Understand the daily operations and responsibilities.
- Gain knowledge by working under the guidance of experienced supervisors and administrators.
- Explore different career paths.
- Decide their future career goals based on firsthand experience.
- Facilitate the establishment of professional relationships with supervisor, administrators, and other professionals in the field.
- Provide access to a network of contacts that can be beneficial for future job opportunities and professional growth.
- Foster personal growth by challenging interns to step out of their comfort zones and take on new responsibilities.
- Build confidence and self-efficacy through successful completion of internship tasks and projects.
- Give insight into the policies, regulations, and administrative practices.

- Observe and understand the implementation of standards and policies in practice.
- Provide opportunities for constructive feedback from supervisors and mentors, aiding in the intern's professional development.
- Enable self-assessment and reflection on strengths, areas for improvement, and career aspirations.
- Encourage sensitivity to the needs and backgrounds of different groups, promoting inclusive and equitable industrial practices.

Course Outcomes

CO 1: Demonstrate improved skills.

CO 2: Exhibit increased professional behavior.

CO 3: Apply theoretical knowledge and principles in real-world practices.

CO 4: Develop and utilize assessment tools to evaluate the learning and practices.

CO 5: Engage in reflective practice to continually improve their learning and professional growth.

Facilitating the Interns by an Internship Provider.

- Orient intern in the new workplace. Give interns an overview of the organization, Explain the intern's duties and introduce him or her to co-workers.
- Develop an internship job description with clear deliverables and timeline.
- Allow the interns in meetings and provide information, resources, and opportunities for professional development.
- The interns have never done this kind of work before, they want to know that their work is measuring up to organizational expectations, hence provide professional guidance and mentoring to the intern.
- Daily progress report of Intern is to be evaluated by industry supervisor. Examine what the intern has produced and make suggestions. Weekly supervision meetings can help to monitor the intern's work.

Duties Responsibilities of the Faculty Mentor

- To facilitate the placement of students for the internship
- To liaison between the college and the internship provider
- To assist the Industrial Training Supervisor during assessment

Instructions to the Interns

- Students shall report to the internship provider on the 1st day as per the internship schedule.
- Intern is expected to learn about the organization, its structure, product range, market performance, working philosophy etc.
- The interns shall work on live projects assigned by the internship provider.
- The Intern shall record all the activities in the daily log book and get the signature of the concerned training supervisor.
- Intern shall have 100% attendance during internship programme. In case of unavoidable circumstances students may avail leave with prior permission from the concerned training supervisor of the respective internship provider. However, the maximum leave permitted during internship shall be as per company norms where they are working and intern shall report the leave sanctioned details to their college faculty mentor.
- The interns shall abide all the Rules and Regulations of internship provider
- Intern shall follow all the safety Regulations of internship provider.
- On completion of the internship, the intern shall report to the college and submit the internship certificate mentioning duration of internship, evaluation of interns by internship provider, Student's Diary and Comprehensive Training Report.

Attendance Certification

Every month students have to get their attendance certified by the industrial supervisor in the prescribed form supplied to them. Students have also to put their signature on the form and submit it to the institution supervisor. Regularity in attendance and submission of report will be duly considered while awarding the Internal Assessment mark.

Training Reports

The students have to prepare two types of reports: Weekly report in the form of diary to be submitted to the concerned staff in-charge of the institution. This will be reviewed while awarding Internal

Industrial Training Diary

Students are required to maintain the record of day-to-day work done. Such a record is called Industrial training Diary. Students have to write this report regularly. All days for the week should be accounted for clearly giving attendance particulars (Presence, absence, Leave,

Holidays etc.). The concern of the Industrial supervisor is to periodically check these progress reports.

Comprehensive Training Report

In addition to the diary, students are required to submit a comprehensive report on training with details of the organisation where the training was undergone after attestation by the supervisors. The comprehensive report should incorporate study of plant/product/process/construction along with intensive in-depth study on any one of the topics such as processes, methods, tooling, construction and equipment, highlighting aspects of quality, productivity and system. The comprehensive report should be completed in the last week of Industrial training.

Any data, drawings etc. should be incorporated with the consent of the Organisation.

Scheme of Evaluation

Internal Assessment

Students should be assessed for 50 Marks by industry supervisor and polytechnic faculty mentor during 3rd Month and 5th Month. The total marks (50 + 50) scored shall be converted to 40 marks for the Internal Assessment.

Sl. No.	Description	Marks
A	Punctuality and regularity. (Attendance)	10
B	Level / proficiency of practical skills acquired. Initiative in learning / working at site.	10
C	Ability to solve practical problems. Sense of responsibility.	10
D	Self-expression / communication skills. Interpersonal skills / Human Relation.	10
E	Report and Presentation.	10
Total		**50**

End Semester Examination - Project Exam

Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Chairman Board of Examinations after the completion of internship period (June - May). The marks scored will be converted to 60 marks for the End Semester Examination.

Sl. No.	Description	Marks
A	Daily Activity Report.	20
B	Comprehensive report on Internship, Relevant Internship Certificate from the concerned department.	30
C	Presentation by the student at the end of the Internship.	30
D	Viva Voce	20
Total		**100**

10632	Fellowship	Periods	C
Project		520	12

Introduction

The Fellowship in the Diploma in Engineering program is designed to provide aspiring engineers with a comprehensive educational experience that combines theoretical knowledge with practical skills. This fellowship aims to cultivate a new generation of proficient and innovative engineers who are equipped to meet the challenges of a rapidly evolving technological landscape.

Participants in this fellowship will benefit from a robust curriculum that covers core engineering principles, advanced technical training, and hands-on projects. The program emphasizes interdisciplinary learning, encouraging fellows to explore various branches of engineering, from mechanical and civil to electrical, electronics & communication and computer engineering. This approach ensures that graduates possess a versatile skill set, ready to adapt to diverse career opportunities in the engineering sector.

In addition to academics, the fellowship offers numerous opportunities for professional development. Fellows will engage with industry experts through seminars, workshops, and internships, gaining valuable insights into real-world applications of their studies. Collaborative projects and research initiatives foster a culture of innovation, critical thinking, and problem-solving, essential attributes for any successful engineer.

By offering this fellowship, participants become part of a vibrant community of learners and professionals dedicated to advancing the field of engineering. The program is committed to supporting the growth and development of each fellow, providing them with the tools and resources needed to excel both academically and professionally.

The Fellowship in the Diploma in Engineering is more than just an educational endeavor; it is a transformative journey that equips aspiring engineers with the knowledge, skills, and experiences necessary to make significant contributions to society and the engineering profession.

Objectives

After completing students will be able to,

- Provide fellows with a solid foundation in core engineering principles and advanced technical knowledge across various engineering disciplines.
- Equip fellows with hands-on experience through laboratory work, projects, and internships, ensuring they can apply theoretical knowledge to real-world scenarios.
- Promote interdisciplinary understanding by encouraging exploration and integration of different engineering fields, fostering versatility and adaptability in fellows.
- Encourage innovation and creativity through research projects and collaborative initiatives, enabling fellows to develop new solutions to engineering challenges.
- Facilitate professional growth through workshops, seminars, and interactions with industry experts, preparing fellows for successful careers in engineering.
- Develop critical thinking and problem-solving skills, essential for tackling complex engineering problems and making informed decisions.
- Strengthen connections between academia and industry by providing opportunities for internships, industry visits, and guest lectures from professionals.
- Foster leadership qualities and teamwork skills through group projects and collaborative activities, preparing fellows for leadership roles in their future careers.
- Instill a sense of ethical responsibility and awareness of the social impact of engineering practices, encouraging fellows to contribute positively to society.
- Promote a culture of lifelong learning, encouraging fellows to continually update their knowledge and skills in response to technological advancements and industry trends.
- Prepare fellows to work in a global engineering environment by exposing them to international best practices, standards, and cross-cultural experiences.

Course Outcomes

CO 1: Demonstrate a strong understanding of core engineering principles and possess the technical skills necessary to design, analyze, and implement engineering solutions across various disciplines.

CO 2: Apply theoretical knowledge to practical scenarios, effectively solving engineering problems through hands-on projects, laboratory work, and internships.

CO 3: Exhibit the ability to conduct research, develop innovative solutions, and contribute to advancements in engineering through critical thinking and creative approaches to complex challenges.

CO 4: Understand and adhere to professional and ethical standards in engineering practice, demonstrating responsibility, integrity, and a commitment to sustainable and socially responsible engineering.

CO 5: Enhance strong communication skills, both written and verbal, and be capable of working effectively in teams, demonstrating leadership and collaborative abilities in diverse and multidisciplinary environments.

Important points to consider to select the fellowship project.

Selecting the right fellowship project is crucial for maximizing the educational and professional benefits of a Diploma in Engineering program.

- **Relevance to Future Plans**: Choose a project that aligns with your long-term career aspirations and interests. This alignment will ensure that the skills and knowledge you gain will be directly applicable to your desired career path.
- **Industry Relevance**: Consider the current and future relevance of the project within the industry. Opt for projects that address contemporary challenges or emerging trends in engineering.
- **Access to Facilities**: Ensure that the necessary facilities, equipment, and materials are available to successfully complete the project. Lack of resources can hinder the progress and quality of your work.
- **Mentorship and Guidance**: Select a project that offers strong mentorship and support from experienced faculty members or industry professionals. Effective guidance is crucial for navigating complex problems and achieving project objectives.
- **Project Scope**: Assess the scope of the project to ensure it is neither too broad nor too narrow. A well-defined project scope helps in setting clear objectives and achievable milestones.
- **Feasibility**: Evaluate the feasibility of completing the project within the given timeframe and with the available resources. Consider potential challenges and ensure you have a realistic plan to address them.

- **Technical Skills**: Choose a project that allows you to develop and enhance important technical skills relevant to your field of study. Practical experience in using specific tools, technologies, or methodologies can be highly beneficial.
- **Soft Skills**: Consider projects that also offer opportunities to develop soft skills such as teamwork, communication, problem-solving, and project management.
- **Innovative Thinking**: Select a project that encourages creativity and innovative problem-solving. Projects that push the boundaries of traditional engineering approaches can be particularly rewarding.
- **Societal Impact**: Consider the potential impact of your project on society or the engineering community. Projects that address significant challenges or contribute to social good can be highly fulfilling and make a meaningful difference.

Guidelines to select Fellowship

- Ensure the program is accredited by a recognized accrediting body and has a strong reputation for quality education in engineering.
- Ensure it covers core engineering principles that align with your interests and career goals.
- Investigate the qualifications and experience of the faculty mentor. Look for programs with faculty who have strong academic backgrounds, industry experience, and active involvement in research.
- Check if the program provides adequate hands-on training opportunities, such as laboratory work, workshops, and access to modern engineering facilities and equipment.
- Assess the program's connections with industry. Strong partnerships with companies can lead to valuable internship opportunities, industry projects, and exposure to real-world engineering challenges.
- Explore the availability of research opportunities. Participation in research projects can enhance your learning experience and open doors to innovative career paths.
- Look for programs that offer professional development resources, such as workshops, seminars, and networking events with industry professionals and alumni.
- Ensure the program provides robust support services, including academic advising, career counseling, mentorship programs, and assistance with job placement after graduation.
- Consider the cost of the program and available financial aid options, such as scholarships, grants, and fellowships. Evaluate the return on investment in terms of career prospects and potential earnings.

- Research the success of the program's alumni. High employment rates and successful careers of past graduates can indicate the program's effectiveness in preparing students for the engineering field.

Duties Responsibilities of the Faculty Mentor

Each student should have a faculty mentor for the Institute.

- Get the approval from the Chairman Board of Examinations with the recommendations of the HOD/Principal for the topics.
- Provide comprehensive academic advising to help fellows select appropriate specializations, and research projects that align with their interests and career goals.
- Guide fellows through their research projects, offering expertise and feedback to ensure rigorous methodology, innovative approaches, and meaningful contributions to the field.
- Assist fellows in developing technical and professional skills through hands-on projects, laboratory work, and practical applications of theoretical knowledge.
- Offer career advice and support, helping fellows explore potential career paths, prepare for job searches, and connect with industry professionals and opportunities.
- Provide personal mentorship, fostering a supportive relationship that encourages growth, resilience, and a positive academic experience.
- Facilitate connections between fellows and industry professionals, alumni, and other relevant networks to enhance their professional opportunities and industry exposure.
- Ensure fellows have access to necessary resources, including research materials, lab equipment, software, and academic literature.
- Regularly monitor and evaluate the progress of fellows, providing constructive feedback and guidance to help them stay on track and achieve their goals.
- Instill and uphold high ethical and professional standards, encouraging fellows to practice integrity and responsibility in their work.
- Assist with administrative tasks related to the fellowship program, such as preparing progress reports, writing recommendation letters, and facilitating grant applications.
- Organize and participate in workshops, seminars, and other educational events that enhance the learning experience and professional development of fellows.
- Address any issues or conflicts that arise, providing mediation and support to ensure a positive and productive academic environment.

Instructions to the Fellowship Scholar

- Regularly meet with your faculty mentor for guidance on academic progress, research projects, and career planning. Be proactive in seeking advice and support from your mentor.
- Develop strong organizational skills. Use planners, calendars, and task management tools to keep track of assignments, project deadlines, and study schedules. Prioritize tasks to manage your time efficiently.
- Take advantage of opportunities to participate in research projects and hands-on activities. These experiences are crucial for applying your theoretical knowledge and gaining practical skills.
- Focus on improving essential professional skills such as communication, teamwork, problem-solving, and leadership. Participate in workshops and seminars that enhance these competencies.
- Actively seek networking opportunities through industry events, seminars, and meetings. Establish connections with peers, alumni, and professionals in your field to build a strong professional network.
- Seek internships, co-op programs, or part-time jobs related to your field of study. Real-world experience is invaluable for understanding industry practices and enhancing your employability.
- Uphold high ethical standards in all your academic and professional activities. Practice integrity, honesty, and responsibility. Adhere to the ethical guidelines and standards set by your institution and the engineering profession.
- Adopt a mindset of lifelong learning. Stay updated with the latest developments and trends in engineering by reading industry journals, attending conferences, and taking additional courses.

Documents to be submitted by the student to offer fellowship.

- **Completed Application Form**: This is typically the standard form provided by the institution or fellowship program that includes personal information, educational background, and other relevant details.
- **Detailed CV/Resume**: A comprehensive document outlining your educational background, knowledge experience, interest in research experience, publications, presentations, awards, and other relevant achievements if any.

- **Personal Statement**: A document explaining your motivation for applying to the fellowship, your career goals, how the fellowship aligns with those goals, and what you intend to achieve through the program.
- **Recommendation Letters**: Letters from faculty mentor, employer, or professionals who can attest to your academic abilities, professional skills, and suitability for the fellowship.
- **Proposal/Description**: A detailed proposal or description of the fellowship project or study you plan to undertake during the fellowship. This should include objectives, methodology, expected outcomes, and significance of the project.
- **Enrollment Verification**: Documentation verifying your current acceptance status in the academic institution or industry where the fellowship will be conducted.
- **Funding Information**: Details about any other sources of funding or financial aid you are receiving, if applicable. Some fellowships may also require a budget proposal for the intended use of the fellowship funds.
- **Samples of Work**: Copies of the relevant work that demonstrates your capabilities and accomplishments in your field.
- **Endorsement Letter**: A letter from your current academic institution endorsing your application for the fellowship, if required.
- **Ethical Approval Documents**: If your research involves human subjects or animals, you may need to submit proof of ethical approval from the relevant ethics committee.
- **Additional Documents**: Any other documents requested by the fellowship program required by the institution.

Attendance Certification

Every month students have to get their attendance certified by the supervisor in the prescribed form supplied to them. Students have also to put their signature on the form and submit it to the faculty mentor. Regularity in attendance and submission of report will be duly considered while awarding the Internal Assessment mark.

Rubrics for Fellowship

Sl. No.	Topics	Description
1	Alignment with Objectives	Assess how well the project aligns with the stated objectives and requirements. Determine if the student has addressed the key aspects outlined in the project guidelines.
2	Depth of Research:	Evaluate the depth and thoroughness of the literature review. Assess the student's ability to identify and address gaps in existing research.
3	Clarity of Objectives:	Check if the student has clearly defined and articulated the objectives of the project. Ensure that the objectives are specific, measurable, achievable, relevant, and time-bound (SMART).
4	Methodology and Data Collection:	Evaluate the appropriateness and justification of the research methodology. Assess the methods used for data collection and their relevance to the research questions.
5	Analysis and Interpretation:	Examine the quality of data analysis techniques used. Assess the student's ability to interpret results and draw meaningful conclusions.
6	Project Management:	Evaluate the project management aspects, including adherence to timelines and milestones.Assess the student's ability to plan and execute the project effectively.
7	Documentation and Reporting:	Check the quality of documentation, including code, experimental details, and any other relevant materials. Evaluate the clarity, structure, and coherence of the final report.
8	Originality and Creativity:	Assess the level of originality and creativity demonstrated in the project. Determine if the student has brought a unique perspective or solution to the research problem.

9	Critical Thinking:	Evaluate the student's critical thinking skills in analyzing information and forming conclusions. Assess the ability to evaluate alternative solutions and make informed decisions.
10	Problem-Solving Skills:	Evaluate the student's ability to identify and solve problems encountered during the project. Assess adaptability and resilience in the face of challenges.

INTERNAL MARKS - 40 Marks

As per the rubrics each topic should be considered for the Review 1 and Review 2. Equal weightage should be given for all the topics. It should be assessed by a faculty mentor and the industrial professional or research guide.

Review 1 shall be conducted after 8th week and Review 2 shall be conducted after 14th week in the semester. Average marks scored in the reviews shall be considered for the internal assessment of 40 Marks.

Scheme of Evaluation

PART	DESCRIPTION	MARKS
A	Assessment as per the rubrics.	30
B	Attendance	10
Total		**40**

END SEMESTER EXAMINATION - Project Exam

Students should be assessed for 100 Marks both by the internal examiner and external examiner appointed by the Chairman Board of Examinations after the completion of fellowship. The marks scored will be converted to 60 marks for the End Semester Examination.

Sl. No.	Description	Marks
A	Daily Activity Report.	20
B	Comprehensive report of the Fellowship Work.	30
C	Presentation by the student.	30
D	Viva Voce	20
Total		100

10633	In-house Project	540 Periods	C
Project			12

Introduction

Every student must do one major project in the Final year of their program. Students can do their major project in Industry or R&D Lab or in-house or a combination of any two for the partial fulfilment for the award of Diploma in Engineering.

For the project works, the Department will constitute a three-member faculty committee to monitor the progress of the project and conduct reviews regularly.

If the projects are done in-house, the students must obtain the bonafide certificate for project work from the Project supervisor and Head of the Department, at the end of the semester. Students who have not obtained the bonafide certificate are not permitted to appear for the Project Viva Voce examination.

For the projects carried out in Industry, the students must submit a separate certificate from Industry apart from the regular bonafide certificate mentioned above. For Industry related projects there must be one internal faculty advisor / Supervisor from Industry (External), this is in addition to the regular faculty supervision.

The final examination for project work will be evaluated based on the final report submitted by the project group **of not exceeding four students**, and the viva voce by an external examiner.

Objectives

Academic project work plays a crucial role in the education of Diploma in Engineering students, as it helps them apply theoretical knowledge to practical situations and prepares them for real-world engineering challenges.

- **Integration of Knowledge**: Consolidate and integrate theoretical knowledge acquired in coursework to solve practical engineering problems.
- **Skill Development**: Enhance technical skills related to the specific field of engineering through hands-on experience and application.
- **Problem-Solving Abilities**: Develop critical thinking and problem-solving abilities by addressing complex engineering issues within a defined scope.
- **Project Management**: Gain experience in project planning, execution, and management, including setting objectives, timelines, and resource allocation.
- **Teamwork and Collaboration**: Foster teamwork and collaboration by working in multidisciplinary teams to achieve project goals and objectives.

- **Research Skills**: Acquire research skills by conducting literature reviews, gathering relevant data, and applying research methodologies to investigate engineering problems.
- **Innovation and Creativity**: Encourage innovation and creativity in proposing and developing engineering solutions that may be novel or improve upon existing methods.
- **Communication Skills**: Improve communication skills, both oral and written, by presenting project findings, writing technical reports, and effectively conveying ideas to stakeholders.
- **Ethical Considerations**: Consider ethical implications related to engineering practices, including safety, environmental impact, and societal concerns.
- **Professional Development**: Prepare for future professional roles by demonstrating professionalism, initiative, and responsibility throughout the project lifecycle.

Course Outcomes

CO 1: Demonstrate the ability to apply theoretical concepts and principles learned in coursework to solve practical engineering problems encountered during the project.

CO 2: Develop and enhance technical skills specific to the field of engineering relevant to the project, such as design, analysis, simulation, construction, testing, and implementation.

CO 3: Apply critical thinking and problem-solving skills to identify, analyze, and propose solutions to engineering challenges encountered throughout the project lifecycle.

CO 4: Acquire project management skills by effectively planning, organizing, and executing project tasks within defined timelines and resource constraints.

CO 5: Improve communication skills through the preparation and delivery of project reports, presentations, and documentation that effectively convey technical information to stakeholders.

Important points to consider to select the In-house project.

- Selecting a project work in Diploma Engineering is a significant decision that can greatly influence your learning experience and future career prospects.
- Choose a project that aligns with your career aspirations and interests within the field of engineering. Consider how the project can contribute to your professional development and future opportunities.
- Ensure the project aligns with your coursework and specialization within the Diploma program. It should complement and build upon the knowledge and skills you have acquired in your studies.

- Evaluate the scope of the project to ensure it is manageable within the given timeframe, resources, and constraints. Avoid projects that are overly ambitious or impractical to complete effectively.
- Assess the availability of resources needed to conduct the project, such as equipment, materials, laboratory facilities, and access to relevant software or tools. Lack of resources can hinder project progress.
- Select a project that genuinely interests and motivates you. A project that captures your curiosity and passion will keep you engaged and committed throughout the project duration.
- Consider the availability and expertise of faculty advisors or industry mentors who can provide guidance and support throughout the project. Effective mentorship is crucial for success.
- Clearly define the learning objectives and expected outcomes of the project. Ensure that the project will help you achieve specific learning goals related to technical skills, problem-solving, and professional development.
- Look for opportunities to propose innovative solutions or explore new methodologies within your project. Projects that encourage creativity can set you apart and enhance your learning experience.
- Consider ethical implications related to the project, such as safety protocols, environmental impact, and compliance with ethical guidelines in research and engineering practices.
- Evaluate whether the project offers opportunities for collaboration with peers, experts from other disciplines, or industry partners. Interdisciplinary projects can broaden your perspective and enhance your teamwork skills.
- Consider the potential impact of your project on society or the engineering community. Projects that address significant challenges or contribute to social good can be highly fulfilling and make a meaningful difference.

By carefully considering these points, Diploma Engineering students can make informed decisions when selecting project work that not only enhances their academic learning but also prepares them for successful careers in engineering.

Duties Responsibilities of the internal faculty advisor.

Each group should have an internal faculty advisor assigned by the HOD/Principal.

- The in-house project should be approved by the project monitoring committee constituted by the Chairman Board of Examinations.

- The in-house project should be selected in the fifth semester itself. Each in-house project shall have a maximum of four students in the project group.
- Provide comprehensive academic advising to help in the selection of appropriate in-house project that align with their interests and career goals.
- Offer expertise and feedback to ensure rigorous methodology, innovative approaches, and meaningful contributions to the field.
- Assist in developing technical and professional skills through hands-on projects, laboratory work, and practical applications of theoretical knowledge.
- Provide personal mentorship, fostering a supportive relationship that encourages growth, resilience, and a positive academic experience.
- Facilitate connections between students and industry professionals, alumni, and other relevant networks to enhance their professional opportunities and industry exposure.
- Ensure students have access to necessary resources, including research materials, lab equipment, software, and academic literature.
- Regularly monitor and evaluate the progress of the in-house project, providing constructive feedback and guidance to help them stay on track and achieve their goals.
- Instill and uphold high ethical and professional standards, encouraging students to practice integrity and responsibility in their work.
- Assist in preparing progress reports, writing recommendation letters, and facilitating grant applications.
- Organize and participate in workshops, seminars, and other educational events that enhance the learning experience and professional development.
- Address any issues or conflicts that arise, providing mediation and support to ensure a positive and productive academic environment.

Instructions to the students.

- Regularly meet with your internal faculty advisor for guidance on academic progress, research projects, and career planning. Be proactive in seeking advice and support from your faculty advisor.
- Use planners, calendars, and task management tools to keep track of assignments, project deadlines, and study schedules. Prioritize tasks to manage your time efficiently.
- Take advantage of opportunities to participate in in-house projects and hands-on activities. These experiences are crucial for applying your theoretical knowledge and gaining practical skills.

- Focus on improving essential professional skills such as communication, teamwork, problem-solving, and leadership. Participate in workshops and seminars that enhance these competencies.
- Actively seek networking opportunities through industry events, seminars, and meetings. Establish connections with peers, alumni, and professionals in your field to build a strong professional network.
- Seek internships, co-operative programs, or part-time jobs related to your field of study. Real-world experience is invaluable for understanding industry practices and enhancing your employability.
- Uphold high ethical standards in all your academic and professional activities. Practice integrity, honesty, and responsibility. Adhere to the ethical guidelines and standards set by your institution and the engineering profession.
- Adopt a mindset of lifelong learning. Stay updated with the latest developments and trends in engineering by reading industry journals, attending conferences, and taking additional courses.

LIST OF SUGGESTED PROJECTS

1. Planning, Designing and Estimation of a residential or commercial or institutional building.
2. Preparation of toposheet for a chosen area using Total station.
3. Experimental investigation on performance characteristics of special concrete.
4. Structural modelling and analysis of buildings using Staad Pro and Revit software.
5. Experimental evaluation of different patterns of micro irrigation techniques.
6. Traffic survey studies for design of traffic interchanges.
7. Experimental studies for evaluation of CBR value of different soils and their applicability analysis as a pavement material.
8. Experimental evaluation and analysis of shear strength of different soils.
9. Estimation of surface runoff for a chosen catchment area and methods for conservation of water.
10. Planning and designing of water treatment plant for a educational institution/commercial industry/local colony.
11. Experimental evaluation of water quality parameters and applicability analysis for drinking and construction.
12. Cost effective solution for solid waste management within a colony.

LIST OF SUGGESTED WORKING DOMAINS

1. Structural Engineering
2. Geotechnical Engineering
3. Sustainable Materials
4. Construction Management
5. Estimation and costing
6. Environmental engineering
7. Irrigation engineering
8. Water resources engineering
9. Highway Engineering
10. Traffic Engineering
11. Surveying

Project work can be chosen from above mentioned domains or also beyond the above mentioned domains. The chosen project work can have interlinked working domains where knowledge on more than one working domain may also be used to achieve an efficient and high quality output from the students.

Documents to be submitted by the student for an in-house project.

Submit a printed report of your in-house project work along with the fabrication model / analysis report for the End Semester Examination.

Rubrics for In-House Project Work

Sl. No.	Topics	Description
1	Objectives	Clearly defined and specific objectives outlined. Objectives must align with the project's scope and purpose.
2	Literature Review	Thorough review of relevant literature. Identification of gaps and justification for the project's contribution.
3	Research Design and Methodology	Clear explanation of the research design. Appropriateness and justification of chosen research methods.
4	Project Management	Adherence to project timeline and milestones. Effective organization and planning for the execution of the project

5	Documentation	Comprehensive documentation of project details. Clarity and completeness in recording methods, results, and challenges.
6	Presentation Skills	Clear and articulate communication of project findings. Effective use of visuals, if applicable.
7	Analysis and Interpretation	In-depth analysis of data. Clear interpretation of results in the context of research questions.
8	Problem-Solving	Demonstrative ability to identify and address challenges encountered during the project. Innovative solutions considered where applicable.
9	Professionalism and Compliance	Adherence to ethical standards in research. Compliance with project guidelines and requirements.
10	Quality of Work	To produce high quality project works with contributions to the field of engineering.

SCHEME OF EVALUATION

The mark allocation for Internal and End Semester Viva Voce are as below.

Internal Mark Split (40 Marks)*		
Review 1 (10 Marks)	Review 2 (15 Marks)	Review 3 (15 marks)
Committee: 5 Marks. Supervisor: 5 Marks	Committee: 7.5 Marks Supervisor: 7.5 Marks	Committee: 7.5 Marks Supervisor: 7.5 Marks

Note: * The rubrics should be followed for the evaluation of the internal marks during reviews.

END SEMESTER EXAMINATION - Project Exam

The performance of each student in the project group would be evaluated in a viva voce examination conducted by a committee consisting of an external examiner and the Department project supervisor and an internal examiner.

End Semester (100)#			
Record (20 Marks)	Presentation (20 Marks)	Viva Voce (20 Marks)	Model / Analysis Report (40 Marks)
External: 10 Internal: 5 Supervisor: 5	External: 10 Internal: 5 Supervisor: 5	External: 10 Internal: 5 Supervisor: 5	External: 20 Internal: 10 Supervisor: 10

 # The marks scored will be converted to 60 Marks.

Students who are unable to complete the project work at the end of the semester can apply for an extension to the Head of the Department, with the recommendation from the project guide for a period of a maximum of two months. For those students who extend the project work for two months, Viva Voce will be carried out and results will be declared separately. If the project report is not submitted even beyond the extended time, then students are not eligible to appear for Project Viva Voce Examination.