A) Course Code : 2020371(020)

B) Course Title : CONSTRUCTION MATERIAL

C) Pre- requisite Course Code and Title :

D) Rationale : Civil Engineering diploma holders mostly supervise construction of various types of Civil Engineering works/projects involving use of various construction 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 of civil engineering diploma programme should have requisite knowledge and skills pertaining to the quality, properties and characteristics of specified and required engineering materials , use and availability of various building materials and skills in conducting tests to determine suitability of materials for various construction purposes. In addition to above , BIS specifications and recommendations of various materials should also be known for effective quality control.

E) Course Outcomes :

CO-1 Explain the properties of stone, aggregate and bricks and its selection criteria as per requirement and specifications in civil engineering works/projects.

CO-2 Explain the types and properties of binding materials and its selection condition/criteria as per requirement and specifications in civil engineering works/projects.

CO-3 Select appropriate flooring, roofing, false ceiling and cladding materials, as per construction requirements and specifications and prevailing conditions.

CO-4 Recognize use of timber glass, steel, aluminum-glass and plastics building construction.

CO-5 Recognize uses of miscellaneous building materials.

F) Scheme of Studies:

Board of Study	Course Code	Course	Scheme of Studies (Hours/Week)			Credit L+ T+P/2
			L	T	P	
Civil Engineering	2020371 (020)	Construction Material	**2**	**-**	**2**	**3**

L- Lecture , T- Tutorial, P- Practical,

Legend: Lecture (L) →CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture and others) .

Practical (P) → LI : Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies).

Tutorial (T) → SL:Self Learning

G) Scheme of Assessment:

Board of Study	Course Code	Course	Scheme of Examination					
			Theory			Practical		Total
			ESE	CT	TA	ESE	TA	Marks
Civil Engineering	2020371 (020)	Construction Material	70	20	30	30	50	200

ESE: End Semester Exam, CT: Class Test , TA: Teachers Assessment

Legend - PRA : Process Assessment, PDA : Product Assessment

Note: i) TA in Theory includes Sessional work (SW) and attendance (ATT) with weightage of 70% and 30% of total respectively.

ii) TA in practical includes performance of PRA,PDA and Viva-Voce with weightage of 50%,40% and 10% respectively.

iii) 85% attendance is essential in theory and practical classes to appear in Examination.

H) Course-Curriculum Detailing:

This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW) and Self Learning (SL). Students are expected to demonstrate the attainment of Session Outcomes (SOs) and finally Course Outcomes (COs) upon the completion of course.
Convert unit of the given physical quantity from one unit system to other.

CO-1 Explain the properties of stone, aggregate and bricks and its selection as per requirement in civil engineering works.

(Appx. Hrs: CI+LI= 7+14)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1 Explains properties of construction material. SO1.2 Select building stones as per requirement in the field. SO1.3 Select bricks as per requirement in the field.	LE1.1 Determine Grading of Aggregate and fineness modulus a. Fine aggregate. b. Coarse aggregate LE 1.2 Determine Bulking of sand. LE1.3Determine Water absorption of bricks. LE1.4Determine of Compressive strength of bricks.	**Unit-1.0 Stone, aggregate and brick** **1.1 Properties of construction materials** 1.1.1 Importance of Building materials in civil engineering 1.1.2 Basic properties of construction materials- Physical properties- bulk density, durability, porosity, water absorption, specific gravity, permeability, frost resistance. 1.1.3 Criteria for Selection of construction material based on	SL1.1 List out atleast five materials each of conventional ,modern and alternative . SL1.2 Identify harmful ingredient of Brick earth SL1.3

Session Outcomes	Laboratory Instruction	Class room Instruction (CI)	Self Learning
		prescribed load, serviceability, aesthetics, economy and environment. **1.2 STONE AND AGGREGATE** 1.2.1 Geological , Physical and Chemical Classification of rocks. 1.2.2 Properties of good building stones 1.2.3 Methods of quarrying and dressing of stones 1.2.4 Common building stones of INDIA: characteristics and uses. 1.2.5 Definition, types of aggregate coarse and fine aggregate 1.2.6 Grading of aggregates , fineness modulus, Bulking of sand. **1.3 BRICKS** 1.3.1 Clay Bricks: definition, shape and size , Ingredients of good brick earth, harmful substances in brick earth. 1.3.2 Properties of good building bricks 1.3.3 Classification and specifications of bricks as per BIS: 1077 1.3.4 Defects of clay bricks. 1.3.4 Testing of Bricks (as per BIS Code) and field test on bricks. 1.3.4 Fly ash & Hollow bricks: properties, preparation and uses	Explain detailed procedure of manufacturi ng of bricks SL1.4Descri be use of pre cast hollow and solid concrete blocks.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Give the classification of rocks.
2. Describe the important characteristics features and uses of following rocks: Granite, Syenite, Basalt, Sandstone, Marble, Gneiss
3. Briefly describe quarrying and dressing of stone.
4. State the ingredients of a good brick.
5. Describe the common defects in bricks.
6. Classify bricks as per BIS: 1077.
7. Explain frog in brick? State its importance in clay bricks.
8. Describe briefly the tests of bricks may be required before using them for construction.
9. State properties of fly ash bricks.

Mini Project:

1. Give the typical grading of fine aggregate and coarse aggregate to be used for concreting and road work.

CO-2 Explain the types and properties of binding materials and its selection as per requirement in civil engineering works.

(Appx. Hrs: CI+LI= 7+18)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 2.1 Identify the types of lime and their use as per requirement. SO 2.2 Identify the types of cement, perform test on cement and its use as per requirement in the field. SO 2.3 Explain the effect and use of puzzolana. SO2.4 Identify types and select mortar as per work specifications and requirement.	LE2.1. Determine fineness of cement. LE2.2. Perform consistency test of cement. LE2.3. Determine initial and final setting time of cement LE2.4 Determine Tensile strength of cement mortar. LE 2.5 Determine compressive strength of cement mortar cube. LE 2.6 Determine soundness of cement.	**2.BINDING MATERIAL** 2.1 Cement, Chemical composition of cement, Composition of cement clinker : Bogues compounds , Hydration of cement and heat of hydration. 2.2 Ingredients used for manufacturing of cement, Methods of manufacture of cement by (i)wet process (ii) dry process(flow chart) 2.3 Laboratory test of cement as per IS consistency, setting time, fineness, soundness, compressive strength, tensile strength. 2.4 Field tests on cement. 2.5 Types and grades of cement and suitability- Ordinary Portland cement, rapid hardening cement, low heat cement, high alumina cement, Portland slag cement, white and coloured cement, Portland puzzolana cement, super sulphate cement, quick setting cement. 2.6 Puzzolanas- Introduction, effects, use and classification of puzzolanas. 2.7Cement admixtures and their applications as per requirements	SL2.1 Explain air entraining cement, calcium chloride cement, water repellent cement, water proof cement. SL 2.2 Explain Physical & Chemical Properties of Cement. SL 2.3Describe Grout and Guniting.

Session Outcomes	Laboratory Instruction (LI)	Class room Instruction	Self Learning
		2.8Mortars- classification of mortars, characteristics of a good mortar. Cement mortar, lime mortar, surkhi mortar, Selection of mortar.	

SW-3 Suggested Sessional Work (SW) :

a. Assignments:

1. List the ingredients of Portland cement? State the function and limits of each of them.
2. Describe with the help of flow chart the dry and wet process of manufacturing cement.
3. Enlist different types of cements and conditions of uses.
4. Elaborate the initial and final setting times of cement? Give their importance?
5. Compare cement, lime and puzzolana as building material.
6. Write short notes on –
   (a) Hydration of cement (b) Clinkering
   (c) Use of gypsum in cement.
7. Enlist the types & proportion of mortar used in different civil engineering works.
8. Explain the Grout and Gunniting.
9. Discuss briefly the various effects of adding puzzolanas to cement concrete.

b. Mini Project:.

1. Collect data of various brands and grades of Ordinary Portland cement available in the market and give their Physical & Chemical Properties.

c. Other Activities (Specify):

1. List the properties of good cement on the basis of physical examination.

CO- 3 Select appropriate flooring, roofing, false ceiling and cladding materials, as per construction requirements and prevailing conditions.

(Approx. Hrs: CI+LI = 6)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO3.1 Identify different types of flooring and roofing materials. SO3.2 Select the appropriate flooring and roofing materials. SO3.3 Identify different types of false ceiling and		**Unit- 3 Flooring Materials, Roofing Materials ,False Ceiling and Tiles :** 3.1 **Flooring Materials-** Flag stone floor, Cement concrete floor ,Mosaic flooring , Tile floors, Ceramic tile floor, vitrified tile floors , Granite Flooring, PVC tiles, Linoleum floor, Paver blocks, Wooden floor, Glass floor.	SL3.1Explain manufacture of clay tiles.

cladding materials. SO3.4 Select the appropriate false ceiling and cladding materials.		3.2 **Roofing Materials-** 3.2.1Roof covering materials- bamboo mats, galvanized iron sheets, asbestos cement sheet, profiled steel and aluminum sheets, polycarbonate roofing material. 3.2.2 Clay tiles- Allahabad tiles, flat tiles, Mangalore tiles, half round tiles, local country tiles. 3.3 **Materials used for false ceiling-** Gypsum Board Ceiling, Plaster of Paris Ceiling, Fiber Ceiling, Wooden Ceiling, Synthetic Leather Ceiling, Glass Ceiling, Metal Ceiling 3.4 **Cladding materials-**Clay Tiles Claddings, Stone Claddings, Timber Claddings, Fiber Cement Claddings, Clay Tiles Claddings, Steel Claddings, Aluminum Claddings, Aluminum Composite Panel (ACP) Claddings	

SW-3 Suggested Sessional Work (SW) :

a. Assignments:

1. State different types of flooring material with their suitability.
2. Explain AC Sheet, GI Sheet, Profiled Steel and Aluminum Sheets.
3. Compare AC Sheet and GI Sheet.
4. Write Short notes on false ceiling materials.
5. Discuss following for building façade cladding-
   (a) Glass Cladding (b) Aluminum Composite Cladding
   (c) Aluminum Cladding (d) Stone Cladding

b. Other Activities: Compare different flooring and roofing material.

Project: 1. Prepare PPT on showing different flooring and roofing materials available in the market wrt price, size, design etc.

CO -4 Recognize use of timber, glass, steel, aluminum and plastic in building construction.

(Approx. Hrs: CI+LI = 6)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO4.1 Identify use of timber as building material. SO4.2 Identify use of steel and aluminum, building material. SO 4.3 Identify forms of glasses and its performance. SO 4.4 Identify common plastics and application of plastic as construction material.		**4. TIMBER,GLASS, STEEL,ALUMINIUM AND PLASTIC** 4.1.1Timber, Properties of timber, requirement of timber to be used for building. 4.1.2Seasoning of timber: Purpose, methods of seasoning and Preservation of timber and methods of treatment as per BIS 4.1.3 Defects in timber 4.1.4Other wood based products, their uses: laminated board, block board, fiber board, hard board, sunmica, plywood, veneers, nu-wood., Moulded Door. **4.2Glass-**ingredients, commercial forms of glasses, Characteristics and performance of glass, glass wool. **4.3 Frame/truss Steel-** 4.3.1Properties and uses :Mild Steel, High Carbon Steel, High Tensile steel 4.3.2 Rolled steel sections, Steel sections-L,T, I , PIPE section **4.4 Aluminium-** Advantages of Aluminum in construction, available forms of aluminum, use of aluminum material glass. **4.5 Plastics** 4.5.1Plastic, Thermoplastic and Thermosetting Plastic, Common plastics used as construction material, Properties of plastics, Application of Plastics. 4.5.2 Rubber, use of rubber in building construction.	SL4.1 Explain Classification of timber as per BIS.

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others) , LI : Laboratory Instruction (Includes Practical performances in Laboratory, Workshop, field or other locations using different instructional strategies) SL: Self Learning

SW-5 Suggested Sessional Work (SW) :

a. Assignments:

1. Describe defects in timber.
2. Explain seasoning of timber.
3. State the qualities you will consider in selecting timber for construction purposes.
4. Write short notes on the following-
   (a) Preservation of timber. (b) Ply wood
   (b) Hard wood (c) Veneers
5. Describe commercial forms of glasses.
6. Explain glass wool and its use.
7. Illustrate different market forms rolled steel sections.
8. Differentiate between mild steel bars and HYSD bars.
9. State Advantages of Aluminum in construction, available forms of Aluminum and use of Aluminum.
10. Differentiate between following:
    (a)Thermoplastic and Thermosetting Plastic.
    (b) Plastic and Rubber.
11. Describe briefly use of plastics as building material.

b. Mini Project

1. Market survey different form of timber, commercial form of glasses, reinforcement bars, aluminum and plastics with respect to cost, purpose etc.

Note: Performance under Laboratory and Sessional work may appear in more than one COs/SOs.

CO – 5 Recognize uses of miscellaneous building materials.

(Approx. Hrs: CI+LI = 6)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 5.1 Select paint, varnish, distemper and primer as per requirement. SO 5.2 Select water proofing material, Damp proofing material, fire proofing material, termite proofing material, heat insulating material and acoustic material materials as per requirement in the field. SO5.3 Describe use of Gypsum, adhesive and water proofing materials. SO5.4 Identify use of Bitumen, Tar, Asphalt as water proofing materials		**5. MISCELLNEOUS BUILDING MATERIALS** 5.1Paints,Enamels and Varnishes -Composition of oil paint, Characteristics of ideal paints, Paints commonly used in building, factors affecting selection of paint. Enamel paint and Varnish and its type. Distemper, primers 5.2 Water proofing materials 5.3 Fire proofing materials 5.4 Acoustic materials. 5.5Heat insulating materials. 5.6 Adhesive materials. 5.7Water proofing resins and chemicals, coating materials. 5.8 Termite proofing materials.	SL5.1 Describe Porcelain, Stoneware and Earthenware.

Session Outcomes	Laboratory Instruction	Class room Instruction	Self Learning (SL)
		5.9Bitumein, Tar, Asphalt-Forms of bitumen, properties and use of bitumen as water proofing material.	

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others) , LI : Laboratory Instruction (Includes Practical performances in Laboratory, Workshop, field or other locations using different instructional strategies) SL: Self Learning

SW-5 Suggested Sessional Work (SW) :

a. Assignments:

1. What are the various ingredients of paints? State the function of each of them.
2. How would you judge the quality of an oil paint?
3. What are the ingredients of varnish?
4. Explain distemper.
5. List common paints used in building.
6. Write short notes on –
   (a) Water proofing materials. (c) Adhesive materials.
   (b) Acoustic materials. (d) Geosynthetic materials.
   (c) Heat insulating materials.
7. Define Bitumen, Asphalt and Tar and how they differ.
8. State the uses of Bitumen, Asphalt and Tar.

b.Project:

1.Market survey of each building material compile in a file.

Note: Performance under Laboratory and Sessional work may appear in more than one COs/SOs.

I) Suggested Specification Table (For ESA of Classroom Instruction CI+SW+SL):

Unit Number	Unit Title	Marks Distribution			Total Marks
		R	U	A	
I	Stone, aggregate and brick	4	6	4	14
II	Binding Materials	4	6	4	14
III	Flooring And Roofing Materials	4	6	4	14
IV	Timber, Glass ,Steel, Aluminum, and Plastics	4	6	4	14
V	Miscellneous Building Materials	4	6	4	14
Total		20	30	20	70

Legend: R: Remember, U: Understand, A: Apply and above

J) Suggested Specification Table (For ESA of Laboratory Instruction*):

Laboratory Instruction Number	Short Laboratory Experiment Title	Assessment of Laboratory Work (Marks)		
		Performance		Viva-Voce
		PRA	PDA	
LE1.1	Determine Grading of Aggregate and fineness modulus a. Fine aggregate. b. Coarse aggregate.	25	20	05
LE1.2	Determine Bulking of sand.			
LE1.3	Determine Water absorption of bricks.			
LE1.4	Determine Compressive strength of bricks.			
LE2.1	Determine fineness of cement.			
LE2.2	Perform consistency test of cement.			
LE2.3	Determine initial and final setting time of cement			
LE2.4	Determine Tensile strength of cement mortar.			
LE2.5	Determine compressive strength of cement cube.			
LE2.6	Determine soundness of cement.			

* Assessment rubric, process and product check list with rating scale need to be prepared by the course wise teachers for each experiment for conduction and assessment of laboratory experiments /practicals

Legend : PRA: Process Assessment, PDA : Product Assessment

Note : Only one experiment has to performed at the end semester examination of 30 Marks as per assessment scheme

K) Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Group Discussion
3. Field Trips
4. ICT Based Teaching Learning (Video Demonstration, CBT, Blog, Face book, Mobile)

L) Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Building Material	S K Duggal	New Age International Publisher	Fourth 2012
2	Building Material	S S Bhavikatti	Vikas Publishing House	2014
3	Building Materials and Construction	Dr Anil Kumar Mishra	S.Chand Publishing	2017
4	Material Technology (Samagri Proudyogiki)	Shivanand Kamde	University Book House Jaipur	First 2017
5	Engineering Materials	S C Rangwala	Charotar Publication	43rd 2016

(b) Open source software and website address :

1. www.nptel.ac.in
2. www.civildigital.com
3. https://swayam.gov.in

M) List of Major Laboratory Equipment and Tools:

S. No.	Name of Equipment	Broad Specifications	Relevant Experiment Number
1	Sieves	Set of sieves as per IS, balance 1 gm accuracy.	LE1.1
2	Sieve shaker	Electrically operated motorized sieve shaker	LE1.1
3	Weighing balance	Digital ,1 gm accuracy	LE1.1, LE1.2, LE1.3
4	Measuring Cylinder with accessories	Measuring Cylinder , Container ,Steel Rule, Steel Rod (6mm Dia)	LE1.2
5	Oven	Thermostatically controlled electric oven	LE1.3
6	Compression Testing Machine	Electrically operated Compression Testing Machine 100 T capacity	LE1.4,LE2.5
7	Sieve	Sieve 90 micron	LE2.1
8	Weighing balance	Digital balance accuracy 0.1 gm	LE2.1
9	Vicat Apparatus	With plunger and needle	LE2.3, LE2.3
10	Le-chatelier Apparatus	Le-chatelier Apparatus	LE2.5
11	Briquette Test Machine	Motorized Operated ,range 0-900 Kg, accuracy 0.5 Kg , Suitable for operation on 230 volts, 50 cycles, single phase, A.C. supply. Complete with one brass briquette mould and one base plate	LE2.4

N) Mapping of POs & PSOs with COs:

Course Outcomes (COs) Titles	**Programme Outcomes (POs)**										**Programme Specific Outcomes (PSOs)**	
	Basic knowledge PO-1	**Discipline knowledge PO-2**	**Experiments & Practice PO-3**	**Engineering Tools PO-4**	**The Engineer & Society PO-5**	**Environment & Sustainability PO-6**	**Ethics PO-7**	**Individual & Team work PO-8**	**Communication PO-9**	**Life Long learning PO-10**	PSO-1	PSO-2
CO-1 Explain the properties of stone, aggregate and bricks and its selection as per requirement in civil engineering works.	2	3	3	2	2	3	1	1	2	2	2	3
CO-2 Explain the types and properties of binding materials and its selection.	2	3	3	2	2	3	1	1	2	2	2	3
CO-3 Select appropriate flooring, roofing false ceiling and cladding materials as per construction requirements and prevailing conditions	2	3	3	2	2	3	1	1	2	2	2	3
CO4- Recognize use of timber, glass, steel, aluminum and plastic in building construction.	2	3	3	2	2	3	1	1	2	2	2	3
CO-5 Recognize uses of miscellaneous building materials.	2	3	3	2	2	3	1	1	2	2	2	3

O) Course Curriculum Map:

POs & PSOs No.	COs No. & Title	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7,8, 9,10 PSO 1,2	CO-1Explain the properties of stone, aggregate and bricks and its selection as per requirement in civil engineering works.	SO1.1 SO1.2 SO1.3	LE 1.1 LE 1.2 LE 1.3 LE 1.4		SL1.1 SL 1.2 SL 1.3
PO 1,2,3,4,5,6,7,8 ,9,10 PSO 1,2	CO-2 Explain the types and properties of binding materials and its selection.	SO 2.1 SO 2.2 SO 2.3 SO 2.4	LE. 2.1 LE. 2.2 LE 2.3 LE 2.4 LE 2.5 LE 2.6		SL2.1 SL 2.2 SL 2.3
PO 1,2,3,4,5,6,7,8 ,9,10 PSO 1,2	CO-3 Select appropriate flooring, roofing false ceiling and cladding materials as per construction requirements and prevailing conditions	SO 3.1 SO 3.2 SO 3.3 SO 3.4			SL3.1
PO 1,2,3,4,5,6,7,8, 9,10 PSO 1,2	CO4- Recognize use of timber, glass, steel, aluminum and plastic in building construction.	SO4.1 SO4.2 SO4.3 SO4.4			SL 4.1
PO 1,2,3,4,5,6,7,8,9,10 PSO 1,2	CO-5 Recognize uses of miscellaneous building materials.	SO5.1 SO5.2 SO5.3			SL5.1

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others) , LI : Laboratory Instruction (Includes Practical performances in Laboratory, Workshop, field or other locations using different instructional strategies) SL: Self Learning

VII. Course Curriculum Detailing (Semester- III)

A) Course Code : 2020372(020)
B) Course Title : SURVEYING - I
C) Pre- requisite Course Code and Title :
D) Rationale : Field survey is carried out and various type of survey maps are prepared before planning and development process for any civil engineering or mining project. These maps and drawing are used for taking various decisions regarding the planning, designing, estimation, execution and construction process .The important functions of a diploma civil engineer includes the jobs of detailed surveying, plotting of survey data, preparation of survey maps and setting out works While framing the curriculum for the subject of surveying, stress has been given to the development of the skill in each type of survey like chain surveying, compass surveying leveling, that the Civil Engineering diploma holder will normally be called upon to perform chain survey, compass survey, levelling and plane table surveying, Field work is required to be done accurately to minimize the errors.
E) Course Outcomes :

CO-1 Conduct chain survey in the field.

CO-2 Conduct field survey using prismatic compass.

CO-3 Calculate the level with respect to fixed datum with the help of leveling instruments

CO-4 Plot and interpret contours.

CO-5 Prepare map with the help of plane table and use minor instruments.

F) Scheme of Studies:

Board of Study	Course Code	Course	Scheme of Studies (Hours/Week)			Credit L+ T+P/2
			L	T	P	
Civil Engineering	2020372(020)	Survey I	**2**	**-**	**4**	**4**

L- Lecture, T- Tutorial, P- Practical,

Legend: Lecture (L)→CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture and others) .

Practical (P)→LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies).

Tutorial (T)→ SL: Self Learning

G) Scheme of Assessment:

Board of Study	Course Code	Course	Scheme of Examination					
			Theory			Practical		Total
			ESE	CT	TA	ESE	TA	Marks
Civil Engineering	2000352(020)	Survey I	70	20	30	30	50	200

ESE: End Semester Exam, CT: Class Test , TA: Teachers Assessment

Legend - PRA : Process Assessment, PDA : Product Assessment

Note: i) TA in Theory includes Sessional work (SW) and attendance (ATT) with weightage of 70% and 30% of total respectively.

ii) TA in practical includes performance of PRA,PDA and Viva-Voce with weightage of 50%,40% and 10% respectively.

iii) 85% attendance is essential in theory and practical classes to appear in Examination.

H) Course-Curriculum Detailing:

This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW) and Self Learning (SL). Students are expected to demonstrate the attainment of Session Outcomes (SOs) and finally Course Outcomes (COs) upon the completion of course.

Convert unit of the given physical quantity from one unit system to other.

CO-1 Conduct chain survey in the field.

(Appx. Hrs: CI+LI=6+12 hrs)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1 Explain purpose and principles of Surveying. SO1.2 Explain method of chain survey. SO1.3 Explain triangulation	LE1.1 Chain surveying: a) Ranging a line b) Chaining a line and recording in the field book c) Taking offsets - perpendicular and oblique (with a tape only) d) Setting out right angle with a tape	UNIT-1 **1.1 INTRODUCTION** 1.1.1Introduction to surveying, Plane and Geodetic surveying. 1.1.2 Purpose of engineering surveys 1.1.3 Principles of surveying **1.2 CHAIN SURVEY** 1.2.1 Instrument used in chain survey:- Types of	SL1.1 Classification of survey based on nature of the field and based on the object of survey.

Session Outcomes	Laboratory Instruction	Class room Instruction	Self Learning
method in chain surveying.	e) Chaining a line involving obstacles to ranging LE1.2 To perform chain survey of an area by chain triangulation and plot it. LE1.3 To perform a chain survey of closed traverse fixing the angle between two chain lines by tie lines and to plot them and adjusting the closing error by graphical method. LE1.4 To perform a chain survey of an area by chain triangulation and plot .	chain and tapes, Study of 20m and 30m chain, Metric Chain, Tapes, Arrow, Ranging rod, Offset rod, Open cross staff, optical square, prism square 1.2.2Ranging: Direct/indirect/ reciprocal, offsets and recording in field book. 1.2.3 Use of line ranger, Chaining on plane and sloping ground 1.2.4 Obstacles in chaining, 1.2.5 Offsets:- Types- Perpendicular/Oblique Instruments used to take offsets. 1.2.6 **Chain Triangulation**- Principal of Chain Triangulation, Survey Stations, Survey lines Arrangement of survey lines, conditions to be fulfilled by survey lines or survey stations, Recording field book: Single line and Double line booking , chain traversing, 1.2.7 Errors in chain surveying and their corrections. 1.2.8 Symbols and signs to indicate ground features	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Identify and prepare a list of tools and equipment used in chain and Tape survey.
2. Explain with neat diagram the construction and working of Optical Square, Prism Square and Cross Staff.
3. Explain well conditioned triangle and its necessity in field measurement.
4. Identify errors and their corrective measures in chain survey.
5. Solve numerical problems on chain survey.
6. Identify and prepare a list of Symbols and signs to indicate ground features.

b. Mini Project

1. Compute area of the field with the help of chain survey and record the data in field book.

c. Other Activities (Specify):

1. Use various types of chain.

CO-2 Conduct field survey using prismatic compass.

(Appx. Hrs: CI+LI=7+16)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 Explain procedure for Angular measurement with the help of prismatic compass.. SO2.2 Record bearing accurately. SO 2.3 Prepare drawing as per recorded and corrected measurements of bearings with chain and compass survey	LE2.1 Study the parts of prismatic compass and to measure the bearings of lines joining different station point LE2.2 To take the fore bearing and back bearing of sides of a regular polygon and to calculate included angle and check them. LE2.3 To perform a chain and compass survey of an area by open traverse and prepare a map. LE2.4 To perform a chain and compass survey of an area by close traverse and prepare a map.	Unit-2 **COMPASS SURVEY** 2.1 Traverse Survey – Traversing, Closed and Open Traverse, Name of instruments used for measurement of directions and angles. 2.2 Bearings and Angles – Bearing, Meridian, Types of meridian and bearing, Systems of bearing, Conversion of bearings from one system to other, Fore and Back Bearing, Calculation of angles from bearings and bearings from angles. 2.3 Magnetic Compass – Magnetic Compass ,Prismatic Compass, Surveyor's Compass, Temporary adjustment of prismatic compass and taking observation, Magnetic dip and declination. 2.4 Local attraction - causes, detection, errors and corrections, problems on local attraction, magnetic declination and calculation of included angles in a compass traverse, Graphical adjustment of closing error.	SL1.1Comparison between surveyor and prismatic compass. SL1.2Study of variation of earth magnetic field and Declination

SW-2 Suggested Sessional Work (SW) :

a. Assignments:
1. Describe with the help of neat sketch prismatic compass and surveyors compass.
2. Compare prismatic compass and surveyors compass
3. Identify errors and their corrective measures in compass survey.
4. Explain local attraction in compass surveying.
5. Explain methods to detect and eliminate local attraction.

b. Mini Project:

1. Take a simple closed traverse of 5-6 sides .Calculate included angles, locate details and plot them on a drawing sheet.

CO- 3 Calculate the level with respect to fixed datum with the help of leveling instruments.

(Appx. Hrs: CI+LI = 7+12)

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO3.1 Explain different methods and their procedure for levelling. SO3.2 Explain procedure for using the instruments and levelling staff and entering level in proper table SO3.3 Calculate corrections for errors in levelling records if any .	LE3.1 To learn temporary adjustment of leveling instrument and to find the R.L. of the given point. LE3.2 To find the difference of R.L. of two given point by shifting of instrument on change points and applying arithmetical checks. LE3.3 To take the longitudinal and cross-section levels of an existing road	Unit-3 **LEVELLING** 3.1 Levelling-Levelling , Level surfaces,Level Line, Horizontal Plane, Horizontal Line, Vertical Line, Datum, Bench Marks, Reduced Level, Mean Sea Level. 3.2 Levelling Instruments –Dumpy Level, , Tilting Level, Auto Level, Digital Level Leveling Staff, Temporary adjustment of Dumpy Level. 3.3 Terms used in leveling - Line of collimation, Axis of Telescope, Axis of bubble tube, Station, Height of instruments, Back sight, Fore sight, intermediate sight, Change point, Rise,Fall 3.4 Classification of Levelling - Simple Levelling, Differential Levelling, Fly	SL3.1Study of modern instruments used in leveling.

Session Outcomes	Laboratory Instruction	Class room	Self Learning
		Levelling, Profile Levelling, Cross Sectioning Reciprocal Levelling and Precise Levelling 3.5 Examples & methods of finding out the R. L. in Level Book by H.I. Methods and Rise & Fall Methods with necessary check. 3.6 Correction for Curvature and refraction and related examples, Balancing of backsight and foresight. 3.7 Errors in Levelling ,Degree of Precision	

SW-3 Suggested Sessional Work (SW) :

a. Assignments:
1. Describe dumpy level with net sketch.
2. State the essential difference between Dumpy Level Y-Level and Tilting Level.
3. Illustrate with neat sketch construction of a surveying telescope.
4. Explain the procedure of reciprocal levelling eliminating the effect of atmospheric refraction.
5. Solve numerical problems.

b. Mini Project: Carry out longitudinal sectioning and cross sectioning of a road and plot it.

CO- 4 Plot and interpret contours.

(Appx. Hrs: CI+LI= 6+16)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO4.1Prepare contours of given Reduced levels(RL) SO4.2 Estimate the volume of earthwork excavated or filled. SO4.3	LE4.1Take the block leveling of undulated site and to draw the contours using method of interpolation. LE4.2 Prepare a contour map of a small area by direct method of contouring.	Unit 4.0 **CONTOURING** 4.1 Contour 4.2 Contour interval, horizontal equivalent 4.2 Uses of contours 4.3 Characteristics of contours 4.4 Methods of Contouring 4.5 Interpolation of	SL 4.1 Study of toposheets and calculate catchment areas.

Explain ridge line and trough line.	LE4.3 Draw contour map of a small panel and to calculate its capacity. LE4.4 Study a Topo sheet of certain area and to mark on it watershed line and find out catchments area of a stream at a place.	contours 4.6 Preparation of contour map. 4.7 Uses of Contour Map- Drawing of Sections, Determination of intervisibilty between two points, Tracing of contour gradient and location of route, measurement of drainage areas ,calculation of capacity of reservoirs & related examples 4.8 Use of Topo sheet	

SW-4 Suggested Sessional Work (SW) :

a. Assignments:
1. Describe various methods of contouring. Discuss the merits and demerits of each.
2. Describe with sketches the characteristics o contour.
3. Explain grade contour and methods to locate it (a) on the ground (b) on the map.
4. Explain various methods of interpolating contour.
5. Explain, with sketches, the uses of the contours.
6. Solve numerical problem on calculation of earth work, reservoir capacity.

b. Mini Project:
1. Prepare contour map of given area

CO- 5 Prepare map with the help of plane table and use minor instruments.

(Appx. Hrs: CI+LI=6+8)

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO5.1 Explain two point problem in plane table surveying. SO5.2 Explain three point problem in plane table surveying. SO5.3 Use minor instruments in measurement.	LE5.1 Use the accessories of plane table surveying and to plot the objects by radial method. LE5.2 Conduct the plane table survey of small area by intersection method. LE5.3 Take measurements using minor instruments	Unit 5.0 5.1 **PLANE TABLE SURVEY** 5.1.1 Principles of plane table surveying, Advantages and disadvantages of plane table survey. 5.1.2 Plane table and its accessories, 5.1.3 Setting of a plane table:	SL5.1Application of plane table survey to prepare the map of area showing physical features of the area.

Session Outcomes	Laboratory	Class room Instruction	Self Learning
		(a) Centering (b) Levelling (c) Orientation 5.1.4 Methods of plane table surveying (a) Radiation, (b) Intersection (c) Traversing (d) Resection 5.1.5 Errors in plane table survey and precautions to control them. 5.2 **Minor instruments**:- Construction and use of Hand Level, Abney Level, Box Sextant, Pentagraph and Ceylon Ghat Tracer, Planimeter.	

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others) , LI : Laboratory Instruction (Includes Practical performances in Laboratory, Workshop, field or other locations using different instructional strategies) SL: Self Learning

SW-5 Suggested Sessional Work (SW) :

a. Assignments:
   1. Discuss advantages and disadvantages of a plane table survey.
   2. Explain with sketches the methods of locating a point by plane table survey.
   3. Explain with sketches the various methods of orienting plane table.
   4. Solve three point problems in the field.
   5. Solve two point problems in the field.

b. Mini Project: Carry out plane table survey of given area .
   2 Use of minor instruments.

Note: Performance under Laboratory and Sessional work may appear in more than one COs/SOs.

I) Suggested Specification Table (For ESA of Classroom Instruction CI+SW+SL):

Unit Number	Unit Title	Marks Distribution			Total Marks
		R	U	A	
I	Chain surveying	4	6	4	14
II	Compass surveying	4	6	4	14
III	Levelling	4	6	4	14
IV	Contours	4	6	4	14
V	Plane table and minor instruments	4	6	4	14
Total		20	30	20	70

Legend: R: Remember, U: Understand, A: Apply and above

J) Suggested Specification Table (For ESA of Laboratory Instruction*):

Laboratory Instruction Number	Short Laboratory Experiment Title	Assessment of Laboratory Work (Marks)		
		Performance		Viva-Voce
		PRA	PDA	
LE1.1	Chain surveying: a) Ranging a line b) Chaining a line and recording in the field book c) Taking offsets - perpendicular and oblique (with a tape only. d) Setting out right angle with a tape e) Chaining a line involving obstacles to ranging	25	20	05
LE1.2	To fix station point and to measure length of a line by direct ranging with the help of chain and tape and plot it.			
LE1.3	To perform a chain survey of closed traverse fixing the angle between two chain lines by tie lines and to plot them and adjusting the closing error by graphical method.			
LE1.4	To perform a chain survey of an area by chain triangulation and plot .			
LE2.1	Study the parts of prismatic compass and to measure the bearings of lines joining different station point			
LE2.2	To take the fore bearing and back bearing of sides of a regular polygon and to calculate included angle and check them.			
LE2.3	To perform a chain and compass survey of an area by open traverse and prepare a map			
LE2.4	To perform a chain and compass survey of an area by close traverse and prepare a map			
LE3.1	To learn temporary adjustment of levelling instrument and to find the R.L. of the given point.			
LE3.2	To find the difference of R.L. of two given point by			

	shifting of instrument on change points and applying arithmetical checks.			
LE3.3	To take the longitudinal and cross-section levels of an existing road			
LE4.1	To take the block leveling of undulated site and to draw the contours using method of interpolation.			
LE4.2	Preparing a contour map of a small area by direct method of contouring.			
LE4.3	To draw contour map of a small pond and to calculate its capacity.			
LE4.4	To study a Topo sheet of certain area and to mark on it watershed line and find out catchments area of a stream at a place.			
LE5.1	To study the accessories of plane table surveying and to plot the objects by radial method.			
LE5.2	To perform the plan table survey of small area by intersection method.			
LE5.3	Study of minor instruments			

* Assessment rubric, process and product check list with rating scale need to be prepared by the course wise teachers for each experiment for conduction and assessment of laboratory experiments /practicals

Legend : PRA: Process Assessment, PDA : Product Assessment

Note : Only one experiment has to performed at the end semester examination of 30 Marks as per assessment scheme

K) Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Demonstration
4. ICT Based Teaching Learning (Video Demonstration, CBT, Blog, Face book, Mobile)

L) Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Surveying I	Dr BC Punmia, Ashok Kumar Jain, Dr Arun Kumar ain	Laxmi publication	17th 2016
2	Surveying and Leveling	S K Duggal	TMG publication	
3	Surveying and Leveling	A K arora	Standard book house	
4	Surveying and Leveling	R Agor	Khanna publication	
5	प्रारंभिक सर्वेक्षण-I	Gurucharan singh	Standard publishers distributers delhi	

(b) Open source software and website address :

1. www.nptel.ac.in
2. www.civildigital.com
3. https://swayam.gov.in

M) List of Major Laboratory Equipment and Tools:

S. No.	Name of Equipment	Broad Specifications	Relevant Experiment Number
1	**Steel Tapes 30 metre**	Made of steel as per IS Specifications	LE1.1 LE1.2 LE1.3 LE2.1 LE2.2 LE2.3LE2.4 LE5.1 LE5.2
2	**Engineer's Chain**	made of M.S. 100 foot survey chain with 100 links solid brass handles &link	LE1.1 LE1.2 LE1.3 LE2.3 LE2.4
3	**Metallic Tape 20 /30 metre**	Good quality	LE1.1 LE1.2 LE2.2LE1.3 LE2.1 LE2.3 LE2.4 LE5.1 LE5.2
4	**Ranging Rod Steel 6'**	Length 2 Meter (Straight / Folding / Screw Type)	LE1.1 LE1.2 LE1.3 LE2.1

			LE2.2 LE2.3 LE2.4 LE3.1 LE3.2 LE3.3 LE5.1 LE5.2
5	**Chain 30 metre**	made of M.S. with 100 links solid brass handles	LE1.1 LE1.2 LE1.3 LE2.3 LE2.4 LE5.1 LE5.2
6	**Chain 20 metre**	made of M.S. with 100 links solid brass handles	LE1.1 LE1.2 LE1.3 LE2.3 LE2.4 LE5.1 LE5.2
7	**Optical square Indian pattern**	Circular type, made of brass, fitted with double reflecting mirror right and lift to 90 degree.	LE1.1 LE1.2 LE1.3
8	**Prismatic Compass 100 mm with stand**	Made of Brass, Size 100mm dia.As Per I.S.I. Specification	LE1.3 LE2.1 LE2.2 LE2.3 LE2.4
9	**Open type Cross staff**	Size 4", Open Type having four vanes at right angles.	LE1.1 LE1.2 LE1.3
10	**Dumpy level 300 mm with stand**	Telescopic Length Size 12", Erect Image. Internal Focusing, Fitted with compass.	LE3.1 LE3.2 LE3.3 LE4.1 LE4.2 LE4.3 LE4.4
11	**Levelling staff 4 meter**	Made of Fully Aluminium body, telescopic type in Three sections.I.S.I. Specifications No IS:1779-1961	LE3.1 LE3.2 LE3.3 LE4.1 LE4.2 LE4.3 LE4.4
12	**Tilting level**	Size 178mm /7" Internal focussing, anti reflection coated optics.	LE3.1 LE3.2 LE3.3 LE4.1 LE4.2 LE4.3 LE4.4
13	**Plane Table with Accessories**	complete with alidade,trough compass cover etc.	LE5.1 LE5.2
14	**Telescopic Alidade**	Size 178mm, Internal focussing fitted in anti-reflection Coated Optics, with full circle protractor	LE5.1 LE5.2
15	**Hand Level**	Hand Level	LE5.3
16	**Abny Level**	with slow motion arrangement size 5	LE5.3
17	**Cylone Ghat Tracer**	With rack & pinion adjustment suitable for forest use divided from 1 to 6 to in 120 angles of elevation and depression.	LE5.3
18	**Tangent Clinometer**	Made of Full- Brass, Determine the elevation of distant points.	LE5.3
19	**Pentagraph**	Pentagraph	LE5.3
20	**Planimeter**	Digital	LE5.3
21	**Box Sextant**	Box Sextant	LE5.3

N) Mapping of POs & PSOs with COs:

Course Outcomes (COs) Titles	Programme Outcomes (POs)										Programme Specific Outcomes (PSOs)	
	Basic know ledge PO-1	Discipline Know ledge PO-2	Experime nts & Practice PO-3	Engineeri ng Tools PO-4	The Engin eer & Society PO-5	Environ ment & Sustaina bility PO-6	Ethics PO-7	Individua l & Team work PO-8	Communi cation PO-9	Life Long learning PO-10	PSO-1	PSO-2
CO-1 Conduct chain survey in the field.	1	3	3	3	1	1	1	2	1	2	1	1
CO-2 Conduct field survey using prismatic compass.	1	3	3	3	1	1	1	2	1	2	1	1
CO-3 Calculate level with respect to fixed datum with the help of leveling instruments.	1	3	3	3	1	1	1	2	1	2	1	1
CO-4 Plot and interpret contours.	1	3	3	3	1	1	1	2	1	2	1	1
CO-5 Prepare map with the help of plane table and use minor instruments.	1	3	3	3	1	1	1	2	1	2	1	1

O) Course Curriculum Map:

POs & PSOs No.	COs No. & Title	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO-1,2,4,5,6,7,8,9,10 PSO-1,2	CO-1 Conduct chain survey in the field.	SO1.1 SO1.2 SO1.3	LE1.1 LE1.2 LE1.3 LE1.4	1.1.1-1.1.3 1.2.1-1.2.8	SL1.1
PO- 1,2,3,4,5,7,8,9 PSO-1,2	CO-2 Conduct field survey using prismatic compass.	SO.2.1 SO.2.2 SO2.3	LE. 2.1 LE. 2.2 LE 2.3 LE 2,4	2.1 2.2 2.3 2.4	SL2.1 SL2.2
PO-1,2,3,4,5,7,8,9,10 PSO-1,2	CO-3 Calculate the level with respect to fixed datum with the help of leveling instruments.	SO.3.1 SO3.2 SO3.3	LE3.1 LE 3.2 LL 3.3	3.1 3.7 3.2 3.3 3.4 3.5 3.6	SL3.1
PO-1,2,3,4,5,7,8,9,10 PSO-1,2	CO-4 Plot and interpret contours.	SO4.1 SO4.2 SO4.3	LE4.1 LE4.2 LE4.3 LE4.4	4.1 4.5 4.2 4.6 4.3 4.7 4.4 4.8	SL4.1
PO-1,2,3,4,5,7,8,9,10 PSO-1,2	CO-5 Prepare map with the help of plane table and use minor instruments.	SO5.1 SO5.2 SO5.3	LE5.1 LE5.2 LE5.3	5.1.1-5.1.5 5.2	SL5.1

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others) , LI : Laboratory Instruction (Includes Practical performances in Laboratory, Workshop, field or other locations using different instructional strategies) SL: Self Learning

A) Course Code : 2020373(020)
B) Course Title : BUILDING DRAWING & CAD
C) Pre- requisite Course Code and Title :
D) Rationale : Drawing is considered as language of core engineering. In case of Civil Engineering it very important medium of communication between Architect , Design Engineer and Diploma holder who is supposed to implement the construction works using basic plan, working drawings, design drawings etc..

A Civil Engineering diploma holder must be capable of preparing drawings/ sketching detailed constructional drawing of various components of building using CAD software for the purpose of communication with the field workers. Planning of small buildings, developing a line plan, dimensioning, key plan, and drainage plan are the important skills to develop. The diploma engineer must be conversant with reading and interpretation of drawing for execution of work. In view of above this course curriculum of Building Drawing and CAD is developed.

E) Course Outcomes :

CO-1 Apply the basic principles and bye laws for preparation of engineering drawings of a building.

CO-2 Use Computer Aided Drawing Applications in Civil Engineering.

CO-3 Draw Plan, Elevation, Sectional Elevation of a residential building and plan of water supply sanitary and sewage system of buildings/campus.

CO-4 Prepare detailed working drawings of building components including doors, windows and typical staircase.

CO-5 Prepare perspective view of building.

F) Scheme of Studies:

Board of Study	Course Code	Course	Scheme of Studies (Hours/Week)			Credit L+ T+P/2
			L	T	P	
Civil Engineering	2020373 (020)	Building Drawing & CAD	2	2	4	6

L- Lecture , T- Tutorial, P- Practical,

Legend: Lecture (L) →CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture and others).

Practical (P) → LI : Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies).

Tutorial (T) → SL:Self Learning

G) Scheme of Assessment:

Board of Study	Course Code	Course	Scheme of Examination					
			Theory			Practical		Total
			ESE	CT	TA	ESE	TA	Marks
Civil Engineering	2020373 (020)	Building Drawing & CAD	70	20	30	30	50	200

ESE: End Semester Exam, CT: Class Test, TA: Teachers Assessment

Legend - PRA : Process Assessment, PDA : Product Assessment

Note: i) TA in Theory includes Sessional work (SW) and attendance (ATT) with weightage of 70% and 30% of total respectively.

ii) TA in practical includes performance of PRA,PDA and Viva-Voce with weightage of 50%,40% and 10% respectively.

iii) 85% attendance is essential in theory and practical classes to appear in Examination.

Note: ESE theory will be of 4 hrs duration. In ESE theory drawings have to be prepared manually.

In ESE practical drawings have to be prepared using AutoCAD.

H) Course-Curriculum Detailing:

This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW) and Self Learning (SL). Students are expected to demonstrate the attainment of Session Outcomes (SOs) and finally Course Outcomes (COs) upon the completion of course. Convert unit of the given physical quantity from one unit system to other.

CO-1 Apply the basic principles and bye laws for preparation of engineering drawings of a Building

(Approx. Hrs: CI+LI= 12 Hrs)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1Identify the different features & components of a building in a given drawing SO1.2Verify the drawings as per Bye laws SO1.3Apply the basic principles of planning		**UNIT-1** **1.1 Introduction to building drawing** 1.1.1Size of Drawing, Layout of drawing, Title block, Scale, Dimensioning 1.1.2 Symbols for Doors & Windows, Drains and Pipes, Sanitary and Plumbing, Electrical Fittings as per IS 962	SL1.1Study the Bye laws prevailing in the local cooperation bodies

Session Outcomes	Laboratory Instruction	Class room Instruction (CI)	Self Learning
		1.2 Building Bye-laws 1.2.1 Building Bye-laws for Residential Building 1.2.2Building Byelaws for Commercial Building 1.2.3Plot area, built up area, plinth area, carpet area and Floor Area Ratio (FAR) **1.3 Principles of Planning** 1.3.1 General principles of architecture : Function, Economy, Safety, Aesthetics, Economy 1.3.2 Basic elements of planning residential building: living area, sleeping area, service area, other areas. Principles of planning of residential building: Orientation, Privacy, Grouping, Circulation, Sanitation, Flexibility, Elegance, Landscaping 1.3.3 Dimensions for different types of rooms, height, Size of doors and windows.	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Elaborate in brief the general principles of architecture in planning.
2. Explain orientation, privacy, grouping and flexibility.
3. Define Plot area, built up area, plinth area, carpet area and Floor Area Ratio (FAR).
4. Give dimensions for different types of rooms, height, Size of doors and windows.

b. Other Activities (Specify):

1. Draw symbols of Doors & Windows, Drains and Pipes, Sanitary and Plumbing, Electrical Fittings used in residential building.
2. Draw line plans for residential building of minimum three rooms, school building, primary health centre, hostel, function hall and library.

CO-2 Use Computer Aided Drawing Applications in Civil Engineering.

(Approx. Hrs: CI+LI= 13+16 Hrs)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 Identify the various AutoCAD features SO2.2 Explain AutoCAD commands. SO2.3 Perform Editing operations to Change Properties of objects in drawing	LI 2.1Draw line plan and section of any building, showing all AutoCAD features (Dimensions, layers, grouping of entities etc), in the drawing. LI 2.2Draw some three D objects using Extrude, Subtract and Union.	Unit 2.0 **Computer Aided Drawing (CAD)** **2.1AutoCAD Features** Graphical input devices Drawing primitives, Text and editing (move, copy rotate, mirror) Scale, filters and round, Grouping of entities ,Layers ,Grid, Snap Ortho ,PEDIT, display and zoom, pan, fill redraw, region, QText, offset, Annotate ,Sectioning, hatching styles ,Block and its creation ,Extrude, Subtract and union ,Shading **2.2 Application of AutoCAD** Enquiry commands ,plotting of drawing ,Uses of plotters, changing plot specification ,Application of Civil Engineering **2.3Editing and Changing Properties of Objects** Filtering, Selecting, Accessing , Understand the property list ,Changing property list .	SL2.1 Superimpose google earth image of your college campus with khasra in AutoCAD SL2.2Prepare the plan of own residential building/campus.

SW-2 Suggested Sessional Work (SW) :

a. Assignments:
1. Enlist and explain various commands of autocad.
2. Draw line plan of your college building using cad.

CO- 3. Draw Plan, Elevation, Sectional Elevation of a residential building

(Approx. Hrs: CI = 13+24 Hrs)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO3.1 Prepare line plan of a building SO3.2 Develop a layout plan. SO3.3 Prepare submission drawing	LI 3.1Draw submission drawing, to the scale of 1:100, of a Residential Building (2BHK) with Flat Roof using CAD and enclose Print out showing: a) Developed plan.	**3.1 Layout plan, detailed plans of residential buildings/campus** 3.1.1 Types of plan ,Site plan, location plan, Line plan, foundation plan,	SL3.1 Prepare the elevation of own residential building.

Session Outcomes	Laboratory Instruction (LI)	Class room Instruction	Self Learning
SO3.4 Draw elevation and section detail of a building. SO3.5 Prepare drawing of a steel roof truss. SO3.6 Prepare detailed plan of water supply sanitary and sewage system.	b) Site plan (1:200) and area statement LI 3.2 Draw submission Drawing of above Drafting in CAD showing Sectional Elevation of building.	layout plan 3.1.2 Line plan of residential building. 3.1.3 Development of plan from line plan of residential building. 3.1.4 Area statement and other details. 3.1.5Submission drawing 3.1.6Working drawing **3.2 Section, Elevation and other detailed drawings** 3.2.1Elevation of building. 3.2.2 Sectional elevation of building. 3.2.3 Steel truss, Lean to roof.	

SW-3 Suggested Sessional Work (SW) :

a. Assignments:
   1. Draw centre line plan of a building.
   2. Develop a plan of building with proper orientation of rooms.
   3. Drawing exercises.
   4. Draw a working drawing of two roomed building.
   5 . Draw elevation and section of a residential building.
   6. Draw a steel roof truss (tubular truss).
   7. Prepare drawing of water supply and sanitary system of a residential building.
b. Mini Project:
   1. Study drawings from various departments (PWD, housing board).
   2. Read and interpret the drawing and discuss with you colleagues

CO- 4 Prepare a detailed working drawings of building components including doors, windows and typical staircase.

(Approx. Hrs: CI = 13+24 Hrs)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO4.1 Identify different types of doors and windows SO4.2 prepare detailed drawings of doors and windows SO4.3 Prepare drawings of staircase. SO4.4 Prepare drawing/sketches of	LI4.1 Draw submission drawing, to the scale of 1:100 of Residential Building (2BHK) with Flat Roof and staircase showing: a) Section passing through Staircase b) Position of Doors and windows LI4.2 Draw the different component of Building	**Doors , Windows and Staircase** **4.1 Doors and Windows** 4.1.1 Types of doors and windows according to material. 4.1.2 Detailed drawing of panel doors and windows. 4.1.3 Detailed drawing of metal framed windows. 4.1.4 Detailed drawing of aluminum framed windows 4.1.5 Detailed drawing of	SL4.1 Study the different types of stair cases with their merits and demerits.

small building elements such as footing, beam, column.	such as Doors Windows, staircase in CAD in three D.	building elements **4.2 Staircase** 4.2.1 Types of staircase. 4.2.2 Detailed drawing of straight staircase. 4.2.3 Detailed drawing of dog-legged staircase. 4.2.4 Detailed drawing of open newel staircase.	

SW-4 Suggested Sessional Work (SW) :

a. Assignments:
   1. Draw detailed drawings of doors (Glazed/ semi-glazed/ paneled)
   2. Draw detailed drawings of windows (Glazed/ semi-glazed/ paneled)
   3. Detailed drawing of dog-legged staircase.

b. Mini Project: Develop Project file with set of drawings.

CO- 5 Prepare perspective view of building.

(Approx. Hrs: CI = 13 Hrs)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO5.1 Demonstrates perspective view of a given Building. SO5.2 Identify different types of perspective. SO5.3 Construct perspective drawing of single and double roomed building.		**Perspective Drawing** **5.1Isometric projection-** drawing an isometric view **5.2Perspective drawing** 5.2.1 Terms used in perspective drawings: Station point, picture plane, axis of vision, vertical plane, horizontal plane, ground plane, eye level, line of vision, centre of vision vanishing points 5.2.2 One point, two point and three point perspective 5.2.3 Perspective drawing of single room 5.2.4 Perspective drawing of two roomed building.	SL5.1Explain Axonometric projection and Oblique projection.

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others) , LI : Laboratory Instruction (Includes Practical performances in Laboratory, Workshop, field or other locations using different instructional strategies) SL: Self Learning

SW-5 Suggested Seasonal Work (SW) :

a. Assignments:
1. Draw perspective drawing of single room building.
2. Draw perspective drawing double room building.
3. Exercises on Perspective drawing.

Note: Performance under Laboratory and Sessional work may appear in more than one COs/SOs.

I) Suggested Specification Table (For ESA of Classroom Instruction CI+SW+SL):

Unit Number	Unit Title	Marks Distribution			Total Marks
		R	U	A	
I	Building Byelaws and Principles of Planning	4	6	4	14
II	Computer Aided Drawing (CAD)	4	6	4	14
III	Elevation and Section	4	6	4	14
IV	Doors , Windows and Staircase	4	6	4	14
V	Perspective Drawing	4	6	4	14
Total		20	30	20	70

Legend: R: Remember, U: Understand, A: Apply and above

J) Suggested Specification Table (For ESA of Laboratory Instruction*):NA

Laboratory Instruction Number	Short Laboratory Experiment Title	Assessment of Laboratory Work (Marks)		
		Performance		Viva-Voce
		PRA	PDA	
LI 2.1	Draw line plan and section of any building, showing all AutoCAD features(Dimensions, layers, grouping of entities etc)., in the drawing	25	20	05
LI 2.2	LI 2.2Draw some three D objects using Extrude, Subtract and Union.			
LI 3.1	LI 3.1Draw submission drawing, to the scale of 1:100, of a Residential Building (2BHK) with Flat Roof using CAD and enclose Print out showing: a) Developed plan. b) Site plan (1:200) and area statement			
LI 3.2	LI 3.2 Draw submission Drawing of above Drafting in CAD showing: a) Sectional Elevation of building.			
LI 4.1	LI4.1 Draw submission drawing, to the scale of 1:100 of Residential Building (2BHK) with Flat Roof and staircase showing: a) Section passing through Staircase b) Position of Doors and windows			
LI4.2	LI4.2 Draw the different component of Building such as Doors Windows, staircase in CAD in three D.			

* Assessment rubric, process and product check list with rating scale need to be prepared by the course wise teachers for each experiment for conduction and assessment of laboratory experiments /practicals

Legend : PRA: Process Assessment, PDA : Product Assessment

Note : Only one experiment has to performed at the end semester examination of 30 Marks as per assessment scheme

K) Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Industrial visits
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration, CBT, Blog, Face book, Mobile)

L) Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Civil Engineering Drawing	V.B. Sikka	S.K. Kataria and Sons	7th 2015
2	Civil Engineering Drawing	Gurucharan singh and Chander	Standard Publishers and Distributers	
3	Building Drawing	M G Shah ,C M kale AND S Y Patki	Mcgraw Hill Publishing	
4	Building Planning and Drawing	S S Bhavikatti and MV Chitawadgi	Willey India Pvt Ltd	
5	Building Planning and Drawing	Kumara Swamy and N Kameshwar Rao	Charotar Publications	
6	Civil Engineering Drawing	Malik and Mayo	Computech Publications	
7	AutoCAD 2000	Ajit Singh	Mcgraw Hill Publishing	
8	Engineering Drawing Using AutoCAD	T Jeyapovan	Vikas Publications	

(b) Open source software and website address :

1. AutoCAD

(c) Others:

1. http://nptel.ac.in
2. http://civildigital.com
3. http://www.civilsimplified.com

M) List of Major Laboratory Equipment and Tools:

S. No.	Name of Equipment	Broad Specifications	Relevant Experiment Number
1	Computer aided drafting software like AutoCAD	Latest educational licensed network version	-
2	CAD workstations	latest configuration	As per batch size
3	Drawing boards	Drawing boards A1 size	As per batch size
4	Printer/plotter	A3 size	2 Nos

N) Mapping of POs & PSOs with COs:

Course Outcomes (COs) Titles	Programme Outcomes (POs)										Programme Specific Outcomes (PSOs)	
	Basic knowledge PO-1	**Discipline knowledge PO-2**	**Experiments & Practice PO-3**	**Engineering Tools PO-4**	**The Engineer & Society PO-5**	**Environment & Sustainability PO-6**	**Ethics PO-7**	**Individual & Team work PO-8**	**Communication PO-9**	**Life Long learning PO-10**	PSO-1	PSO-2
CO-1 Apply the basic principles and bye laws for preparation of engineering drawings of a Building	2	2	3	1	3	1	2	2	3	2	2	3
CO-2 Use Computer Aided Drawing Applications in Civil Engineering	2	2	3	1	3	2	2	1	2	2	2	3
CO-3 Draw Plan, Elevation, Sectional Elevation of a residential building	2	2	3	1	3	2	2	1	2	2	2	3
CO-4 Prepare a detailed working drawings of Building Components including doors, windows and typical staircase.	2	1	2	1	2	1	1	2	2	2	2	3
CO-5 Prepare perspective view of building.	2	2	2	1	1	1	1	1	3	2	2	3

O) Coursb Curriculum Map:

POs & PSOs No.	COs No. & Title	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO-1,2,3,5,7,8,9,10 PSO-1,2	CO-1 Apply the basic principles and bye laws for preparation of engineering drawings of a Building	SO1.1 SO1.2 SO1.3	-	1.1.1-1.1.2 1.2.1-1.2.3 1.3.1-1.3.3	SL1.1
PO-1,2,3,5,6,7,9,10 PSO-1,2	CO-2 Use Computer Aided Drawing Applications in Civil Engineering	SO2.1 SO2.2 SO2.3	LI 2.1 LI 2.2	2.1 2.2 2.3	SL2.1 SL2.2
PO-1,2,3,5,6,7,9,10 PSO-1,2	CO-3 Draw Plan, Elevation, Sectional Elevation of a residential building and plan of water supply sanitary and sewage system of buildings/campus.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5 SO3.6	LI 3.1 LI 3.2	3.1.1-3.1.6 3.2.1-3.2.3	SL3.1
PO-1,3,5,8,9,10 PSO-1,2	CO-4 Prepare a detailed working drawings of Building Components including doors, windows and typical staircase.	SO4.1 SO4.2 SO4.3 SO4.4	LI 4.1 LI 4.2	4.1.1-4.1.5 4.2.1-4.2.4	SL4.1
PO-1,2,3,9,10 PSO-1,2	CO-5 Prepare perspective view of building.	SO5.1 SO5.2 SO5.3	-	5.1 5.2.1-5.2.4	SL5.1

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others) , LI : Laboratory Instruction

(Includes Practical performances in Laboratory, Workshop, field or other locations using different instructional strategies) SL: Self Learning

VII. Course Curriculum Detailing (Semester- III)

A) Course Code : 2020374(020)
B) Course Title : BUILDING CONSTRUCTION
C) Pre- requisite Course Code and Title :
D) Rationale :

The main job of a Diploma civil engineer is to supervise and monitor the construction work as per the design drawing and specifications. Supervisor must be able to understand proper construction procedure, selection of materials and equipments. Supervisor must be aware of maintenance work of building, treatment works and to take the safety measures during the construction. Diploma engineer should also have knowledge of National Building Code and relevant Indian Standard Codes.

Keeping above requirement in mind this subject curriculum is designed for developing the ability in the student to prepare layout and supervise the construction and maintenance works as per working drawing and decision to select necessary equipment and machines.

E) Course Outcomes :

CO-1 Supervise foundation and masonry work as per working drawing and specifications and prevailing BOQ/SOR.

CO-2 Supervise the construction of walls, arches, and lintel and identify location of doors and windows as per plan and drawings.

CO-3 Demonstrate the types and construction methods of different floors, roofs, false ceiling and stairs.

CO-4 Monitor the different type of Damp Proofing, Water Proofing, Plastering and Painting, Distempering and White-Washing.

CO-5 Recognise Anti Termite Measures, Building Services, maintenance work, safety measures using suitable/appropriate Machinery & Equipments.

F) Scheme of Studies:

Board of Study	Course Code	Course	Scheme of Studies (Hours/Week)			Credit L+ T+P/2
			L	T	P	
Civil Engineering	2020374(020)	Building Construction	2	-	2	3

L- Lecture , T- Tutorial, P- Practical,

Legend: Lecture (L) →CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture and others).

Practical (P) → LI : Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies).

Tutorial (T) → SL:Self Learning

G) Scheme of Assessment:

Board of Study	Course Code	Course	Scheme of Examination					
			Theory			Practical		Total
			ESE	CT	TA	ESE	TA	Marks
Civil Engineering	2020374 (020)	Building Construction	70	20	30	30	50	200

ESE: End Semester Exam, CT: Class Test , TA: Teachers Assessment

Legend - PRA : Process Assessment, PDA : Product Assessment

Note: i) TA in Theory includes Sessional work (SW) and attendance (ATT) with weightage of 70% and 30% of total respectively.

ii) TA in practical includes performance of PRA,PDA and Viva-Voce with weightage of 50%,40% and 10% respectively.

iii) 85% attendance is essential in theory and practical classes to appear in Examination.

H) Course-Curriculum Detailing:

This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW) and Self Learning (SL). Students are expected to demonstrate the attainment of Session Outcomes (SOs) and finally Course Outcomes (COs) upon the completion of course.

Convert unit of the given physical quantity from one unit system to other.

CO-1 Supervise foundation and masonry work as per working drawing and specifications and BOQ/SOR

(Approx. Hrs: CI+LI= 7+8)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1Identify components of building. SO1.2Explain types of foundation and select suitable foundation for given condition. SO1.3Explain brick and stone masonry work.	LE1.1 Give Layout of a building: two rooms building with front verandah. LE1.2 Construct brick bonds (English bond only) in one, one and half and two brick thick walls. LE1.3 Construct brick bonds for L, T and cross junction.	**Unit I** **1.1 Introduction** Classification of building as per NBC ,Components of a building, Load bearing and framed structure ,comparison between Load bearing and framed structure **1.2 Foundation** 1.2.1 Function of	SL 1.1 Study of different types of bonds in brick masonry.

Session Outcomes	Laboratory Instruction	Class room Instruction	Self Learning
SO1.4Describe special care taken during construction of brick and stone masonry.		foundation, requirement of good foundation. 1.2.2 Types of foundation: Shallow and deep foundation Shallow foundation: spread footing, combined footing, strap footing, mat foundation. Deep foundation : Pile foundation, cast in situ and pre cast concrete piles, under reamed pile foundation 1.2.3 Selection of suitable foundation 1.2.4 Setting out of foundation. 1.2.5 Excavation for foundation-Implements for foundation, Shoring, Excavation in ground with subsoil water. **1.3 Stone Masonry** 1.3.1 Glossary of terms, Classification of stone masonry: rubble masonry - random and coursed, Ashlar masonry 1.3.2 Dressing of stone, size and placing of joint and corner stones, filling joints, proper packing of internal cavities of rubble masonry wall, making of joints to receive finishes, supervision of stone masonry. 1.4 **Brick masonry**: 1.4.1Definition of terms in brick masonry. 1.4.2Bonds,Rules for bonding, Stretcher, Header, Brick laying, supervision of brick work. 1.4.3Comparision between brick and stone masonry. 1.5 Construction of walls of precast	

Session Outcomes	Laboratory Instruction	Class room Instruction	Self Learning
		hollow concrete blocks.	

SW-1Suggested Sessional Work (SW):

a. Assignments:

1. State the requirements of a good foundation?
2. Enumerate different types of foundations you would recommend under different situations.
3. Write advantages and disadvantages of precast concrete piles.
4. Draw a typical sketch of under-reamed pile foundation along with the grade beam.
5. Sketches of spread and stepped footing.
6. Draw a typical section of a stone masonry wall.
7. Describe ashlar fine tooled masonry.
8. Compare brick and stone masonry.
9. Write a note on walls of precast hollow concrete blocks.

Mini Project:

Study nearby civil engineering structure and identify different types of foundation and masonry in different buildings.

b. Other Activities (Specify):

Observe actual construction process of brick masonry work at any site.

CO-2 Supervise the construction of walls, arches, and lintel and describe doors and windows .

(Approx. Hrs: CI+LI = 7+8)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 Identify different types of walls used in building. SO2.2 Describe different types of scaffolding. SO2.3 Explain arches and lintels SO2.4 Select suitable type of doors and windows.	LE2.1 Draw sketches of different types of doors and windows. LE2.2 Draw sketches of different types of Arches and Lintels. LE2.3 Draw sketches of different types of Scaffolding.	**UNIT II** **2.1 Walls** Classification of walls: load bearing, non-load bearing, dwarf wall and partition walls. **2.2 Scaffolding**: Purpose of scaffolding Different types of scaffolding, Merits and demerits of different types of scaffolding. **2.3. Arches:** 2.3.1 Meaning and use of arches 2.3.2 Glossary of terms used in arches : Abutment, pier, arch ring, intrados, soffit, extrados,	SL 2.1 Study of modern materials used in doors and window.

Session Outcomes	Laboratory Instruction	Class room Instruction	Self Learning
		voussoiers, Springer, springing line, crown, key stone, skew back, span, rise, depth of an arch, haunch, spandrel, jambs, effective span 2.3.3 Types of Arches - Semi circular, segmental, elliptical and parabolic 2.3.4 Construction of Concrete Arches. **2.4 Lintels**: Purpose of lintel, Materials used for lintels, Cast-in-situ and pre-cast lintels, Lintel along with sun-shade or chhajja. **2.5 Doors, Windows and Ventilators:** 2.5.1 Glossary of terms with neat sketches 2.5.2 Classification based on materials i.e. wood, metal and plastic and their Suitability for different situations. 2.5.3 Door and window frames: Materials and sections, door closures, hold-fasts. 2.5.4 Different type of doors-Classification of doors, Battened and Ledged Doors, Battened, Ledged and Braced Doors, Panel Door, Flush Door, Glazed Door, Rolling Shutter, Steel Door, Sliding Door, Plastic And Aluminium Doors. 2.5.5 Window – Fixed and Pivoted Window, Panel Window, Glazed Windows Ventilators, Sky Light Window, Louvers Shutters, Steel Windows, Aluminium Windows and Plastic Windows.	

Session Outcomes	Laboratory Instruction	Class room Instruction	Self Learning
		2.5.6Door and window frames: Materials and sections, door closures, hold-fasts.	

SW-2 Suggested Sessional Work (SW) :

a. Assignments:

1. Write the purposes of scaffolding? State its essential requirements?
2. Draw sketches of Single scaffolding, Double scaffolding and Cantilever scaffolding.
3. Compare timber scaffolding and steel scaffolding.
4. Draw a labeled neat sketch of an arch.
5. Draw sketches of –
   (a) Battened and Ledged Door (c) Panel Door
   (b) Ledged and Braced Door
6. Differentiate between the following-

(i) Sky light and dormer window.
(ii) Ventilator and clerestory window.
(iii) Corner window and bay window.

CO-3 Demonstrate the types and construction methods of different floors, roofs, false ceiling and stairs

(Approx. Hrs: CI+LI = 6+16)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO3.1 Describe different types of floors and their components. SO3.2 Explain different types of roofs and their components SO3.3 Identify different types of stairs and it's elements. SO3.4 Escalators and Elevators.	LE3.1 Draw sketches of various types of floors. LE3.2 Draw sketches of various types of roofs. LE3.3 Draw sketches of various types of stairs. LE3.4 Prepare sketches of cantering , shuttering and scaffoldings	**Unit III** **3.1 Floors** 3.1.1 Glossary of terms- floor finish, topping, under layer, base course, rubble filling and their purpose 3.1.2 Types of floor- flag stone, kota stone, marble, granite flooring, glazed and vitrified tiles flooring, concrete floors, timber floor, other miscellaneous floor. Construction method of different types of floor. **3.2 Roofs** 3.2.1Construction of flat roof, shuttering for beam and slab floor. 3.2.2 Steel roof truss. Slopes, overlaps of roofing materials, Procedure for laying AC and GI sheet. 3.2.3 Procedure for laying false ceiling. **3.4 Stairs** 3.4.1 Glossary of terms: Staircase, landing, riser, tread, nosing, width of staircase, hand-rail, 3.4.2 Types of Stairs - straight flight, dog legged, open well, quarter turn, half turn, geometrical stairs, bifurcated stair, spiral stair. Construction of	SL 3.1 Study of modern flooring and roofing materials. .

Session Outcomes	Laboratory Instruction	Class room	Self Learning
		RCC stair. 3.4.3 Escalators and Elevators.	

SW-3 Suggested Sessional Work (SW) :

a. Assignments:
1. Explain the method of laying marble flooring.
2. Explain method of construction of cement concrete flooring.
3. Explain granolithic finish, terrazzo flooring and mosaic flooring.
4. Explain with reasons what type of floor finishing will be required for –
   (i) Operation theatre (ii) Dancing Hall (iii) Library
   (iv) Ware house (v) Workshop (vi) Hostel
5. Draw sketches of roofs.
6. Draw sketches of different types of stairs.
7. Draw typical sketch of form work for beam slab floor.
8. Write notes on Elevators and Escalators.

b. Mini project

Visit a site and study construction of RCC roof. .

CO 4 Monitor the different type of Damp Proofing, Water Proofing, Plastering and Painting, Distempering and White-Washing.

(Approx. Hrs: CI+LI = 6)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 4.1 Provide Damp Proofing and Water Proofing as per needs. SO 4.2 Explain plastering. SO 4.3 Explain different type of white washing, colour washing and painting work.		**Unit IV** **4.1 Damp Proofing and Water Proofing:** 4.1.1 Causes of dampness, its ill effects 4.1.2 Methods of Damp proofing ,water proofing materials and their specifications, Rich concrete and mortar, bitumen, bitumen mastic, polymer coating, use of chemicals. 4.1.3 Damp Proof Course treatments in buildings-treatment to foundation against gravitational water, treatment to basements, treatment to floors, treatment to walls, treatment to roofs.	SL 4.1 Study of suitability of different types of paints and emulsion on different type of surfaces.

		4.2 Plastering – objects of plastering, requirements of good plaster, cement mortar mixes for plastering, number of coats of plaster, method of plastering with cement mortar, types of plaster finishes, special materials used in plastering, defects in plastering. **4.3Painting,Distempering and White-Washing** 4.3.1 Painting method of painting on new and old wood work, iron and steel work, plastered surfaces, defects in painting, 4.3.2 Method of distempering, white washing, colour washing.	

SW-4 Suggested Sessional Work (SW) :

a. Assignments:
1. List the ill effects of dampness in buildings.
2. Explain the method of damp proofing for the following –
   (a)Foundations (b) Floors
3. Explain the method of plastering with cement mortar.
4. Write a note on various defects in plastering.
5. Draw sketches of types of pointing in masonry work.
6. Explain the procedure of painting on plastered surface.
7. Explain various defects in painting.
8. Explain method of distempering.

CO 5 Recognize Anti Termite Measures, Building Services, maintenance work, safety measures using suitable/appropriate Machinery & Equipments

(Approx. Hrs: CI+LI = 6 hrs)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO5.1 Select termite proofing method. SO5.2Describe fire protection work in building. SO5.3Recognise Ventilation and air conditioning		**Unit 5.0 Building Services and Equipment** 5.1 Anti Termite Measures Introduction, preconstruction treatment, post construction treatment, chemicals used in anti-termite treatment. 5.2 Fire Protection – Fire	SL 5.1 Study of fire resistant properties of common building materials. .

Session Outcomes	Laboratory	Class room Instruction (CI)	Self Learning
SO5.4 Enlist equipment, machineries used in construction work. SO5.5 Plan building maintenance work.		hazard, general fire safety requirements for buildings as per IS1641-1988, Fire resistant construction, fire alarm, fire extinguishing equipments. 5.3Ventilation and Air conditioning- natural ventilation, mechanical ventilation, air conditioning. 5.4 Machinery & Equipment: List of machines and equipments required during building construction and their use 5.5 Building maintenance and safety measures**:** Causes and types of defects in buildings, Preparation of report on maintenance work, Remedial measures and execution procedure of any one type of building maintenance work, Safety precautions to be observed during the construction work.	

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others) , LI : Laboratory Instruction (Includes Practical performances in Laboratory, Workshop, field or other locations using different instructional strategies) SL: Self Learning

SW-5 Suggested Sessional Work (SW) :

a. Assignments:

1. Write a note on fire safety requirements for building.
2. Explain fire resistant construction of the following elements-
   (a) Walls and columns.
   (b) Floors and roofs.
3. Write short notes on natural ventilation, mechanical ventilation and air conditioning.
4. Explain with sketch the method of taking a house connection for water supply.
5. Explain various principles that should be kept in mind while designing a house drainage system.

b. Mini Project:

1. Sketching of water supply system of small existing building.
2. Sketching of sewage disposal system of small existing building.
3. List the machine/equipments used in building construction.

Note: Performance under Laboratory and Sessional work may appear in more than one COs/SOs.

I) Suggested Specification Table (For ESA of Classroom Instruction CI+SW+SL):

Unit Number	Unit Title	Marks Distribution			Total Marks
		R	U	A	
I	Introduction, Foundation, Masonry	4	6	4	14
II	Walls, Scaffolding, Arches, Lintels, Doors, Windows and Ventilators	4	6	4	14
III	Floors, Roofs, False Ceiling and Stairs	4	6	4	14
IV	Damp Proofing and Water Proofing, Plastering , Painting, Distempering and White-Washing	4	6	4	14
V	Anti Termite Measures, Building Services , Machinery & Equipment, Building maintenance and safety measures	4	6	4	14
Total		20	30	20	70

Legend: R: Remember, U: Understand, A: Apply and above

J) Suggested Specification Table (For ESA of Laboratory Instruction*):

Laboratory Instruction Number	Short Laboratory Experiment Title	Assessment of Laboratory Work (Marks)		
		Performance		Viva-Voce
		PRA	PDA	
LE 1.1	To prepare Layout of a building: two rooms building with front verandah.	25	20	05
LE 1.2	To construct brick bonds (English bond only) in one, one and half and two brick thick walls.			
LE 1.3	To construct brick bonds for L, T and cross junction.			
LE 2.1	Draw sketches of different types of doors and windows.			
LE 2.2	Draw sketches of different types of Arches and Lintels			
LE 2.3	Draw sketches of different types of Scaffolding.			

LE 3.1	Draw sketches of various types of floors.			
LE 3.2	Draw sketches of various types of roofs.			
LE 3.3	Draw sketches of various types of stairs.			

* Assessment rubric, process and product check list with rating scale need to be prepared by the course wise teachers for each experiment for conduction and assessment of laboratory experiments /practicals

Legend : PRA: Process Assessment, PDA : Product Assessment

Note : Only one experiment has to performed at the end semester examination of 30 Marks as per assessment scheme.

K) Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Field Trips
5. Demonstration
6. Others

L) Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Building Construction	Dr. B.C. Punmia, Dr. Arun Kumar Jain	Laxmi Publication	11th Edition, 2016
2	Building Construction	Sushil Kumar	Standard Publisher	20th Edition, 2010
3	Building Construction	S. C. Rangwala	Charotar Publication	33th Edition, 2017
4	Building Construction	S.S.Bhavikatti	Vikas Publication House	
5	Building Construction	S.K.Sharma	S. Chand and Co	

(b) Open source software and website address :

1. www.nptel.ac.in
2. www.civildigital.com
3. www.engineeringtoolbox.com
4. www.swayam.gov.in

(c) Others:

M) List of Major Laboratory Equipment and Tools:

S. No.	Name of Equipment	Broad Specifications	Relevant Experiment Number
1	Mason kit	Trovel: small, medium and large; spirit level, set square, plumb bob, pick axes, showel, plainer, pan, bucket, transparent flexible pipe, brick hammer, belcha, Gurmala, steel tape, nails and pegs, mason yarn etc.	LE 1.1, LE 1.2, LE 1.3
2	Models of doors and windows	Models of doors and windows	LE 2.2,LE 3.1, LE 3.2, LE 3.3, LE 3.4

N) Mapping of POs & PSOs with COs:

Course Outcomes (COs) Titles	Programme Outcomes (POs)										Programme Specific Outcomes (PSOs)	
	Basic knowledge PO-1	Discipline knowledge PO-2	Experiments & Practice PO-3	Engineering Tools PO-4	The Engineer & Society PO-5	Environment & Sustainability PO-6	Ethics PO-7	Individual & Team work PO-8	Communication PO-9	Life Long learning PO-10	PSO-1	PSO-2
CO-1 Supervise foundation and masonary work.	3	2	2	2	3	-	-	2	-	2	2	3
CO- 2 Supervise construction of walls, arches, lintel and identify location of doors and windows.	3	2	2	2	3	-	-	2	-	2	2	3
CO–3Demonstrate the types and construction methods of different floors, roofs, false ceiling and stairs.	3	2	2	2	3	-	-	2	-	2	2	3
CO-4 Monitor the different type of Damp Proofing, Water Proofing , Plastering and Painting, Distempering and White-Washing.	3	2	2	2	3	-	-	2	-	2	2	3
CO-5 Recognize Anti Termite Measures , Building Services , maintenance work, safety measures and selection of Machinery & Equipments.	3	2	2	2	3	-	-	2	-	2	2	3

O) Course Curriculum Map:

POs & PSOs No.	COs No. & Title	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO-1,2,3,4,5,8,10 PSO-1,2	CO-1Supervise foundation and masonry work as per working drawing and specifications and BOQ/SOR	SO1.1 SO1.2 SO1.3 SO 1.4	LE1.1 LE1.2 LE1.3	1.1 1.2.1-1.2.5 1.3.1-1.3.2 1.4.1-1.4.3 1.5	SL 1.1
PO-1,2,3,4,5,8,10 PSO-1,2	CO- 2 Supervise construction of walls, arches, lintel and identify location of doors and windows.	SO.2.1 SO.2.2 SO2.3 SO 2.4	LE2.1 LE2.2 LE2.3	2.1 2.2 2.3.1-2.3.4 2.4 2.5.1-2.5.6	SL 2.1
PO-1,2,3,4,5,8,10 PSO-1,2	CO – 3 Demonstrate the types and construction methods of different floors, roofs, false ceiling and stairs.	SO.3.1 SO3.2 SO3.3 SO3.4	LE3.1 LE3.2 LE3.3 LE3.4	3.1.1-3.1.2 3.2.1-3.2.3 3.4.1-3.4.3	SL 3.1
PO-1,2,3,4,5,8,10 PSO-1,2	CO – 4 Monitor the different type of Damp Proofing, Water Proofing , Plastering and Painting, Distempering and White-Washing.	SO4.1 SO4.2 SO4.3		4.1.1-4.1.3 4.2 4.3.1-4.3.2	SL 4.1
PO-1,2,3,4,5,8,10 PSO-1,2	CO–5Recognize Anti Termite Measures, Building Services, building maintenance work, safety measures and selection of Machinery & Equipments.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5		5.1 5.2 5.3 5.4 5.5	SL 5.1

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others) , LI : Laboratory Instruction (Includes Practical performances in Laboratory, Workshop, field or other locations using different instructional strategies) SL: Self Learning

VII. Course Curriculum Detailing (Semester- III)

A) Course Code : 2020375(020)
B) Course Title : HYDRAULICS
C) Pre- requisite Course Code and Title:
D) Rationale : Hydraulics is a branch of engineering science which deals with behaviour of fluid in static and dynamic condition. The basic knowledge about hydraulics is required in subjects of civil engineering like Irrigation, Water Resources Management and Public Health Engineering. In this course, basics of hydraulics and its application oriented content has been kept with a focus that students should be able to solve practical problems related to pipe flow, open channel flow and different type of pumps. Competencies developed by this course would therefore be useful for students while performing his/her job in the field of Water resources / Irrigation/PHE and Environment Engineering.

E) Course Outcomes:

CO -1 Measure pressure of fluid using equipments such as manometer, mechanical gauges.
CO -2 Apply Bernoullis theorem in different situations.
CO -3 Measure discharge by different methods.
CO-4 Analyse pipe flow.
CO-5 Analyse flow through open channel and use pumps in different situations.

F) Scheme of Studies:

Board of Study	Course Code	Course	Scheme of Studies (Hours/Week)			Credit L+ T+P/2
			L	T	P	
Civil Engineering	2020375(020)	Hydraulics	3	1	2	5

L- Lecture , T- Tutorial, P- Practical,

Legend: Lecture (L) →CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture and others).

Practical (P) → LI : Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies).

Tutorial (T) → SL: Self Learning

G) Scheme of Assessment:

Board of Study	Course Code	Course	Scheme of Examination					
			Theory			Practical		Total
			ESE	CT	TA	ESE	TA	Marks
Civil Engineering	2020375(020)	Hydraulics	70	20	30	30	50	200

ESE: End Semester Exam, CT: Class Test , TA: Teachers Assessment

Legend - PRA : Process Assessment, PDA : Product Assessment

Note: i) TA in Theory includes Sessional work (SW) and attendance (ATT) with weightage of 70% and 30% of total respectively.

ii) TA in practical includes performance of PRA,PDA and Viva-Voce with weightage of 50%,40% and 10% respectively.

iii) 85% attendance is essential in theory and practical classes to appear in Examination.

H) Course-Curriculum Detailing:

This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW) and Self Learning (SL). Students are expected to demonstrate the attainment of Session Outcomes (SOs) and finally Course Outcomes (COs) upon the completion of course.

Convert unit of the given physical quantity from one unit system to other.

CO-1 Measure pressure of fluid using equipments such as manometer, mechanical gauges.

(Approx. Hrs: CI+LI = 13+6)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1Describe different properties of liquid SO1.2Describe different types of pressure and methods of measurement SO1.3Explain the	LE1.1Measure the pressure of water in pipe using Piezometer. LE1.2Measure the pressure of water in pipe using simple manometer. LE1.3Measure the pressure of water in pipe using differential	**UNIT-1** **1.1 Introduction** 1.1.1 Definition of liquid, Ideal liquid and Real liquid 1.1.2 Properties of liquid - Mass density, Specific weight, Specific Gravity, Compressibility, Viscosity, Surface Tension, Capillarity,	SL 1.1 Describe SI Units(International System of Units).

Session Outcomes	Laboratory Instruction	Class room Instruction	Self Learning
relationship between pressure and depth of liquid SO1.4Compute total Pressure and Centre of pressure	manometer.	1.1.3 Branches of hydraulics- Hydro Statics, Hydro Kinematics and Hydro Dynamics. **1.2 Pressure and its measurement** 1.2.1 Pressure, Pressure intensity, Variation of pressure with depth of liquid, Pressure head, Effect of shape and size of container on pressure, PASCAL's law. 1.2.2 Atmospheric Pressure, Gauge Pressure, Absolute Pressure, Vacuum Pressure. 1.2.3 Measurement of pressures by different methods – Piezometer, Manometer, Differential Manometer and Inverted Differential Manometer, Bourdons pressure gauge. **1.3 Hydrostatics** 1.3.1 Total pressure and centre of pressure and pressure distribution diagram 1.3.2 Computation of Total pressure and centre of pressure on plane horizontal surface, vertical surface and inclined surface.	

SW-1 Suggested Sessional Work (SW):

a. Assignments:
   1. Define properties of liquid and specify their units.
   2. Distinguish between gauge pressure and absolute pressure.
   3. Solve numerical problems based on pressure measurement.
   4. Solve numerical problems based on total pressure and centre of pressure.

b. Mini Project:
   1. Draw neat diagram of different types of pressure measuring device.
   2. Draw neat diagram showing center of gravity and center of pressure in vertical surface.

CO-2 Apply Bernoullis theorem in different situations.

(Approx. Hrs: CI+LI = 13+2)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 Explain different types of liquid flow SO2.2 Derive Continuity Equation SO2.3 Explain different kinds of energy present in liquid flow. SO 2.4 Apply Bernoulli's theorem to measure the pressure and Discharge of liquid flow.	LE2.1Verification of Bernoulli's theorem.	Unit 2.0 **2.1 Hydrokinematics** 2.1.1 Types of liquid flow Laminar, Turbulent, Uniform-Non uniform, Steady, Unsteady, and Compressible, Incompressible flow 2.1.2 Rate of flow, Law of conservation of mass, Continuity Equation 2.1.3 Stream line, Path line, Streak Line **2.2 Hydrodynamics** 2.2.1 Various forms of energies present in liquid flow - potential energy, kinetic energy, pressure energy, total energy, potential head, kinetic head, pressure head, total head 2.2.2 Bernoulli's Equation and Limitations of Bernoulli's theorem. 2.2.3 Simple Application of Equation of Continuity and Bernoulli's theorem. 2.2.4 Pitot Tube	SL2.1Describe flow net.

SW-2 Suggested Sessional Work (SW) :

a. Assignments:
   1. Describe different types of liquid flow.
   2. Explain total head of liquid.
   3. State the limitations of Bernoulli's theorem.
   4. Explain working of pitot tube.
   5. Solve numerical problem based on continuity equation.
   6. Solve numerical problem based on Bernoulli's theorem.

b. Mini Project:
   1. Draw a neat labeled sketch showing different types of energy in pipe flow.

CO- 3 Measure discharge by different methods.

(Approx. Hrs: CI+LI = 13+14)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO3.1 Compute discharge through Venturimeter, Orifice meter, Pitot tube, current meter SO3.2 Compute different hydraulic coefficient for different types of orifice SO3.3 Describe different types of notches and weirs used in open channel flow. SO3.4 Calculate discharge through notches and weirs in open channel flow.	LE3.1Determination of Hydraulic coefficients Cc , Cv and Cd of orifice and verify the relation between them. LE3.2Determine discharge through venturimeter. LE3.3Determine discharge through orifice meter. LE3.4To determine coefficient of discharge of a rectangular notch/triangular notch. LE3.5Study of pitot tube and current meter LE3.6To determine coefficient of discharge of a weir.	**Flow measurement** **3.1 Ventrimeter-** Components of venturimeter, discharge through venturimeter. **3.2 Orifice meter-** Discharge through orifice meter **3.3 Flow through orifice** 3.3.1 Definition and types of orifice 3.3.2 Vena Contracta, Various Hydraulic Coefficients Cc, Cv and Cd and relationship between them. 3.3.3 Time required for emptying tank through orifice at the bottom of tank.(No Derivation) **3.4 Flow through Notches** 3.4.1 Definition and Description 3.4.2 Computation of discharge through notches – Rectangular Notch, V – Notch and Trapezoidal Notch. **3.5 Flow through Weirs** 3.5.1 Definition and Description 3.5.2 Computation of discharge through weirs - Discharge through narrow crested and broad Crested weir (No Derivation), Discharge through Cipolletti weir**.**	SL3.1Describe current meter for velocity measurement.

SW-3 Suggested Sessional Work (SW) :

a. Assignments:
1. Sketch a venutrimeter and state why a certain angle of divergence is to be maintained.
2. Explain the term "vena contracta".
3. What are the advantages of V-notch over a rectangular notch?
4. Explain the difference between a weir and a notch.
5. Explain the difference between a narrow crested and broad crested weir
6. Solve numerical problem based on measurement of discharge.

b. Mini Project:
1. Draw labeled sketch of venturimeter.
2. Draw various types of notches and weirs.

CO- 4 Analyse pipe flow.

(Approx. Hrs: CI+LI = 12+ 6)

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO 4.1 Explain Energy (Head) losses in pipe flow. SO 4.2 Draw Hydraulic Gradient Line (HGL) and Total Energy Line (TEL) in pipe flow. SO4.3 Compute loss of head due to Sudden enlargement, Sudden contraction, Bend in pipe flow.	LE4.1 Determine friction losses through pipes LE4.2 Determine loss of head in pipe flow due to a) Sudden enlargement b) Sudden contraction c) Bend in pipe.	**Flow through Pipes** 4.1 Characteristics of flow through pipes 4.2 Major Energy (Head) losses in pipe Flow- Expression for head loss in pipes due to friction and Computation of major head by Darcy Weisbach Equation. 4.3 Minor Energy (Head) losses in pipe Flow loss of head at Sudden enlargement, contraction, entry, exit and at bend. 4.4 Hydraulic Gradient Line (HGL) and Total Energy Line (TEL) in various cases. 4.5 Flow of water from one tank to another by long pipe. 4.6 Flow through pipes in series and parallel	SL4.1 Explain transmission of power through pipe.

SW-4 Suggested Sessional Work (SW) :

a. Assignments:
1. Explain with the help of neat sketches-
(a) Hydraulic Gradient Line.
(b) Total Energy Line.
2. Explain Friction coefficient used in Darcy Weisbach Equation.
3. What is compound pipe (pipes in series)? Under what circumstances is it used.
4. Explain the reason for connecting two tanks with the pipes in parallel.

5. Solve numerical problem based on minor and major losses in pipes.
6. Solve numerical problem based on flow through pipes in series and parallel.

b. Mini Project:
1. Draw neat labeled sketches of Hydraulic Gradient Line (HGL) and Total Energy Line (TEL) in various cases of pipe flow.
.

CO- 5 Analyse flow through open channel and use pumps in different situations.

(Approx. Hrs: CI+LI = 13 +4)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO5.1 Describe Open channel flow. SO5.2 Calculate discharge through open channel flow. SO5.3 Explain Specific Energy Diagram. SO5.4 Explain Hydraulic Jump. SO5.5 Describe different types of pumps.	LE5.1 Study the working of a. Reciprocating pump b. Centrifugal pump	**5.1 Flow through Open Channel** 5.1.1 Open channel flow 5.1.1 Comparison of pipe flow and open channel flow. 5.1.2 Wetted perimeter, Hydraulic mean depth, Hydraulic gradient, Froude number, uniform and non uniform flow 5.1.3 Use of Chezy's and Manning's formulae (No Derivation). 5.1.4 Most economical sections of channel Rectangular, Trapezoidal. 5.1.5 Specific Energy Diagram, Critical Depth, Critical Velocity, Streaming Flow, Critical Flow ,Shooting Flow, Hydraulic Jump **5.2 Pumps** (No numerical and derivations) 5.2.1Definition, description of Centrifugal pump , Reciprocating pump and Submersible Pump. 5.2.2 Components and working principles of centrifugal pump and Reciprocating pump 5.2.3 Priming, Selection criteria for pumps.	SL 5.1 Describe Air lift pump, Jet Pump, Rotary pump.

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others) , LI : Laboratory Instruction (Includes Practical performances in Laboratory, Workshop, field or other locations using different instructional strategies) SL: Self Learning

SW-5 Suggested Sessional Work (SW) :

a. Assignments:
1. Explain most economical section and give the condition for most economical section in case of rectangular and trapezoidal section.
2. Explain specific energy diagrams and their usefulness open channel flow.
3. Explain hydraulic jump.
4. Solve numerical problem based on Chezy's and Manning's formulae.
5. Solve numerical problem based on most economical sections of channel.

b. Mini Project:
1. Draw labeled sketches of centrifugal and reciprocating pump.

Note: Performance under Laboratory and Sessional work may appear in more than one COs/SOs.

I) Suggested Specification Table (For ESA of Classroom Instruction CI+SW+SL):

Unit Number	Unit Title	Marks Distribution			Total Marks
		R	U	A	
I	Intoduction,Pressure and its measurement, Hydrostatics	4	6	4	14
II	Hydrokinematics, Hydrodynamics	4	6	4	14
III	Flow measurement	4	6	4	14
IV	Flow through pipes	4	6	4	14
V	Flow through open channels, pumps	4	6	4	14
Total		20	30	20	70

Legend: R: Remember, U: Understand, A: Apply and above

J) Suggested Specification Table (For ESA of Laboratory Instruction*):

Laboratory Instruction Number	Short Laboratory Experiment Title	Assessment of Laboratory Work (Marks)		
		Performance		Viva-Voce
		PRA	PDA	
LE 1.1	Measure the pressure of water in pipe using Piezometer.	25	20	05

LE 1.2	Measure the pressure of water in pipe using simple manometer.			
LE 1.3	Measure the pressure of water in pipe using differential manometer.			
LE 2.1	Verification of Bernoulli's theorem.			
LE 3.1	Determination of Hydraulic coefficients Cc , Cv and Cd of orifice and verify the relation between them.			
LE 3.2	Determine discharge through venturimeter.			
LE 3.3	Determine discharge through orifice meter.			
LE 3.4	To determine coefficient of discharge of a rectangular notch/triangular notch.			
LE 4.1	Determine friction losses through pipes.			
LE 4.2	To determine loss of head in pipe flow due to a) Sudden enlargement b) Sudden contraction c) Bend			
LE 5.1	Determine discharge through open channel using Notch.			
LE 5.2	Determine discharge through open channel using weir.			
LE 5.3	Study the working of a. Reciprocating pump b. Centrifugal pump			

* Assessment rubric, process and product check list with rating scale need to be prepared by the course wise teachers for each experiment for conduction and assessment of laboratory experiments /practicals

Legend : PRA: Process Assessment, PDA : Product Assessment

Note : Only one experiment has to performed at the end semester examination of 30 Marks as per assessment scheme

K) Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Industrial visits
4. Industrial Training
5. Demonstration
6. Others

L) Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Hydraulics, Fluid Mechanics and Hydraulic Machines	R K Bansal	Laxmi Publication	9th Edition , 2017
2	Fluid Mechanics	A K Jain	Khanna Publishers	2008
3	Hydraulic and Hydraulic Machine(Hindi)	B. L. Gupta, Amit Gupta	Standard Publishers	6th Edition , 2012
4	Hydraulics, Fluid Mechanics and Hydraulic Machines	R S Khurmi	S Chand	20th Edition,2014

(b) Open source software and website address :

1. www.nptel.ac.in
2. www.civildigital.com
3. www.engineeringtoolbox.com
4. https://swayam.gov.in

M) List of Major Laboratory Equipment and Tools:

S. No.	Name of Equipment	Broad Specifications	Relevant Experiment Number
1	Piezometer, simple manometer, differential manometer	Acrylic Differential manometer 250-0-250mm. • Single well Manometer 0-25mm (Limb) 0-30mm (Cup) • Inclined U Tube manometer- 0-30mm (Limb) and 0-30mm(Inclined Limb) • Pressure gauge- 0-4 Kg/cm2 • Vacuum Gauge- 0-760 mmHG • Flow control valve to change Pressure. • Sump tank- 900 X 350 X 350 mm • motor for recalculating type unit. - 0.5H.P. Self Priming • Stop clock.	LE 1.1, LE 1.2, LE 1.3
2	Bernoulli's apparatus	Flow channel: - transparent acrylic. a) Width of Channel = 0.05 m b) Length of Chanel = 0.7 m • Flow control valve to change graph. • Transparent acrylic tubes and scales fixed over the flow channel to measure head- 11Nos. or 9Nos. • Measuring tank- 295 X 345 X 345 mm • Sump tank- 900 X 350 X 350 mm • motor for recalculating type unit.- 1H.P. Self Priming • Stop clock.	LE 2.1
3	Orifice	Sliding pointer with scale to measure X and Y axis. • Orifice-meter - 16 & 12 mm (Mild Steel with Chrome Plating) • Chrome platted over flow pipe to change the variable heads. • Flow control valve to change Discharge. • Transparent pizometer tubes with scale to measure head and measuring tank discharge. • Measuring tank- 295 X 345 X 345 mm • Sump tank- 900 X 350 X 350 mm • motor for recalculating type unit.- 0.5H.P. Self Priming • Stop clock..	LE 3.1
4	Venturimeter	Venturi-meter - 13 mm (Mild Steel with Painting) • Block Type Acrylic Differential Manometer (250-0-250 mm)	LE 3.2

		• Flow control valve to change Discharge. • Transparent pizometer tubes with scale to measure measuring tank discharge. • Measuring tank- 295 X 345 X 345 mm • Sump tank- 900 X 350 X 350 mm • motor for recalculating type unit.- 0.5H.P. Self Priming • Stop clock.	
5	Orifice meter	Orifice-meter - 13 mm (Mild Steel with Painting) • Block Type Acrylic Differential Manometer (250-0-250 mm) • Flow control valve to change Discharge. • Transparent pizometer tubes with scale to measure measuring tank discharge. • Measuring tank- 295 X 345 X 345 mm • Sump tank- 900 X 350 X 350 mm • motor for recalculating type unit.- 0.5H.P. Self Priming • Stop clock.	LE 3.3
6	Current meter	6 cup wheel, range 0.05 – 3.5 meter/sec (staring upto maximum operational velocity) with suspension rod with counter and electrical cable.	LE 3.5
7	Pitot tube	one-piece, impact-resistant machined acrylic body, Pipe Diameter: 1 to 8 inch Media Temperature Range: 190 F	LE 3.5
8	Notches	Open Flow channel- 1000 X 250 mm • Rectangular Notch- 80 mm (Aluminium or Brass) • Triangular Notch - 450,600,900 (Aluminium or Brass) • Flow control valve to change Discharge. • Transparent pizometer tubes with scale to measure head and measuring tank discharge. • Measuring tank- 295 X 345 X 345 mm • Sump tank- 900 X 350 X 350 mm • motor for recalculating type unit.- 0.5H.P. Self Priming • Stop clock.	LE 3.4
9	Friction losses through pipes	Block Type Acrylic Differential Manometer (250-0-250 mm) •Pipes of different diameters • Flow control valve to change Discharge. • Transparent pizometer tubes with scale to measure. • Measuring tank- 295 X 345 X 345 mm • Sump tank- 900 X 350 X 350 mm	LE 4.1

		• motor for recalculating type unit.- 0.5H.P. Self Priming • Stop clock.	
9	Head loss apparatus for minor losses	Block Type Acrylic Differential Manometer (250-0-250 mm) • Number of fittings : 4 Nos • Flow control valve to change Discharge. • Transparent pizometer tubes with scale. • Measuring tank- 295 X 345 X 345 mm • Sump tank- 900 X 350 X 350 mm • motor for recalculating type unit.- 0.5H.P. Self Priming • Stop clock.	LE 4.2
10	Weir	It should be a self contained unit. At least two weirs (rectangular, triangular) should be provided. Provision for measurement of head. Provision for measurement of flow rate	LE 3.6
11	Reciprocating pump	consists of reciprocating pump mounted over the sump tank, the unit is self contained, recirculating type, provided with vaccum gauge at suction & pressure gauge at discharge. Input to motor & output of pump can be measured and pump performance can be estimated at different speeds by means of and at different heads.	LE 5.1
12	Centrifugal pump	consist of a centrifugal pump provided with variable speed motor. The pump is provided with a vaccum gauge at suction and a pressure gauge on discharge pipe. The pump is provided with a variable speed drive & gate valve at discharge which facilitates estimation of pump performance at various speeds & discharge heads. Power input to motor is measure with energymeter.	LE 5.1

N) Mapping of POs & PSOs with COs:

Course Outcomes (COs) Titles	Programme Outcomes (POs)										Programme Specific Outcomes (PSOs)	
	Basic knowledge PO-1	**Discipline knowledge PO-2**	**Experiments & Practice PO-3**	**Engineering Tools PO-4**	**The Engineer & Society PO-5**	**Environment & Sustainability PO-6**	**Ethics PO-7**	**Individual & Team work PO-8**	**Communication PO-9**	**Life Long learning PO-10**	PSO-1	PSO-2
CO -1 Measure pressure of fluid using equipments such as manometer, mechanical gauges.	3	3	2	2	2	1	0	2	0	1	1	1
CO -2 Apply Bernoullis theorem in different situations.	2	2	3	2	2	0	0	1	0	2	1	1
CO -3 Measure discharge by different methods.	2	2	3	2	2	0	0	1	0	2	1	2
CO -4 Analyse in pipe flow.	2	2	3	2	2	0	0	1	0	2	1	2
CO - 5 Analyse flow through open channel and use pumps in different situations	2	2	3	2	2	0	0	1	0	2	1	2

O) Course Curriculum Map:

POs & PSOs No.	COs No. & Title	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO-1,2,3,4,56,8, 10 PSO -1,2	CO - 1 Measure pressure of fluid using equipments such as manometer, mechanical gauges.	SO1.1 SO1.2 SO1.3 SO1.4	LE1.1 LE1.2 LE1.3	1.1.1-1.1.3 1.2.1-1.2.3 1.3.1-1.3.2	SL1.1
PO-1,2,3,4,5,8,10 PSO-1,2	CO -2 Apply Bernoullis theorem in different situations.	SO.2.1 SO.2.2 SO2.3 SO2.4	LE. 2.1	2.1.1-2.1.3 2.2.1-2.2.4	SL2.1
PO-1,2,3,4,5,8,10 PSO-1,2	CO -3 Measure discharge by different methods.	SO.3.1 SO3.2 SO3.3 SO3.4	LE3.1 LE 3.2 LE3.3 LE3.4 LE3.5 LE3.6	3.1 3.2 3.3.1-3.3.3 3.4.1-3.4.2 3.5.1-3.5.2	SL 3.1
PO-1,2,3,4,5,8,10 PSO-1,2	CO -4 Analyse pipe flow**.**	SO4.1 SO4.2 SO4.3	LE4.1 LE4.2	4.1 4.4 4.2 4.5 4.3 4.6	SL 4.1
PO-1,2,3,4,5,8,10 PSO-1,2	CO - 5 Analyse flow through open channel and use pumps in different situations.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	LE5.1	5.1.1-5.1.5 5.2.1-5.2.3	SL 5.1

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others) , LI : Laboratory Instruction (Includes Practical performances in Laboratory, Workshop, field or other locations using different instructional strategies) SL: Self Learning

Name of program: Diploma in Engineering **Semester: III**
Branch : Civil Engineering **Code: NIL**
Subject : Health, Hygiene & Yoga **Total Tutorial Periods: NIL**
No. Of Periods : 2 Periods/Week

Course Objectives:

1 To provide understanding the importance of health.
2 To provide insight into the hygiene aspect & quality of life.
3 To study the concepts of various medical therapy.
4 To practice the various yogasans.
5 To provide knowledge about common diseases and its cure through yagasans and pranayam.
6 To develop concentration through various methods.

UNIT- I **HEALTH & HYGIENE:** Concept of health, Physical health and mental health and wellbeing and how to achieve these, longevity and how to achieve it, concept and common rules of hygiene, cleanliness and its relation with hygiene; Overeating and underrating, amount of food intake required, intermittent fasting; adequate physical labour, sleep; consumption of junk fast food vs nutritious food; fruits, vegetables cereals and qualities of each of these.

UNIT-II **INTRODUCTORY KNOWLEDGE OF COMMON STREAMS OF MEDICINAL CURE:** History, development, basic concepts, modes of operation of Alopathy, Ayurved, Homoeopathy, Biochemic, Unani, Siddha, Accurpressure, Accupunture, Naturopathy, Yogic and Herbal system of medicines, Introduction of Anatomy and Physiology concerned.

UNIT- III **YOGASANS:** Meaning and concept of Yoga, Yogasans and its mode of operation, How to perform Yogasans, Common Yogasans with their benefits, such as, Padahastasan, Sarvangasan, Dhanurasan, Chakrasan, Bhujangasan, Paschimottasan, Gomukhasan, Mayurasan, Matsyasan, Matsyendrasan, Pawanmuktasan, Vajrasan, Shalabhasan, Sinhasan, Shashankasan, Surya Namaskar, Halasan, Janushirasan, Utshep Mudra.

UNIT-IV **YOGASANS FOR COMMON DISEASES:** From Yogic Materia Medica with symptoms, causes, asans and herbal treatment.

- **Modern silent killers:** High blood pressure, diabetes and cancer, causes and cure; Common health problems due to stomache disorders, such as, indigestion, acidity, dycentry, piles and fissures, artheritis, its causes, prevention and cure.
- **Asans for relaxation:** Shavasan, Makarasan, Matsyakridasan, Shashankasan.
- **Asans to increase memory and blood supply to brain:** Shirsh padasan, Shashankasan.
- **Asans for eye sight:** Tratak, Neti Kriya .
- **Pranayam:** Definition and types: Nadi Shodhan, Bhastrik, Shitakari, Bhramari useful for students.

UNIT-V **CONCENTRATION:** Concentration Of Mind And How To Achieve It. Tratak (त्राटक), Concentration On Breath, Japa (जप), Ajapajap (अजपाजप), Internal silence(अन्तमौनक्र Visualization In Mental Sky (चिदाकाश धारणाक्र Concentration On Point Of Light(ज्योति ध्यानक्र Concentration On Feeling (भाव ध्यानक्रConcentration On Figure (मूर्ड्ड ध्यानक्र

Text Books:

Health, Hygiene & Yoga, Dr P B Deshmukh, Gyan Book Pvt Ltd. New Delhi.

Reference Books:

(1) Yogic Materia Medica
(2) Asan, Pranayam and Bandh