

- A) **Course Code** : 2020671(020)
 B) **Course Title** : Quantity Surveying and Costing-II
 C) **Pre- requisite Course Code and Title** :
 D) **Rationale** :

One of the job specifications of a diploma holder is to prepare estimate of civil engineering structures as for cost and quantity of various construction materials required. This is an essential and basic requirement for all projects. This is the first step towards efficient management of the project including proper estimation and utilization of human resources required for the project. This subject is in continuation of quantity surveying and costing-I. In this, the timber structure, R.C.C. structures and steel structures bridge and culverts, water supply and sanitary engineering are included. The students will be able to calculate the quantity of works of the structure of the above mentioned chapters. A provision has also been made to use various software for accuracy and speedy determination of quantity. A chapter on valuation and rent fixation is also included so that the students will be familiar with the method for valuation work and fixing rent

E) Course Outcomes :

CO-1 Prepare estimate of R.C.C. structures i.e. slab, beam, column and column footing, staircase.

CO-2 Prepare estimate of steel structures i.e. beam, column and column footing, and roof trusses.

CO-3 Prepare estimates of culvert and bridges.

CO-4 Prepare estimates of water supply and sanitary engineering works.

CO-5 a. Do the valuation and rent fixation of different type of buildings.

b. Prepare estimates for repairing works for dismantling, demolishing and repair works in buildings.

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	2020671 (020)	Quantity Surveying and Costing-II	3	-	2	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 Title	Scheme of Examinations					
			Theory			Practical		Total Marks
			ESE	CT	TA	ESE	TA	
Civil Engineering	2020671 (020)	Quantity Surveying and Costing-II	70	20	30	40	60	220

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 Prepare estimate of R.C.C. structures i.e. slab, beam, column and column footing, staircase.

(Approx. Hrs: CI+LI = 9+10)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1 Identify items of work in RCC structure and prepare schedule of bars. SO1.2 Prepare estimate of RCC slab and beam. SO1.3 Prepare estimate of RCC stair case. SO1.4 Prepare estimate of RCC column and footing.	LI 1.1 Estimate the quantities and prepare abstract of cost for RCC slab from given working drawing. LI 1.2 Estimate the quantities and prepare abstract of cost for RCC beam from given working drawing. LI 1.3 Estimate the quantities and prepare abstract of cost for RCC staircase from given working drawing. LI 1.4 Estimate the quantities and prepare abstract of cost for RCC column and footing from given working drawing.	Unit-1 Estimate of R.C.C. structures 1.1 Items of work in RCC structures, bar bending schedule. 1.2 Estimate of slab 1.3 Estimate of beam 1.4 Estimate of T-beam 1.5 Estimate of RCC column with footing. 1.6 Preparation of abstract of cost above estimates.	SL1.1 Study description of PCC and RCC work from CG PWD SOR for buildings.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Explain the method of estimation of RCC work.
2. Explain bar bending schedule and calculation of quantity of steel reinforcement.
3. Numerical problems on estimate of RCC structure.

b. Mini Project

1. Prepare the estimate of RCC framed building (one BHK) from given working drawing using suitable software for estimation.

CO-2 Prepare estimate of steel structures i.e. beam, column and column footing, and roof trusses.

(Approx. Hrs: CI+LI = 9+6)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 Identify items of work in steel structure and prepare schedule of bars. SO2.2 Prepare estimate of steel beam and column. SO2.3 Prepare estimate of steel truss. SO2.4 Prepare estimate of GIC roof and AC roof.	LI 2.1 Estimate the quantities and prepare abstract of cost for steel beam and column with base from given working drawing. LI 2.2 Estimate the quantities and prepare abstract of cost for steel truss from given working drawing. LI 2.3 Estimate the quantities and prepare abstract of cost for GIC roof and AC roof from given working drawing.	Unit-2 Estimate of Steel Structures 2.1 Items of work in steel structure. 2.1 Estimate of steel beam and column (Stanchion) with base. 2.2 Estimate of steel truss. 2.3 Estimate of roof covering materials 2.4 Estimate of GIC roof and AC roof. 2.5 Estimate of steel frames for doors and windows. 2.6 Preparation of abstract of cost above estimates	SL2.1 Study description of steel work from CG PWD SOR for building.

SW-2 Suggested Sessional Work (SW) :

a. Assignments:

1. Explain the method of estimation of steel work.
2. Numerical problems on estimate of steel structure.

b. Mini Project

1. Prepare the estimate of GIC roof of workshop with steel truss from given working drawing using suitable software for estimation.

CO-3 Prepare estimates of culvert and bridges.

(Approx. Hrs: CI+LI = 10+6)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 3.1 Identify items of work in culverts and bridges. SO3.2 Prepare estimate of hume pipe culvert. SO3.3 Prepare estimate of slab culvert. SO3.4 Prepare estimate of single span R.C.C.T beam bridge.	LI 3.1 Estimate the quantities and prepare abstract of cost of hume pipe culvert from given working drawing. LI3.2 Estimate the quantities and prepare abstract of cost of slab culvert from given working drawing. LI3.3 Estimate the quantities and prepare abstract of cost of single span R.C.C.T beam bridge from given working drawing.	Unit-3 Estimate of Culverts and Bridges 3.1 Items of work in culverts and bridges, method of estimating culverts and bridges. 3.2 Estimate of hume pipe culvert with splayed type of wing wall, turn wall, face wall 3.3 Estimate of R.C.C. slab culvert, straight / return type wing walls. 3.4 Estimate of single span R.C.C.T beam bridge, splayed wing walls. 3.5 Preparation of abstract of cost above estimates.	SL3.1 Study CG PWD SOR for bridges.

SW-3 Suggested Sessional Work (SW) :

a. Assignments:

1. State the items of work in culverts.
2. Numerical problems on estimate of bridge and culverts.

b. Mini Project

1. Visit a bridge construction site and study the estimate of the project.

CO-4 Prepare estimates of water supply and sanitary engineering works for building.

(Approx. Hrs: CI+LI = 10+10)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 4.1 Identify items of water supply work for a building. SO4.2 Identify items of sanitary work for a building. SO4.3 Prepare estimate of water supply works in buildings. SO 4.4 Prepare estimate of sanitary in buildings. SO4.5 Prepare estimate of septic tank. SO4.6 Prepare estimate of drainage pipe.	LI 4.1 Estimate the quantities and prepare abstract of cost for water supply works in buildings from given working drawing. LI 4.2 Estimate the quantities and prepare abstract of cost for sanitary works in buildings from given working drawing. LI 4.3 Estimate the quantities and prepare abstract of cost for septic tank with soak pit from given working drawing. LI 4.4 Estimate the quantities and prepare abstract of cost for manhole from given working drawing. LI 4.5 Estimate the quantities and prepare abstract of cost for HDPE drainage pipe from given working drawing.	UNIT-4 Estimates of Water Supply and Sanitary Engineering Works for Buildings 4.1 Items of work in Water Supply and Sanitary Engineering Works for Buildings. 4.2 Detailed estimate of water supply for building work. 4.3 Detailed estimate of sanitary works for building work. 4.4 Estimate of S.W., R.C.C. and H.D.P.E pipe line. 4.5 Estimate of septic tank 4.6 Estimate of manhole. 4.7 Preparation of abstract of cost above estimates.	SL4.1 Study CG PWD SOR for Water Supply and Sanitary Engineering Works for Buildings

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. State the items of work in Water Supply and Sanitary Engineering Works for Buildings..
2. Numerical problems on estimate of Water Supply and Sanitary Engineering Works for Buildings..

b. Mini Project

1. Prepare the detailed estimate of sanitary and water supply works of building from given plan.

- CO-5 a. Do the valuation and rent fixation of different type of buildings.**
b. Prepare estimates for repairing works for dismantling, demolishing and repair works in buildings.

(Approx. Hrs: CI+LI = 10+8)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 5.1 Explain different terms related to valuation and rent fixation. SO 5.2 Describe method of valuation. SO 5.3 Explain rent fixation of a building. SO 5.4 Identify item of works in dismantling, demolishing and repair works in buildings. SO 5.5 Prepare estimate of dismantling, demolishing and repair works in buildings.		UNIT-5(a) Valuation and Rent Fixation 5.1.1 Definition, purpose of valuation 5.1.2 Gross income/Net income, Out goings. 5.1.3 Scrap value, Salvage value, Market value, Book value, Rateable value, Obsolescence, Annuity, Capital Cost, Capitalized value, Year's purchase, and Sinking fund. 5.1.4 Depreciation, Methods of calculating depreciation. 5.1.5 Methods of valuation 5.1.6 Free hold property and Leasehold Property. 5.1.7 Rent fixation of building. (b) Dismantling, Demolishing and Repair Works 5.2.1 Dismantling and Demolishing work and their estimate. 5.2.2 Repair works and their estimate.	SL5.1 Study rent fixation of Govt Buildings. SL5.2 Study CG PWD SOR for dismantling, demolishing and repair works in buildings.

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. Define Gross income, Net income, Out goings.
2. Explain obsolescence.
3. Differentiate annuity and sinking fund.
4. What is depreciation? State the methods of calculating depreciation.
5. Describe rent fixation of building.
6. Solve numerical problems on valuation and rent fixation.
7. Solve numerical problems on dismantling, demolishing and repair works in buildings.

b. Project:

1. Visit a old building and prepare estimate for dismantling, demolition and repair for addition, alternation and maintenance.

- c. Mini Project:** Visit nearby godowns/plants/factories and observe the types of trusses used and prepare a report regarding selection of type of truss.

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

Unit Number	Unit Title	Marks Distribution			Total Marks
		R	U	A	
I	Estimate of R.C.C. structures	4	6	4	14
II	Estimate of Steel Structures	4	6	4	14
III	Estimate of Culverts and Bridges	4	6	4	14
IV	Estimates of Water Supply and Sanitary Engineering Works for Buildings	4	6	4	14
V	(a) Valuation and Rent Fixation (b) Dismantling, Demolishing and Repair Works	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	Estimate the quantities and prepare abstract of cost for RCC slab from given working drawing.	30	24	06
LE 1.2	Estimate the quantities and prepare abstract of cost for RCC beam from given working drawing.			
LE 1.3	Estimate the quantities and prepare abstract of cost for RCC staircase from given working drawing.			
LE 1.4	Estimate the quantities and prepare abstract of cost for RCC column and footing from given working drawing.			
LE 2.1	Estimate the quantities and prepare abstract of cost for steel beam and column with base from given working drawing.			
LE 2.2	Estimate the quantities and prepare abstract of cost for steel truss from given working drawing.			
LE 2.3	Estimate the quantities and prepare abstract of cost for GIC roof and AC roof from given working drawing.			
LE 3.1	Estimate the quantities and prepare abstract of cost of hume pipe culvert from given working drawing.			
LE 3.2	Estimate the quantities and prepare abstract of cost of slab culvert from given working drawing.			
LE 3.3	Estimate the quantities and prepare abstract of cost of single span R.C.C.T beam bridge from given working drawing.			
LE 4.1	Estimate the quantities and prepare abstract of cost for water supply works in buildings from given working drawing.			
LE 4.2	Estimate the quantities and prepare abstract of cost			

	for sanitary works in buildings from given working drawing.			
LE 4.3	Estimate the quantities and prepare abstract of cost for septic tank with soak pit from given working drawing.			
LE 4.4	Estimate the quantities and prepare abstract of cost for manhole from given working drawing.			
LE 4.5	Estimate the quantities and prepare abstract of cost for HDPE drainage pipe from given working drawing.			

* 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 40 Marks as per assessment scheme.

K) Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Industrial visits
5. Industrial Training
6. Field Trips
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration, CBT, Blog, Face book, Mobile)
9. Brainstorming
10. Others

L) Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Estimating and Costing	B.N.Dutta	B.N. Dutta, S.D. Dutta & Co., Tagore Path, Motilal Bose Road, Lucknow	Latest Revised
2	Estimating, Costing, specification & Valuation in civil engineering	M. CHAKRABORTI	M. CHAKRABORTI 21 B Bhabananda road Kolkata-7000 26	Latest Revised Edition
3	Estimating, Costing & Valuation	Rangwala	Charotar Publications, Station Road	Latest Revised Edition
4	Estimating, & Costing	Anand Birdi, J.C. Kapoor	Dhanpet Rai & Sons, Delhi & Julandhar	Latest Revised Edition

5	Estimating & Costing Vol. I & II	J.C. Malhotra,	Khanna Publishers, 28, Nath Market, Nai Sarak, New Delhi	Latest Edition	Revised
6	Current Schedule of rates from	PWD/PHE/Irrigation /CPWD	Govt. publications	Latest	

(b) Open source software and website address:

1. nptel.ac.in
2. swayam portal

M) List of Major Laboratory Equipment and Tools:

S. N.	Name of Equipment	Broad Specifications	Relevant Experiment Number
1	Computer system	With basic configuration	Project work
2	Available software of estimating and costing		Project work

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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
CO1-Prepare estimate of R.C.C. structures i.e. slab, beam, column and column footing, staircase.	3	3	2	1	3	1	1	2	1	3	3	3
CO-2 Prepare estimate of steel structures i.e. beam, column and column footing, and roof trusses.	3	3	2	1	3	1	1	2	1	3	3	3
CO-3 Prepare estimates of culvert and bridges.	3	3	2	1	3	1	1	2	1	3	3	3
CO-4 Prepare estimates of water supply and sanitary engineering works.	3	3	2	1	3	1	1	2	1	3	3	3
CO-5 a.Do the valuation and rent fixation of different type of buildings. b. Prepare estimates for repairing works for dismantling, demolishing and repair works in buildings.	3	3	2	1	3	1	1	2	1	3	3	3

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O) Course Curriculum Map:

POs & PSOs No.	COs No. & Title	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO-1,2,3,4,5,6,7,8,10 PSO-1,2	CO1-Prepare estimate of R.C.C. structures i.e. slab, beam, column and column footing, staircase.	SO 1.1 SO 1.2 SO 1.3 SO 1.4	LI 1.1 LI 1.2 LI 1.3 LI 1.4	1.1 1.4 1.2 1.5 1.3 1.6	SL1.1
PO-1,2,3,4,5,6,7,8,9,10 PSO-1,2	CO-2 Prepare estimate of steel structures i.e. beam, column and column footing, and roof trusses.	SO 2.1 SO 2.2 SO 2.3 SO 2.4	LI 2.1 LI 2.2 LI 2.3	2.1 2.4 2.2 2.5 2.3 2.6	SL2.1
PO-1,2,3,4,5,6,7,8,10 PSO-1,2	CO-3 Prepare estimates of culvert and bridges.	SO 3.1 SO 3.2 SO 3.3 SO 3.4	LI 3.1 LI 3.2 LI 3.3	3.1 3.4 3.2 3.5 3.3	SL3.1
PO-1,2,3,4,5,6,7,8,10 PSO-1,2	CO-4 Prepare estimates of water supply and sanitary engineering works.	SO 4.1 SO 4.5 SO 4.2 SO 4.6 SO 4.3 SO 4.4	LI 3.1 LI 3.2 LI 3.3 LI 4.4 LI 4.5	4.1 4.5 4.2 4.6 4.3 4.7 4.4	SL4.1
PO-1,2,3,4,5,6,7,8,10 PSO-1,2	CO-5 a.Do the valuation and rent fixation of different type of buildings. b. Prepare estimates for repairing works for dismantling, demolishing and repair works in buildings.	SO 5.1 SO 5.4 SO 5.2 SO 5.5 SO 5.3	-	5.1.1-5.1.7 5.2.1-5.2.2	SL5.1 SL 5.2

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** : 2020672(020)
- B) **Course Title** : Structural Design and Drafting-II
ESE Hrs. : 3.00
- C) **Pre- requisite Course Code and Title** :
- D) **Rationale** :

The Civil Engg Diploma pass outs must have the concept of steel structure and should be able to design simple steel structures. The course has been designed for this objective and it also includes the fabrication of steel structures. For the design of steel structures ,the properties of steel, different steel sections, various grades and strength characteristics of steel and design of connections are required as per IS 800-2007.IS 875-1987 is to be used for loading conditions. The latest good practice of design is based on Limit State Method. Hence, knowledge of this latest method is most important for civil engineers. LSM of design has been followed.

E) Course Outcomes :

CO-1 Recognize the concept of Limit State Method as per IS 800 – 2007, Working Stress Method and Plastic Analysis in design of steel structures.

CO-2 Design Bolted and welded Connections as per code IS: 800: 2007.

CO-3 Design Tension Members and Compression Members as per code IS: 800: 2007.

CO-4 Design Column base and Beams as per code IS: 800: 2007.

CO-5 Analyze and design Roof Trusses as per code IS: 800: 2007.

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	2020672 (020)	Structural Design and Drafting-II	3	-	2	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 Title	Scheme of Examinations					
			Theory			Practical		Total Marks
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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.
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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 Recognize the concept of Limit State Method as per IS 800 – 2007, Working Stress Method and plastic analysis in design of steel structures.

(Approx. Hrs: CI+LI = 9)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1 Identify different structural steel sections SO1.2 Explain concept of Limit State Method of design SO1.3 Describe general requirements of Working Stress Method SO1.4 Explain the concept of plastic analysis		Unit-1 Introduction to IS: 800–2007, Working Stress Method and Plastic Analysis 1.1 Introduction to IS: 800 – 2007 1.1.1 Structural steel and properties of structural steel 1.1.2 Standard structural steel sections 1.1.3 Permissible stresses in structural steel 1.2 Limit state design 1.2.1 Limit state of strength 1.2.2 Limit state of serviceability. 1.2.3 Action (loads) 1.2.4 Design strength 1.2.5 Partial safety factor for materials 1.2.6 Loads, Load combination and partial safety factors for loads. 1.2.7 Maximum effective slenderness ratio 1.3 Introduction to Working Stress Method 1.3.1 General design requirements	SL1.1 Study composition of structural steel.

Session Outcomes	Laboratory Instruction	Class room Instruction (CI)	Self Learning (SL)
		of Working Stress Method 1.3.2 Permissible stresses as per section 11 of IS800-2007 1.4 Introduction to plastic Analysis 1.4.1 Assumptions in plastic analysis. 1.4.2 Plastic moment, shape factor for different common sections, load factor, concept of plastic hinge 1.4.3 Principle of virtual work and calculation of collapse moment for simple beams (simple numerical problems.)	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

- 1-Sketch Standard structural steel sections
- 2-Explain limit state of strength and serviceability
- 3- Explain Partial safety factor for materials and Maximum effective slenderness ratio
- 4- Write assumptions in plastic analysis.
- 5- Solve simple numerical problems on calculation of collapse moment for simple beams

CO-2 Design Bolted Connections and Welded Connections as per code IS: 800: 2007.

(Approx. Hrs: CI+LI = 9+4)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 Identify different types of bolts, bolted joints SO2.2 Explain failures of Bolted joints SO2.3 Compute strength and efficiency of bolted joints SO2.4 Identify different types of welded joints SO2.5 Compute strength of welded joints	LI 2.1 Draw bolted end connections. LI 2.1 Draw welded end connections.	Unit-2 Design of bolted and Welded Connections 2.1 Bolted Connections 2.1.1 Types of bolts 2.1.2 Definition of general terms related to bolting, Permissible stresses in bolts 2.1.3 Types of bolted joints 2.1.4 Specifications as per IS 800-2007 2.1.5 Failure of bolted joints, strength and efficiency of bolted joint 2.1.6 Design of Bolted Connections (only axially loaded members) 2.2 Welded Connections 2.2.1 Definition of terms related to welded joints 2.2.2	SL2.1 Difference between riveted and bolted connections SL2.2 Advantages and disadvantages of welded joints over riveted/ bolted joints

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Semester -VI

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
		Types of welded joints 2.2.3 Types of welds 2.2.4 Strength of welded joint 2.2.5 Design of welded joints	

SW-2 Suggested Sessional Work (SW) :

a. Assignments:

1. Define and explain with the help of neat sketches general terms related to bolting.
2. Explain with the help of neat sketches types of failure of bolted joints.
3. Solve numerical problems on strength and efficiency of bolted joints.
4. Define terms related to welded joints.
5. Solve numerical problems on strength of welded joints.

CO- 3 Design tension members and compression members as per code IS: 800: 2007.

(Approx. Hrs: CI+LI = 10+8)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 3.1 Identify the sections used for tension member SO 3.2 Calculate the net sectional area, effective net area and slenderness ratio SO 3.3 Design and Draft axially loaded tension members SO3.4 Identify the sections used for Compression member SO 3.5 Design and draft simple column, built-up column, lacing and battening	LI 3.1 Draw lacing and battening system used to connect members of compound column LI 3.2 Sketching of lacing and battening system used to connect members of compound column	Unit-3 Design of Tension and Compression members 3.1 Tension Members 3.1.1 Types of tension members 3.1.2 Sections used as tension members 3.1.3 Net sectional area, effective net area 3.1.4 Slenderness Ratio 3.1.5 Types of failures 3.1.6 Design of axially loaded tension members 3.2 Compression Members 3.2.1 Standard sections used as compression member 3.2.2 Effective length and slenderness ratio 3.2.3 Design compressive stress and strength 3.2.4 Find design strength of strut 3.2.5 Design of strut 3.2.6 Design of simple columns and built up columns 3.2.7 Design of lacings 3.2.8 Design of battens	SL3.1 Comparison of net area calculated using LSM and WSM

SW-3 Suggested Sessional Work (SW) :

a. Assignments:

1. Sketch various sections used as tension members.
2. Explain types of failures of tension members.
3. Define net sectional area, effective net area, slenderness ratio.
4. Solve numerical problems on design of axially loaded tension members.
5. Solve numerical problems on design of simple columns and built up columns.
6. Solve numerical problems on design of lacing and battens.(at least two problems)

CO- 4 (a)Design Column base as per code IS: 800: 2007.

(b) Design Beams as per code IS: 800: 2007.

(Approx. Hrs: CI+LI = 10+12)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO4.1 Design M.S. Slab base with concrete pedestal SO4.2 Sketch gusseted base SO4.3 Design laterally supported beams SO4.4 Design built up beams (plated beams)	LI 4.1 Draw M.S. Slab base with concrete pedestal LI 4.2 Draw gusseted base LI 4.3 Draw laterally supported beams	UNIT-4 4.1 Design of column base 4.1.1 Types of column bases Slab base and gusseted base 4.1.2 Design of M.S. Slab base with concrete pedestal 4.1.3 Cleat angles, their use only 4.1.4 Sketch of gusseted base 4.2 Design of beams 4.2.1 Types of beams 4.2.2 Common sections used as beams 4.2.3 laterally supported and laterally unsupported beams 4.2.3 Web buckling and web crippling 4.2.4 Design of laterally supported beams for flexure, shear and deflection 4.2.5 Design of built up beams (plated beams)	SL4.1 Different types of built up sections other than plated beams

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Define cleat angles and write their uses.
2. Solve numerical problems on design of M.S. Slab base with concrete pedestal
3. Differentiate between laterally supported and laterally unsupported beams
4. Explain web buckling and web crippling
5. Solve numerical problems on design of laterally supported beams and built-up beams

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CO-5 Analyze and design roof trusses as per code IS: 800: 2007.

(Approx. Hrs: CI+LI = 10+8)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO5.1 Compute Forces in the members of truss SO5.2 Design members of truss SO5.3 Design purlin. SO5.4 Draw different roof joints and purlin connection	LI 5.1 Find forces in the members of truss by graphical method. LI5.2 Working drawing of steel roof truss with details of joint.	UNIT-5 Roof trusses 5.1 Types of Trusses 5.2 Definitions of terms related to truss 5.3 Combination of loads for design of truss 5.4 Selection of truss 5.5 Forces in the member 5.6 Design of members of truss 5.7 Design of purlin 5.8 Detailing of different roof joints and purlin connection	SL5.1 Difference between truss and frame.

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. Define terms related to truss.
2. Solve numerical problems on forces in truss members.
3. Solve numerical problems on design of members of truss.
4. Solve numerical problems on design of purlins.

- b. **Mini Project:** Visit nearby godowns/plants/factories and observe the types of trusses used and prepare a report regarding selection of type of truss.

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 to IS: 800 – 2007, Working Stress Method and Plastic Analysis	4	6	4	14
II	Design of Bolted and Welded Connections	4	6	4	14
III	Design of Tension and Compression members	4	6	4	14
IV	(a) Design of column base. (b) Design of beams	4	6	4	14
V	Roof trusses	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 2.1	Draw sketches of different types of bolts	30	24	06
LE 2.2	Draw sketches of different types of lap and butt bolted joints			
LE 3.1	Design and draw various axially loaded tension members			
LE 3.2	Design and draw various axially loaded compression members			
LE 4.1	Design and draw M.S. Slab base with concrete pedestal			
LE 4.2	Sketching of gusseted base			
LE 4.3	Design and draw laterally supported beams			
LE 5.1	Draw different types of trusses			
LE 5.2	Working drawing of steel roof truss with details of joint			

* 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 40 Marks as per assessment scheme.

K) Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Industrial visits
5. Industrial Training
6. Field Trips
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration, CBT, Blog, Face book, Mobile)
9. Brainstorming
10. Others

L) Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Limit State Design of Steel Structure	S K Duggal	McGraw Hill	Latest
2	Design of Steel Structures Limit State Method	N. Subramanian	Oxford University Press	Latest

3	Indian Standard – General Construction in Steel –Code of Practice (3rd Revision) (IS:800 – 2007)			
4	Design of steel structural.	S.S.Bhavikatti.	IK International Publishing House	Latest
5	Limit State Design in Structural Steel	M R Shiyekar	PHI	Latest
6	Limit State Design of Steel Structures (IS:800-2007)	V. L. Shah, V. Gore	Structures Publications	Latest

(b) Open source software and website address:

1. nptel.ac.in
2. swayam portal
- 3 www.steel-insdag.org (Institute for Steel Development and Growth)

M) List of Major Laboratory Equipment and Tools: NA

S. No.	Name of Equipment	Broad Specifications	Relevant Experiment Number
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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 Recognize the concept of Limit State Method as per IS 800 – 2007, Working Stress Method and Plastic Analysis in design of steel structures.	3	3	2	2	2	2	1	2	1	2	3	3
CO-2 Design Bolted and welded Connections as per code IS: 800: 2007.	3	3	2	2	2	2	1	2	1	2	3	3
CO-3 Design Tension Members and Compression Members as per code IS: 800: 2007.	3	3	2	2	2	2	1	2	1	2	3	3
CO- 4 (a) Design Column base as per code IS: 800: 2007. (b) Design Beams as per code IS: 800: 2007.	3	3	2	2	2	2	1	2	1	2	3	3
CO-5 Analyze and design Roof Ttrusses as per code IS: 800: 2007	3	3	2	2	2	2	1	2	1	2	3	3

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O) Course Curriculum Map:

POs & PSOs No.	COs No. & Title	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO-1,2,3,4,5,6,7,8,10 PSO-1,2	CO-1 Recognize the concept of Limit State Method as per IS 800 – 2007, Working Stress Method and Plastic Analysis in design of steel structures.	SO1.1 SO1.2 SO1.3 SO 1.4		1.1.1-1.1.11 1.2.1-1.2.2 1.3.1-1.3.3	SL1.1
PO-1,2,3,4,5,6,7,8,9,10 PSO-1,2	CO-2 Design Bolted and welded Connections as per code IS: 800: 2007.	SO.2.1 SO.2.2 SO2.3 SO 2.4 SO 2.5	LE. 2.1 LE. 2.2	2.1.1-2.1.6 2.2.1-2.2.5	SL 2.1 SL 2.2
PO-1,2,3,4,5,6,7,8,10 PSO-1,2	CO- 3 Design Tension Members and Compression Members as per code IS: 800: 2007.	SO.3.1 SO3.2 SO3.3 SO3.4 SO3.5	LE 3.1 LE 3.2	3.1.1-3.1.6 3.2.1-3.2.8	SL 3.1
PO-1,2,3,4,5,6,7,8,10 PSO-1,2	CO- 4 (a) Design Column base as per code IS: 800: 2007. (b) Design Beams as per code IS: 800: 2007.	SO4.1 SO4.2 SO4.3 SO4.4	LE4.1 LE4.2 LE4.3	4.1.1-4.1.4 4.2.1-4.2.5	SL 4.1
PO-1,2,3,4,5,6,7,8,10 PSO-1,2	CO-5 Analyze and design Roof Trusses as per code IS: 800: 2007.	SO5.1 SO5.2 SO5.3	LE5.1 LE5.2	5.1-5.8	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

- A) **Course Code** : 2020674(020)
 B) **Course Title** : Construction Management
 C) **Pre- requisite Course Code and Title** :
 D) **Rationale** :

A Civil Engineering Diploma pass out is supposed to know different facets of construction management. The subject on Construction Management develops abilities related to solving day to day problems arising during constructions maintenance work such as handling live problems in the department, issuing of tender documents, handling of cash book, muster role, settlement of imprest account, time scheduling with the help of CPM and PERT, understanding labour laws and successfully dealing with labour and sub ordinate staff. In brief the subject has been introduced to develop managerial skills in the students, so that he can successfully handle live situations at work.

E) **Course Outcomes :**

CO-1 Recognize of execution of Civil Engineering works by Govt. Departments.

CO-2 Describe execution of work by contract.

CO-3 Explain and interpret tender process.

CO-4 Explain construction planning and scheduling.

CO-5 (a) Explain material management methods.

(b) Recognize safety in construction and labour welfare.

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	2020674 (020)	Construction Management	2	-	-	2

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 Title	Scheme of Examinations					
			Theory			Practical		Total Marks
			ESE	CT	TA	ESE	TA	
Civil Engineering	2020674 (020)	Construction Management	70	20	30	-	-	120

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 Recognise of execution of Civil Engineering works by Govt Departments.

(Approx. Hrs: CI+LI= 6)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1 Describe the organization of Govt Departments for execution of Civil Engg Works. SO 1.2 Explain the procedure for initiating Civil Engg Work. SO1.3 Identify methods of execution of work by Govt Departments SO1.4 Recognize different accounting papers in Govt Departments		UNIT-1 Execution of work by Govt. Departments 1.1 Organization -Major departments executing civil works, Structure of departments 1.2 Procedure of initiating the work- Detailed Project Report (DPR), administrative approval, technical sanction, budget provision, land acquisition 1.3 Methods used in for carrying out works - contract method and departmental method 1.4 Different types of accounting papers - Measurement Books, Nominal Muster Roll, Imprest Cash, indent, Invoice, Bills, Vouchers, Cash Book, Temporary advance.	SL1.1 Study DPR of a small Civil Engg Work.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. State the organization of state PWD.
2. Explain detailed project report.
3. Explain administrative sanction and Technical sanction.
4. Describe departmental method of construction.
5. Explain land acquisition.
6. Write notes on –

(i) Measurement Book.
(ii) Nominal Muster Roll

 (iii) Cash Book

b. Other Activities (Specify):

1. Visit any Govt agency of Civil Engg Works and prepare a brief report on their working.

CO-2 Describe executive of work by contract.

(Approx. Hrs: CI+LI = 6)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 2.1 State requirements of valid contract. SO 2.2 Explain different types of separated contract. SO 2.3 Distinguish Design-build, Turnkey, BOT and BOOT contract. SO 2.4 Explain mode of payment to contractor.		Unit 2 Contract 2.1 Definition of contract objects of contract, requirements of valid contract, Class of contractor, Registration of contractor. 2.2 Classification of civil engineering contract- 2.2.1 Separated Contract-Lump sum contract, Measurement contract -item rate contract, percentage rate contract, cost plus percentage contract. 2.2.2 Management Contract- construction management contract ,Design, Management and construction Contract 2.2.3 Integrated Contract – Design-Build, Turnkey, BOT and BOOT contract. 2.3 Mode of payment to the contractor - Interim payment and its necessity, Advance payment, secured advance, on account payment, first and final payment, retention money, reduced rate payment, petty advance, mobilization advance.	SL2.1 Study PPP projects.

SW-2 Suggested Sessional Work (SW) :

a. Assignments

1. Explain contract system.
2. Classify Civil Engineering contract.
3. Write notes on –

(i) Lump sum contract
 (iii) Percentage rate contract

(ii) Item rate contract
 (iv) Cost plus percentage contract.
4. Describe Design, Management and Construction contract.
5. Differentiate Turnkey, BOT and BOOT contract.
6. Explain the payment procedure to contractor.

b. Other activity

1. Visit a Civil Engg construction site and study system of contract in that project.

CO- 3 Explain and interpret tender process.

(Approx. Hrs: CI+LI = 7)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 3.1 Classify tenders and draft tender notice. SO 3.2 Define different terms related to tender. SO 3.3 State tender documents. SO 3.4 Explain bidding process.		Unit-3 Tender Process 3.1 Definition of Tender, necessity of Tender, Types of tenders, Tender Notice, points to be included while drafting Tender Notice. 3.2 Meaning of terms: Earnest money, security deposit, validity period, corrigendum to tender notice and its necessary. 3.3 Tender documents – Contract drawings, specifications, General Conditions of contract, Special conditions of contract, bill of quantities. 3.4 Bidding Process-Pre-qualification process, Notice inviting tender, Submission of bids, Analysis of submitted tenders, basis for evaluation and acceptance, Letter of Intent, Work Order, agreement, PWD contract conditions	SL3.1 Study e-tendering system of CG Govt.

SW-3 Suggested Sessional Work (SW) :

a. Assignments:

1. State different types of tender.
2. Write a sample tender Notice.
3. Earnest money, security deposit, validity period.
4. Describe documents to be furnished with tender documents.
5. Explain bidding process.
6. State in brief CG PWD contract conditions.

b. Other Activities (Specify):

1. Visit a Govt Departments of Civil Engg Works and study tender documents of an ongoing project.

CO- 4 Explain construction planning and scheduling.

(Approx. Hrs: CI+LI= 7)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 4.1 Describe bar chart. SO 4.2 Define different terms in CPM network. SO 4.3 Distinguish		Unit-4 Planning and Scheduling 4.1 Identifying broad activities in construction work & allotting time to it, Methods of Scheduling, 4.2 Development of bar charts, Merits & limitations of bar chart. 4.3 CPM networks, activity time estimate,	SL4.1 Study the scope of PERT.

normal time-cost and crash time- cost. SO 4.4 State the concept of PERT. SO 4.5 Explain project monitoring and control.		Event Times by forward & backward pass calculation, start and finish time of activity, project duration. Floats: Types of Floats- Free, independent and total floats, critical activities and critical path, Purpose of crashing a network, Normal Time and Cost, Crash Time and Cost, Cost slope, Optimization of cost and duration. 4.4 PERT-Introduction to PERT 4.5 Project Monitoring and Control System- Updating bar chart and CPM/PERT, Monthly progress report, stage wise completion cost.	
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SW-4 Suggested Sessional Work (SW) :

a. Assignments:

1. Explain development of bar chart and state it's merits and demerits.
2. Define different terms in CPM network.
3. Explain critical path.
4. Explain float.
5. Explain normal time-cost and crash time- cost and cost optimization.
6. What is PERT? Explain in brief.
7. Describe project monitoring and control.
8. Simple numerical problem on CPM.

b. Other Activities (Specify):

1. Prepare CPM for a small building project and determine project completion time.

CO- 5 (a) Explain material management methods.

(b) Recognize safety in construction and labour welfare.

(Approx. Hrs: CI+LI = 6)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 5.1 Define different terms in material management. SO 5.2 Explain inventory control by ABC technique. SO 5.3 Describe Causes of Accidents, Remedial and Preventive Measures. SO 5.4 Recognize the steps for labour welfare in construction industry.		Unit-5 (a) Material Management 5.1.1 Material Management- Ordering cost, inventory carrying cost, Economic Order Quantity 5.1.2 Store management, various records related to store management, inventory control by ABC technique, Introduction to material procurement through portals (b) Safety and Labour Welfare 5.2.1 Safety in Construction Industry— Causes of Accidents, Remedial and Preventive Measures. 5.2.2 Labour welfare and Laws ,Acts pertaining to Civil construction activities- Building and other Construction Workers (Regulation of Employment and Conditions of Services) Act 1996 and Central Rules	SL5.1 Study construction quality management.

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		1998 (Introduction only)	
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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 Ordering cost, inventory carrying cost, Economic Order Quantity.
2. State various records related to store management.
3. Explain inventory control by ABC technique.
4. Write a note on material procurement through portals.
5. State causes of accidents in construction industry.
6. State labour laws and welfare measures to be adhered in construction industry.
7. State the objects of Building and other Construction Workers (Regulation of Employment and Conditions of Services) Act 1996 and Central Rules 1998

b. Any other activity:

1. Visit a Govt Department of Civil Engg Works and study the procedure of material procurement and management.
2. Visit a construction site and study safety and labour welfare arrangements.

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	Execution of work by Govt Departments	4	6	4	14
II	Contract	4	6	4	14
III	Tender Process	4	6	4	14
IV	Planning and Scheduling	4	6	4	14
V	(a)Material Management (b) Safety and Labour Welfare	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

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	Construction Engineering and Management	Sharma S C and Deodhar S V	Khanna Book Publishing, New Delhi	
2	Construction Engineering and Management	Gahlot, P.S. and Dhir B.M	New Age International (P) Ltd. Publishers, New Delhi	
3	Construction Engineering and Management	Shrivastava, U.K.	Galgotia Publication Pvt Ltd. New Delhi	
4	The A To Z of Practical Building Construction and its Management,	Mantri, S.	Satya Prakashan New Delhi	
5	Construction Management and Planning,	Punmia, B.C. and Khandelwal	Tata-McGraw Hill	
6	Construction Management and Accounts	Harpal, Singh	Mc-Graw Hill	
7	Construction Project Management	Kumar Neeraj Jha	Pearson	

(b) Open source software and website address :

M) List of Major Laboratory Equipment and Tools: NA

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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 Recognize of execution of Civil Engineering works by Govt Departments	1	3	1	2	2	2	3	3	3	2	3	3
CO -2 Describe execution of work by contract	1	3	1	2	2	2	3	3	3	2	3	3
CO -3 Explain and interpret tender process	1	3	1	2	2	2	3	3	3	2	3	3
CO -4 Explain construction planning and scheduling	1	3	1	2	2	2	3	3	3	2	3	3
CO -5 (a) Explain material management methods. (b) Recognize safety in construction and labour welfare	1	3	1	2	2	2	3	3	3	2	3	3

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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 -1 Recognize of execution of Civil Engineering works by Govt Departments	SO 1.1 SO 1.2 SO 1.3 SO 1.4	-	1.1 1.2 1.3 1.4	SL 1.1
PO-1,2,3,4,5,6,7,8,9,10 PSO-1,2	CO -2 Describe execution of work by contract	SO 2.1 SO 2.2 SO 2.3 SO 2.4	-	2.1 2.2.1-2.2.3 2.3	SL 2.1
PO-1,2,3,4,5,6,7,8,9,10 PSO-1,2	CO -3 Explain and interpret tender process.	SO 3.1 SO 3.2 SO 3.3 SO 3.4	-	3.1 3.2 3.3 3.4	SL 3.1
PO-1,2,3,4,5,6,7,8,9,10 PSO-1,2	CO -4 Explain construction planning and scheduling	SO 4.1 SO 4.2 SO 4.3 SO 4.4 SO 4.5	-	4.1 4.2 4.3 4.4 4.5	SL 4.1
PO-1,2,3,4,5,6,7,8,9,10 PSO-1,2	CO -5 (a) Explain material management methods. (b) Recognize safety in construction and labour welfare.	SO 5.1 SO 5.2 SO 5.3 SO 5.4		5.1.1-5.1.2 5.2.1-5.2.2	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

- A) Course Code : 2000673(020)
B) Course Title : Entrepreneurship Development and Management
C) Pre- requisite Course Code and Title :
D) Rationale :

Our fast growing economy provides ample opportunities for diploma engineers to succeed in entrepreneurship. Diploma engineers can be their own masters and job provider to others by starting their service industry/assembly/marketing/consultancy/manufacturing enterprises. As entrepreneurship requires distinct set of skills which may not be developed while undergoing technical subjects. Hence a separate course has been introduced for developing such skills set amongst diploma students. This course aims at developing competencies in the diploma engineer for becoming an intrapreneur or a successful entrepreneur. After successfully completing this course students who develop qualities of successful entrepreneur can set up their own manufacturing industry/service industry/business/startup or be self employed and those who prefer job can become intrapreneur and share profits with their company.

E) Course Outcomes

CO-1 Demonstrate traits of a successful intrapreneur/entrepreneur

CO-2 Analyze the level of achievement motivation by preparing one's own portfolio.

CO-3 Innovate products and services using creativity techniques.

CO-4 Manage critical resources from support institutions.

CO-5 Prepare sustainable small business plans.

F) Scheme of Studies:

S.No.	Board of Study	Course Code	Course Title	Scheme of Studies (Hours/Week)			
				L	P	T	Total Credits(C) L+T+(P/2)
1	Mechanical Engineering	2000673(020)	Entrepreneurship Development and Management	2	-	1	3

Legend: L:Classroom Instruction (Includes different instructional strategies i.e.Lecture and other), P: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies) T- Tutorial includes Sessional Work(SW) (includes assignment, seminar, mini project etc.) and Self Learning (SL), C: Credits

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

G) Scheme of Assessment:

S. No	Board of Study	Course Code	Course Title	Scheme of Examinations					
				Theory			Practical		Total Marks
				ESE	CT	TA	ESE	TA	
1	Mech. Engg.	2000673(020)	Entrepreneurship Development and Management	70	20	30	-	-	120

Note: i. Separate passing is must for TA component of Progressive Assessment, both for theory and practical.

ii. Separate passing is must for End Semester Exam (Theory) and End Semester Exam (Practical).

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 (L), Laboratory Instruction (P), T- Tutorial includes 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.

CO-1 Demonstrate traits of a successful intrapreneur /entrepreneur.

(Approx. Hrs: L+T=9)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO1.1 Select intrapreneurship or entrepreneurship as a career based on the qualities possessed by an individual. SO1.2 Identify various avenues of entrepreneurship for diploma engineers. SO1.3 Demonstrate qualities of successful intrapreneur /entrepreneur. SO1.4 Explain various steps in establishment of enterprise. SO1.5 Select an area of business opportunity as per your interest.		Unit 1.0 Characteristics of entrepreneurs 1.1 Concept of entrepreneur and intrapreneur 1.2 Benefits of becoming an intrapreneur/ entrepreneur. 1.3 Scope of entrepreneurship in local and global market. 1.4 Planning for establishment of an enterprise. 1.5 Traits of successful intrapreneur/ entrepreneur and passion, initiative, independent decision making, team work, assertiveness, persuasion, persistence, information seeking, commitment to work contract etc. SW analysis. Team work simulation. 1.6 Trait of successful entrepreneur: calculated risk taking. Risk taking simulation exercise. 1.7 Business opportunity Guidance	<ul style="list-style-type: none">History of entrepreneurship.Definition of entrepreneurshipSocial entrepreneurship

SW-1 Suggested Sessional Work (SW):

a. Assignments:

- Identify existing needs of the institute/college and convert them into business opportunity.
- Enumerate characteristics of assigned first generation successful entrepreneurs, intrapreneurs, managers by preparing a presentation.
- Analyze the reasons for success and failure of the assigned entrepreneurs by preparing ppt on the basis of news, articles, reviews, video etc.

b. Mini project:

- Interviewing few local entrepreneurs and prepare a collage on "Traits of successful entrepreneurs".
- Identify traits to be developed in you for becoming a successful entrepreneur based on your strength and weakness analysis and submit an action plan to develop the same.

iii. Organize “best from waste” competition.

c. Other Activities:

- Identify your hobbies and interests and convert them into business idea.
- Organize seminar on history of entrepreneurship, Definition and selected case studies of social entrepreneurship.

CO-2 Analyze the level of achievement motivation by preparing one’s own portfolio.

(Approx. Hrs: L+T= 10)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO2.1 Explain the concept of achievement motivation. SO2.2 Assess level of need for Achievement in the individual through different tools. SO2.3 Prepare an action plan for enhancing need for achievement.		Unit 2.0 Motivation Management 2.1 Motives, motivation and motivational cycle. 2.2 Concept of Need for Achievement. 2.3 Need for Achievement assessment through various tools. <ul style="list-style-type: none">• Ring toss game• Boat making exercise• Building block exercise• TAT stories• Who am I? 2.4 Interpretation and action plan for self development.	<ul style="list-style-type: none">• Kakinada experiment• Techno-preneurship.

SW-2 Suggested Sessional Work (SW):

a. Assignments:

- Prepare a portfolio based on achievement motivation exercise and tasks.

b. Mini project:

- Prepare a report on need for achievement exercises.
- Develop achievement motivation field exercises.

c. Other Activities:

- Prepare a plan for development of achievement motivation and execute it.
- Develop case studies on Techno-preneurship.
- Prepare a report on Kakinada experiment.

CO-3 Innovate products using creativity techniques.

(Approx. Hrs: L+T= 10)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO3.1 Elucidate the use of creativity techniques for entrepreneurs. SO3.2 Improve a chosen product using brainstorming technique. SO3.3 Differentiate		Unit 3.0 Management of Creativity & Innovation 3.1 Creativity: Divergent thinking, creativity techniques. 3.2 Innovation, types and applications 3.3 Product life cycle, New product development	<ul style="list-style-type: none">• Check list of questions.• Six thinking hats.• Case study of innovative first generation entrepreneur.• Schemes and

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
<p>between creativity and innovation.</p> <p>SO3.4 Apply concept of product life cycle for conceiving a project.</p> <p>SO3.5 Design a product using new product development process.</p>		<p>process. Product development and innovation through creativity and innovation.</p>	<p>incentives for innovation.</p> <ul style="list-style-type: none"> • Innovative solutions for social problems.

SW-3 Suggested Sessional Work (SW):

a. Assignments:

- Use the assigned creativity technique for improvement of product characteristic.
- Use the assigned creativity technique for improvement of service process characteristic.

b. Mini project:

- Apply innovative practices in different process of an enterprise.

c. Other Activities:

- Prepare a prototype of a creative solution to industrial/ social problem.
- Organise seminar on Schemes and incentives for innovation, Innovative solutions for social problems and Kakinada experiment.

CO-4 Manage critical resources from support institutions.

(Approx. Hrs: L+T= 10)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
<p>SO4.1 Select appropriate form of business organization for enterprise</p> <p>SO4.2 Identify entrepreneurship support institutions for technical/ marketing and finance.</p> <p>SO4.3 Explain salient features of entrepreneurship promotion schemes of centre and state.</p> <p>SO4.4 Prepare a marketing mix plan for identified industry.</p> <p>SO4.5 Develop a materials management</p>		<p>Unit 4.0 Critical Resources</p> <p>4.1 Forms of business organization: Proprietorship, Partnership, Cooperative, Private, Public Ltd Company, Section 8 company, LLP</p> <p>4.2 Institutional Support for entrepreneurship: MSMESI, CED, DTIC, CITCON, CSIDC, LUN, NSIC, KVIC, NABARD, Banks, SIDBI</p> <p>4.3 Entrepreneurship promotion schemes of centre and state.</p> <p>4.4 Marketing Mix, Market survey for project identification</p> <p>4.5 Inventory control, vendor development, material movement, store management.</p> <p>4.6 Manpower plan, hiring process, compensation, performance appraisal.</p>	<ul style="list-style-type: none"> • Establishment procedure of Proprietorship, LLP, Cooperative, Section 8 company, LLP Factory Act, Labour Laws, GST.

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
plan. SO4.6 Develop a human resource plan.			

SW-4 Suggested Sessional Work (SW):

a. Assignments:

- Examine suitability of different forms of business organization for the given project and prepare a presentation for the same.
- Conduct a market survey and prepare a report along with marketing mix plan for the given project.
- Prepare materials management strategy for a business or manufacturing unit and submit a report.
- Prepare a man power plan chart and job specifications for identified positions.

b. Mini project:

- Explore facilities extended by support institutions to entrepreneurs for marketing of the given situation.
- Investigate facilities extended by support institutions to entrepreneurs for technical support of the given situation.
- Identify facilities extended by support institutions to entrepreneurs for financial support of the given situation

c. Other Activities:

- Visit the assigned agencies engaged in institutional support for entrepreneurship and make a report.
- For your selected project decide a unique name of the enterprise, logo, signboard, letterhead and pamphlet.
- Organize a seminar on establishment procedure of proprietorship, LLP, cooperative, section 8 company, factory act, labour laws and GST.

CO-5 Prepare sustainable small business plans.

(Approx. Hrs: L+T= 9)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO5.1 Prepare business plan/techno economic feasibility report. SO5.2 Calculate and comment on breakeven point for given project. SO5.3 Explain financing of startups.		Unit 5.0 Sustainable business plan 5.1 Format of business plan/techno-economic feasibility report. 5.2 Demand and annual production target based on market survey. 5.3 Outline production/service process. 5.4 Land, building and machinery requirement. 5.5 Power, utilities and raw material requirement. 5.6 Fixed capital, Working capital, Subsidy and Cost of Project. 5.7 Means of finance, calculation of interest. 5.8 Profitability analysis, Break-even point.	<ul style="list-style-type: none"> Techno-economic feasibility report of MSME. Startup process. Angel Investors. Venture capitalist. Incubators.

SW-5 Suggested Sessional Work (SW):

a. Assignments:

- Describe the procedure of registration and availing of facilities from the assigned support institution.
- Prepare a process plan for the selected project.

b. Mini project:

- Prepare a marketing plan for the assigned project.
- Prepare a financial plan for the assigned project.
- Prepare a technical feasibility plan for the assigned project.
- Prepare a techno-economical feasibility report of the assigned project.

c. Other Activities:

- Analyse a case study on startups focusing on financing from angel investor and venture capitalist.
- Organize seminar on Startup process, Angel investors, Venture Capitalist and Incubators

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

I) Suggested Specification Table (For ESE of Classroom Instruction):

Unit Number	Unit Title	Marks Distribution			Total Marks
		R	U	A	
I	Characteristics of entrepreneurs	4	6	4	14
II	Motivation Management	4	6	4	14
III	Management of Creativity and Innovation	4	6	4	14
IV	Critical Resource	4	6	4	14
V	Sustainable Business Plan	4	6	4	14
Total		20	30	20	70

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

J) Suggested Specification Table (For ESE of Laboratory Instruction*): Not Applicable

K) Suggested Instructional/Implementation Strategies:

- Improved Lecture
- Tutorial
- Case Method
- Group Discussion
- Field Trips
- Portfolio Based Learning
- Demonstration
- ICT Based Teaching Learning (Video Demonstration, CBT, Blog, Face book, Mobile)
- Brainstorming

L) Suggested Learning Resources:

(a) Books :

S. No.	Titles	Author	Publisher	Edition & Year
1.	Entrepreneurial Development	Desai Vasant	Himalaya Publishing House	Mumbai/2017 ISBN 978 93 5097 383 7
2	Starting your own business, step by step Blue print for the First – time Entrepreneur	Harper Stephen C.	Mc Crow-Hill	2003 ISBN13: 9780071410120
3.	The Business Planning GUIDE	H.Bangs David	Upstart Publishing Company in Chicago	978-0793154098
4	Entrepreneurship Development in India	Gupta Dr.C.B. Shrinivasa NP	Sultan Chand & Sons	9788180548185
5	Entrepreneurship Development	Khanka Dr.S.S.	S.Chand New Delhi	ISBN 81 219 1801 4
6	Entrepreneurship Development and small Business Enterprises	Charantimath M.	Pearson Edu.Soc. INDIA	2013/ISBN 13 978 8131 762264
7.	Entrepreneurship Development	Sharma Sangita	PHI, DELHI	ISBN 978 81 203 5270 4

(b) Open source software and website address:

1. Free e books: <https://www.free-ebooks.net/book-list/entrepreneurship>
2. Startups: https://inc42.com/startups/?utm_source=top-menu&utm_medium=website&utm_campaign=menu
3. Indian Tech Startup funding report: https://pages.inc42.com/annual-indian-tech-startup-funding-report-2017/?utm_source=top-menu&utm_medium=website&utm_campaign=menu
4. Project profile: <https://my.msme.gov.in/MyMsmeMob/MsmeProjectProfile/Home.htm>
5. Project profile: <http://www.dcmsme.gov.in/publications/pmryprof/pjseries.html>
6. Project profile <http://www.dcmsme.gov.in/reports/ProjectProfile.htm>

M) List of Major Laboratory Equipment and Tools: Not Applicable

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N) Mapping of POs & PSOs with COs:

Course Outcomes (COs)	Programme Outcomes (POs)										Programme Specific Outcomes (PSOs)	
	PO-1 Basic knowledge	PO-2 Discipline knowledge	PO-3 Experiments and practice	PO-4 Engineering Tools	PO-5 The engineer and society	PO-6 Environment and sustainability	PO-7 Ethics	PO-8 Individual and team work	PO-9 Communication	PO-10 Life-long learning	PSO-1	PSO-2
CO-1 Demonstrate traits of a successful intrapreneur/entrepreneur.	-	3	-	-	2	2	2	2	2	2	-	-
CO-2 Analyse the level of achievement motivation by preparing one's own portfolio.	-	3	-	-	2	2	2	2	2	2	-	-
CO-3 Innovate products using creativity techniques.	-	3	-	-	2	2	2	2	2	2	-	-
CO-4 Manage critical resources from support institutions.	-	3	-	-	2	2	2	2	2	2	-	-
CO-5 Prepare sustainable small business plans.	-	3	-	-	2	2	2	2	2	2	-	-

Legend: 1 – Low, 2 – Medium, 3 – High

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O) Course Curriculum Map:

POs & PSOs No.	COs No. & Title	SOs No.	Laboratory Instruction (P)	Classroom Instruction (L)	Self Learning (SL)
PO-2,5,6,7,8, 9,10	CO-1 Demonstrate traits of a successful intrapreneur/entrepreneur.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit 1.0 Characteristics of entrepreneurs 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7	As mentioned in relevant page numbers
PO-2,5,6,7,8, 9,10	CO-2 Analyse the level of achievement motivation by preparing one's own portfolio.	SO2.1 SO2.2 SO2.3		Unit 2.0 Motivation Management 2.1, 2.2, 2.3, 2.4	
PO-2,5,6,7,8, 9,10	CO-3 Innovate products using creativity techniques.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5		Unit 3.0 Management of Creativity and Innovation 3.1, 3.2, 3.3	
PO-2,5,6,7,8, 9,10	CO-4 Manage critical resources from support institutions.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5 SO4.6		Unit 4.0 Critical Resources 4.1, 4.2, 4.3, 4.4,4.5,4.6	
PO-2,5,6,7,8, 9,10	CO-5 Prepare sustainable small business plans.	SO5.1 SO5.2 SO5.3		Unit 5.0 Sustainable Business Plan 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8	

- A) **Course Code** : 2020681(020)
 B) **Course Title** : Repair and Maintenance of Structure
 C) **Pre- requisite Course Code and Title** :
 D) **Rationale** :

Retro fitting of structures is one of the most important subjects in civil engineering. This subject covers repair, maintenance, re-strengthening and rehabilitation of existing structures. It is one of the major areas in Civil Engineering construction. In this scenario standards of retrofitting and maintenance are continuously being improved with latest technology. Diploma engineers must be able to analyze structure and suggest suitable method for retrofitting and maintenance. Curriculum intends to give adequate knowledge about repair, maintenance as well as retrofitting of existing structures. It is to cater the needs of present scenario of fully utilizing and extending the serviceability of structures. This subject aims at basic knowledge of rehabilitation of RCC structures in respect of their various types, materials used, functions of component parts, methods of repair, aspects of supervision and maintenance.

E) **Course Outcomes :**

- CO-1 Describe basics of maintenance and retrofitting of civil engineering structures.
 CO-2 Explain causes of damages and tests on damaged structure.
 CO-3 Select appropriate materials for repair of different types of defects.
 CO-4 Explain repair process for masonry structure.
 CO-5 Explain repair process for RCC structures.

F) **Scheme of Studies:**

S.No.	Board of Study	Course Code	Course Title	Scheme of Studies (Hours/Week)			
				L	P	T	Total Credits(C) L+T+(P/2)
1	Civil Engineering	2020681(020)	Repair and Maintenance of Structure	3	-	0	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:**

S. No	Board of Study	Course Code	Course Title	Scheme of Examinations				
				Theory			Practical	
				ESE	CT	TA	ESE	TA
1	Civil Engineering	2020681 (020)	Repair and Maintenance of Structure	70	20	30	-	-
							Total Marks	
							120	

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) 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 Describe basics of maintenance and retrofitting of civil engineering structures.

(Approx. Hrs: CI+LI = 9)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1 Explain repair, retrofitting, rehabilitation and restoration. SO1.2 Recognize Management required for Maintenance of structure SO1.3 Describe periodical maintenance. SO 1.4 Explain retrofitting of concrete and steel structures.		Unit-1 Basics of Maintenance and Retrofitting 1.1 Types of Maintenances- Repair, retrofitting, Re-strengthening, Rehabilitation and Restoration. 1.2Necessity, objectives and importance of maintenance 1.3 Approach of effective management for maintenance 1.4 Periodical Maintenance- check list, Maintenances Manual containing building plan, reinforcement details, Material Sources, Maintenance frequency, Corrective Maintenance Procedure and sources Pre and post monsoon maintenance. 1.4 Retrofitting of concrete structures- retrofitting techniques, shear walls, infill walls, adding steel bracing, adding wing walls or braces, base isolation. 1.5 Retrofitting of steel structures-using steel and fiber reinforced polymers (FRP)	SL1.1 Study PWD maintenance procedure.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. What are the objectives of maintenance?
2. Explain repair, retrofitting, re-strengthening, rehabilitation and restoration.
3. What is the approach of effective management for maintenance?
4. Explain Briefly Periodical maintenances of structures
5. What are pre and Post Monsoon Maintenances of Structures?
6. State retrofitting methods of steel and concrete structure.

b. Other Activities (Specify):

1. Visit a nearby building and suggest maintenance required..

CO-2 Explain causes of damages and tests on damaged structure.

(Approx. Hrs: CI+LI = 9)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO 2.1 Describe causes of damages of structure. SO 2.2 Explain load test and Non Destructive Tests on damaged structures. SO 2.3 Describe chemical tests on damaged structures.		UNIT 2 Causes of Damages and Tests on Damaged Structure 2.1 Causes of damages due to distress, earthquake, wind, flood, dampness, corrosion, fire, deterioration, termites, pollution and foundation settlement. 2.2 Various aspects of visual observations for detection of damages. 2.3 Load test and non-destructive tests. Non Destructive Tests (NDT) on damaged structure-rebound hammer, ultrasonic pulse velocity, rebar locator, crack detection microscope, digital crack measuring gauge. 2.4 Chemical test - Chloride test, sulphate attack, carbonation test, pH measurement, resistivity method, Half-cell potential meter.	SL 2.1 Interpretation of Results of NDT Tests.

SW-2 Suggested Sessional Work (SW) :

a. Assignments:

1. State the causes of damage in a structure.
2. Explain various aspects of visual observation for Detection of damages
3. Describe rebound hammer test.
4. Explain ultrasonic pulse velocity test.
5. Describe rebar locator and crack detection microscope
6. Explain chemical test involved in assessment of health of structures.

b. Other Activities (Specify):

1. Prepare a presentation on Tests on Damaged Structure.

CO- 3 Select appropriate materials for repair of different types of defects.

(Approx. Hrs: CI+LI = 10)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO 3.1 Identify the parameters for maintenance and repair materials. SO 3.2 Describe various Water proofing		Unit-3 Materials for Repairs 3.1 Types of repair material, material selection. 3.2 Essential parameters for maintenance and repair materials such - bond with substrate, durability.	SL 3.1 Study use of emulsions and paints in maintenance.

Session Outcomes (SOs)	Laboratory	Class room Instruction (CI)	Self-Learning
materials SO 3.3 Identify repair material for masonry structure SO 3.4 Explain repair material for RCC structure.		3.3 Waterproofing materials based on polymer modified cement slurry, UV resistant acrylic Polymer, Ferro-cement. 3.4 Repairing materials for masonry: plastic/aluminum nipples, non-shrink cement, polyester putty or 1:3 cement sand mortar, galvanized steel wire fabrics and clamping rods, wire nails, ferro-cement plates. 3.5 Repairing materials for RCC: epoxy resins, epoxy mortar, cement mortar impregnated with polypropylene, silicon, polymer concrete composites, sealants, fiber reinforcement concrete,	

SW-3 Suggested Sessional Work (SW) :

a. Assignments:

1. Classify various types of repair material.
2. State essential parameters for maintenance and repair material.
3. Briefly Describe Waterproofing materials.
4. Describe repairing materials for masonry.
5. Explain repairing materials RCC.

b. Other Activities (Specify):

1. Study repairing materials for masonry and concrete available in the market and prepare a report.

CO- 4 Explain repair process for masonry structure.

(Approx. Hrs: CI+LI = 10)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 4.1 Recognize causes of cracks in walls. SO 4.2 Identify crack locations in walls. SO 4.3 Explain repair methods for crack in Walls. SO 4.4 Describe remedial measures for dampness and efflorescence in walls.		UNIT-4 Repair of Masonry Structure 4.1 Causes of cracks in walls - bulging of wall, shrinkage, bonding, shear, tensile, vegetation. 4.2 Probable crack location: junction of main and cross wall, junction of slab and wall, cracks in masonry joints 4.3 Repair methods based on crack type - for minor & medium cracks grouting and for major cracks fixing mesh across cracks, RCC band, installing ferro-cement plates at corners, dowel bars, propping of load bearing. 4.5 Retrofitting of masonry structures- reinforced masonry walls and jacketing.	SL 4.1 Study grade of cracks in masonry.

		4.6 Remedial measures for dampness & efflorescence in wall.	
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SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. What are the causes of cracks in walls.
2. State the probable crack locations in masonry walls.
3. What are the repair methods for restoring the masonry structure.
4. Differentiate between minor cracks and major cracks
5. What are the remedial measures for dampness of wall.

b. Other Activities (Specify):

1. Prepare a presentation on repair of masonry structures.

CO-5 Explain repair process on RCC structures.

(Approx. Hrs: CI+LI = 10)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO 5.1 Identify stages of repair in RCC structures. SO 5.2 Describe different repair options in RCC structures. SO 5.3 Explain common methods for dormant crack repairs. SO 5.4 Recognize strengthening methods for live cracks in concrete.		UNIT-5 Repair of RCC Structures 5.1 Repair stages such as concrete removal and surface preparation, fixing suitable formwork, bonding /passive coat and repair application, various methods of surface preparation. 5.2 Repair options such as grouting, patch repairs, carbonated concrete, cleaning the corroded steel, concrete overlays, latex concrete, epoxy bonded mortar and concrete, polymer concrete, corrosion protection such as jacketing. 5.3 Building cracks and its prevention, common methods for dormant crack repairs such as Epoxy injection, grooving and sealing, stitching, grouting and guniting/ shotcreting. 5.4 Strengthening methods for live cracks such as addition of reinforcements, Jacketing, brackets, collars, supplementary members i.e. shoring, underpinning and propping of framed structure	SL5.1 Horizontal And Vertical Extension Of RCC Buildings

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 Various Stages of repair work in RCC structure
2. Explain grouting, patch repairs and carbonated concrete.
3. Explain cleaning the corroded steel and concrete overlays.
4. Describe latex concrete, epoxy bonded mortar and concrete, polymer concrete, corrosion protection such as jacketing.
5. Explain methods of Strengthening of live cracks.

b. Other Activities (Specify):

1. Prepare a presentation on repair of concrete structures.

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

Unit Number	Unit Title	Marks Distribution			Total Marks
		R	U	A	
I	Basics of Maintenance and Retrofitting	4	6	4	14
II	Causes of Damages and Tests on Damaged Structure	4	6	4	14
III	Materials for Repairs	4	6	4	14
IV	Repair of Masonry Structure	4	6	4	14
V	Repair of RCC Structures	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	

* 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 NA Marks as per assessment scheme

K) Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Industrial visits
5. Industrial Training
6. Field Trips
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration, CBT, Blog, Face book, Mobile)
9. Brainstorming
10. Others

L) Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Building Repair and Maintenance Management,	Gahlot, P. S., Sharma, S.,	CBS Publishers & Distributors Pvt. Ltd	Latest
2	Maintenance and Repairs of Buildings,	Guha, P. K.,	New Central Book Agencies	Latest
3	Maintenance and Repairs of Buildings	Hutchin Son, B. D.,	Newnes-Butterworth	Latest
4	Repair and Rehabilitation of Concrete Structures	Modi Poonam I. Patel Chirag N.	PHI	Latest
5	Maintenance and Rehabilitation and Minor Works of Building	Vargese P.C.	PHI	Latest

(b) Open source software and website address:

- 1.nptel.ac.in
- 2.swayam portal

M) List of Major Laboratory Equipment and Tools:NA

S. No.	Name of Equipment	Broad Specifications	Relevant Experiment Number
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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 Describe basics of maintenance and retrofitting of civil engineering structures.	3	3	2	2	2	2	1	2	1	2	3	3
CO-2 Explain causes of damages and tests on damaged structure.	3	3	2	2	2	2	1	2	1	2	3	3
CO-3 Select appropriate materials for repair of different types of defects.	3	3	2	2	2	2	1	2	1	2	3	3
CO-4 Explain repair process for masonry structure.	3	3	2	2	2	2	1	2	1	2	3	3
CO-5 Explain repair process for RCC structures.	3	3	2	2	2	2	1	2	1	2	3	3

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O) Course Curriculum Map:

POs & PSOs No.	COs No.& Title	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO-1,2,3,4,5,6,7,8,10 PSO-1,2	CO-1 Describe basics of maintenance and retrofitting of civil engineering structures.	SO1.1 SO1.2 SO1.3 SO1.4		1.1 1.4 1.2 1.5 1.3	SL1.1
PO-1,2,3,4,5,6,7,8,9,10 PSO-1,2	CO-2 Explain causes of damages and tests on damaged structure.	SO2.1 SO2.2 SO2.3		2.1 2.2 2.3 2.4	SL 2.1
PO-1,2,3,4,5,6,7,8,10 PSO-1,2	CO-3Select appropriate materials for repair of different types of defects.	SO3.1 SO3.2 SO3.3 SO3.4		3.1 3.5 3.2 3.3 3.4	SL 3.1
PO-1,2,3,4,5,6,7,8,10 PSO-1,2	CO-4 Explain repair process for masonry structure.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		4.1 4.4 4.2 4.5 4.3 4.6	SL 4.1
PO-1,2,3,4,5,6,7,8,10 PSO-1,2	CO-5 Explain repair process for RCC structures.	SO5.1 SO5.2 SO 5.3 SO 5.4		5.1 5.2 5.3 5.4	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

- A) **Course Code** : 2020682(020)
- B) **Course Title** : Precast and Prestressed Concrete
- C) **Pre- requisite Course Code and Title** :
- D) **Rationale**

Precast concrete is a construction product produced by casting concrete in a reusable mould or "form" which is then cured in a controlled environment, transported to the construction site and lifted into place. Using a precast concrete system offers many potential advantages over onsite casting. Precast concrete production can be performed on ground level. There is greater control over material quality and workmanship in a precast plant compared to a construction site. The forms used in a precast plant can be reused hundreds to thousands times before they have to be replaced, often making it cheaper than onsite casting when looking at the cost per unit of formwork.

Prestressed concrete is concrete where an internal stress has been introduced to put the element into compression. Tensile bending stresses due to self and applied loading are then offset by the inbuilt compression. Prestressed concrete is used in a wide range of building and civil engineering structures where its improved performance can allow for longer spans, reduced structural thicknesses, and material savings compared with simple reinforced concrete. Typical applications include high-rise building, slabs, foundation systems, bridge and dam structures silos and tanks, and nuclear containment structures.

E) **Course Outcomes :**

- CO-1 Explain precast concrete.
- CO-2 Select components for prefabricated structures.
- CO-3 Explain prestressed concrete.
- CO-4 Select prestressing systems for given construction work.
- CO-5 Analyse and design prestressed rectangular beam section.

F) **Scheme of Studies:**

S.No.	Board of Study	Course Code	Course Title	Scheme of Studies (Hours/Week)			
				L	P	T	Total Credits(C) L+T+(P/2)
1	Civil Engineering	2020682(020)	Precast and Prestressed Concrete	3	-	-	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:**

S. No	Board of Study	Course Code	Course Title	Scheme of Examinations					
				Theory			Practical		Total Marks
				ESE	CT	TA	ESE	TA	
1	Civil Engineering	2020682 (020)	Precast and Prestressed Concrete	70	20	30	-	-	120

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 precast concrete.

(Approx. Hrs: CI+LI = 9)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1 State the advantages and disadvantages of precast members SO1.2 Identify various non structural precast elements SO1.3 Identify various structural precast elements SO1.4 Recognize Test of precast components		Unit 1- Precast Concrete 1.1 Advantages and disadvantages of precast concrete member. 1.2 Non-structural Precast elements - Paver blocks, Fencing Poles, Transmission Poles, Manhole Covers, Hollow and Solid Blocks, kerb stones as per relevant BIS specifications 1.3 Structural Precast elements – tunnel linings, Canal lining, Box culvert, bridge panels, foundation, sheet piles 1.4 Testing of Precast components as per BIS standards	SL1.1 Study various types of precast structures used in construction projects.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

- What are the advantages and disadvantages of precast concrete?
- State non structural precast concrete elements.
- State structural precast concrete elements.
- What are the different tests on precast components?

b. Other Activities (Specify):

- Visit a nearby construction site where precast concrete is used and study the specification of precast concrete unit.

CO-2 Select components for prefabricated structures.

(Approx. Hrs: CI+LI = 9)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 Identify different types of precast structural building components SO2.2 Recognize prefabricated building SO2.3 Classify prefab system SO2.4 Describe different types of joints and their requirements SO2.4 Explain the process of manufacturing, storage, curing, transportation and erection of prefabricated components		Unit 2-Prefabricated Building 2.1 Precast Structural Building components such as slab panels, beams, columns, footings, walls, lintels and chajjas, staircase elements. 2.2 Prefabricated building using precast load bearing and non load bearing wall panels, floor systems - Material characteristics, Plans & Standard specifications 2.3 Modular co-ordination, modular grid and finishes 2.4 Prefab systems and structural schemes and their classification. 2.5 Joints – requirements of structural joints 2.6 Manufacturing, storage, curing, transportation and erection of above elements, equipment needed	SL2.1 Study prefab materials other than precast concrete.

SW-2 Suggested Sessional Work (SW) :

a. Assignments:

1. List various precast structural building components and their manufacturing process.
2. Describe material characteristics and specifications for prefabricated buildings.
3. Explain modular co-ordination and modular grids.
4. Describe various types of structural joints used in precast building components and their use
5. Describe the process of manufacture of precast elements.
6. State the equipments needed for manufacture, transportation and erection of precast elements.

b. Other Activities (Specify):

1. Visit a nearby construction site where precast concrete is used and study the different structural elements and joints.

CO-3 Explain prestressed concrete.

(Approx. Hrs: CI = 10)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 3.1 Recognize the principles of prestressed concrete SO 3.2 Identify, Applications and state advantages and disadvantages of prestressed concrete SO 3.3 Identify the		Unit 3-Prestressed Concrete 3.1 Principles of pre-stressed concrete and basic terminology. 3.2 Applications, advantages and disadvantages of prestressed concrete 3.3 Materials used and their properties, Necessity of high grade materials 3.4 Types of Pre-stressing steel -Wire,	3.1 Differentiate RCC and Prestressed Concrete.

Session Outcomes (SOs)	Laboratory	Class room Instruction (CI)	Self Learning
various materials used in prestressed concrete and their properties SO3.4 Describe prestressing steel wire, cable, tendons.		Cable, tendon, merits demerits and applications 3.5 Methods of prestressing – Internal and External pre-stressing, Pre and Post tensioning- applications	

SW-3 Suggested Sessional Work (SW) :

a. Assignments:

1. Explain principle of prestressed concrete.
2. Define basic terminology used in prestressed concrete.
3. State the applications of prestressed concrete.
4. State advantages and disadvantages of prestressed concrete.
5. Explain the necessity of high grade materials in prestressed concrete.
6. Describe different types of prestressing steel.
7. Differentiate –
 - (i) Internal and External pre-stressing.
 - (ii) Pre and Post tensioning.

b. Other Activities (Specify):

1. Visit a nearby construction site where prestressed concrete is used and study the different types of materials used.

CO- 4 Select prestressing systems for given construction work.

(Approx. Hrs: CI+LI = 10)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 4.1 Describe pretensioning system. SO 4.2 Describe post tensioning system. SO 4.3 Explain Prestressing forces in cables and loss of prestress during tensioning process. SO 4.4 Calculate losses in prestress subsequently due to shrinkage and creep of concrete and elastic shortening and creep in steel.		Unit 4- Systems of Prestressing 4.1 Systems for pre tensioning – process, applications, merits and demerits - Hoyer system 4.2 Systems for post-tensioning - process, applications, merits and demerits - Freyssinet system, Magnel Blaton system, Gifford Udall system. 4.3 Prestressing force in Cable, Loss of prestress during the tensioning process - loss due to friction, length effect, wobbling effect and curvature effect, (Simple Numerical problems to determine loss of pre-stress), Loss of pre-stress at the anchoring stage. 4.4 Loss of pre-stress occurring subsequently: losses due to shrinkage of concrete, creep of concrete, elastic shortening, and creep in steel, (Simple Numerical problems to determine loss of pre-stress).	SL 4.1 Study BIS recommendations for percentage loss in case of Pre and Post tensioning

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Explain various process of pretensioning.
2. State merits and demerits of pretensioning.
3. Explain various process of post tensioning.
4. State merits and demerits of posttensioning
5. Solve simple numerical problems on loss in prestress.

b. Other Activities (Specify):

1. Visit a nearby construction site where prestressed concrete is used and study the prestressing system used.

CO-5 Analyse and design prestressed rectangular beam section.

(Approx. Hrs: CI+LI = 10)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO5.1 Draw the cable profile in prestressed concrete. SO5.2 Calculate the stresses at different sections SO5.3 Design of simply supported rectangular beam section		Unit 5 – Analysis and Design of Prestressed Beam 5.1 Basic assumptions in analysis of pre-stressed concrete beams. 5.2 Cable profile in simply supported rectangular beam section – concentric, eccentric straight and parabolic 5.3 Effect of cable profile on maximum stresses at mid span and at support. 5.4 Numerical problems on determination of maximum stresses at mid spans with linear (concentric and eccentric) cable profiles only 5.5 Simple steps involved in design of simply supported rectangular beam section	SL5.1 Study parabolic cable profile.

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. State assumptions in analysis of pre-stressed concrete.
2. Explain cable profile in prestressed concrete beam.
3. Explain effect of cable profile on maximum stresses at mid span and at support
4. Solve simple numerical problems to identify stresses and various sections
5. Design simply supported rectangular beams

b. Other Activities (Specify):

1. Visit a nearby construction site where prestressed concrete is used and study the cable profile..

Unit Number	Unit Title	Marks Distribution			Total Marks
		R	U	A	
I	Precast Concrete	4	6	4	14
II	Prefabricated Building	4	6	4	14
III	Prestressed Concrete	4	6	4	14
IV	Systems of Prestressing	4	6	4	14
V	Analysis and Design of Prestressed Beam	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	

* 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 NA Marks as per assessment scheme.

K) Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Industrial visits
5. Industrial Training
6. Field Trips
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration, CBT, Blog, Face book, Mobile)
9. Brainstorming
10. Others

L) Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Pre-stressed Concrete	Krishna Raju	Tata McGraw Hill, New Delhi	Latest publication
2	Prestressed Concrete	ShrikantB. Vanakudre,	Khanna publishing house New Delhi	Latest publication
3	Pre Cast and Pre Stress technology process method and future technology	Marzuki, Nor Ashikin,	Create space independent application	Latest publication
4	Design of Pre -Stressed Concrete Structures,	John Wiley and Sons	Pearson education India	Latest publication
5	Precast Concrete Structures,	Elliott, Kim S	CRC Press, New York	Latest publication
6	Handbook on Precast	Indian Concrete Institute	Indian Concrete Institute	Latest publication
7	IS 12592 Precast Concrete Manhole Cover and Frame	BIS, New Delhi	BIS, New Delhi	Latest publication
8	IS 15658 Precast concrete blocks for paving - Code of Practice	BIS, New Delhi,	BIS, New Delhi	Latest publication
9	IS 15916 Building Design and Erection Using Prefabricated Concrete - Code of Practice,	BIS, New Delhi,	BIS, New Delhi	Latest publication
10	IS 15917 Building Design and Erection Using Mixed/Composite Construction - Code of Practice,	BIS, New Delhi,	BIS, New Delhi	Latest publication

(b) Open source software and website address:

1. nptel.ac.in
2. swayam portal

M) List of Major Laboratory Equipment and Tools: NA

S. No.	Name of Equipment	Broad Specifications	Relevant Experiment Number
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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 precast concrete.	3	3	2	2	2	2	1	2	1	2	3	3
CO-2 Select components for prefabricated structures	3	3	2	2	2	2	1	2	1	2	3	3
CO-3 Explain prestressed concrete.	3	3	2	2	2	2	1	2	1	2	3	3
CO-4 Select prestressing systems for given construction work.	3	3	2	2	2	2	1	2	1	2	3	3
CO-5 Analyse and design prestressed rectangular beam section.	3	3	2	2	2	2	1	2	1	2	3	3

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O) Course Curriculum Map:

POs & PSOs No.	COs No. & Title	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO-1,2,3,4,5,6,7,8,10 PSO-1,2	CO-1 Explain precast concrete.	SO 1.1 SO 1.2 SO 1.3 SO 1.4		1.1 1.2 1.3 1.4	SL1.1
PO-1,2,3,4,5,6,7,8,9,10 PSO-1,2	CO-2 Select components for prefabricated structures	SO 2.1 SO 2.4 SO 2.2 SO 2.5 SO 2.3 SO 2.5		2.1 2.4 2.2 2.5 2.3 2.6	SL2.1
PO-1,2,3,4,5,6,7,8,10 PSO-1,2	CO-3 Explain prestressed concrete.	SO 3.1 SO 3.2 SO 3.3 SO 3.4		3.1 3.4 3.2 3.5 3.3	SL3.1
PO-1,2,3,4,5,6,7,8,10 PSO-1,2	CO-4 Select prestressing systems for given construction work.	SO 4.1 SO 4.2 SO 4.3 SO 4.4		4.1 4.2 4.3 4.4	SL4.1
PO-1,2,3,4,5,6,7,8,10 PSO-1,2	CO-5 Analyse and design prestressed rectangular beam section.	SO 5.1 SO 5.2 SO 5.3		5.1 5.4 5.2 5.5 5.3	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

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Diploma in Civil Engineering

Semester -VI

- A) Course Code : 2020683(020)
B) Course Title : Green Building and Energy Conservation
C) Pre- requisite Course Code and Title :
D) Rationale :

Concept of Green Building is today's need of the hour. With the whole world facing energy crises, this method of construction of building could help in reducing energy demand and thus this course is of immense importance for Civil Engineers Diploma pass outs. This subject aims at basic knowledge about construction of energy efficient building in respect of their various types of materials used, methods of construction, aspects of supervision of such construction.

E) Course Outcomes :

CO-1 Explain various Design Criteria for green buildings.

CO-2 Explain Energy Audit and Environmental Impact Assessment (EIA).

CO-3 Describe Energy resource and Energy conservation.

CO-4 Explain design and construction of green building.

CO-5 Explain different rating systems and their criteria.

F) Scheme of Studies:

S.No.	Board of Study	Course Code	Course Title	Scheme of Studies (Hours/Week)			
				L	T	P	Total Credits(C) L+T+(P/2)
1	Civil Engineering	2020683(020)	Green Building and Energy Conservation	3	-	-	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:

S. No	Board of Study	Course Code	Course Title	Scheme of Examinations					
				Theory			Practical		Total Marks
				ESE	CT	TA	ESE	TA	
1	Civil Engineering	2020683 (020)	Green Building and Energy Conservation	70	20	30	-	-	120

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) 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.

CO-1 Explain various design criteria for green buildings.

(Approx. Hrs: CI+LI= 9)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1 Describe Benefits and features of green buildings. SO1.2 Explain site selection strategies for green buildings. SO1.3 Recognize construction techniques for green buildings. SO1.4 Explain advanced passive heating and cooling techniques.		UNIT-1 Green Building Design Features 1.1. Definition of Green building, benefits of green building, components/features of green building. 1.2. Energy Efficiency, Energy benchmark, Water efficiency, rain water use, grey water use, Material Efficiency, Indoor Air Quality, temperature, visual comfort, acoustics 1.3 Site selection strategies- Landscaping, building form, orientation, building envelope and fenestration, Materials, land use and consumption. 1.4 Construction Techniques- roofs, walls, fenestration and shaded finishes. 1.5 Advanced passive heating and cooling techniques, waste reduction during construction	SL1.1 Study contribution of concrete towards green house gases.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Define green building and state its advantage.
2. State features of green building.
3. Explain Energy Efficiency, Water efficiency, Material Efficiency, Indoor Air Quality.
4. Explain site selection strategies for green building.
5. Explain advanced passive heating and cooling techniques and Waste reduction Techniques.
6. Explain various Construction techniques for green building.

b. Other Activities (Specify):

1. Prepare a presentation on Green Building Design Features.

CO-2 Explain Energy Audit and Environmental Impact Assessment (EIA).

(Approx. Hrs: CI+LI = 9)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 Recognize energy audit. SO2.2 Explain types of energy audit. SO 2.3 Explain Environmental Impact Assessment (EIA).		Unit 2 Energy Audit and Environmental Impact Assessment (EIA) 2.1 Energy Audit: Meaning, Necessity, Procedures, Types, Energy Management Programs. 2.2 Types of energy audit and selection of suitable energy audit. 2.3 Environmental Impact Assessment(EIA): Introduction, EIA regulations, Steps in environmental impact assessment process, Benefits of EIA, 2.3Environmental clearance for the civil engineering projects.	SL2.1 Write Limitations of EIA.

SW-2 Suggested Sessional Work (SW) :

a. Assignments

1. Define energy audit and state its necessity.
2. Describe Energy management Program.
3. State types of energy audit.
4. Explain Environmental Impact Assessment(EIA)
5. What are Benefits of EIA,
6. Explain Briefly the Limitations of EIA.

b. Other Activities (Specify):

1. Prepare a presentation on Environmental Impact Assessment (EIA).

CO- 3 Describe Energy resource and Energy conservation.

(Approx. Hrs: CI+LI = 10)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO3.1 Explain Renewable Energy Resources SO 3.2 Describe Non Renewable Energy Resources SO 3.3 Recognize Energy Conservation. SO 3.4 Explain Indoor climate control system.		Unit-3Energy and Energy conservation 3.1 Renewable Energy Resources: Solar Energy, Wind Energy, Ocean Energy, Hydro Energy, Biomass Energy 3.2 Non-renewable Energy Resources: Coal, Petroleum, Natural Gas, Nuclear Energy, Chemical Sources of Energy, Fuel Cells, Hydrogen, Biofuels. 3.3 Energy conservation: Introduction, Specific objectives, present scenario, Need of energy Conservation. 3.4 Indoor climate control system.	SL3.1 Study energy generation in a building unit.

SW-3 Suggested Sessional Work (SW) :

a. Assignments:

1. Explain briefly Renewable Energy Resources
2. Explain briefly Non- Renewable Energy Resources
3. Enlist Objectives of specific energy conservation
4. Indoor climate control system.
5. Write a note on Study energy generation in a building unit.

b. Other Activities (Specify):

1. Study solar power installation in the vicinity and prepare areport.

CO- 4 Explain design and construction of green building.

(Approx. Hrs: CI+LI= 10)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 4.1 Describe Various Principles in Planning Green Building SO 4.2Identify Materials for building Green Building SO 4.3 Describe construction features of green building. SO 4.4 Recognize facacde construction quality management		Unit-4 Design and Construction of Green Building 4.1Introduction: Definition of Green building, Benefits of Green building, 4.2.1Principles: Principles and planning of Green building 4.2.2Construction Features: Salient features of Green building, building envelop , heat insulation, solar protection, glare protection, noise protection. 4.3Materials: Green building materials and products- Bamboo, Rice husk ash concrete, plastic bricks, Bagasse particle board, insulated concrete forms, smart materials. 4.4 Facacde construction quality management, use of natural resources.	SL 4.1 Study commissi oning of green building.

SW-4 Suggested Sessional Work (SW) :

a. Assignments:

1. What are the Principles and planning of Green building
2. What are the materials that are used in Green Building
3. Explain construction features of green building.
4. Write a note of natural resources in green building concept.
5. Write a note facade construction quality management.

b. Other Activities (Specify):

1. Study literature on smart material for green building and prepare a report.

CO- 5 Explain different rating systems and their criteria.

(Approx. Hrs: CI+LI = 10)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO5.1 Explain Rating System in Green Building. SO 5.2 Compare IGBC, GRIHA and LEED rating. SO 5.3 Recognize Heating Ventilation Air Conditioning (HVAC) unit in green Building. SO 5.3 Describe functions of various Government organization working for energy conservation and audit.		Unit-5 Rating System for Green Buildings 5.1 Ratings system for sustainable building, Indian Green Building Council (IGBC) rating, US Green Building Council (LEED) criteria, Green Rating for Integrated Habitat Assessment (GRIHA) criteria, key aspect in assessment and levels of certification. 5.2 Heating Ventilation Air Conditioning (HVAC) unit in green building 5.3 Functions of Government organization working for Energy conservation and Audit(ECA)- National Productivity council(NPC), Ministry of New and Renewable Energy (MNRE), Bureau of Energy efficiency (BEE)	SL5.1 Study DGNB (Germany), BREEAM (Great Britain), CASBEE (Japan) rating system.

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 Rating System in Green Building
2. Compare different rating system.
3. Describe Functions of Government organization working for Energy conservation and Audit(ECA).
4. Write a note on Heating Ventilation Air Conditioning (HVAC) unit in green building

b. Any other activity:

1. Prepare a presentation on rating system for green building.

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

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Semester -VI

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

Unit Number	Unit Title	Marks Distribution			Total Marks
		R	U	A	
I	Green Building Design Features	4	6	4	14
II	Energy Audit and Environmental Impact Assessment (EIA)	4	6	4	14
III	Energy and Energy conservation	4	6	4	14
IV	Design and Construction of Green Building	4	6	4	14
V	Rating System for Green Buildings	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

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	Sustainable construction: Green Building design and Delivery	Kibert, C.J.,	John Wiley Hobouken, New Jersey	latest
2	Non-conventional Energy Resources	Chauhan, D S Sreevasthava, S K	New Age International Publication	latest
3	Energy Technology	O P Gupta	Khanna Publishing House New Delhi	latest
4	Alternative Building Materials and Technology	Jagadish K S,Reddy Venkatrama,Najunda Rao K S	New Age International Publisher Delhi	latest
5	Hand Book of Green Building Design and Construction	Sam Kubba	Butterworth-Heinemann	latest
6	Green Building-Project Planning and Cost Estimating	Means R S	John Willey & Sons	latest
7	Energy Management and Conservation	Sharma K.V., Venkateshaiah P	I K International	latest

(b) Open source software and website address :

1. nptel.ac.in
2. swayam portal

M) List of Major Laboratory Equipment and Tools: NA

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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 various Design Criteria for green buildings.	1	3 3	3 1	3 3	3 3	2 3	- 1	3 3	- 1	2 3	3 3	3
CO -2 Explain Energy Audit and Environmental Impact Assessment (EIA).	1	3 3	3 1	3 3	3 3	2 3	- 1	3 3	- 1	2 3	3 3	3
CO -3 Describe Energy resource and Energy conservation.	1	3 3	3 1	3 3	3 3	2 3	- 1	3 3	- 1	2 3	3 3	3
CO -4 Explain design and construction of green building.	1	3 3	3 1	3 3	3 3	2 3	- 1	3 3	- 1	2 3	3 3	3
CO -5 Explain different rating systems and their criteria.	1	3 3	3 1	3 3	3 3	2 3	- 1	3 3	- 1	2 3	3 3	3

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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 -1 Explain various Design Criteria for green buildings.	SO 1.1 SO 1.2 SO 1.3 SO 1.4	-	1.1 1.5 1.2 1.3 1.4	SL 1.1
PO-1,2,3,4,5,6,7,8,9,10 PSO-1,2	CO -2 Explain Energy Audit and Environmental Impact Assessment (EIA).	SO 2.1 SO 2.2 SO 2.3	-	2.1 2.2 2.3	SL 2.1
PO-1,2,3,4,5,6,7,8,9,10 PSO-1,2	CO -3 Describe Energy resource and Energy conservation.	SO 3.1 SO 3.2 SO 3.3 SO 3.4	-	3.1 3.2 3.3 3.4	SL 3.1
PO-1,2,3,4,5,6,7,8,9,10 PSO-1,2	CO -4 Explain design and construction of green building.	SO 4.1 SO 4.2 SO 4.3 SO 4.4	-	4.1 4.2 4.3 4.4	SL 4.1
PO-1,2,3,4,5,6,7,8,9,10 PSO-1,2	CO -5 Explain different rating systems and their criteria.	SO 5.1 SO 5.2 SO 5.3		5.1 5.2 5.3	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

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Diploma in Civil Engineering

Semester-VI

Name of program: Diploma in Engineering
Branch : Civil Engineering
Subject : Indian Constitution
No. Of Periods : 2 Periods/Week

Semester: VI
Code: 2020663(046)
Total Tutorial Periods: NIL

Course Content-

Unit 1 – The Constitution - Introduction

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

Unit 2 – Union Government

- Structure of the Indian Union
- President – Role and Power
- Prime Minister and Council of Ministers
- Lok Sabha and Rajya Sabha

Unit 3 – State Government

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

Unit 4 – Local Administration

- District Administration
- Municipal Corporation
- Zila Panchayat

Unit 5 – Election Commission

- Role and Functioning
- Chief Election Commissioner
- State Election Commission

Suggested Learning Resources:

S. No.	Title of Book	Author	Publication
1	Ethics and Politics of the Indian Constitution	Rajeev Bhargava	Oxford University Press, New Delhi, 2008
2	The Constitution of India	B.L. Fadia	Sahitya Bhawan; New edition (2017)
3	Introduction to the Constitution of India	DD Basu	Lexis Nexis; Twenty-Third 2018 edition

Suggested Software/Learning Websites:

- <https://www.constitution.org/cons/india/const.html>
- <http://www.legislative.gov.in/constitution-of-india>
- <https://www.sci.gov.in/constitution>
- <https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/>

A)	Course Code	:	2020664(020)
B)	Course Title	:	Major Project
C)	Pre- requisite Course Code and Title	:	
D)	Rationale	:	

Project work plays a very important role in engineering educations in developing core technical skills, soft skills and higher level of cognitive, psychomotor and affective domain skills. It encourages the thinking process in the students.

Project work is normally done when students have acquired sufficient knowledge, skills and attitude and are able to integrate all these, entirely in new situation or task to solve the problems of the industries.

Through project work, students get direct exposure to the world of work in their relevant field. They are intrinsically motivated to explore new things, new methods, new design and many more ideas.

They also develop many soft skills like confidence, communication skills, creative ability, inquisitiveness, learning to learn skills, lifelong learning skills, problem solving skills, management skills, positive attitude, ethics etc. through project work.

Normally in a curriculum document, there is a mention of project work in two different situations.

In situation one, Project work is reflected as Mini Project under each and every course curricular detailing, in the form of sessional work mentioned under different semesters. These projects are normally related to the developing skills in respective course of the specific programme.

In another situation, project work is reflected as a complete course or as a major project in the total programme structure, normally at higher semester either at 4th, 5th and 6th, depending on the requirement of the programme Normally.

E) **Course Outcomes:** After completion of the project work of a course or full semester, the students will be able to -

CO-1 Integrate the Knowledge (K), Skills (S), Attitudes (A) developed in a new task or problem identified in the form of project work.

CO-2 Develop higher level of cognitive, psychomotor and affective domain skills relevant to the course/programme.

CO-3 Integrate the generic skills/soft skills/employable skills with relevant technical skills for successful completion of the project work.

CO-4 Develop the skills of innovativeness, creativity, resourcefulness, time management, problem solving abilities, interpersonal skills, pro-activeness, cost effectiveness, environment consideration and sustainability.

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	2020664 (020)	Major project	-	-	6	4 [^]

Note:- [^] One credit is carried forward from the Vth semester major project evaluation.

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:

S. No	Board of Study	Course Code	Course Title	Scheme of Examinations					
				Theory			Practical		Total Marks
				ESE	CT	TA	ESE	TA	
1	Civil Engineering	2020664 (020)	Major Project	-	-	-	60	80	140

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) Guidelines to Teachers for Implementation of the Project Work :

Once the project is identified and allocated to students, teacher's role is very important. Teachers act as guide, facilitator, catalyser, motivator to promote brain storming, thinking, creatively, initiatives and many other skills in the students. Teachers should help or guide continually to monitor whether the students are proceeding in the right direction as per outcomes to be attained.

It is also suggested that teachers are not supposed to guide and plan each and every step from the point of view of execution of the project, otherwise it will curb their creativity or thinking process. Teachers have to see that he or she is able to create think tank for this fast technological world of work for the growth of our country. Following points should be taken into consideration while planning and implementing the project work.

1. Identification of project and allocation methodology :

Though the teachers and students, both are involved in identification of project titles, but the prime responsibility of identification of project titles goes to the teachers involved in implementing the course or programme. Teachers are fully aware of course/programme curriculum. They are also aware of related industrial problems. They try to explore the possibility of identification of project titles through these problems.

These small industrial problems in the form of project titles may be brought into the laboratories or workshop of institutions of a specific programme, which are equipped with all necessary facilities and resources to carry out the project work. These labs or workshop can function as miniature industry to solve the industrial problems in the form of simulated industrial projects. These projects may be integrated problem of courses or programme.

The project identified may be application type, product type, Research type and review type.

1.1 Criteria for Identification and Implementation of Project Titles :

Identification of project title is planned to be done based on many considerations like :

- Cost effectiveness

- Safety considerations
- Ethical issues
- Environmental considerations
- Improvised process
- Improvised equipment
- Simulated industry's problem
- Application or utility in the world of work.
- Relevance to the Curriculum
- Mapping of Outcomes of Project with POs and PSOs
- Feasibility of implementation of the project

2. Implementation and Evaluation of Project Work:

Once the identification of project titles and guide allocation process is over, quality of student's project, on different criteria including the report writing need to be continually monitored.

Projects planning, design, execution and report writing is done by the students under the guidance and feedback by respective teachers for attainment of courses specific outcomes, POs and PSOs.

Continual Monitoring, feedback and assessment mechanism on weekly progress/updates on action taken on different criteria and sub-criteria of the project work need to be planned for individual and team of students. Path breaking teachers who think out of the box are required to guide, monitor and evaluate the project work.

For objective, valid and reliable assessment, teachers should use different tools of assessment such as checklist, rating scale, assessment rubric, observation schedule, portfolio assessment, incidental records etc. Even the students may be encouraged to adopt self assessment techniques using the assessment rubrics.

2.1 Criteria of Evaluation of Project:

The different criteria of evaluation of project under different sub heads of project work completion are given below :

2.2.1 Project Planning :

Project planning, its action plan, steps of realizing the projects, may be specifically planned in advance based on feasibility, resources available, time allocation, finance and manpower requirement for each and every step or activity of project work.

Under project planning, many points need to be considered like -

- Selection of relevant industry based projects as per the requirement of curriculum
- Rationale/Application
- Objectives Set
- Literature survey

Literature survey on the project title need to be done through abstract, journals, websites, open sources and other relevant sources available.

It need to be ensured that objectives are written properly with clear specific, measurable and attainable statements. The sample size has to be delimited and decided as per the time limit allotted, feasibility and many other considerations. Objectives formulated will decide the further course of action, depth and breadth of the project and implementation plan.

2.2.2 Design, Development and Execution of Project :

Following important characteristic features of project are need to be given special emphasis during the implementation of the project work-

- Innovativeness
- Creativity
- Originality
- Pro-activeness
- Initiableness
- Cost Effectiveness
- Resourcefulness
- Development of soft skills/generic skills

There may be deviation from planning, design and implementation of the project as per the requirement.

2.2.3 Quality of Report Writing :

Following points need to be taken care of for report writing-

- Report writing as per prescribed format
- Clarity of Objectives
- Presentation of Data
- Data Analysis, Interpretation and Result
- Quality of Product

2.2.4 Presentation & Discussion :

Quality of presentation of data need to be ensured using the following criteria -

- Clarity in Communication and Presentation
- Voice Audibility
- Use of Media and methods
- Satisfying the queries of audience
- Attainment of objectives set

2.2.5 Project's Potential :

Futuristic scope and recommendation for further studies related to project may be assessed from the following criteria -

- Papers published or award received
- Exhibition or Display or showcase of project in competition or exhibition or Tech Fest
- Evaluation of working of projects or prototype
- Relevance and Applications in the world of work
- Recognition in any form
- Related areas/sub areas for further studies

The students need to be assessed continuously based on the assessment rubric prepared by the implementing teachers on different stages of project work completion.