Final

DIPLOMA CURRICULUM OF
CIVIL ENGINEERING
(SECOND YEAR)
(4th Semester)

(To be implemented from 2025-26)

Prepared by;

National Institute of Technical Teachers' Training & Research Kolkata
Block – FC, Sector – III, Salt Lake City, Kolkata – 700106

Vetted by:
Domain experts from Polytechnics of Odisha

State Council for Technical Education & Vocational Training
Near Raj Bhawan, Unit-VIII, Bhubaneswar, Odisha

Table of Contents

PROGRAMME TITLE: CIVIL ENGINEERING

SEMESTER - IV

SL. No	Category of Course	Code No	Course Title	Study Scheme				Evaluation Scheme				Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory		Practical			
					L	T	P	End Exam	Progressive Assessment	End Exam	Progressive Assessment		
1	Programme core	CEPC202 TH:1	Hydraulics & Irrigation Engineering		3	0	0	70	30	-	-	100	3
2		CEPC204 TH:2	Theory of Structure		3	0	0	70	30	-		100	3
3		CEPC206 TH:3	Estimating, Costing & Valuation		3	0	0	70	30	-		100	3
4		CEPC208 PR:1	Hydraulics & Irrigation Engg Lab.		0	0	4	-		15	35	50	2
5		CEPC210 PR:2	Estimating and Costing Lab		0	0	4	-		15	35	50	2
6		CEPC212 PR:3	Building planning & drawing Lab-1		0	0	4	-		15	35	50	2
7	Programme elective	CEPE202 (Any one) Elective 1 TH:4	A) Precast and Prestressed Concrete B) Construction Management C) Rural Construction Technology		3	0	0	70	30	-		100	3
8		CEPE204 (Any one) Elective 2 TH:5	A) Repairs and Maintenance of Structures B) Solid Waste Management C) Design of Steel Structures		3	0	0	70	30	-		100	3
9	Minor Project	PR202 PR:4	MINOR PROJECT		0	0	4	-		30	70	100	2
10	Mandatory	AU202	Essence of Indian knowledge and tradition		**2**	**0**	**0**	**0**		**0**		**0**	**0**
TOTAL					**17**	**0**	**16**	**350**	**150**	**75**	**175**	750	**23**

The best of 2 IA conducted in a subject out of 20 marks to be considered. Assignment/ quiz etc. of 10 marks to be treated as part of IA. Besides this, Monthly Test to be conducted for each subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester. Club/Innovation/ Idea Tinkering Activities etc. shall be encouraged to be performed by students beyond the above stipulated hours.

SEMESTER - IV COURSES

TH:1- HYDRAULICS & IRRIGATION ENGINEERING

L	T	P		
3	0	0		**Course Code: CEPC 202**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre-Requisite		**: Nil**		
Credit		**3**		Category of Course: PC

RATIONALE

This course deals with behaviour of fluid at rest and in motion. The Civil Engineering profession is much concerned with subjects like water supply, Sanitary Engineering and Irrigation Engineering, which need a sound knowledge of Hydraulics. Additionally, the course aims to train the student in methods of developing water supplies and to briefly describe the means to treat water for consumptive use. It helps them to understand water demand of crops and provisions to meet the same. It also includes planning of reservoirs / dams and design of irrigation projects, canals and other diversion works

LEARNING OUTCOMES

After completion of this course, the students will be able to

- Explain the different types of flow
- Describe the parameters associated with fluid flow and hydrostatic pressure.
- Explain head loss and water hammer in fluid flowing through pipes.
- Illustrate different types of pumps and their uses
- Measure the discharge using different equation
- Estimate hydrological parameters.
- Estimate crop water requirements of a command area and capacity of canals.
- Execute Minor and Micro Irrigation Schemes.
- Select the relevant Cross Drainage works for the specific site conditions.
- Design simple irrigation regulatory structures

COURSE CONTENT DETAILS

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
UNIT –I	**Pressure measurement and Hydrostatic pressure** • Technical terms used in Hydraulics –fluid, fluid mechanics, hydraulics, hydrostatics and hydrodynamics - ideal and real fluid, application of hydraulics. • Physical properties of fluid – density-specific volume,	**2**

	specific gravity, surface tension, capillarity, viscosity-Newton's law of viscosity. • Various types of pressure – Atmospheric Pressure, Gauge Pressure, Absolute Pressure, Vacuum Pressure. Concept of Pressure head and its unit, Pascal's law of fluid pressure and its uses. • Measurement of differential Pressure by different methods. • Variation of pressure with depth, Pressure diagram, hydrostatic pressure and center of pressure on immersed surfaces and on tank walls. • Determination of total pressure and center of pressure on sides and bottom of water tanks, sides and bottom of tanks containing two liquids, vertical surface in contact with liquid on either side	
UNIT –II	**Fluid Flow Parameters** • Types of flow – Gravity and pressure flow, Laminar, Turbulent, Uniform, Non-uniform, Steady, Unsteady flow. Reynolds number. • Discharge and its unit, continuity equation of flow. • Energy of flowing liquid: potential, kinetic and pressure energy. • Bernoulli's theorem : statement, assumptions, equation.	**2**
UNIT –III	**Flow through pipes** • Major head loss in pipe: Frictional loss and its computation by Darcy's Weisbach equation, • Minor losses in pipe: loss at entrance, exit, sudden contraction, sudden enlargement andfittings. • Flow through pipes in series, pipes in parallel and Dupuit's equation for equivalent pipe. • Hydraulic gradient line and total energy line. • Discharge measuring device for pipe flow: Venturi meter - construction and working. • Discharge measurement-using Orifice, Hydraulic Coefficients of Orifice.	**8**
UNIT –IV	**Flow through Open Channel** • Geometrical properties of channel section: Wetted area, wetted perimeter, hydraulic radius for rectangular and trapezoidal channel section. • Determination of discharge by Chezy's equation and Manning's equation. • Conditions for most economical rectangular and trapezoidal channel section. • Discharge measuring devices: Triangular and rectangular Notches. • Velocity measurement devices: current meter, floats and Pitot's tube. • Specific energy diagram, Froudes' Number	**7**

UNIT –V	**Hydraulic Pumps** • Concept of pump, Types of pump - centrifugal, reciprocating, submersible. • Centrifugal pump: components and working • Reciprocating pump: single acting and double acting, components and working. • Suction head, delivery head, static head, Manometric head • Power of centrifugal pump. • Selection and choice of pump.	**5**
UNIT –VI	**Introduction to Hydrology** • Hydrology: Definition and Hydrological cycle • Rain Gauge: Symons rain gauge, automatic rain gauge, • Methods of calculating average rainfall: Arithmetic mean, Isohyetal, and Theissen polygon method. • Runoff, Factors affecting Run off, Computation of run–off. • Maximum Flood Discharge measurement: Rational and empirical methods, Simple numerical problems. • Yield and Dependable yield of a catchment, determination of dependable yield.	**5**
UNIT –VII	**Crop water requirement and Reservoir Planning** • Irrigation and its classification. • Crop Water requirement: Cropping seasons, Crop period, base period, Duty, Delta, CCA, GCA, intensity of irrigation, factors affecting duty, Problems on water requirement and capacity of canal. • Methods of application of irrigation water and its assessment. • Area capacity curve. • Silting of reservoir, Rate of silting, factors affecting silting and control measures. • Control levels in reservoir, Simple numerical problems on Fixing Control levels.	**5**
UNIT –VIII	**Dams and Spillways** • Dams and its classification: Earthen dams and Gravity dams (masonry and concrete). • Earthen Dams – Components with function, typical cross section, seepage through embankment and foundation and its control. • Methods of construction of earthen dam, types of failure of earthen dam and preventive measures. • Gravity Dams – Forces acting on dam, Theoretical and practical profile, typical cross section, drainage gallery, joints in gravity dam, concept of high dam and low dam. • Spillways-Definition, function, location, types and components, Energy dissipaters.	**5**

UNIT –IX	**Diversion Head Works & Canals** • Weirs – components, parts, types, K.T. weir – components and construction • Diversion head works – Layout, components and their function. • Barrages – components and their functions. Difference between weir and Barrage. • Canals – Classification according to alignment and position in the canal network, Cross section of canal in embankment and cutting, partial embankment and cutting, balancing depth, Canal lining - Purpose, material used and its properties, advantages. • Cross Drainage works- Aqueduct, siphon aqueduct, super passage, level crossing. • Canal regulators- Head regulator, Cross regulator, Escape, Falls and Outlets	**6**
	Total=	**45**

SUGGESTED LEARNING RESOURCES:

1. Modi, P. N.and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.
2. S.S. Rattan, Fluid Mechanics & Hydraulic Machines, Khanna Book Publishing Co., New Delhi
3. Ramamrutham, and Narayan, R., Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat RaiPublishing Company, New Delhi.
4. Khurmi R S, Hydraulics, Fluid Mechanics, Hydraulic machines, S. Chand Publishers
5. Rajput, R K, Fluid Mechanics, S Chand, New Delhi.
1. Ojha, C S P, Berndtsson, R, and Chandramoulli P. N., Fluid Mechanics and Machinery, Oxford Uni- versity Press, New Delhi. Punmia, B.C., Pande, B, Lal, Irrigation and Water Power Engineering, Laxmi Publications
2. Subramanayan, Engineering Hydrology, McGraw Hill.
3. Mutreja K N, Applied Hydrology, McGraw Hill
4. Sharma, R.K. and Sharma, T.K., Irrigation Engineering, S.Chand
5. Basak, N.N., Irrigation Engineering, McGraw Hill Education
6. Asawa, G.L., Irrigation and water resource Engineering, New Age
7. Dahigaonkar, J.G., Irrigation Engineering, Asian Book Pvt. Ltd., New Delhi.
8. Garg, S K, Irrigation and Hydraulic Structures, Khanna Publishers, Delhi.
9. Priyani V.B., Irrigation Engineering, Charotar Book Stall, Anand.

TH:2- THEORY OF STRUCTURE

L	T	P		
3	0	0		**Course Code: CEPC 204**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre-Requisite		**: Nil**		
Credit		**3**		Category of Course: PC

RATIONALE

The Theory of Structures is vital for Civil Engineering diploma holders. This course teaches students to solve problems related to beams, assess the stability of dams and retaining walls, analyze trusses, and apply deflection formulas. It also covers the behavior of reinforced concrete beams and cracks. The course aims to equip students with a strong understanding of structural behavior, enabling them to confidently supervise construction projects, perform maintenance, and analyze simple structures. By understanding the principles of structural behavior and failure, students will be better prepared to make informed decisions in construction and maintenance tasks.

COURSE OUTCOME

After competing this course, student will be able to:

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

COURSE CONTENT DETAILS

UNIT NO & TITLE	CONTENT	LECTURE HOURS
UNIT –I	**Direct and Bending Stresses in vertical members** • Introduction to axial and eccentric loads, eccentricity about one principal axis only, nature of stresses, Maximum and minimum stresses, resultant stresses and distribution diagram. • Condition for no tension or zero stress at extreme fiber, Limit of eccentricity, core of section for rectangular and circular cross sections, Middle third rule. • Chimneys of circular cross section subjected to wind pressure, Maximum and minimum stresses, resultant stresses and distribution diagram at base. • Analysis of dams subjected to horizontal water pressure, conditions of stability, Maximum and minimum stresses,	**8**

	resultant stresses and distribution diagram at base.	
UNIT –II	**Slope and Deflection** • Concept of slope and deflection, stiffness of beams, Relation among bending moment, slope, deflection and radius of curvature, (no derivation). • Double integration method to find slope and deflection of cantilever and simply supported beams subjected to concentrated load and uniformly distributed load on entire span. • Macaulay's method for slope and deflection, application to cantilever and simply supported beam subjected to concentrated and uniformly distributed load on entire span.	**8**
UNIT –III	**Determinate and Indeterminate structures (Fixed and Continuous Beam)** • Concept of Determinate and Indeterminate structures • Concept of fixity, effect of fixity, advantages and disadvantages of fixed beam over simply supported beam. • Principle of superposition, Fixed end moments from first principle for beam subjected to point load, UDL over entire span. • Application of standard formulae in finding end moments, end reactions and drawing S.F. and B.M. diagrams for a fixed beam. • Definition, effect of continuity, nature of moments induced due to continuity, concept of deflected shape, practical examples. • Clapeyron's theorem of three moment (no derivation), Application of Clapeyron's theorem maximum up to three spans and two unknown support moment only, Support at same level spans having same and uniform moment of inertia subjected to concentrated loads and uniformly distributed loads over entire span. • Concept of influence line diagram (ILD)	**10**
UNIT –IV	**Moment distribution method** • Introduction to moment distribution method, sign convention, Carry over factor, stiffness factor, distribution factor. • Application of moment distribution method to various types of continuous beams subjected to concentrated loads and uniformly distributed load over entire span having same or different moment of inertia, supports at same level, up to three spans and two unknown support moments only. • Introduction to portal frames – Symmetrical and unsymmetrical portal frames with the concept of Bays and stories.	**10**

UNIT –V	**Simple trusses** • Types of trusses (Simple, Fink, compound fink, French truss, pratt truss, Howe truss, North light truss, King post and Queen post truss) • Calculate support reactions for trusses subjected to point loads at joints • Calculate forces in members of truss using Method of joints and Method of sections.	**9**
		45

SUGGESTED LEARNING RESOURCES:

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

TH:3- ESTIMATING COSTING AND VALUATION

L	T	P		
3	0	0		**Course Code: CEPC 206**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre-Requisite		**: Nil**		
Credit		**3**		Category of Course: PC

RATIONALE

The subject of estimating costing and valuation is very important for the diploma holders in Civil Engineering. In order to construct any item, pertaining to Civil Engineering, one should have knowledge of resource required for the works as also the money required for completion of the job.

COURSE OUTCOME

After competing this course, student will be able to:

- Select modes of measurements for different items of works.
- Prepare approximate estimate of a civil engineering works.
- Prepare detailed estimate of a civil engineering works.
- Use relevant software for estimating the quantities and cost of items of works.
- Justify rate for given items of work using rate analysis techniques.

COURSE CONTENT DETAILS

UNIT NO & TITLE	CONTENT	LECTURE HOURS
UNIT –I	**Fundamentals of Estimating and Costing** ▪ Estimating and Costing – Meaning, purpose, administrative approval, Technical Sanction and ▪ Types of methods of estimates – Approximate and Detailed estimate. ▪ Roles and responsibility of Engineers at different positions/levels, administrative set ups and heirarchy of Engineering Dept. in State Govt./Central Govt./PSUs ▪ Standard formats of Measurement sheet, Abstract sheet, ▪ Modes of measurement and desired accuracy in measurements for different items of work as per IS:1200. ▪ Rules for deduction in different category of work as per IS:1200. ▪ Description / specification of items of building work as per OPWD /DSR. /CPWD/Railways	**8**

UNIT –II	**Detailed Estimate** ▪ Detailed Estimate- Definition and Purpose, Data required for detailed estimate - Civil cost, GST, Contingencies, Supervision charges, Procedure for preparation of detailed estimate ▪ Long wall and Short wall method, Centre line method. ▪ Bar bending schedule for footing, column, beam, Lintel, chajja and slab elements ▪ Provisions in detailed estimate: contingencies, work charged establishent, percentage charges, water supply	**15**
	and sanitary Charges and electrification charges etc. ▪ Prime cost, Provisional sum, Provisional quantities, Bill of quantities, Spot items or Site items. ▪ Detailed estimate of residential buildings using long wall short wall and centre line method	
UNIT –III	**Estimate for Civil Engineering Works** ▪ Earthwork - Quantities for roads, Embankment and canal by – Mid sectional area method, mean sectional area method, Prismoidal and trapezoidal formula method. ▪ Detailed estimate for septic tank, ▪ Estimate of RCC culvert, drainage syphon and vertical fall ▪ Estimate of Bituminous Road	**12**
UNIT –IV	**Rate Analysis** ▪ Rate Analysis: Definition, purpose and importance. ▪ Lead (Standard and Extra), lift, overhead charges, water charges and contractors' profit, procedure for rate analysis. ▪ Task work- Definition, types. Task work of different skilled labour for different items. ▪ Categories of labours, their daily wages, types and number of labours for different items of work. ▪ Transportation charges of materials - Lead and Lift, Hire charges of machineries and equipment. ▪ Preparing rate analysis of different items of work pertaining to buildings and roads. (Different items of work like PCC, Plastering, Flooring, and Brick work)	**10**
	Total	**45**
*****Latest analysis of rate and Schedule of rate of Govt. of Odisha may be allowed during end semester examination.		

SUGGESTED LEARNING RESOURCES:

1. Datta, B.N., Estimating and Costing in Civil engineering, UBS Publishers Distributors Pvt. Ltd. New Delhi.
2. Peurifoy,Robert L. Oberlender,Garold, Estimating construction cost (fifth edition), McGraw Hill Education, , New Delhi.
3. Rangwala,S.C., Estimating and Costing, Charotar Publishing House PVT. LTD., Anand. Birdie,G.S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd. New Delhi.
4. Patil,B.S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai.

5. Chakraborti,M., Estimating and costing, specification and valuation in civil engineering, Monojit Chakraborti, Kolkata.
6. PWD Schedule of Rates. Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Schedule of Rates.
7. Manual of Specifications and Standards for DBFOT projects, EPC works.

PR:1- HYDRAULICS & IRRIGATION ENGINEERING LAB

L	T	P		
0	0	4		**Course Code: CEPC 208**
Total Contact Hours				**Practical Assessment**
Practical		: 60Hrs	**Total Marks: 50**	End Exam 15
				Progressive Assessment : 35
Pre-Requisite		**: Nil**		
Credit		**2**		Category of Course: PC

RATIONALE

This course provides the student with an opportunity to explore the fundamental principles of fluid mechanics through experimentation. This course aims to enable the students to learn estimation of hydrological parameters. How to plan and design irrigation projects, canals and other diversion works.

LEARNING OUTCOME

After completing this course, student will be able to:

- Measure pressure and total hydrostatic pressure for different conditions.
- Determine head loss of fluid flow through pipes.
- Find the fluid flow parameters in open channels.
- Select relevant hydraulic pumps for different applications
- Estimate hydrological parameters.
- Estimate crop water requirements of a command area and capacity of canals.
- Execute Minor and Micro Irrigation Schemes.
- Select relevant Cross Drainage works for the specific site conditions.
- Design, construct and maintain simple irrigation regulatory structures

COURSE CONTENT DETAILS

LIST OF PRACTICALS TO BE PERFORMED:(Minimum 15 experiments to be performed.)

1. Use piezometer to measure pressure at a given point.
2. Use U tube differential manometer to measure pressure difference between two given points.
3. Use Bernoulli's apparatus to apply Bernoulli's theorem to get total energy line for a flow in a closed conduit of varying cross sections.
4. Use Friction factor Apparatus to determine friction factor for a given pipe.
5. Determine minor losses in pipe fittings due to sudden contraction and sudden enlargement.
6. Determine minor losses in pipe fitting due to Bend and Elbow.
7. Calibrate Venturi meter to find out the discharge in a pipe.
8. Calibrate the Orifice to find out the discharge through a tank
9. Use Current meter to measure the velocity of flow of water in open channel.
10. Use Pitot tube to measure the velocity of flow of water in open channel.
11. Use triangular/rectangular notch to measure the discharge through open channel.
12. Calculate average rainfall for the given area using arithmetic mean method/isohyetal/ Theissen polygon method.

13. Compute the yield of the Catchment area demarcated in **Sr.No.12.**

14. Estimate crop water requirement for the given data.

15. Estimate capacity of the canal for the given data.

16. Calculate reservoir capacity from the given data.

Draw a labeled sketch of the given masonry/earthen dam section.

17. Draw the theoretical and practical profile of the given gravity dam section.

18. Prepare a model of any irrigation structure using suitable material in your area, based on field visit.

19. Draw a labeled sketch of the given diversion head works and Cross Drainage works.

SUGGESTED LEARNING RESOURCES:

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

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

PR:2- ESTIMATION COSTING & VALUATION LAB

L	T	P		
0	0	4		**Course Code: CEPC 210**
Total Contact Hours				**Practical Assessment**
Practical		: 60Hrs	**Total Marks: 50**	End Exam 15
Pre-Requisite		**: NIL**		Progressive Assessment : 35
Credit		**2**		Category of Course: PC

RATIONALE

The subject of estimating is very important for the diploma holders in Civil Engineering. In order to construct any item, pertaining to Civil Engineering, one should have knowledge of resource required for the works as also the money required for completion of the job.

COURSE OUTCOME

After competing this course, student will be able to:

- Select modes of measurements for different items of works.
- Prepare approximate estimate of a civil engineering works.
- Prepare detailed estimate of a civil engineering works.
- Use relevant software for estimating the quantities and cost of items of works.
- Justify rate for given items of work using rate analysis techniques.

(Use of computer /softwares / programmes /MS Excel for detailed estimate Preparation of Civil Engineering Works.)

List of Practical to be performed:

1. Prepare the list of items to be executed with units for detailed estimate of a given structure from the given drawing.
2. Prepare a report on market rates for given material, labour wages, hire charges of tools & equipments required to construct the given structure as mentioned in at Serial number 1 above.
3. Study of items with specification given in the DSR (for any ten item)
4. Recording in Measurement Book (MB) for any four items
5. Prepare bill of quantities of given item from actual measurements. (Any four items).
6. Prepare approximate estimate for the given civil engineering works.
7. Calculate the reinforcement quantities from the given set of drawings for a room size of 3 m x 4 m with bar bending schedule (footing, column, beam, lintel with chajjah, slab)
8. Prepare rate analysis for the given five item of works.
9. Prepare detailed estimate of small Septic tank from the given set of drawings.
10. Prepare detailed estimate of a Road.
11. Prepare detailed estimate of a residential building.

SUGGESTED LEARNING RESOURCES:

1. Datta, B.N., Estimating and Costing in Civil engineering, UBS Publishers Distributors
2. Peurifoy, Robert L. Oberlender,Garold, Estimating construction cost (fifth edition), McGrawHill Education, , New Delhi.
3. Rangwala,S.C., Estimating and Costing, Charotar Publishing House, Anand.

4. Birdie,G.S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd. Delhi.
5. Patil,B.S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai.
6. Chakraborti,M., Estimating and costing, specification and valuation in civil engineering,Monojit Chakraborti, Kolkata.
7. Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Schedule of Rates.
8. Manual of Specifications and Standards for DBFOT projects, EPC works.

PR:3- BUILDING PLANNING & DRAWING LAB-1

L	T	P		
0	0	4		**Course Code: CEPC 212**
Total Contact Hours				**Practical Assessment**
Practical		: 60Hrs	**Total Marks: 50**	End Exam 15
				Progressive Assessment : 35
Pre-Requisite		**: Nil**		
Credit		**2**		Category of Course: PC

RATIONALE

The subject of building planning and drawing deals with different plan, layout of building and drawing of different part of building, sectional views etc. Therefore, building planning and drawing is a very important basic subject for students of civil engineering.

COURSE OUTCOME

After completing this course, student will be able to:

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

COURSE CONTENT DETAILS

UNIT NO & TITLE	CONTENT	LECTURE HOURS
UNIT –I	**Introduction** • Draw various types of lines, graphical symbols for materials, doors and windows, symbols for sanitary, water supply and electrical installations and write abbreviations as per IS 962. • Write summary of observations of all technical details from the given drawing (One/Two BHK) obtained from the professional architect or civil engineer (Group activity in four students) • Draw line plans to suitable scale for any Five Public Buildings from the following (School Building, Primary Health Centre, Bank, Post Office, Hostel, Restaurant, Community Hall and Library).	**6**
UNIT –II	**Planning of Building** • Principles of planning for Residential and Public building- Aspect, Prospect, Orientation, Grouping, Privacy, Elegance, Flexibility, Circulation, Furniture requirements, Sanitation, Economy. • Space requirement and norms for minimum dimension of different units in the residential and public buildings as per IS 962.	**16**

	• Rules and bye-laws of sanctioning authorities for construction work. • Plot area, built up area, super built-up area, plinth area, carpet area, floor area and FAR (Floor Area Ratio). • Line plans for residential building of minimum three rooms including water closet (WC), bath and staircase as per principles of planning.	
UNIT –III	**Drawing of Load Bearing Structure** • Drawing of Single storey Load Bearing residential building (2 BHK) with staircase. • Data drawing –plan, elevation, section, site plan, schedule of openings, construction notes with specifications, area statement, Planning and design of staircase- Rise and Tread for residential and public building. • Working drawing – developed plan, elevation, section passing through staircase or WC and bath. • Foundation plan of Load bearing structure.	**16**
UNIT –IV	**Drawing of Framed Structure** • Drawing of Two storeyed Framed Structure (G+1), residential building (2 BHK) with staircase. • Data drawing – developed plan, elevation, section, site plan, schedule of openings, construction notes with specifications, area statement. Planning and design of staircase- Rise and Tread for residential and public building. • Working drawing of Framed structure – developed plan, elevation, section passing through staircase or WC and bath. • Foundation plan of Framed Structure. • Details of RCC footing, Column, Beam, Chajjas, Lintel, Staircase and slab.	**16**
UNIT –V	**Perspective Drawing** • Definition, Types of perspective, terms used in perspective drawing, principles used in perspective drawing • Two Point Perspective of small objects only such as steps, monuments, pedestals.	**6**
		60
All the drawings are tobe prepared using AutoCAD Software.		

SUGGESTED LEARNING RESOURCES:

1. Shah. M.G. Kale, CM, Patki, S.Y., Building Drawing, Mcgraw Hill Publishing company Ltd. New Delhi.
2. Malik and Mayo, Civil Engineering Drawing, Computech Publication Ltd New Asian Publishers, New Delhi.

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

ELECTIVE - I : ANY ONE

TH:4(A)- PRECAST & PRESTRESSED CONCRETE

L	T	P	Total Marks: 100	Course Code: CEPE 202A
3	0	0		
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs		End Term Exam 70
				Progressive Assessment : 30
Pre-Requisite		**: Nil**		
Credit		**3**		Category of Course: PC

RATIONALE

This course aims to introduce various types of precast and prefabricated concrete elements to the students. As a Civil Engineer, he will understand prestressing methods, systems for Reinforced Concrete members and issues involved in design of prestressing system and loss of prestressing.

LEARNING OUTCOME

After competing this course, student will be able to:

- Select the relevant precast concrete element for a given type of construction.
- Use relevant components for prefabricated structures.
- Justify the relevance of prestressed element in a given situation.
- Select relevant methods / systems for given construction work.
- Propose suitable cable profile for the given prestressed concrete members.

COURSE CONTENT DETAILS

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
UNIT –I	**Precast concrete Elements** • Advantages and disadvantages of precast concrete members • Non-structural Precast elements - Paver blocks, Fencing Poles, Transmission Poles, Manhole Covers, Hollow and Solid Blocks, kerb stones as per relevant BIS specifications • Structural Precast elements – tunnel linings, Canal lining, Box culvert, bridge panels, foundation, sheet piles • Testing of Precast components as per BIS standards	**5**
UNIT –II	**Prefabricated building** • Precast Structural Building components such as slab panels, beams, columns, footings, walls, lintels and chajjas, staircase elements, • Prefabricated building using precast load bearing and non	**12**

	load bearing wall panels, floor systems - Material characteristics, Plans & Standard specifications • Modular co-ordination, modular grid, and finishes • Prefab systems and structural schemes and their classification including design considerations • Joints – requirements of structural joints and their design considerations • Manufacturing, storage, curing, transportation and erection of above elements, equipment needed	
UNIT –III	**Introduction to Prestressed Concrete** • Principles of pre-stressed concrete and basic terminology. • Applications, advantages and disadvantages of prestressed concrete • Materials used and their properties, Necessity of high-grade materials • Types of Pre-stressing steel -Wire, Cable, tendon, Merits-demerits and applications	**7**
UNIT –IV	**Methods and systems of prestressing** • Methods of prestressing – Internal and External pre-stressing, Pre and Post tensioning- applications • Systems for pre tensioning – process, applications, merits and demerits - Hoyer system • Systems for post-tensioning - process, applications, merits and demerits - Freyssinet system, Magnel Blaton system, Gifford Udall system. • 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. • 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). • BIS recommendations for percentage loss in case of Pre and Post tensioning.	**11**
UNIT –V	**Analysis and design of Prestressed rectangular beam section** • Basic assumptions in analysis of pre-stressed concrete beams. • Cable Profile in simply supported rectangular beam section – concentric, eccentric straight and parabolic • Effect of cable profile on maximum stresses at mid span and at support. • Numerical problems on determination of maximum	**10**

	stresses at mid spans with linear (concentric and eccentric) cable profiles only. • Simple steps involved in Design of simply supported rectangular beam section (No numerical problems)	
		45

SUGGESTED LEARNING RESOURCES

1. Krishna Raju, N., Pre-stressed Concrete, Tata McGraw Hill, New Delhi.

2. Shrikant B. Vanakudre, Prestressed Concrete, Khanna Publishing House, New Delhi

3. Marzuki, Nor Ashikin, Pre Cast and Pre Stress Technology: Process, Method and Future Technology, Createspace Independent Publication.

4. Indian Concrete Institute., Handbook on Precast Concrete buildings.

5. Elliott, Kim S., Precast Concrete Structures, CRC Press, New York.

6. Lin, T.Y., Design of Pre-Stressed Concrete Structures, John Wiley and Sons, New York Nagarajan, Pravin., Pre-stressed Concrete Structures, Pearson Education India

7. BIS, New Delhi. IS 12592 Precast Concrete Manhole Cover and Frame, BIS, New Delhi

8. BIS, New Delhi. IS 15658 Precast concrete blocks for paving - Code of Practice, BIS, New Delhi

9. BIS, New Delhi. IS 15916 Building Design and Erection Using Prefabricated Concrete - Code of Practice, BIS, New Delhi

10. BIS, New Delhi. IS 15917 Building Design and Erection Using Mixed/Composite Construction - Code of Practice, BIS, New Delhi

11. BIS, New Delhi. IS 458 Precast Concrete Pipes (with and without reinforcement) — Specification, BIS, New Delhi

TH:4(B)- CONSTRUCTION MANAGEMENT

L	T	P		
3	0	0		**Course Code: CEPC 202B**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre-Requisite		**: Nil**		
Credit		**3**		Category of Course: PC

RATIONALE

This course enables the students to learn about professional service that provides a project's owner(s) with effective management of the project's schedule, cost, quality, safety, scope, and function.

LEARNING OUTCOME

After competing this course, student will be able to:

- Explain the contract management and associated labour laws.
- Prepare the nuances of executing the site layout.
- Prepare networks and bar charts for the given construction project.
- Explain the intricacies of disputes, related arbitration and settlement laws.
- Apply safety measures at construction projects.

COURSE CONTENT DETAILS

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
UNIT –I	**Construction industry and management** • Organization-objectives, principles of organization, types of organization: government/public and private construction industry, Role of various personnel in construction organization Agencies associated with construction work- owner, promoter, builder, designer, architects. • Role of consultant for various activities: Preparation of Detailed Project Report (DPR), monitoring of progress and quality, settlement of disputes.	**6**
UNIT –II	**Site Layout** • Principles governing site layout. • Factors affecting site layout. • Preparation of site layout. • Land acquisition procedures and providing compensation.	**8**
UNIT –III	**Planning and scheduling**	**15**

	• Identifying broad activities in construction work & allotting time to it, Methods of Scheduling, Development of bar charts, Merits & limitations of bar chart. • Elements of Network: Event, activity, dummy activities, Precautions in drawing Network, Numbering the events. • CPM networks, activity time estimate, 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. • Material Management- Ordering cost, inventory carrying cost, Economic Order Quantity • Store management, various records related to store management, inventory control by ABC technique, Introduction to material procurement through portals (e.g. www.inampro.nic.in).	
UNIT –IV	**Construction Contracts and Specifications** • Types of Construction contracts • Contract documents, specifications, general special conditions • Contract Management, procedures involved in arbitration and settlement (Introductiononly)	**8**
UNIT –V	**Safety in Construction** • Safety in Construction Industry—Causes of Accidents, Remedial and Preventive Measures. • Labour Laws and Acts pertaining to Civil construction activities (Introduction only)	**8**
		45

SUGGESTED LEARNING RESOURCES

1. Sharma S C and Deodhar S V, Construction Engineering and Management, Khanna Book Publishing, New Delhi
2. Gahlot,P.S. and Dhir, B.M Construction planning and management New Age International (P) Ltd. Publishers, New Delhi.
3. Shrivastava, U.K., Construction planning and management, Galgotia Publication Pvt Ltd. NewDelhi
4. Mantri, S., The A To Z of Practical Building Construction and its Management, Satya Prakashan New Delhi
5. Khanna, O.P. , Industrial Engineering and management, Dhanpat Rai New Delhi

6. Punmia, B.C. and Khandelwal, K.K., Project Planning and Controlling with PERT And CPM,
   Laxmi Publications (P)Ltd.
7. Sengupta, B., Guha H., Construction Management and Planning, Tata-McGraw Hill.
8. Harpal, Singh, Construction Management and accounts, Mc-Graw Hill.
9. Sharma, S.C., Industrial Engineering and Management, Khanna Publications, New Delhi

TH:4(C)- RURAL CONSTRUCTION TECHNOLOGY

L	T	P		
3	0	0		**Course Code: CEPC 202C**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre-Requisite		**: Nil**		
Credit		**3**		Category of Course: PC

RATIONALE

This course enables the students to learn development and planning of low-cost housing infrastructure, different government schemes for rural development, techniques for rural road construction and watershed management in rural areas.

LEARNING OUTCOME

After competing this course, student will be able to:

- Plan low-cost housing using rural materials.
- Make use of relevant government schemes for construction of roads and housing.
- Use guidelines for rural road construction.
- Implement different irrigation systems for rural areas.
- Identify the need of watershed management in rural areas

COURSE CONTENT DETAILS

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
UNIT –I	**Rural Development and Planning** • Scope; development plans; various approaches to rural development planning. • Significance of rural development. • Rural development programme/projects.	**5**
UNIT –II	**Rural Housing** • Low-cost construction material for housing • Composite material- ferro-cement & fly ash, autoclaved calcium silicate bricks and • soil-stabilized un-burnt brick; Plinth protection of mud walls. • Water-proof and fire-retardant roof treatment for thatch roofs. Pre-cast stone masonry, rattrap bond for walls; Panels for roof, ferro-cement flooring/roofing units. • Biomass - types of fuels such as firewood, agricultural residues, dung cakes. • Renewable energy and integrated rural energy program - Objectives, Key elements, Implementation, Financial provisions, sources of renewable energy. • Working of gobar gas and bio gas plants.	**10**

UNIT –III	**Water Supply and Sanitation for Rural Areas** • Sources of water: BIS & WHO water standards. • Quality, Storage and distribution for rural water supply works. • Hand pumps-types, installation, operation, and maintenance of hand pumps. • Conservation of water - rainwater harvesting, drainage in rural areas. • Construction of low cost latrines: Two pit pour flush water seal, septic tank etc. • Low cost community and individual Garbage disposal systems, Ferro-cement storage tanks.	**10**
UNIT –IV	**Low Cost Rural Roads** • Broad categories of Pavement Layers, types of Granular Sub-Bases and Bases. • Guidelines for Surfacing of Rural Road as per relevant IRC codes. • Pradhan Mantri Gram Sadak Yojna (PMGSY)- Highlights of Scheme.	**10**
UNIT –V	**Low Cost Irrigation** • Design consideration and construction of tube-well, drip & sprinkler irrigation systems. • Watershed and catchment area development –problems and features of watershed management. • Watershed management structures - K. T. weir, Gabian Structure, Cement Plug, Contour Bunding, Farm Pond, Bandhara system.	**10**
		45

SUGGESTED LEARNING RESOURCES

1. Madhov Rao A G, and Ramachandra Murthy, D S, Appropriate Technologies for low-cost Housing Oxford and IBH Publishing Co. Pvt. Ltd.

2. CBRI, Roorkee, Advances in Building Materials and Constriction.

3. Desai,Vasant , Rural Development in India: Past, Present and Future : a Challenge in the Crisis, Himalaya Publishing House, Delhi.

4. Rastogi, A.K.Rural Development Strategy, Wide Vision, Jaipur.

5. Singh, Katar, Rural Development Principles, Policies and Management, Sage Publications India Pvt Ltd.

6. Gaur, Keshav Dev, Dynamics of Rural Development, Mittal Publications, Delhi.

7. Document Published by Ministry of Rural development, Govt. of India, Ministry of Rural development

Professional elective 2

TH:5(A)- REPAIRS AND MAINTENANCE OF STRUCTURES

L	T	P	Total Marks: 100	Course Code: CEPE 204A
3	0	0		
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs		End Term Exam 70
				Progressive Assessment : 30
Pre-Requisite		**: Nil**		
Credit		**3**		Category of Course: PC

RATIONALE:

The appropriate design, exact detailing, and construction in compliance with certain designs and specifications are requirements for a structure's safety and durability. Therefore, a civil engineering profesional should know the repair and maintenance of structures. Diploma holders must also assist designers, make recommendations for renovation and repair projects. The subject aims to cover the aforementioned aspects of civil engineering profession.

COURSE OBJECTIVES:

After competing this course, student will be able to

- Apply the different types of maintenance techniques
- Identify the causes of various types of damages the structures.
- Select the relevant materials for repairing the structures.
- Select the suitable methods of retrofitting for different structures.

COURSE CONTENT DETAILS

UNIT NO & TITLE	CONTENT	LECTURE HOURS
UNIT –I	**Basics of maintenance** • Types of Maintenances - repair, retrofitting, re- strengthening, rehabilitation and restoration. Necessity, objectives and importance of maintenance. • Approach of effective management for maintenance. Periodical maintenance: check list, maintenance manual containing building plan, reinforcement details, material sources, maintenance frequency, corrective maintenance procedures and sources. Pre- and post-monsoon maintenance.	8
UNIT-II	**Causes and detection of damages** • Causes of damages due to distress, earthquake, wind, flood, dampness, corrosion, fire, deterioration, termites, pollution and foundation settlement. Various aspects of visual observations for detection of damages. • Load test and non-destructive tests (brief description). NDT tests on damaged structure such as rebound hammer, ultrasonic pulse velocity, rebar locator, crack detection micro- scope, digital crack measuring gauge. • Chemical test - Chloride test, sulphate attack, carbonation test, pH	7

	measurement, resistivity method, Half-cell potential meter (Introduction and demonstration only).	
UNIT-III	**Materials for maintenance and repairs** • Types of repair material, material selection. • Essential parameters for maintenance and repair materials such as , bond with substrate, durability. Waterproofing materials based on polymer modified cement slurry, UV resistant acrylic polymer, ferro-cement. • 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. • Repairing materials for RCC: epoxy resins, epoxy mortar, and cement mortar impregnated with polypropylene, silicon, polymer concrete composites, sealants, fiber reinforcement concrete, emulsions and paints.	10
UNIT-IV	**Maintenance and repair methods for masonry Construction** • Causes of cracks in walls - bulging of wall, shrinkage, bonding, shear, tensile, vegetation. Probable crack location: junction of main and cross wall, junction of slab and wall, cracks in masonry joints. • Repair methods based on crack type - For minor & medium cracks (width 0.5 mm to 5mm): grouting and for major cracks (width more than 5mm): fixing mesh across cracks, RCC band, installing ferro-cement plates at corners, dowel bars, propping of load bearing. • Remedial measures for dampness & efflorescence in wall.	10
UNIT-V	**Maintenance and repair methods for RCC Construction** • Repair stages such as concrete removal and surface preparation, fixing suitable formwork, bonding/passive coat and repair application, various methods of surface preparation. • Repair options such as grouting, patch repairs, carbonated concrete, cleaning the corroded steel, concrete overlays, latex concrete, and epoxy bonded mortar and concrete, polymer concrete, corrosion protection such as jacketing. • Building cracks and its prevention, common methods for dormant crack repairs such as Ep-oxy injection, grooving and sealing, stitching, grouting and guniting/ shotcreting. • Strengthening methods for live cracks such as addition of reinforcements, Jacketing, brackets, collars, supplementary members i.e. shoring, underpinning and propping of framed structure.	10
	Total	**45**

SUGGESTED LEARNING RESOURCES

1. Gahlot, P. S., Sharma, S., Building Repair and Maintenance Management, CBS Publishers & Distributors Pvt. Ltd., New Delhi

2. Guha, P. K., Maintenance and Repairs of Buildings, New Central Book Agencies

3. Hutchin Son, B. D., Maintenance and Repairs of Buildings, Newnes-Butterworth

4. Relevant BIS codes

TH:5(B)- SOLID WASTE MANAGEMENT

L	T	P		
3	0	0		**Course Code: CEPC 204B**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre-Requisite		**: Nil**		
Credit		**3**		Category of Course: PC

RATIONALE

Urbanisation and industrialization are both accelerating day by day. Because of this, the production of solid waste is a significant issue in both urban and rural areas of the country, and it is getting worse every day. From this vantage point, managing solid waste is a crucial component of maintaining a healthy and safe environment. Therefore, a civil engineer with a diploma should be properly knowledgeable about managing solid waste, as the concepts of recycling, recovery, and reuse will result in proper disposal that is acceptable and economic.

COURSE OUTCOME

After competing this course, student will be able to:

- Identify the sources of solid waste.
- Select the relevant method of collection and transportation of solid waste
- Suggest an action plan for composting of solid waste.
- Devise suitable disposal technique for solid waste
- Use the relevant method for disposal of Bio-medical and E-waste.

COURSE CONTENT DETAILS

UNIT NO.	CONTENT	LECTURE HOURS
UNIT –I	**Introduction** • Definition of solid waste, different solid waste – domestic Waste, commercial waste, industrial waste, market waste, agricultural waste, biomedical waste, E-waste, hazardous waste, institutional waste, etc. • Sources of solid waste, Classification of solid waste – hazardous and non- hazardous waste. • Physical and chemical characteristics of municipal solid waste.	**7**
UNIT –II	**Storage, Collection and Transportation of Municipal Solid Waste** • Collection, segregation, storage and transportation of solid waste. • Tools and Equipment: Litter Bin, Broom, Shovels, Handcarts, Mechanical Road sweepers, Community bin like movable and stationary bin. • Transportation vehicles with their working capacity -Animal carts, Auto vehicles, Tractors or Trailers, Trucks, Dumpers, Compactor vehicles. Transfer station- meaning, necessity,	**10**

	location. • Role of rag pickers and their utility for society	
UNIT –III	**Composting of Solid Waste** • Concept of composting of waste, Principles of composting process. Factors affecting the composting process. • Methods of composting – Manual Composting – Bangalore method, Indore Method, Mechanical Composting – Dano Process, Vermi composting	**10**
UNIT –IV	**Techniques for Disposal of Solid Waste** • Solid waste management techniques – solid waste management hierarchy, waste prevention and waste reduction techniques • Land filling technique, Factors to be considered for site selection, Land filling methods - Area method, Trench method and Ramp method, Leachate and its control, Biogas from landfill. • Advantages and disadvantages of landfill method, recycling of municipal solid waste • Incineration of waste: Introduction of incineration process, Types of incinerators - Flash, Multiple chamber Incinerators, Products of incineration process with their use, Pyrolysis of waste – Definition, Methods	**8**
UNIT –V	**Biomedical and E-waste management** • Definition of Bio medical Waste. • Sources and generation of Biomedical Waste and its classification • Bio medical waste Management technologies. • Definition, varieties and ill effects of E- waste, • Recycling and disposal of E- waste.	**10**
	Total	**45**

SUGGESTED LEARNING RESOURCES:

1. Gupta O.P, Elements of Solid Hazardous Waste Management, Khanna Book Publishing Co., Delhi Ed. 2018
2. Bhide, A. D., Solid Waste Management, Indian National Scientific Documentation Centre, New Delhi.
3. George Techobanoglous, Kreith, Frank., Solid Waste, McGraw Hill Publication, New Delhi.
4. Sasikumar, K., Solid Waste Management, PHI learning, Delhi.
5. Hosetti, B.B., Prospect and Perspectives of Solid Waste Management, New Age International Publisher.

TH:5(C)- DESIGN OF STEEL STRUCTURES

L	T	P		
3	0	0		**Course Code: CEPC 204C**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment : 30
Pre-Requisite		**: Nil**		
Credit		**3**		Category of Course: PC

RATIONALE:

The objective of this course is to make students conversant in designing steel structural elements as per Indian code provisions. This course covers topics like steel material properties, connections, tension/compression member design, beams, using limit state design methodology

COURSE OUTCOME

After completing this course, student will be able to:

- demonstrate the concepts involved in the design of riveted and welded connections.
- Explain the provisions of BIS code for design of built up sections.
- Analyze T and L shaped beam sections.
- Explain the concept for design of one way and two way slabs.
- Identify short and long columns and their design provisions.

COURSE CONTENT DETAILS

UNIT NO.	CONTENT	LECTURE HOURS
UNIT –I	**Design of connections in steel structures** • Types of connection, bolted connection, Strength of bolted joints, • Design of bolted joints for axially loaded members. • Types of weld, welded connections, Permissible stresses in weld, Strength of weld. • Advantages and disadvantages of weld, Design of fillet weld and butt weld for axial load. •	**10**
UNIT-II	**Design of Steel Tension (Limit State Method)** • Types of sections used for Tension members. • Strength of tension member by- yielding of section, rupture of net cross-section and block shear. • Design of axially loaded single angle and double angle tension members with bolted and welded connections.	**10**
UNIT-III	**Design of Steel Compression Members (Limit State Method)** • Types of sections used as compression member, Calculation of effective length, Radius of gyration and slenderness ratio, Permissible values of slenderness ratio as per IS 800-2007, Design compressive stress,	**15**

	Design of column bases for axially loaded columns only.	
	• Introduction to built up sections, lacing and battening (Meaning and purpose), Diagrams of single and double lacing and battening system. (No numerical problems). • Design of axially loaded single and double angle struts connected by bolted and welded connections with gusset plate.	
UNIT-IV	**Design of Steel beams (Limit State Method)** • Standard beam sections, Bending stress calculations. • Design of simple I and channel section. • Check for shear as per IS 800 2007 • Simple and built up sections, • Introduction to plate girder: Components and functions (no numerical	**10**
	Total	**45**

SUGGESTED LEARNING RESOURCES:

1. Shah, V. L., and Gore, V., Limit State Design of Steel Structures, Structures Publications, Pune.
2. Dayarathnam, P., Design of Steel Structures, S. Chand and Company, New Delhi.
3. Subramanian N., Design of Steel Structures, Oxford University Press.
4. Sairam, K.S., Design of Steel Structures, Pearson Publication, Chennai, Delhi.
5.Shah, V. L., and Karve, S.R., Limit State Theory and Design of Reinforced Concrete Structures, Structures Publications, Pune.
6. Sinha N.C., and Roy S.K., Fundamentals of Reinforced Concrete, S. Chand & Co.,
7. Krishna Raju, and N.Pranesh, R.N., Reinforced Concrete Design Principles and Practice, New Age International, Mumbai.
8. Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGraw Hill
9. Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Private Limited, Delhi.

PR:4- MINOR PROJECT

L	T	P		
0	0	4		**Course Code: PR 202**
Total Contact Hours				**Project Assessment**
Theory		: 60Hrs	**Total Marks: 100**	End Exam 30
				Progressive Assessment 70
Pre-Requisite		**: Nil**		
Credit		**2**		Category of Course : Project

RATIONALE:

A Minor project is generally requires a larger amount of effort and more independent work than that involved in a normal assignment. It requires students to undertake their own fact-finding and analysis. The students will select the topic, perform and design work. Minor project is as preparation for the students to take on more responsibilities and bigger project in the future. It is a learning experience, which aims to provide students with the opportunity to synthesize knowledge from different areas of learning, and critically and creatively apply it to real life situations. The leadership quality, co-ordination of job and maintaining good communal harmony is an important factor of this type of activity.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Plan a Minor Project
- Execute a Minor Project with team.
- Implement hardware/software/analytical/numerical techniques, etc. based on project requirements.
- Optimize time related works through sharing of work responsibility
- Develop cost awareness and utilisation of fund.
- Prepare a technical report on the project.

GUIDELINES FOR MINOR PROJECT

Unit No.	Topic/Sub-Topic
I	○ Minimum three and maximum five students can form a group for the minor project.
II	○ Project type can include • Development of a simple prototype system/product. • Investigation of performance of some systems using experimental method • Analysis of components/systems/devices using suitable software • Investigation of optimum process/material for product development using market survey. • Solution for society/industry problems

III	○ Project domain may not be limited to the specific area / discipline.
IV	○ Project report to be prepared and submitted by the students with following components: 1. Title 2. Objectives 3. Relevance and significance 4. Methodology 5. Analysis-Simulation/experimentation/survey/testing etc. 6. Result and Discussion 7. Conclusion

ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

L	T	P		Course Code: AU202	
2	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 30Hrs	**Total Marks: NIL**	End Term Exam	0
				Progressive Assessment*	0
Pre-Requisite		**: Nil**			
Credit		**0**		Category of Course: Mandatory	

RATIONALE:

Considering the need of protecting Indian knowledge and tradition, the diploma level students of Automobile Engineering should be facilitated the concepts Indian traditional knowledge and to make them understand the importance of roots of knowledge system and methods of application in today's life and how to protect traditional knowledge system. Interpretation of the concepts of Intellectual property to protect the traditional knowledge as well as importance of Traditional knowledge in Agriculture and Medicine must be known.

LEARNING OUTCOMES:

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

- Discuss the concepts of traditional Indian knowledge and roots of knowledge system and indigenous knowledge system
- Explain the technique of protection of traditional Indian knowledge
- Discuss legal frameworks of traditional knowledge
- State intellectual property rights
- State traditional knowledge in Different Sectors

DETAILED COURSE CONTENTS

UNIT	TOPIC/SUB-TOPIC	Allotted HRS.
1	Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge (Unani / Siddha/ Ayurveda), Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge of Odisha	07
2	Protection of traditional knowledge (TK): The need for protecting traditional knowledge, Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.	07
3	Legal framework and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.	06
4	Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, Geographical Indications (GI).	04
5	Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK	06

REFERENCE BOOKS:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. "Knowledge Traditions and Practices of India" Kapil Kapoor.
3. Madhya Himalayi Sanskriti mein Gyan, Vigyan evam Paravigyan by Prof PC Pandey.

Suggested Online Link:

Web Links:
1.https://www.youtube.com/watch?v=LZP1StpYEPM
2.http://nptel.ac.in/courses/12110600/

*****Progressive Assessment to be conducted for ensuring learning of students.