Semester IV

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-10	CEPC-401	Fluid Mechanics and Machinery	3	0	0	3	3
2	Programme core course-11	CAPC-402	Building Automation System 1	2	0	0	2	2
3	Programme core course-12	CEPC-403	Transportation Engineering	3	0	0	3	3
4	Programme core course-13	CEPC-404	Hydraulics and Water Resource Engg. Lab.	0	0	2	2	1
5	Programme core course-14	CEPC-405	Transportation Engineering Lab.	0	0	2	2	1
6	Programme core course-15	CEPC-406	Building Planning and Drawing Lab.	0	0	4	4	2
7	Programme Elective course-1 (Any one to be selected)	CEPE-407/A	Construction Management	3	0	0	3	3
		CEPE-407/B	Rural Construction Technology	3	0	0	3	
		CEPE-407/C	Building Services and Maintenance	3	0	0	3	
8	Humanities & Social Science-4	HS 408	Professional Skill Development	2	1	0	3	3
9	Minor Project	CEPR-409	Minor Project	0	0	4	4	2
10	Mandatory Course-1	AU-410	Essence of Indian Knowledge and Tradition	2	0	0	2	0
			Total				**28**	**20**

FLUID MECHANICS AND MACHINERY

Course Code	CEPC-401
Course Title	Fluid Mechanics and Machinery
Number of Credits	3 (L:3, T:0, P:0)
Prerequisites	NIL
Course Category	Programme core course-10

Course Objectives: -

1) To understand parameters associated with fluid flow and hydrostatic pressure. (K1)
2) To learn the kinematic and dynamics of fluid flow. (K1)
3) To know head loss and water hammer in fluid flowing through pipes. (K1)
4) To recognize different types of pumps and their uses. (K2)
5) To illustrate different parameters of an open channel flow. (K3)

Course Content:-

Module 1: FLUID PROPERTIES AND FLOW CHARACTERISTICS
Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Archimedes principle.

Module 2: FLOW THROUGH PIPES
Hydraulic and energy gradient - Laminar flow through circular conduits and circular annuli-Boundary layer concepts – types of boundary layer thickness – Darcy Weisbach equation –friction factor- Moody diagram- commercial pipes- minor losses – Flow through pipes in series and parallel.

Module 3: PUMPS
Impact of jets - Euler's equation - Theory of roto-dynamic machines – various efficiencies– velocity components at entry and exit of the rotor- velocity triangles - Centrifugal pumps– working principle - work done by the impeller - performance curves - Reciprocating pump- working principle – Rotary pumps – classification.

Module- 4: Flow through Open Channel
Geometrical properties of channel section: Wetted area, wetted perimeter, hydraulicradius 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

Module 5: TURBINES
Classification of turbines – heads and efficiencies – velocity triangles. Axial, radial and mixed flow turbines. Pelton wheel, Francis turbine and Kaplan turbines- working principles - work done by water on the runner – draft tube. Specific speed - unit quantities – performance curves for turbines – governing of

References: -

1) Modi, P. N.and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.
2) S.S. Rattan, Fluid Mechanics & Hydraulic Machines, Khanna Book Publishing Co., New Delhi
3) Ramamrutham, and Narayan, R., Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat Rai Publishing 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.
6) Ojha, C S P, Berndtsson, R, and Chandramoulli P. N., Fluid Mechanics and Machinery, OxfordUniversity Press, New Delhi.

BUILDING AUTOMATION SYSTEM 1

Course Code	CAPC-402
Course Title	Building automation system 1
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

Course Objectives: After completing this course, student will be able to:

C.O.1.**:** Learn about intelligent building, automated buildings, responsive building (K1)

C.O.2.**:** Discus about energy management and services. (K2)

C.O.3.**:** Explain about different factors that affect energy in intelligent building (K1)

C.O.4**:** Discus about key issues for intelligent building. (K2)

C.O.4**:** Discus about design criteria and building with respect to life cycle cost. (K2)

Detailed Course Content

Module 1

Introduction 12 Hrs.

Introduction and Origins of the Intelligent Buildings Concept - Definition and characteristics of Intelligent Buildings with brief history and contemporary concept. Automated buildings, Responsive buildings, Evaluation of natural ventilation in buildings and indoor wind speed.

Module 2

Energy management and services 13 Hrs.

Demands on building and services, Control systems, Study of development of Computer Integrated Building from single function systems to integrated solutions. Use of building intelligence in energy management.

Module 3

Factors that affect energy use in buildings - functional factors, environmental factors, envelope factors, air-conditioning systems factors, energy source factors and electrical systems factors. Fenestration design for optimal day lighting.

Module 4

Key issues for intelligent buildings 10 Hrs.

Multiple activity settings, Generic analysis of space utilization. Models for shared space use. The development of briefing process including design activity and building elements, life cycles, Coordination between life cycle, building technologies. Study of issues related to site, shell, skin, services and technology.

Module 5

Intelligent design and construction 10 Hrs.

Effective Space utilization, Energy conservation through site selection, siting & orientation. Energy conservation through integration of building and site, site planning & site design. Expectations of user, effective communication of architectural concepts to user, Locating people and information, Introduction to building efficiency with respect to life cycle costs. Max.

Suggested Learning Resources:

- Jim sinopoli, smart buildings, Butterworth-Heinemann imprint of Elsevier, 2nd Edition,
- Albert Ting pat so, WaiLok Chan, intelligent building system, Kluwer Academic publisher, 3rd Edition
- Er. V.K Jain, Automation Systems in Smart and Green Buildings, Khanna Publishers, 1st Edition

TRANSPORTATION ENGINEERING

Course Code	CEPC-403
Course Title	Transportation Engineering
Number of Credits	3 (L:3, T:0, P:0)
Prerequisites	NIL
Course Category	PC

Course Objectives: -

1) To understand the importance of proper highway transportation for development of a nation. (K1)
2) To identify various elements of road geometry and solve engineering problems. (K3)
3) To explore the pavement construction by various materials. (K2)
4) To realize the basic concept of railway engineering and track geometrics. (K1)
5) To classify different types of stations, yard, points and crossings. (K2)

Course Content:-

Module- 1: Overview of Highway Engineering

Number of class hours: 6

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Describe the history of Indian roads and road development.
2) Distinguish between different modes of transportation.
3) Understand the importance of road survey.

Detail Course Content:

- History of roads and road development in India
- Mode of transportation – land way, waterway, airway. Merits and demerits of roadway and Role of transportation in the development of nation,
- General classification of roads.
- Highway Surveys: Different types, objects and instruments used.
- Selection and factors affecting road alignment.

Module- 2: Geometric Design of Highway

Number of class hours: 8

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Outline different parameters of road geometry.
2) Solve simple numerical problems related to super-elevation and sight distance.
3) Classify different types of vertical and horizontal curves in highway.

Detail Course Content:

- Camber: Definition, purpose, types as per IRC – recommendations.
- Kerbs: Road margin, road formation, right of way.
- Design speed and various factors affecting design speed as per IRC – recommendations.
- Gradient: Definition, types as per IRC – Recommendations.
- Sight distance (SSD): Definition, types IRC – recommendations, simple numerical.
- Curves: Necessity, types: Horizontal, vertical curves.
- Extra widening of roads: numerical examples.
- Super elevation: Definition, formula for calculating minimum and maximum Super elevation and method of providing super-elevation.
- Standards cross-sections of national highway in embankment and cutting.

Module- 3: Construction of Road Pavements

Number of class hours: 8

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Describe different tests of road construction materials.
2) Explain the constructional procedure of WBM, WMM and Bituminous Roads.
3) Distinguish between flexible pavement and rigid pavement.

Detail Course Content:

- Types of road materials and their Tests – Test on aggregates-Flakiness and Elongation Index tests, Angularity Number test, test on Bitumen- penetration, Ductility, Flash and Fire point test and Softening point test.
- Pavement – Definition, Types, Structural Components of pavement and their functions
- Construction of WBM road. Merits and demerits of WBM & WMM road.
- Construction of Flexible pavement/ Bituminous Road, Types of Bitumen and its properties, Emulsion, Cutback, Tar, Terms used in BR-prime coat, tack coat, seal coat, Merits and Demerits of BR.
- Cement concrete road -methods of construction, Alternate and Continuous Bay Method, Construction joints, filler and sealers, merits and demerits of concrete roads. Types of joints.

Module- 4: Basics of Railway Engineering

Number of class hours: 8

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Define basic terms of railway engineering.
2) Describe different components of permanent way.
3) Write the functions of different rail fixtures and fastenings.

Detail Course Content:

- Classification of Indian Railways, zones of Indian Railways
- Permanent way: Ideal requirement, Components; Rail Gauge, types, factors affecting selection of a gauge.
- Rail, Rail Joints - requirements, types.
- Creep of rail: causes and prevention.
- Sleepers - functions and Requirement, types - concrete sleepers and their density
- Ballast - function and types, suitability.

- Rail fixtures and fastenings – fish plate, spikes, bolts, keys, bearing plates, chairs-types of anchors and anti-creepers.

Module- 5: Track geometrics, Railway crossings, Station and Yard.

Number of class hours: 10

Suggestive Learning Outcomes: After completion of the module, students will be able to:

1) Explain different elements of track geometry.
2) Name different component parts of railway crossings.
3) Classify Railway stations and Yards.

Detail Course Content:

- Track Cross sections – standard cross section of single and double line in cutting and embankment. Important terms-permanent land, formation width, side drains,
- Railway Track Geometrics: Gradient, curves- types and factors affecting, grade compensation, super elevation, limits of Super elevation on curves, cant deficiency, negative cant, coning of wheel, tilting of rail.
- Branching of Tracks, Points and crossings, Turn out- types, components, functions and inspection. Track junctions: crossovers, scissor cross over, diamond crossing, track triangle.
- Station -Purpose, requirement of railway station, important technical terms, types ofrail-way station, factors affecting site selection for railway station.
- Station yard: Classification- Passenger, goods, locomotive and marshalling yards. Function & drawbacks of marshalling yards.

References: -

1. L.R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., Delhi (ISBN: 978-93- 82609-858) Edition 2018
2. Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Broth- ers, Roorkee.
3. Arora, N. L., Transportation Engineering, Khanna Publishers, Delhi.
4. Saxena S C and Arora S P, A Textbook of Railway Engineering, Dhanpat Rai Publication.
5. Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg , Standard Book House, New Delhi.
6. Sharma, S.K., Principles, Practice and Design of Highway Engineering, S. Chand Publication, New Delhi.
7. Duggal, Ajay K. and Puri, V. P., Laboratory Manual in Highway Engineering, New Age International (P) Limited, Publishers, New Delhi.
8. Subramanian, K.P., Highway, Railway, Airport and Harbour Engineering, Scitech Publications, Hyderabad.
9. Rex W. Faulks, International Transport, CRX Press, 1st Edition (1999)

HYDRAULICS AND WATER RESOURCE ENGINEERING LAB

Course Code	CEPC-404
Course Title	Hydraulics and Water Resource Engg. Lab.
Number of Credits	1 (L:0, T:0, P:2)
Prerequisites	NIL
Course Category	Programme core course-13

Course Objectives: -

1) To apply the knowledge of kinematic and dynamics of fluid flow. (K3)
2) To determine different parameters of pipe flow and open channel flow. (K4)
3) To learn estimation of hydrological parameters. (K1)
4) To estimate different parameters of an irrigational project. (K2)
5) To draw leveled sketch of different hydraulic structures. (K3)

Course Content:-

Number of class hours: 25

List of Practicals to be performed:

1) Use piezometer to measure pressure at a given point.
2) Use U tube differential manometer to measure pressure difference between two given points.
3) Use Reynold's apparatus to determine type of flow.
4) Use Bernoulli's apparatus to apply Bernoulli's theorem to get total energy line for a flow in a closed conduit of varying cross sections.
5) Use Pitot tube to measure the velocity of flow of water in open channel.
6) Determine minor losses in pipe fittings due to sudden contraction and sudden enlargement.
7) Calibrate the Orifice to find out the discharge through a tank.
8) Use rectangular and triangular notch to measure the discharge through open channel.
9) Determine the efficiency of centrifugal pump.
10) Calculate average rainfall for the given area using arithmetic mean method, Isohyetal method and Theissen polygon method.
11) Estimate crop water requirement for the given data.
12) Calculate reservoir capacity from the given data.
13) Draw a labeled sketch of the given masonry/earthen dam section
14) Draw the theoretical and practical profile of the given gravity dam section.
15) Draw a labeled sketch of the given diversion head works and Cross Drainage works.
16) Design a canal section for the given conditions with estimation of the quantity of material required for lining.

References: -

1) Modi, P. N. and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.
2) S. S. Rattan, Fluid Mechanics and Hydraulic Machines, Khanna Publishing House, Delhi
3) Ramamrutham, and Narayan, R., Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat Rai Publishing Company, New Delhi.
4) Khurmi,R S, Hydraulics, Fluid Mechanics, Hydraulic machines, S Chand Publishers, New Del- hi.
5) Rajput, R K, Fluid Mechanics, S Chand, New Delhi.
6) Punmia, B.C., Pande, B, Lal, Irrigation and water power engineering, Laxmi Publications
7) Subramanayan, Engineering Hydrology, McGraw Hill.
8) Sharma, R.K. and Sharma, T.K., Irrigation Engineering, S.Chand and Company
9) Basak, N.N., Irrigation Engineering, McGraw Hill Education India Pvt. Ltd.
10) Asawa, G.L., Irrigation and water resource Engineering, New Age International(P)
11) Garg, S K, Irrigation and Hydraulic structures, Khanna Publishers, Delhi.
12) Priyani V.B., Irrigation Engineering, Charotar Book Stall, Anand.

TRANSPORTATION ENGINEERING LAB

Course Code	CEPC-405
Course Title	Transportation Engineering Lab.
Number of Credits	1 (L:0, T:0, P:2)
Prerequisites	NIL
Course Category	Programme core course-14

Course Objectives: -

1) To identify the types of roads as per IRC recommendations.
2) To perform different tests on aggregates.
3) To perform different tests on bitumen.
4) To identify the components of railway tracks.
5) To prepare photographic report containing details of highway and railway track.

Course Content:-

Number of class hours: 25

List of Practicals to be performed:

1) Draw the sketches showing standard cross sections of Expressways, Freeways, NH/SH, MDR/ODR
2) Specific Gravity test of aggregates

3) Aggregate impact test
4) Aggregate crushing test
5) Los Angeles Abrasion test
6) Flakiness and Elongation Index of aggregates
7) Angularity Number of aggregates
8) Specific Gravity test of bitumen
9) Penetration test of bitumen
10) Softening point test of bitumen
11) Ductility test of Bitumen
12) Flash and Fire Point test of bitumen
13) Visit the road of any one type (flexible or rigid) to know the drainage condition and prepare a photographic report containing details of the road.
14) Visit to railway track for visual inspection of fixtures, fasteners and yards and prepare a photographic report containing details of the track.

References: -

1) L. R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., New Delhi (ISBN: 978-93-82609-858) Edition 2018
2) Khanna S. K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Broth- ers, Roorkee.
3) Arora, N. L., Transportation Engineering, Khanna Publishers, Delhi.
4) Saxena S C and Arora S P, A Textbook of Railway Engineering, Dhanpat Rai Publication.
5) Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg , Standard Book House, Delhi.
6) Sharma, S. K., Principles, Practice and Design of Highway Engineering,, S. Chand
7) Duggal, Ajay K. and Puri, V. P., Laboratory Manual in Highway Engineering, New Age International (P) Limited, Publishers, New Delhi.
8) Subramanian, K.P., Highway, Railway, Airport and Harbour Engineering, Scitech Publications, Hyderabad.

Building Planning and Drawing Lab.

Course Code	CEPC-406
Course Title	Building Planning and Drawing Lab.
Number of Credits	2 (L : 0, T : 0, P : 4)
Prerequisites	Nil
Course Category	PC

Course outcomes: After completing this course, student will be able to-

C.O.1: Interpret the symbols, signs and conventions from the given drawing. (K1)

C.O.2: Arrange line plans of residential single storey buildings using Load Bearing wall. (K2)

C.O.3: Prepare working drawing for the given requirement of Framed Structure Building. (K3)

C.O.4: Prepare working drawing for the given requirement of Public Buildings. (K3)

C.O.5: Illustrate two-point perspective drawing for given small objects. (K3)

Detail Course Content

Module – 1

No. of Lectures required: 10

Unit Learning Outcomes:

1. Identify the various symbol of building materials of given drawing.
2. Recognize the abbreviations as per IS 962 for water supply and electrical installations.
3. Summarize the technical details of one/two BHK drawing.

Contents:

Use Sketch Book

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).

Module – 2

No. of Lectures required: 10

Unit Learning Outcomes:

1. Outline and measure the existing building to suitable scale.
2. Relate the plan, foundation plan, elevation and section of a single storey load bearing residential building.
3. State the construction notes, area statement and site plan of a single storey load bearing residential building.

Contents:

Use Sketch Book

Measure the units of existing building (Load Bearing / Framed structure).

Draw line plan of measured existing building to the suitable scale.

Use Full Imperial Size Sheet (A1)

Draw submission drawing to the scale 1:100 of a single storey load bearing residential building (2BHK) with flat Roof and staircase showing:

a) Developed plan and elevation.
b) Section passing through Stair **or** W.C. and Bath
c) Foundation plan and schedule of openings.
d) Site plan (1:200), area statement, construction notes.

Module – 3

No. of Lectures required: 10

Unit Learning Outcomes:

1. Show the plan of Residential Bunglows and Apartment to suitable scale.
2. Prepare the plan, foundation plan, elevation and section passing through staircase, WC and bathroom of framed structure residential building.
3. Interpret the construction notes, area statement and site plan of framed structure residential building.

Contents:

Use Sketch Book

Draw line plan to suitable scale (Minimum 1BHK, staircase, WC and Bathroom)

a) Residential Bunglows (Minimum three plans)
b) Apartment (Minimum two plans)

Use Full Imperial Size Sheet (A1)

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

a) Developed plan.
b) Elevation.
c) Section passing through Staircase, WC and Bath.
d) Site plan (1:200) and area statement.
e) Schedule of openings and Construction Notes.

Draw working drawing for above mentioned drawing at serial number (B-2) showing:

a) Foundation plan to the scale 1:50
b) Detailed enlarged section of RCC column and footing with plinth filling.
c) Detailed enlarged section of RCC Beam, Lintel and Chajjas.
d) Detailed enlarged section of RCC staircase and slab.

Module – 4

No. of Lectures required: 10

Unit Learning Outcomes:

1. Illustrate the plans of various public buildings like school building, primary health building, post office, bank, hostel, restaurant, library, community hall etc.

2. Prepare the plan, foundation plan, elevation and section of various public buildings.

3. Write the construction notes, area statement and site plan of various public buildings.

Contents:

Use Sketch Book

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).

Use Full Imperial Size Sheet (A1)

Draw the above-mentioned drawing for the given requirement of Framed Structure.

a) Developed plan.
b) Elevation.
c) Section passing through Staircase, W.C. and Bath.
d) Foundation plan.
e) Site plan (1:200), area statement, Schedule of openings and construction notes.

Module – 5

No. of Lectures required: 10

Unit Learning Outcomes:

1. Schedule the two-point perspectives drawing of small objects.
2. Relate the plans for Framed Structure (One/Two BHK) buildings.
3. Prepare the plan, elevation, eye level, picture plane and vanishing points of framed structure building.

Contents:

Use Sketch Book

Draw the following plans for a Framed Structure (One/Two BHK) from given line plan.

a. Developed plan, Elevation
b. Section for above developed plan.
c. Site plan for above drawings including area statement, schedule of opening and construction notes.

Use Full Imperial Size Sheet (A1)

Draw two-point perspectives drawing of small objects - steps, monuments, pedestals (any one)scale 1:50

a) Draw plan, elevation, eye level, picture plane and vanishing points.
b) Draw perspective view.

Suggested Learning Resources:

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

Construction Management

Course Code	CEPE-407/A
Course Title	Construction Management
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

Course Outcomes: -Upon completion of the course the student will be able to:

1. Understand the contract management and associated labour laws. **(K2)**
2. Prepare and understand the nuances of executing the site layout**. (K3)**
3. Prepare networks and bar charts for the given construction project**. (K3)**
4. Understand the intricacies of disputes, related arbitration and settlement laws. **(K2)**
5. Apply safety measures at construction projects.**(K3)**

Course Content:-

Module- 1: Construction industry and management

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Describe the objectives principals and types of organisation
2) Settle disputes and the role of different personnel in construction organisation.
3) Prepare detailed project report.

Detailed content of the unit: -

- 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.

Module- 2: Site Layout

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain principles of governing site layout.
2) Prepare the site layout
3) Explain land acquisition procedures

Detailed content of the unit: -

- Principles governing site layout
- Factors affecting site layout
- Preparation of site layout
- Land acquisition procedures and providing compensation.

Module-3: Planning and scheduling

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Develop bar charts regarding construction activities
2) Explain elements of network, CPM network
3) Describe Material Management, Store management

Detailed content of the unit: -

- 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 andCost, 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)

Module-4: Construction Contracts and Specifications

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Illustrate types of construction contracts
2) Explain contract documents, specifications, general special conditions
3) Describe the procedures involved in arbitration and settlement

Detailed content of the unit:

- Types of Construction contracts
- Contract documents, specifications, general special conditions
- Contract Management, procedures involved in arbitration and settlement (Introduction only)

Module- 5: Safety in Construction

Number of class hours: 8-10 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain causes of accidents
2) Describe remedial and preventive measures of accidents
3) Apply the labour laws and acts pertaining to civil construction activities.

Detailed content of the unit: -

- Safety in Construction Industry—Causes of Accidents, Remedial and Preventive Measures.
- Labour Laws and Acts pertaining to Civil construction activities (Introduction only)

References: -

1. Sharma SC and Deodhar SV, Construction Engineering and Management, Khanna Book Publishing, NewDelhi
2. Gahlot, P.S. and Dhir, B.M Construction planning and management New Age International (P) Ltd. Publishers, New Delhi.
3. Khanna, O.P., Industrial Engineering and management, Dhanpat Rai New Delhi
4. Punmia, B.C. and Khandelwal, K.K., Project Planning and Controlling with PERT And CPM, Laxmi Publications (P)Ltd.
5. Sengupta, B., Guha H., Construction Management and Planning, Tata-Mc Graw Hill.
6. Harpal, Singh, Construction Management and accounts, Mc-Graw Hill.
7. Sharma, S.C., Industrial Engineering and Management, Khanna Publications, New Delhi
8. Construction Management, Eugenio Pellicer, Víctor Yepes, José C. Teixeira, Helder P. Moura, Joaquín Catalá ISBN: 978-1-118-53957-6 December 2013 Wiley-Blackwell 336 Pages

Rural Construction Technology

Course Code	CEPE-407/B
Course Title	Rural Construction Technology
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

Course Outcomes: -Upon completion of the course the student will be able to:

1) Plan low-cost housing using rural materials. **(K3)**
2) Make use of relevant government schemes for construction of roads and housing. **(K3)**
3) Use guidelines for rural road construction. **(K3)**
4) Implement different irrigation systems for rural areas. **(K3)**
5) Identify the need of watershed management in rural areas. **(K2)**

Course Content:-

Module- 1: Rural Development and Planning

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Describe various approaches to rural development planning
2) Explain the significance of rural development
3) Prepare rural development programmes,

Detailed content of the unit: -

- Scope; development plans; various approaches to rural development planning.
- Significance of rural development.
- Rural development programme/projects.

Module- 2: Rural Housing

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain low cost materials for housing construction
2) Apply different composite materials, roof treatment and biomass
2) Explain the objectives and different sources of renewal energy, and Bio gas.

Detailed content of the unit: -

- Low-cost construction material for housing
- Composite material- ferro-cement & fly ash, autoclaved calcium silicate bricks andsoil-stabilized un-burnt brick; Plinth protection of mud walls.
- Water-proof and fire-retardant roof treatment fort hatch roofs. Pre- cast stone masonry, rat- trap 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.

Module-3: Water Supply and Sanitation for Rural Areas

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Utilize BIS & WHO water standards
2) Describe quality, Storage and distribution for rural water supply works.
3) Explain conservation of water in rural areas
4) Construct low cost latrines and garbage disposal systems

Detailed content of the unit: -

- Sources of water: BIS & WHO water standards.
- Quality, Storage and distribution for rural water supply works.
- Hand pumps-types, installation, operation, and maintenance of handpumps.
- Conservation of water - rainwater harvesting, drainage in rural areas.
- Construction of low-cost latrines: Two pits pour flush water seal, septic tank etc.
- Low-cost community and individual Garbage disposal systems, Ferro- cement storage tanks.

Module-4: Low Cost Rural Roads

Number of class hours: 8-10 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Describe categories of Pavement layers.
2) Illustrate guidelines for surfacing rural road as per IRC codes
3) Explain the highlights of Pradhan Mantri Gram Sadak Yojna (PMGSY)-scheme.

Detailed content of the unit:

- 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.

Module- 5: Low Cost Irrigation

Number of class hours: 8-10 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1. Design tube well, drip & sprinkler irrigation system
2. Describe watershed and catchment area development
3. Explain different watershed management structures,

Detailed content of the unit: -

- Design consideration and construction of tube-well, drip & sprinkler irrigation systems.
- Water shed and catchment area development– problems and features of water shed management.
- Watershed management structures - K. T. weir, Gabian Structure, Cement Plug, Contour Bunding, Farm pond, Bandharasystem

References: -

1) Madhov Rao AG, and Ramachandra Murthy, DS, Appropriate Technologies forlow cost Housing Oxford and IBH Publishing Co. Pvt. Ltd.
2) CBRI, Roorkee, Advances in Building Materials and Constriction.
3) Desai, Vasant, Rural Development inIndia: Past, Present and Future: a Challen geinthe 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.
8) Eric Fleming, Construction Technology, Btechwell Publishing

Building Services and Maintenance

Course Code	CEPE-407/C
Course Title	Building Services and Maintenance
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

Course Outcomes: -Upon completion of the course the student will be able to:

1) Classify various types of building services as per functional requirements. **(K2)**
2) Propose the fire safety requirements for multistoried building. **(K3)**
3) Devise suitable water supply and sanitation system for given type of building. **(K3)**
4) Evaluate the potential of rain water harvesting and solar water heater system for the given type of building. **(K3)**
5) Justify the necessity of designing the system of lighting, ventilation and acoustics for the given type of building. **(K2)**

Course Content:-

Module- 1: Overview of Building Services

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Classify buildings as per National Building code.
2) Describe Role and responsibility of Building Service Engineer.
3) Explain role of BMS and concept of smart building.

Detailed content of the unit: -

- Introduction to building services, Classification of buildings as per National Building code, Necessity of building services, Functional requirements of building, Different types of building services i.e. HVAC(Heat, Ventilation and Air Conditioning),Escalators and lifts, fire safety, protection and control, plumbing services, rainwater harvesting, solar water heating system, lighting, acoustics, sound insulation and electricinstallation.
- Role and responsibility of Building Service Engineer, Introduction to BMS (Building Management Services), Role of BMS, concept of smart building.

Module- 2: Modes of vertical communication

Number of class hours: 8-10 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain objectives and modes of vertical communication in building
2) Describe the design provisions for basic size calculation of spaceto accommodate lift services, safety measures.
3) Illustrate Escalators and ramp.

Detailed content of the unit: -

- Objectives and modes of vertical communication inbuilding.
- Lifts**:** Different types of lifts and its uses, Component parts of Lift- Lift Well, Travel, Pit, Hoist Way, Machine, Buffer, Door Locks, Suspended Rope, Lift Car, Landing Door, Call Indicators, Call Push etc., Design provisions for basic size calculation of space enclosure to accommodate lift services, Safety measures.
- Escalators**:** Different Types of Escalators and its Uses, Components of escalators, Design provisions for basic size calculation of space enclosure to accommodate escalator services, Safety measures.
- Ramp: Necessity, design consideration, gradient calculation, layout and Special features required for physically handicapped and elderly.

Module-3: Fire Safety

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain fire protection systems.
2) Explain causes and requirements of fire protection.
3) Describe National Building code provision for fire safety

Detailed content of the unit: -

- Fire protection requirements for multi-storeyed building, causes of fire in building, Fire detecting and various extinguishing systems, Working principles of various fire protection systems.
- Safety against fire in residential and public buildings (multi-storeyed building), National Building Code provision for fire safety, Fire resisting materials and their properties, Fire resistant construction, procedures for carrying out fire safety inspections of existing buildings, Provisions for evacuation.

Module-4: Plumbing Services

Number of class hours: 6-8 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1) Explain plumbing and its types.
2) Describe system of plumbing like storage of water, hot and cold water supply system.
3) Describe different types of drainage system.
4) Explain different materials used in plumbing

Detailed content of the unit:

- Importance of plumbing, AHJ (Authority Having Jurisdiction) approval, Plumbing Terminology and fixtures: Terms used in plumbing, Different types of plumbing fixtures, shapes/ sizes, capacities, situation and usage, Traps, Interceptors.
- System of plumbing for building water supply: storage of water, hot and cold water supply system.
- System of plumbing for building drainage: Types of drainage system such as two pipe system, one pipe system, types of Vents and purpose of venting, Concept of grey water and reclaimed water.
- Different pipe materials, and jointing methods, fittings, hanger, supports and valves used in plumbing and their suitability.

Module- 5: Lighting, Ventilation and Acoustics

Number of class hours: 8-10 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

1.Describe the concepts of solar water heating.
2.Explain the concepts of lighting and ventilation3.
Describe acoustic control in a building.

Detailed content of the unit: -

Concept of SWH (Solar water heating), component parts of SWH, various system of SWH (heat transfer, propulsion, passive direct system, active direct system, Do-it-yourself), installation and maintenance.

- Concept of lighting, types of lighting (natural and artificial), factorsinfluencing the brightness of room, factors affecting selection ofartificial lighting, installation of light (direct, half-direct, indirect, half-indirect and direct-indirect), types of light control (manual switch, remoteswitch, timer switch and photo-electric cell switch), types oflamps (incandescent, tungsten halogen and electric discharge), Lamp selection as per room sizes.
- Concept of ventilation, necessity and Types of ventilation.
- Building Acoustic, Objectives, acoustic Control in a building, acousticmaterial (porous absorber and cavity resonator)

References: -

1. Patil, S. M., Building Services, Seema Publication, Mumbai.
2. Mantri and Sandeep., The AtoZ of Practical Building Construction and its Man agement, Satya Prakashan, New Delhi**.**
3. Bag S P, Fire Services in India: History, Detection, Protection, Management, Mittal Publications, New Delhi.
4. Deolalikar, S. G., Plumbing Design and Practice, McGraw-Hill,
5. Akhil Kumar Das., Principles of Fire Safety Engineering: Understanding Fire and Fire Protection, PHI Learning Pvt. Ltd, New Delhi.
6. Shraman N L, Solar panel installation guide & user manual**,** The Memory Guru of India.
7. Gupta M K, Practical handbook on building maintenance - Civil works,Nabhi Publications.
8. BIS., National Building Code Part1, 4, 8, 9., Bureau of Indian Standard, New Delhi
9. BIS., IS 12183(Part 1):1987 Code of practice for plumbing in multistoried buildings., Bureau of Indian Standard, New Delhi
10. BIS., 2008 Uniform plumbing code – India (UPC-I)., Bureau of Indian Standard

Professional Skill Development

Course Code	:	HS 408
Course Title	:	Professional Skill Development (Theory)
Number of Credits	:	3 (L: 2, T: 1, P:0)
Prerequisites	:	NIL
Course Category	:	HS

Course Outcomes:

After successful completion of this course, students would be able to:

CO1: Understand the importance of soft skills and personality in a person's career growth. K2

CO2: Communicate uprightly while looking for a job. K3

CO3: Learn and utilize the key skills while facing job interview. K2 & K3

CO4: Demonstrate effective writing skills for professional excellence. K2

CO5: Explore ways to make oral communications interesting and captivating. K3

Module – 1 Soft Skills & Personality Development

Number of Class Hours: 06-08

Learning Outcomes:

1) Get acquainted with the details of soft skills and the importance of personality K1
2) Understand the importance of communication skills in developing one's personality. K2
3) Understand the importance of soft skills and personality in a person's career growth K2

Detailed Content:

1. **Soft skills - Demand of Every Employer:** How soft skills complement hard skills, Soft skills as competitive weapon, Classification of soft skills into personal and interpersonal traits, Soft skills needed for career growth- Time management, Leadership traits, Communication and networking skills, Teamwork and Interpersonal skills, Empathy and Listening skills, Responsibility, Attitude, Ethics, Integrity, Values and Trust.

2. **Personality Development – A must for career Growth:** Grooming one's personality asa signal that others read, mapping different personality types – Perfectionists, Helpers, Achievers, Romantics, Observers, Questioners, Enthusiasts or adventurers, Bosses or asserters, Mediators or peacemakers.

Module– 2 Looking for a Job

Number of Class Hours: 05-08

Learning Outcomes:

1) Learn to write Job Applications, Cover Letter, Resume, Curriculum Vitae, bio data K2

2) Develop interpersonal skills/ soft skills through Group Discussion. K3

Detailed Content

1. Job Application : Job Application Letters in response to advertisements, Self-application letters for Jobs
2. Curriculum Vitae/Resume: Formats of Resume and CV for a fresher and for someone with experience, Differences between Resume, CV, Bio-data, and choice of referees.
3. Group Discussion : A test of soft skills

Module – 3 Job Interviews

Number of Class Hours: 05-08

Learning Outcomes:

1) Understand the importance of Job interviews in the selection procedure K2
2) Comprehend and Adapt to various types, stages and processes of job interviews K1&K3
3) Demonstrate appropriate body language in interviews K3

Detailed Content

1. Job Interviews: Definition, processes of Interviews, Types of Interviews
2. Stages in Job interviews: Before interview stage, On D' Day, After interview stage.
3. Importance of Body language in Interviews: : Facing an interview, Using proper verbaland non- verbal cues, the perfect handshake ,Exhibiting confidence, the business etiquettes to maintain, body language ,and dress code - what to speak, how to speak in an interview and answer interview questions, negative body language, handling an awkward situation in an interview.
4. Probable interview questions and answers.
5. Mock interviews to be conducted by mock interview boards.

Module – 4 Enhancing Writing skills

Number of Class Hours: 12

Learning Outcomes:

1) Write dialogues on given topics / situations K3
2) Express facts & ideas effectively in written form K3
3) Learn to write formal and informal letters & emails. K2

Detailed Content

1) **Art of Condensation**: Principles to increase clarity of written communication.
2) **Dialogue Writing:** Meeting and Parting, Introducing and Influencing, Requests, Agreeing and Disagreeing, Inquiries and Information.
3) **Letter Writing:** Placing an order, Letter to Inquiry, Letter of Complaint, Letter seeking permission.
4) **E- mail writing**: writing the perfect e-mail, steps to the perfect e-mail, formal and informal greetings, requests through an e-mail, writing an apology, complaint and seeking help and information in an e-mail, informing about a file attached in an email, writing the formal ending of an e-mail.

Module – 5 Conversations, Panel Discussion and Public Speaking

Number of Class Hours: 12

Learning Outcomes:

1. Speak persuasively on a given topic fluently and clearly. K3
2. Participate in formal and informal conversations. K3
3. Express ideas and views on given topics. K3

Detailed Content

1) Conversation & Dialogue Practice:

a) Introducing oneself
b) Introduction about family
c) Discussion about the weather
d) Seeking Permission to do something
e) Seeking Information at Railway Station/ Airport
f) Taking Appointments from superiors and industry personnel
g) Conversation with the Cashier- College/ bank
h) Discussing holiday plans
i) Asking about products in a shopping mall
j) Talking over the Telephone

2) **Panel Discussion:** Act of a moderator - ways to respond to audience questions.
Suggested topics: Current Affairs

3) **Public Speaking**: Art of Persuasion, making speeches interesting, Delivering different types of speeches: Ceremonial, Demonstrative, Informative, Persuasive.

List of Software/Learning Websites

1. http://www.free-english-study.com/
2. http://www.english-online.org.uk/course.htm
3. http://www.english-online.org.uk/
4. http://www.talkenglish.com/
5. http://www.learnenglish.de/

Reference Books:

(Name of Authors/ Title of the Book /Edition /Name of the Publisher)

1) Sanjay Kumar & Pushp Lata Communications Skills, 2nd Edition, Oxford University Press
2) Meenakshi Raman & Sangeeta Sharma Technical Communication: Principles & Practice Oxford University Press
3) M. Raman & S. Sharma Technical Communication Oxford University Press
4) Barun Kumar Mitra, Personality Development and Soft Skills Oxford University Press

Minor Project

Course Code	CEPR-409
Course Title	Minor Project
Number of Credits	2 (L: 0, T: 0, P: 4)
Prerequisites	Nil
Course Category	Project Work (PR)

Course Outcome:-

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

C.O.1: Demonstrate a through and systematic understanding of project contents (K2).

C.O. 2: Identify the methodologies and professional way of documentation and communication (K3).

C.O. 3: Illustrate the key stages in development of the project (K2).

C.O. 4: Develop the skill of working in a Team (K3).

C.O. 5: Apply the idea of mini project for developing systematic work plan in major project(K3).

Course Content:-

The minor project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The course should have the following-

1) Perform detailed study about various components of a project.
2) Study about methodologies and professional way of documentation and communication related to project work.
3) Develop idea about problem formulation.
4) Knowledge of how to organize, scope, plan, do and act within a project thesis.
5) Familiarity with specific tools (i.e. hardware equipment and software) relevant to the project selected.
6) Demonstrate the implementation of a minor project work.

Essence of Indian Knowledge and Tradition

Course Code	AU 410
Course Title	Essence of Indian Knowledge and Tradition
Number of Credits	0
Prerequisites	NA
Course Category	Audit

Course Outcomes: -

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

CO 1: Understand the essence of Indian tradition and the importance of carrying them forward. (**K_2**)
CO 2: Understand the Vedic literature and important ideas discussed in the Vedas. (**K_2**)
CO 3: Describe scientific heritage of ancient India along with comprehending its relevance and application in various modern scientific disciplines. (**K_1**)
CO 4: Relate the theoretical and practical sides of the science of Yoga and Aurveda with modern knowledge systems. (**K_1**)
CO 5: Explain the worth of Indian intellectual heritage, traditional practices and Indian lifestyle from scientific lenses. (**K**

Module- 1

Name of the Module: Introduction to Vedic Literature

Number of class hours: **05**

Content:

- General structure of Vedic Literature,
- Different theories on the age of the Vedas,
- Educational system in the Vedic times
- subject-matter of Ṛgveda-samhitā, *Sāmaveda -Saṁhitā, Yajurveda-Saṁhitā, Atharvaveda-Saṁhitā, Brāhmaṇa* and *Āraṇyaka* literature, Upaveda

Learning outcomes of the Module

1	Describe the Vedic literature (K1)
2	Outline the heritage of ancient India specially the scientific knowledge that is embedded in the Vedas will be shown through this module (K2)

Module- 2

Name of the Unit: Fundamental doctrines of the *Upaniṣad*s

Number of class hours:**05**

Content:

- General introduction of Upaniṣadic literature
- Philosophical ideas and ethics in Upaniṣadas

Learning outcomes of the Module

1.	Understand Upaniṣads and its significance as the perennial source Indian philosophy (K2)
2.	Explain the scientific temperament, knowledge and methods of scientific enquiry that is embedded in the Upaniṣadas (K2)

Module- 3

Name of the Unit: *Vedāṅga*s, Purāṇas and Dharmaśāstra Literature

Number of class hours: **05**

Content:

- Introduction to Vedāṅga Literature
- History of Sanskrit Grammar
- An Overview of Purāṇic literature
- History of Dharmaśāstra

Learning outcomes of the Module

1.	Describe various scientific and academic disciplines of ancient India along with scientific knowledge that is rooted in the Puranic literature (K1)
2.	Remember ancient system of Law and Governance in a nutshell especially the principles and philosophy behind the ancient constitutions (K1)

Module- 4

Name of the Module: Introduction to Indian Philosophical Systems, Scientific aspects of Indian knowledge systems

Number of class hours:**05**

Content:

- General introduction to Indian Philosophical systems, i.e. Orthodox and Heterodox
- Glimpse of ancient Indian Science and technology.

Learning outcomes of the Module

1.	Describe the Indian Philosophical systems and their relevance and application in modern scientific enquiry (K1)
2.	Remember the various scientific methods, means and validity of knowledge as discussed in these systems, methods of discussion, debate and systemic learning as structured in ancient Indian knowledge literature (K1)

Module- 5

Name of the Unit: Introduction to Yoga & Āyurveda

Number of class hours:**05**

Content:

- General ideas about Yoga,
- Origin and Development of Pātañjala Yoga,
- Origin and Development of Āyurveda and its relevance

Learning outcomes of the Module

1.	Understand about principles and philosophy of Yogic sciences and Āyurveda. (K2)
2.	Identify various ancient texts, practices of Yoga and Āyurveda along with gaining basic practical and theoretical knowledge which they will be able to relate with modern healthcare systems (K4)

References: -

1) Capra, Fritjof. *The Tao of Phisics*. New York: Harpercollins, 2007.
2) Capra, Fritjof. *The Web of Life*. London: Harpar Collins Publishers, 1996.
3) Dasgupta, Surendranath & De, Sushil Kumar. *A History of Sanskrit Literature.* Delhi: Motilal Banarsidass, 2017.
4) Dasgupta, Surendranath. *A History of Indian Philosophy*. Delhi: Motilal Banarsidass, 1991.
5) Gonda, Jan. *A History of Vedic Literature*. Delhi: Monohar Publishers and Distributors, 2020.
6) Jha, R.N. *Science and Consciousness Psychotherapy and Yoga Practices*. Delhi: Vidyanidhi Prakashan, 2016.
7) Kane. P.V. *History of Dharmasastra*, Poona: Bhandarkar Oriental Research Institute, 1930.
8) Max Muller. *Ancient Sanskrit Literature*, London: Spottiswoode and Co., 1859.
9) *Pride of India*,New Delhi: Samskrita Bharati, 2006.
10) Shastri, Gourinath. *A History of Vedic Literature*, Kolkata: Sanskrit Pustak Bhandar, 2006.
11) Sinha, Jadunath. *Indian Philosophy*. Delhi: Motilal Banarsidass,1938.
12) Wujastiyk, Dominik. *The Roots of Ayurveda*. India: Penguin India, 2000.