Architectural Assistantship

(AR)

(III to VI Semester)

Semester III

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact hrs / week	Credits
				L	T	P		
Theory Subjects								
1.	Program core course	ARPC301	History of Architecture	2	0	0	2	2
2.	Program core course	ARPC302	Vernacular architecture	**2**	1	0	3	3
3.	Program core course	ARPC303	Basic design and visual art	0	0	2	2	1
4.	Program core course	ARPC304	Architectural graphics and drawing-I	0	0	2	2	1
5.	Program core course	CEPC-301	Building Materials and Construction	3	0	0	3	3
6.	Program core course	CEPC-302	Surveying	3	0	0	3	3
7.	Program core course	CEPC-304	Mechanics of Materials & Theory of Structure	3	0	0	3	3
8.	Program core course	CEPC-306	Construction Materials & Mechanics of Materials Lab.	0	0	2	2	1
9.	Program core course	CEPC-307	Surveying Lab.	0	0	2	2	1
10.	Summer Internship-I (3 to 4 weeks) after IInd Semester	CESI-310	Summer Internship-I	0	0	0	0	2
	Total Credits							**20**

Semester IV

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact hrs / week	Credits
				L	T	P		
Theory Subjects								
1.	Program core course	ARPC401	Climatology	2	0	0	2	2
2.	Program core course	ARPC402	Building services	2	0	0	2	2
3.	Program core course	ARPC403	Interior design	2	0	0	2	2
4.	Program core course	ARPC404	Architectural workshop	0	0	4	4	2
5.	Program core course	ARPC405	Architectural design-I and CAD	0	0	4	4	2
6.	Program core course	ARPC406	Working Drawing-I	0	0	4	4	2
7.	Program Elective course- I (Any one to be selected)	ARPE407/A	Landscape architecture	3	0	0	3	3
		ARPE407/B	Eco cities	3	0	0	3	
		CEPE407/A	Construction Management	3	0	0	3	
8.	Humanities & Social Science-4	HS-408	Professional Skill Development	2	1	0	3	3
9.	Minor Project	ARPR-409	Minor Project	0	0	4	4	2
10.	Mandatory Course	AU-410	Essence of Indian knowledge and tradition	2	0	0	2	0
	Total Credits							**20**

Semester V

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact hrs / week	Credits
				L	T	P		
Theory Subjects								
1.	Program core course	ARPC501	Advance building services(MEP)	3	0	0	3	3
2.	Program core course	ARPC502	Green Building Technology	2	0	0	2	2
3.	Program core course	ARPC503	Architectural Workshop-II	0	0	2	2	1
4.	Program core course	ARPC504	Interior design & drawing	0	0	2	2	1
5.	Program core course	CEPC501	Design of RCC and Steel Structure	3	0	0	3	3
6.	Program Elective course-II (any one to be selected)	CEPC502	Estimating, Costing and valuation	3	0	0	3	3
		ARPE 506/A	Applied arts	3	0	0		
		ARPE 506/B	Site planning and landscape design	3	0	0		
7.	Program Elective course -III(any one to be selected)	ARPE507/A	Building maintenance	2	0	0	2	2
		ARPE507/B	Sustainable architecture	2	0	0	2	
		CEPE506/B	Solid waste management	2	0	0	2	
8.	Open Elective course-I	(Any one to be selected from Annexure-I)		3	0	0	3	3
				3	0	0	3	
				3	0	0	3	
9.	Summer Internship-II (6 weeks) after IVth Semester	ARSI509		0	0	0	0	3
10	Major Project I	ARPR510		0	0	2	2	1
	Total Credits							**22**

Semester VI

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact hrs / week	Credits
				L	T	P		
Theory Subjects								
1.	Program core course	ARPE601	Building by laws & regulations	2	0	0	2	2
2.	Program core course	ARPE602	Town planning	3	0	0	3	3
3.	Program core course	ARPC603	BIM	0	0	2	2	1
4.	Humanities and Social Science course-5	HS604	Entrepreneurship and Start-ups	3	1	0	4	4
5.	Open Elective course-II	(Any one to be selected from Annexure-II)		3	0	0	3	3
				3	0	0	3	
				3	0	0	3	
6.	Professional Elective course-IV(any one to be selected)	CEPE-603/C	Advanced Design of Structures	3	0	0	3	3
		ARPE 606/A	Housing	3	0	0	3	
		ARPE 606/B	Professional Practice	3	0	0	3	
7.	Mandatory Course	AU606	Indian Constitution	2	0	0	2	0
Lab. / Seminar / Project								
8.	Architectural Project II	ARPR607		0	0	6	6	3
9.	Arch Seminar	ARSE608		1	0	0	1	1
	Total Credits							**20**

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DETAILED SYLLABUS

Semester III

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact hrs / week	Credits
				L	T	P		
Theory Subjects								
1.	Program core course	ARPC301	History of Architecture	2	0	0	2	2
2.	Program core course	ARPC302	Vernacular architecture	**2**	1	0	3	3
3.	Program core course	ARPC303	Basic design and visual art	0	0	2	2	1
4.	Program core course	ARPC304	Architectural graphics and drawing-I	0	0	2	2	1
5.	Program core course	ARPC305 (CEPC-301)	Building Materials and Construction	3	0	0	3	3
6.	Program core course	ARPC306 (CEPC-302)	Surveying	3	0	0	3	3
7.	Program core course	ARPC307 (CEPC-304)	Mechanics of Materials & Theory of Structure	3	0	0	3	3
8.	Program core course	ARPC308 (CEPC-306)	Construction Materials & Mechanics of Materials Lab.	0	0	2	2	1
9.	Program core course	ARPC 309 (CEPC-307)	Surveying Lab.	0	0	2	2	1
10.	Summer Internship-I (3 to 4 weeks) after IInd Semester	ARSI-310	Summer Internship-I	0	0	0	0	2
	Total Credits							**20**

HISTORY OF ARCHITECTURE

Course code	ARPC301
Course title	History of Architecture
Number of Credits	2(L:2, T:0, P:0)
Prerequisites	Nil
Course Category	Program Core

Course outcomes:

After completing this course, student will be able to:

- CO-1: Identify the evolution of architecture from prehistoric period (K1)
- CO-2: Discuss the major influential factors for architectural development (K2)
- CO-3: Apply the specific architectural styles from appropriate religious background (K3)
- CO-4: Classify the primary construction technologies developed during early days (K2)
- CO-5: Identify various types of ornamentation and built forms in architectural design. (K3)

Detailed Course Content:

Module-1

Number of class hours: 8

Learning Outcomes:

1. Identify the primitive architecture(K1)
2. Express the elements of planning of ancient time.(K2)
3. Discover the initial stages of Architectural development in ancient India.(K3)

Detailed content of the unit:

1.1 Primitive Architecture; Primitive people, shelters, settlements, burial systems.
1.2 Megaliths and memorials.
1.3 Introduction to ancient architecture of Egypt and Indus Valley civilization.

Module 2:-

Number of class hours: 8

Learning Outcomes:

1. Identify the philosophies and forms of Buddhist and Islamic Architecture.(K1)
2. Apply the unique characteristics of rock-cut architecture.(K2)

Detailed content of the unit:

2.1 Outline of Buddhist architecture, Rock-cut and free standing.
2.2 Study of caves, stupas, and viharas. Introduction to Indo-Islamic Architecture.
2.3 Development of basic mosque and tomb prototypes; Mughal Architecture.

Module 3:-

Number of class hours: 8

Learning Outcomes:

1. Identify the regional concepts of temple architecture. (K1)
2. Choose the techniques and usage of appropriate materials in construction (K3)

Detailed content of the unit:

3.1 Study of chronological development of Hindu architecture
3.2 Early examples of monolithic and rock-cut architecture.
3.3 Classification of Hindu Temples; Characteristic features of Indian temple architecture for form, plan, *shikhara*, pillars, decoration, sculpture, master-planning etc.

Module 4:-
Number of class hours: 8

Learning Outcomes:
1) Identify the western classical and early Christian architecture.(K1)
2) Describe the gradual developments of techniques and building materials.(K2)

Detailed content of the unit:
4.1 Evolution of Classical European Architecture; Introduction to architecture and planning of ancient Greece and Rome.
4.2 Types of buildings built during Greco-roman period
4.3 Evolution of church form, building typologies, and building elements; characteristic features of Byzantine and Gothic architecture.

Module 5:-

Number of class hours: 8

Learning Outcomes:
1. Identify the contemporary design philosophies of great architects.(K1)
2. Discuss the features of modern Cities and their Architecture.(K3)
3. Apply the foreign contribution on Indian architecture.(K2)

Detailed content of the unit:
5.1 Post-Independence architecture and city planning examples.
5.2 Contribution of great architects in the development of modern India.
5.3 Colonial architecture in Indian subcontinent.

References:

- Banister Fletcher, History of Architecture
- G. K. Hiraskar, The Great ages of World Architecture
- Percy Brown, Indian Architecture (Buddhist and Hindu period)
- Brown Percy, Indian Architecture (Islamic Period).
- Satish Grover, The Architecture of India (Buddhist and Hindu period)
- Satish Grover, The Architecture of India (Islamic)
- Nath – History of Mughal Architecture

VERNACULAR ARCHITECTURE

Course code	ARPC302
Course title	Vernacular Architecture
Number of Credits	3(L:2, T:1, P:0)
Prerequisites	Nil
Course Category	Program Core

Course outcomes:

After completing this course, student will be able to:

CO-1: Recognize the grass root principles of indigenous architecture (K1)
CO-2: Classify the various vernacular building material (K2)
CO-3: Classify, ecologically sensitive and culturally relevant building (K2)
CO-4: Relate the different traditional built form, dwelling typologies of NE region (K1)
CO-5: Relate the knowledge of Sustainable Architecture that can be reinforced with the knowledge of Vernacular Architecture. (K1)

Module 1:-

Number of class hours: 8

Learning Outcomes:

1. Identify the native architecture of a place(K1)
2. Outline the influence of climate over the human lifestyle of a place (K1)

Detailed content of the unit:

1.1 Introduction to Vernacular Architecture Definitions and theories, Categories
1.2 Contextual responsiveness: Climatic, Geographical, Anthropological and Cultural influences

Module 2

Number of class hours: 8

Learning Outcomes:

1) Identify the various material used for construction.(K1)
2) Describe the different built forms appropriate in different climatic conditions(K2)
3) Explain the various construction techniques of different climatic zones.(K2)

Detailed content of the unit:

2.1 Environment and Materials: Classify the building materials

2.2 Illustration of various Built form & elements

2.3 Construction techniques.

Module 3:-

Number of class hours: 8

Learning Outcomes:

1) Describe various built form related to tribal architecture (K2)
2) Identify the different settlement pattern and different dwelling typologies(K1)

Detailed content of the unit:

3.1 Illustrate the regional Variations in Built Form: Tribal Architecture Settlement Pattern

3.2 Dwelling Typology, Symbolism, Typical features, Construction materials and techniques

Module 4:-

Number of class hours: 8

Learning Outcomes:

1) Describe to dwelling typologies and construction material and techniques of vernacular architecture
2) Identify the vernacular architecture of the region.
3) Identify the various material related to vernacular architecture

Detailed content of the unit:

4.1 Describe the various regional Variations in Built Form: Traditional Architecture Settlement Pattern, Dwelling Typology, Symbolism, Typical features

4.2 Construction materials and techniques.

4.3 Discuss any one type of vernacular architecture of NE region

Module 5:-

Number of class hours: 8

Learning Outcomes:

1) Identify Sustainable building material in contemporary architecture.(K1)
2) Identify the existing work of famous architects with relevant to vernacular field.(K1)

Detailed content of the unit:

5.1 Contemporary Architecture : Adaptations in Sustainable building materials and construction techniques

5.2 Discuss Works of Laurie Baker, Hasan Fathy , Anil Laul, Building Centres- Auroville,

References:

1. Brunskill, R. W. (1987). Illustrated Handbook of Vernacular Architecture. Castle Rock
2. Carmen, K. (1986). VISTARA – The Architecture of India
3Traditional buildings of India. London : Thames & Hudson.
4. Jain, K. and Jain, Mud Architecture of the Indian Desert. Ahmadabad : Aadi Centre.
5. Kenneth, F. Towards a Critical Regionalism: Six points for an architecture of resistance,
6. Muthiah, S., Meyappan, M., Ramswamy, V. and Muthuraman, The Chettiar Heritage.
Chennai : Chettiar Heritage.
7. Encyclopedia of Vernacular Architecture of the World. Cambridge :
8. Haveli-Wooden Houses and Mansions of Gujarat, Ahmadabad : Mapin Publishing.
9). House, Form & Culture. Eaglewood : Prentice Hall Inc.
10. The tradition of Indian Architecture Oxford University Press.

BASIC DESIGN AND VISUAL ART

Course Code	ARPC-303
Course Title	Basic design and visual art
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Nil
Course Category	Program Core

Expected Course outcome: By the end of the course, the students are expected

CO-1: Demonstrate a thorough and systematic understanding various object
CO-2: Identify the line wave line and various geometric object
CO-3: Illustrate the key stages in development of the project (K2).
CO- 4: Develop the skill of working as a single student (K3).
CO- 5: Apply the idea of visual object convert in scale drawing (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, which was used in engineering drawing

1) Perform detailed study about various scales of a project.
2) Study about methodologies and professional way of dimension
3) Develop idea about problem dimension
4) Knowledge of how to draw plan, section and 3D object on scale
5) Demonstrate the implementation of basic design and visual Ar**t**

ARCHITECTURAL GRAPHICS & DRAWING-I

Course Code	ARPC-304
Course Title	Architectural Graphics & drawing-I
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Nil
Course Category	Program Core

Course outcome: By the end of the course, the students are expected to

CO-1. Describe the accurate measurement from the point of view of Architecture. (k1)
CO-2 Identify a proper vision to see everything in nature orderly. (k1)
CO-3 Learn to express by looking at anything. (k2)
CO-4 Draw Architectural Presentation and Rendering (K2)

CO-5 Sketch landscape elements, Vehicles & Furnitures, Human Figures & Interior space(K4)

Course Content: -

Introduction

Free hand Indoor Sketching & outdoor Sketching.

Study of elements of Drawing: Point, Line, Plane, Shape, Form, Space, Texture etc.

Study of Principles of Drawing: Balance, Rhythm, Monotony, Harmony, Contrast, Scale, Proportion. Developing Sense of Proportion.

Elements and principles of perspective drawing: Introduction to basic terms used in making perspective like Picture plane, Vanishing points, Station Point, Horizon line & Ground line. **Various types of perspectives:** One point perspective Two-point perspective Multipoint perspective

Architectural presentation & rendering of Landscape elements, Vehicles & Furnitures, Human Figures & Interior space.

Reference:

- Architecture: A Visual History by Jonathan Glancey. ...
- Architecture: Form, Space, and Order by Francis D.K. ...
- The Architecture Reference & Specification Book: Everything Architects Need To Know Every Day by Julia McMorrough.

BUILDING MATERIALS AND CONSTRUCTION

Course Code	ARPC305 (CEPC301)
Course Title	Building material and construction
Number of Credits	3 (L:3, T: 0, P: 0)
Prerequisites	NIL
Course Category	Program Core Course

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

- Identify relevant construction materials. **(K2)**
- Identify relevant natural artificial construction materials. **(K2)**
- Select relevant special and processed types of construction materials. **(K3)**
- Identify components of building structures. **(K2)**
- Prepare suitable type of foundation and suitable type of masonry for building

structures. **(K3)**

Course Content:-

Module- 1: Overview of Construction Materials

Number of class hours: 2-3 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Describe the scope of construction materials (K1)
2) Select materials for different civil engineering structures (K2)
3) Classify broadly the building construction materials(K3).

Detailed content of the unit: -

- Scope of construction materials in Building Construction, Transportation Engineering, Environmental Engineering, Irrigation Engineering (applications only).
- Selection of materials for different civil engineering structures on the basis of strength, durability, Eco friendly and economy.
- Broad classification of materials –, Natural, Artificial, special, finishing and recycled.

Module- 2: Natural and Artificial Construction Materials

Number of class hours: 4-5 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Explain utilization of stone, timber, asphalt and bitumen etc(K2).
2) Describe soil suitability, use of bricks and flooring tiles(K1).
3) Illustrate the manufacturing process of cement(K3).

Detailed content of the unit: -

- Requirements of good building stone; general characteristics of stone; quarrying and dressing methods and tools for stone.
- Structure of timber, general properties and uses of good timber, different methods of seasoning for preservation of timber, defects in timber, use of bamboo in construction.
- Asphalt, bitumen and tar used in construction, properties and uses, Properties of lime, its types and uses.
- Types of soil and its suitability in construction., Properties of sand and uses, Classification of coarse aggregate according to size
- Constituents of brick earth, Conventional / Traditional bricks, Modular and Standard bricks, Special bricks –fly ash bricks, Characteristics of good brick, Field tests on Bricks, Classification of burnt clay bricks and their suitability, Manufacturing process of burnt clay brick, fly ash bricks, Aerated concrete blocks.
- Flooring tiles – Types, uses
- Manufacturing process of Cement - dry and wet (only flow chart), types of cement and its uses. field tests on cement.

Module-3: Special and Processed Construction Materials

Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Explain suitability of Water proofing, Termite proofing; Thermal and sound insulating materials.(K2)
2) Describe fibers, Geopolymer cement and Plaster of Paris(K1)
3) Explain Industrial and Agro waste materials, Special processed construction materials(K2)

Detailed content of the unit: -

- Types of material and suitability in construction works of following materials: Water proofing, Termite proofing; Thermal and sound insulating materials.
- Fibers – Types –Jute, Glass, Plastic Asbestos Fibers, (only uses).
- Geopolymer cement: Geo-cement: properties, uses.
- Constituents and uses of POP (Plaster of Paris), POP finishing boards, sizes and uses.
- Industrial waste materials- Fly ash, Blast furnace slag, Granite and marble polishing waste and their uses.
- Agro waste materials - Rice husk, Bagasse, coir fibres and their uses.
- Special processed construction materials; Geo-synthetic, Ferro Crete, Artificial timber, Artificial sand and their uses.

Module-4: Overview of Building Components

Number of class hours: 2-3 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Classify buildings as per NBC(K3)
2) Explain different building components (K2)
3) Describe Superstructure(K1)

Detailed content of the unit:

- Classification of Buildings as per National Building Code Group A to I, As per Types of Constructions- Load Bearing Structure, Framed Structure, Composite Structure.
- Building Components - Functions of Building Components, Substructure – Foundation, Plinth.
- Superstructure – Walls, Partition wall, Cavity wall, Sill, Lintel, Doors and Windows,floor, Mezzanine floor, Roof, Columns, Beams, Parapet

Module- 5: Construction of Substructure and superstructure

Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Identify proper job layout(K1)
2) Describe earthwork, different foundation types.(K1)
3) Explain use of Stone and brick masonry.(K2)

4) Illustrate Scaffolding and Shoring(K3)

Detailed content of the unit: -

- Job Layout: Site Clearance, Layout for Load Bearing Structure and Framed Structure by Center Line and Face Line Method, Precautions.
- Earthwork: Excavation for Foundation, Timbering and Strutting, Earthwork for embankment, Material for plinth Filling, Tools and plants used for earthwork.
- Foundation: Functions of foundation, Types of foundation, Pumping Methods of Dewatering, Deep wells, Well points, Cofferdams (Introduction only).
- **Stone Masonry:** Terms used in stone masonry- facing, backing, hearting, Through stone, corner stone, cornice. Types of stone masonry, Joints in stone masonry and their purpose. Selection of Stone Masonry, Precautions to be taken in Stone Masonry Construction.
- **Brick masonry:** Terms used in brick masonry- header, stretcher, closer, quoins, course, face, back, hearting, bat bond, joints, lap, frog line, level and plumb. Bonds in brick masonry- header bond, stretcher bond, English bond and Flemish bond. Requirements of good brick masonry. Junctions in brick masonry and their purpose and procedure. Precautions to be observed in Brick Masonry Construction. Comparison between stone and Brick Mason- ry. Tools and plants required for construction of stone and brick masonry. Hollow concrete block masonry and composite masonry.
- **Scaffolding and Shoring:** Purpose, Types of Scaffolding, Process of Erection and Dismantling. Purpose and Types of Shoring, Underpinning. Formwork: Definition of Formwork, Requirements of Formwork, Materials used in Formwork, Types of Formwork, Removal of formwork.

References: -

1. Ghose, D. N., Construction Materials, Tata McGraw Hill, New Delhi.
2. Varghese, P.C. , Building Materials, PHI learning, New Delhi.
3. Rajput, R.K, Engineering Materials, S. Chand and Co., New Delhi.
4. Sood H., Laboratory Manual on Testing of Engineering Materials, New Age Publishers, New Delhi.
5. Duggal, S. K, Building Materials, New International, New Delhi.
6. Sushil Kumar., Building Construction, Standard Publication.
7. Rangawala, S. C., Building Construction, Charotar Publication, Anand.
8. Punmia B. C., and Jain A. K., Building Construction ,Firewall Media.

SURVEYING

Course Code	ARPC306 (CEPC-302)
Course Title	Surveying
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	Programme core course

Course Outcomes: -

After completing this course, student will be able to:

1) Select the type of survey required for a given situation. (K1)

2) Compute area of open field using chain, tape and cross staff and Conduct traversing in the field using chain and compass. (K3)

3) Use levelling instruments to determine reduced level for preparation of contour maps and Use digital planimeter to calculate the areas. (K3)

4) Prepare plans using Plane Table Surveys, Compute horizontal angle and vertical angle using Theodolite and illustrate the use of Total Station. (K3)

5) Solve problems related to simple curve and Compute constants of tacheometer, horizontal and vertical distances. (K3)

6) Identify distances and elevations using Tachometer and Locate coordinates of stations and discuss the use and functions of GPS and GIS. (K2)

Course Content:

Module – 1: Overview, Classification of Survey and Chain Surveying

Number of class hours: 6 hours

Suggestive Learning Outcomes:

At the end of module -1, students will be able to:-

1. Know the purpose and use of different types of survey. (K1)
2. Classify the types of survey. (K2)
3. Explain the Principles of Surveying. (K2)
4. Know the various terms related to chain surveying. (K1)
5. Conduct ranging. (K3)
6. Explain the Principles of Chain Surveying. (K2)

Detailed content of the unit: -

• Survey- Purpose and Use.

• Types of surveying- Primary and Secondary, Classification: Plane, Geodetic, Cadastral, Hydrographic, Photogrammetry and Aerial.

• Principles of Surveying.

• Scales: Engineer's scale, Representative Fraction (RF) and diagonal scale.

• Instruments used in chain survey: Metric Chain, Tapes, Arrow, Ranging rod, Line ranger, offset rod, Open cross staff, Optical square.

• Chain survey Station, Base line, Check line, Tie line, Offset, Tie station.

• Ranging: Direct and Indirect Ranging.

• Methods of Chaining, obstacles in chaining.

• Errors in length: Instrumental error, personal error, error due to natural cause, random error.
• Principles of triangulation.
• Types of offsets: Perpendicular and Oblique.
• Conventional Signs, Recording of measurements in a field book.

Module-2: Compass Traverse Survey and Plane Table Surveying

Number of class hours: 8 hours

Suggestive Learning Outcomes:
At the end of module -2, students will be able to:-

1. Know the various technical terms related to compass surveying. (K1)
2. Conduct traversing using Prismatic compass and Solve problems related to local attraction (K3)
3. Explain principles of plane table surveying and various methods of plane table surveying (K2)
4. Prepare plans using various methods of plane table surveying. (K3)

Detailed content of the unit: -

• Compass Traversing- open, closed.
• Technical Terms: Geographic/ True Magnetic Meridians and Bearings, Whole Circle Bearing system and Reduced Bearing system and examples on conversion of given bearing to another bearing (from one form to another), Fore Bearing and Back Bearing, Calculation of internal and external angles from bearings at a station, Dip of Magnetic needle, Magnetic Declination.
• Components of Prismatic Compass and their Functions, Methods of using Prismatic Compass- Temporary adjustments and observing bearings.
• Local attraction, Methods of correction of observed bearings - Correction at station and correction to included angles.
• Methods of plotting a traverse and closing error, Graphical adjustment of closing error.
• Principles of plane table survey.
• Accessories of plane table and their use, Telescopic alidade.
• Setting of plane table; Orientation of plane table - Back sighting and Magnetic meridian method, True Meridian Method.
• Methods of plane table surveys- Radiation, Intersection and Traversing.
• Merits and demerits of plane table survey.

Module-3: Levelling and Contouring

Number of class hours: 7 hours

Suggestive Learning Outcomes:
At the end of module -3, students will be able to:-

1. Know the various terminologies related to levelling and contouring. (K1)
2. Solve problems of reduced level by different methods. (K3)
3. Prepare contour maps. (K3)

Detailed content of the unit: -

• Basic terminologies: Level surfaces, Horizontal and vertical surfaces, Datum, Bench Marks- GTS, Permanent, Arbitrary and Temporary, Reduced Level, Rise, Fall, Line of collimation, Station, Back sight, Fore sight, Intermediate sight, Change point, Height of instruments.
• Types of levels: Dumpy, Tilting, Auto level, Digital level, Components of Dumpy Level and its fundamental axes, Temporary adjustments of Level.

• Types of Leveling Staff: Self-reading staff and Target staff.
• Reduction of level by Line of collimation and Rise and Fall Method.
• Leveling Types: Simple, Differential, Fly, Profile and Reciprocal Leveling.
• Contour, contour intervals, horizontal equivalent.
• Uses of contour maps, Characteristics of contours, Methods of Contouring: Direct and indirect.

Module-4: Theodolite Surveying, Tacheometric surveying and Curve setting

Number of class hours: 10 hours

Suggestive Learning Outcomes:

At the end of module -4, students will be able to:-

1. Know components and the functions of transit theodolite. (K1)
2. Compute horizontal angle and vertical angle using Theodolite. (K3)
3. Perform theodolite traversing. (K3)
4. Know components and terminology related to Tacheometric surveying and curve setting. (K1)
5. Compute constants of tacheometer, horizontal and vertical distances. (K3)
6. Solve problems related to simple curve by offsets from long chord and Rankine's method. (K3)

Detailed content of the unit: -

• Types and uses of Theodolite, Components of transit Theodolite and their functions, Reading the Vernier of transit Theodolite.
• Technical terms- Swinging, Transiting, Face left, Face right.
• Fundamental axes of transit Theodolite and their relationship
• Temporary adjustment of transit Theodolite.
• Measurement of horizontal angle- Direct and Repetition method, Errors eliminated by method of repetition.
• Measurement of magnetic bearing of a line, Prolonging and ranging a line, deflection angle.
• Measurement of vertical angle.
• Theodolite traversing by Included angle method and Deflection angle method.
• Checks for open and closed traverse, Calculations of bearing from angles.
• Traverse computation-Latitude, Departure, Consecutive coordinates, Independent coordinates, balancing the traverse by Bowditch's rule and Transit rule, Gale's Traverse table computation.
• Principles of Tacheometry, Tacheometer and its component parts, Anallatic lens.
• Tacheometric formula for horizontal distance with telescope horizontal and staff vertical.
• Field method for determining constants of tacheometer, Determining horizontal and vertical distances with tacheometer by fixed hair method and staff held vertical, Limitations of tacheometry.
• Types of curves used in roads and railway alignments. Designation of curves.
• Setting simple circular curve by offsets from long chord and Rankine's method of deflection angles.

Module-5: Measurement of Area and Volume, Advanced surveying equipments and Remote sensing, GPS and GIS

Number of class hours: 9 hours

Suggestive Learning Outcomes:
At the end of module -5, students will be able to:-

1. Know the various components of digital planimeters and define drone surveying. (K1)
2. Use digital planimeter to calculate the areas and volume of reservoir (K3)
3. Know the principle, components and functions related to EDM. (K1)
4. Illustrate the use and functions of Total Station and Compute distances and coordinates using Total Station (K3)
5. Discuss the applications of remote sensing. (K2)
6. Discuss the use and functions of GPS and GIS. (K2)

Detailed content of the unit: -

- Components and use of Digital planimeters.
- Measurement of area using digital planimeter.
- Measurement of volume of reservoir from contour map.
- Principle of Electronic Distance Meter (EDM), its component parts and their Functions, use of EDM.
- Use of micro optic Theodolite and Electronic Digital Theodolite.
- Use of Total Station, Use of function keys.
- Measurements of Horizontal angles, vertical angles, distances and coordinates using Total Station, Traversing, Profile Survey and Contouring with Total Station.
- Remote Sensing – Overview, Remote sensing system, Applications of remote sensing in Civil Engineering, land use / Land cover, mapping, disaster management.
- Use of Global Positioning System (G.P.S.) instruments.
- Geographic Information System (GIS): Overview, Components, Applications, Software for GIS.
- Introduction to Drone Surveying.

References: -

1. Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying Vol. I and Surveying Vol. II, Laxmi Publications Pvt. Ltd., New Delhi.
2. Basak, N. N., Surveying and Levelling, McGraw Hill Education, New Delhi.
3. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune Vidyarthi Gruh Prakashan, Pune.
4. Duggal, S. K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.
5. Saikia, M D.; Das. B.M.; Das. M.M., Surveying, PHI Learning, New Delhi.
6. Subramanian, R., Fundamentals of Surveying and Levelling, Oxford University Press. New Delhi.
7. Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning New Delhi.
8. Bhavikatti, S. S., Surveying and Levelling, Volume 1, I. K. International, New Delhi.
9. Arora K R , Surveying Vol. I, Standard Book House
10. Venkatramaiah, C, Textbook of Surveying, Universities Press, Hyderabad.
11. Anderson, James M and Mikhail, Edward M, Surveying theory and practice, Mc Graw Hill Education, Noida.
12. De, Alak, Plane Surveying, S.Chand Publications, New Delhi.

MECHANICS OF MATERIALS AND THEORY OF STRUCTURES

Course Code	:	ARPC307 (CEPC-304)

Course Title	:	Mechanics of Materials and Theory of Structures
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	Program Core

Course outcomes:

After completing this course, student will be able to:

CO 1. Apply the knowledge of structural behavior of materials under various loading conditions(K3).

CO 2. Draw shear force and bending moment diagrams for various types of beams and loading conditions(K3).

CO 3. Determine the bending and shear stresses in beams under different loading conditions(K5).

CO 4. Identify various loading and end conditions for column (K3).

CO 5. Analyze statically determinate and indeterminate structures (K5)

Detailed Course Content

Module – 1: Simple Stresses and Strains

Number of Class hours: 08

Learning Outcomes:

1. Define the concepts of rigid, elastic and plastic bodies, stress, strain, elasticity, Hook's law, Elastic limit, Modulus of elasticity. (K1)
2. Classify Normal, Direct, Bending and Shear and nature of stresses. (K2)
3. Compute Longitudinal and lateral strain, Modulus of Rigidity, Poisson's ratio, Biaxial and tri-axial stresses, volumetric strain, change in volume, Bulk modulus (K3)

Detailed content of the unit:

1.1 Definition of rigid, elastic and plastic bodies, deformation of elastic body under various forces, Definition of stress, strain, elasticity, Hook's law, Elastic limit, Modulus of elasticity.

1.2 Type of Stresses-Normal, Direct, Bending and Shear and nature of stresses i.e. Tensile and Compressive stresses.

1.3 Standard stress strain curve for tor steel bar under tension, Yield stress, Proof stress, Ultimate stress, Strain at various critical points, Percentage elongation and Factor of safety.

1.4 Deformation of body due to axial force, forces applied at intermediate sections, Maximum and minimum stress induced, Composite section under axial loading.

1.5 Longitudinal and lateral strain, Modulus of Rigidity, Poisson's ratio, Biaxial and tri-axial stresses, volumetric strain, change in volume, Bulk modulus (Introduction only).

1.6 Relation between modulus of elasticity, modulus of rigidity and bulk modulus (without

derivation).

Module – 2: Shear Force and Bending Moment

Number of Class hours: 08

Learning Outcomes:

1. Identify different types of supports, beams and loads. (K1)
2. Explain Relation between load, shear force and bending moment. (K2)
3. Prepare Shear force and bending moment diagram for cantilever and simply supported beams. (K3)

Detailed content of the unit:

2.1 Types of supports, beams and loads.
2.2 Concept and definition of shear force and bending moment, Relation between load, shear force and bending moment (without derivation).
2.3 Shear force and bending moment diagram for cantilever and simply supported beams subjected to point loads, uniformly distributed loads and couple (combination of any two types of loading), point of contra flexure.

Module – 3: Bending and Shear Stresses in beams and Theory of Columns

Number of Class hours: 10

Learning Outcomes:

1. Discuss concept and theory of pure bending, assumptions, flexural equation, bending stresses and their nature, bending stress distribution diagram (K2)
2. Summarize the shear stress equation (without derivation), relation between maximum and average shear stress for rectangular and circular section, shear stress distribution diagram. (K2)
3. Predict buckling load by Eu-ler's equation and crippling load by Rankine' s formula. (K3)

Detailed content of the unit:

3.1 Concept and theory of pure bending, assumptions, flexural equation (without derivation), bending stresses and their nature, bending stress distribution diagram.
3.2 Shear stress equation (without derivation), relation between maximum and average shear stress for rectangular and circular section, shear stress distribution diagram.
3.3 Concept of compression member, short and long column, Effective length, Radius of gy- ration, Slenderness ratio, Types of end condition for columns, Buckling of axially loaded columns.
3.4 Euler's theory, assumptions made in Euler's theory and its limitations, Application of Eu- ler's equation to calculate buckling load.
3.5 Rankine' s formula and its application to calculate crippling load.

Module – 4: Analysis of Statically Determinate Pin Jointed Structures

Number of Class hours: 06

Learning Outcomes:

1. Describe the assumptions made in finding the forces in the members of a Truss. (K1)
2. Calculate forces in the members of a Truss by method of joints and method of section. (K5)

Detailed content of the unit:

4.1 Assumptions made in finding the forces in the members of a Truss.
4.2 Different methods of finding the forces in the members of a Truss – cantilever and simply supported, subjected to loading by: (a) method of joints, (b) method of sections.

Module– 5: Analysis of Statically Indeterminate Structures

Number of Class hours: 10

Learning Outcomes:

1. Analyze Fixed beams under different loading conditions. (K5)
2. Analyze Propped Cantilever under different loading conditions. (K5)
3. Analyze Continuous beams under different loading conditions by Theorem of Three Moments and Slope deflection method. (K5)

Detailed content of the unit:

5.1 FIXED BEAMS: Shear Force and Bending Moment diagrams for – (a) uniformly distributed load over the whole span, and, (b) point load at any intermediate point within the span.
5.2 PROPPED CANTILEVER**:** Shear Force and Bending Moment diagrams for – (a) uniformly distributed load (partly and fully throughout the span), and, (b) point load at any intermediate position in the span.
5.3 TWO SPAN CONTINUOUS BEAMS**:** Shear Force and Bending Moment diagrams for two equal spans carrying – (a) uniformly distributed load over whole span, and, (b) equal point load at center of each span; using Clapeyron's Theorem of Three Moments and Slope deflection method.

Suggested learning resources:

1. Khurmi, R.S., Strength of Materials, S Chand and Co. Ltd. New Delhi..
2. Rattan S.S., Strength of Materials, McGraw Hill Education; New Delhi.
3. Bansal R K, Strength of Materials, Laxmi Publications.
4. Subramaniam R, Strength of Materials, Oxford University Press.
5. Structural Analysis(Vol.1), S S Bhavikatti Vikas Publishing House
6. Structural Analysis, R.C Hibbeler , Pearson
7. https://nptel.ac.in/courses/105/105/105105166/
8. https://nptel.ac.in/courses/105/105/105105108/

CONSTRUCTION MATERIALS & MECHANICS OF MATERIALS LAB.

Course Code	:	ARPC308 (CEPC-306)
Course Title	:	Construction Materials & Mechanics of Materials Lab.

Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	PC

Course outcomes:

After completing this course, student will be able to:

- Test different Civil engineering materials on Universal Testing Machine.
- Analyse structural behaviour of materials under various loading conditions.
- Interpret shear force and bending moment diagrams for various types of beam sections and different loading conditions.
- Determine bending and shear stresses in beams under different loading conditions.
- Calculate flexural strength of different types of floor tiles.

List of Practicals to be performed:

- Study and understand the use and components of Universal Testing Machine (UTM).
- Perform Tension test on mild steel as per IS:432(1).
- Perform tension test on Tor steel as per IS:1608, IS:1139.
- Conduct compression test on sample test piece using Compression Testing Machine.
- Conduct Izod Impact test on three metals. e.g. mild steel/ brass/aluminum/ copper /cast iron etc as per IS:1598.
- Conduct Charpy Impact test on three metals. e.g. mild steel/ brass/aluminum/ copper /cast iron etc as per IS:1757.
- Determine Water Absorption on bricks per IS:3495 (part II), IS:1077 or tile IS:1237.
- Determine Compressive strength of dry and wet bricks as per IS:3495(part I), IS:1077.
- Conduct Abrasion Test on flooring tiles (any one) e.g. Mosaic tiles, Ceramic Tiles as per IS:
13630 (part7), Cement Tile as per IS: 1237.
- Perform Single Shear and double shear test on any two metals e.g. Mild steel/ brass/alumi- num/copper / cast iron etc as per IS:5242.
- Conduct Compression test on timber section along the grain and across the grain as per IS:2408.
- Plot Shear force and Bending Moment diagrams for cantilever, simply supported beams.

- Plot Shear force and Bending Moment diagrams for overhanging beams for different types of loads including moment loading.
- Conduct Flexural test on timber beam on rectangular section in both orientation as per IS:1708, IS:2408.
- Conduct Flexure test on floor tiles IS:1237,IS:13630 or roofing tiles as per IS:654,IS:2690.

Suggested learning resources:

1. Bedi D.S., Strength of Materials, Khanna Publishing House, New Delhi (Edition 2018)
2. Timoshenko, S., Strength of Materials, Vol. I, CBS, New Delhi.
3. Khurmi, R.S., Strength of Materials, S Chand and Co. Ltd. New Delhi.
4. Ramamurtham, S, Strength of Materials, Dhanpat Rai and sons, New Delhi.
5. Punmia B C, Strength of Materials, Laxmi Publications (p) Ltd. New Delhi.
6. Rattan S.S., Strength of Materials, McGraw Hill Education; New Delhi.
7. Bansal R K, Strength of Materials, Laxmi Publications.
8. Subramaniam R, Strength of Materials, Oxford University Press.

SURVEYING LABORATORY

Course Code	ARPC309 (CEPC-307)
Course Title	Surveying Lab.
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	Programme core course

Course Outcomes: -

After completing this course, student will be able to:

1) Select the type of survey required for a given situation. (K1)

2) Compute area of open field using chain, tape and cross staff and Conduct traversing in the field using chain and compass. (K3)

3) Use levelling instruments to determine reduced level for preparation of contour maps and Use digital planimeter to calculate the areas. (K3)

4) Prepare plans using Plane Table Surveys, Compute horizontal angle and vertical angle using Theodolite and illustrate the use of Total Station. (K3)

5) Solve problems related to simple curve and Compute constants of tacheometer, horizontal and vertical distances. (K3)

6) Predict distances and elevations using Tachometer and Locate coordinates of stations and discuss the use and functions of GPS and GIS. (K2)

List of Practical to be performed

1	Measure distance between two survey stations using chain, tape and ranging rods when two stations are inter visible.
2	Undertake reciprocal ranging and measure the distance between two stations.
3	Determine area of open field using chain and cross staff survey.
4	Measure Fore Bearing and Back Bearing of survey lines of open traverse and closed traverse of 5 or 6 sides using Prismatic Compass and correct the bearings and included angles for the local attraction.
5	Undertake Survey Project with chain and compass for closed traverse for minimum 5 sides around a building and Plot the traverse on A1 size imperial drawing sheet for data collected.
6	Undertake simple leveling using dumpy level/ Auto level and leveling staff.
7	Undertake differential leveling and determine Reduced Levels by Height of instrument method and Rise and fall method using dumpy level/Auto Level and leveling staff.
8	Undertake fly leveling with double check using dumpy level/ Auto level and leveling staff
9	Undertake Survey Project with Leveling instrument for Profile leveling and cross-sectioning for a road length of 500 m with cross-section at 30 m interval.
10	Undertake Survey Project with Leveling instrument for Profile leveling and cross-sectioning for a road length of 500 m with cross-section at 30 m interval.
11	Undertake Survey Project for plotting contour map using block contouring method for a block of 150m x 150m with grid of 10m x 10m
12	Measure area of irregular figure using Digital planimeter.
13	Use plane table survey to prepare plans of a plot of seven sided closed traverse by Radiation Method, Intersection Method and Traversing Method.
14	Use plane table survey to carry out Survey Project for closed traverse for minimum five sides around a building.
15	Use transit theodolite to measure Horizontal and Vertical angle by Direct Method and Plot the traverse on A1 size imperial drawing sheet for the collected data.
16	Use Theodolite as a Tacheometer to compute reduced levels and horizontal distances.
17	Set out a circular curve by Rankine's Method of Deflection Angles.
18	Use micro optic Theodolite to Measure Horizontal angle by Direct Method.
19	Use EDM to measure horizontal distance.
20	Use Total station instrument to measure horizontal distances and vertical angle.
21	Use Total station instrument to carry out Survey Project for closed traverse for minimum five sides and Plot the traverse on A1 size imperial drawing sheet for the collected data.
22	Use GPS to locate the coordinates of a station.

References: -

1. Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying Vol. I and Surveying Vol. II, Laxmi Publications Pvt. Ltd., New Delhi.
2. Basak, N. N., Surveying and Levelling, McGraw Hill Education, New Delhi.
3. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune Vidyarthi Gruh Prakashan, Pune.
4. Duggal, S. K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.
5. Saikia, M D.; Das. B.M.; Das. M.M., Surveying, PHI Learning, New Delhi.
6. Subramanian, R., Fundamentals of Surveying and Levelling, Oxford University Press. New Delhi.
7. Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning New Delhi.
8. Bhavikatti, S. S., Surveying and Levelling, Volume 1, I. K. International, New Delhi.
9. Arora K R , Surveying Vol. I, Standard Book House

10. Venkatramaiah, C, Textbook of Surveying, Universities Press, Hyderabad.
11. Anderson, James M and Mikhail, Edward M, Surveying theory and practice, Mc Graw Hill Education, Noida.
12. De, Alak, Plane Surveying, S.Chand Publications, New Delhi.

Summer Internship-I

Course Code	ARSI-310
Course Title	Summer Internship-I
Number of Credits	2 (L: 0, T: 0, P: 0)
Prerequisites	Nil
Course Category	Internship

Internships may be full-time or part-time; they are full-time in the summer vacation and part-time during the academic session.

Sl. no.	Schedule	Duration	Activities	Credits	Hours of Work
1	Summer Vacation after 2nd Semester	3-4 Weeks	Inter/ Intra Institutional Activities **	2	80 Hours

(** Students are required to be involved in Inter/ Intra Institutional Activities viz; Training with higher Institutions; Soft skill training organized by Training and Placement Cell of the respective Institutions; contribution at incubation/ innovation /entrepreneurship cell of the Institute; participation in conferences/ workshops/ competitions etc.; Learning at Departmental Lab/ Tinkering Lab/ Institutional workshop; Working for consultancy/ research project within the Institutes and Participation in all the activities of Institute's Innovation Council for e.g.: IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.)

Benefits to Students:

1. An opportunity to get hired by the Industry/ organization.
2. Practical experience in an organizational setting.
3. Excellent opportunity to see how the theoretical aspects learned in classes are integrated into the practical world. On-floor experience provides much more professional experience which is often worth more than classroom teaching.
4. Helps them decide if the industry and the profession is the best career option to pursue.
5. Opportunity to learn new skills and supplement knowledge.
6. Opportunity to practice communication and teamwork skills.

7. Opportunity to learn strategies like time management, multi-tasking etc. in an industrial setup.
8. Opportunity to meet new people and learn networking skills.
9. Makes a valuable addition to their resume.
10. Enhances their candidacy for higher education.
11. Creating network and social circle and developing relationships with industry people.
12. Provides opportunity to evaluate the organization before committing to a full-time position.

Course Outcome:-

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

C.O.1: Explain the real life organizational and industrial environment situations (K2).

C.O.2: Develop organizational dynamics in terms of organizational behaviour, culture and professional ethics (K1).

C.O.3: Understand the importance of Team work (K2).

C.O.4: Explain invaluable knowledge and networking experience (K2).

C.O.5: Develop skill to build a relationship with a prospective employer (K3).

Course Content:-

Internships are educational and career development opportunities, providing practical experience in a field or discipline. The Summer Internship-I is a student centric activity that would expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship has to be meaningful and mutually beneficial to the intern and the organization. It is important that the objectives and the activities of the internship program are clearly defined and understood. Following are the intended objectives of internship training:

1. Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
2. Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.

3. Exposure to the current technological developments relevant to the subject area of training.
4. Experience gained from the 'Industrial Internship' in classroom will be used in classroom discussions.
5. Create conditions conducive to quest for knowledge and its applicability on the job.
6. Learn to apply the Technical knowledge in real industrial situations.
7. Gain experience in writing Technical reports/projects.
8. Expose students to the engineer's responsibilities and ethics.
9. Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
10. Promote academic, professional and/or personal development.
11. Expose the students to future employers.
12. Understand the social, economic and administrative considerations that influence the working environment of industrial organizations
13. Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

Overall compilation of Internship Activities / Credit Framework:

Major Head of Activity	**Credit**	**Schedule**	**Total Duration**	**Sub Activity Head**	**Proposed Document as Evidence**	**Evaluated by**	**Performance appraisal/ Maximum points/ activity**
Inter/ Intra Institutional Activities	2	Summer Vacation after 2nd Semester	3-4 Weeks	Inter/ Intra Institutional Workshop/ Training	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Working for consultancy/ research project	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Festival (Technical / Business / Others) Events	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Contribution in Incubation/ Innovation/ Entrepreneurship Cell/ Institutional Innovation Council	Certificate	Cell In-charge	Satisfactory/ Good/ Excellent
				Learning at	Certificate	Cell In-	Satisfactory/

				Departmental Lab/Tinkering Lab/ Institutional workshop		charge	Good/ Excellent

STUDENT'S DIARY/ DAILY LOG

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day-to-day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed at the end of each day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor visiting the industry from time to time and get ratified on the day of his visit.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

a) Regularity in maintenance of the diary.
b) Adequacy & quality of information recorded.
c) Drawings, sketches and data recorded.
d) Thought process and recording techniques used.
e) Organization of the information.

INTERNSHIP REPORT

After completion of Internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period. The student may contact Industrial Supervisor/ Faculty Mentor/TPO for assigning special topics and problems and should prepare the final report on the assigned topics. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The training report should be signed by the Internship Supervisor, TPO and Faculty Mentor. The Internship report will be evaluated on the basis of following criteria:

a) Originality.
b) Adequacy and purposeful write-up.
c) Organization, format, drawings, sketches, style, language etc.
d) Variety and relevance of learning experience.
e) Practical applications, relationships with basic theory and concepts taught in the course.

Semester IV

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact hrs / week	Credits
				L	T	P		
Theory Subjects								
1.	Program core course	ARPC401	Climatology	2	0	0	2	2

2.	Program core course	ARPC402	Building services	2	0	0	2	2
3.	Program core course	ARPC403	Interior design	2	0	0	2	2
4.	Program core course	ARPC404	Architectural workshop-I	0	0	4	4	2
5.	Program core course	ARPC405	Architectural design-I and CAD	0	0	4	4	2
6.	Program core course	ARPC406	Working Drawing-I	0	0	4	4	2
7.	Program Elective course- I (Any one to be selected)	ARPE407/A	Landscape architecture	3	0	0	3	3
		ARPE407/B	Eco cities	3	0	0	3	
		ARPE 407/C (CEPE407/A)	Construction Management	3	0	0	3	
8.	Humanities & Social Science	HS-408	Professional Skill Development	2	1	0	3	3
9.	Minor Project	ARPR-409	Minor Project	0	0	4	4	2
10.	Mandatory Course	AU-410	Essence of Indian knowledge and tradition	2	0	0	2	0
	Total Credits							**20**

Climatology

Course code	ARPC401
Course title	Climatology
Number of Credits	2(L:2,T:0,P:0)
Prerequisites	Nil
Course Category	Programe Core

Suggestive lab/Space:- Dedicated lab with different equipment used for climatological studies

Expected Course outcome: By the end of the course, the students are expected

CO-1: To describe the elements of climate (K1)
CO-2: To classify various climatic zones of India (K2)
CO-3: To demonstrate the concept of sun path and shading device (K3)
CO-4: To recommend the climatic design in Indian climate (K5)
CO-5: To use the passive design elements in their design problem. (K3)

Module-1

Number of class hours: 4

Suggestive Learning Outcomes

1) Student can describe climatology(K2)
2) Student can explain the elements of climates(k2)
3) students can discuss about the various climatic zones (k2)

Detailed content of the unit:

1.1 Introduction to climatology,
1.2 Climate & Weather, elements of climate,
1.3 Different climatic zones of across globe

Module 2

Number of class hours: 6

Suggestive Learning Outcomes

1) Student can describe the climatic domain(K2)
2) Student will able to compare different climates and its characteristics across the nation(K4)
3) Students can explain effects of climates on human being (K2)

Detailed content of the unit:

2.1 Scales of climate - macro-climate, meso-climate and micro climate.
2.2 Tropical Climate. Climatic Zones of India & their characteristics.
2.3 Effect of climate on human being & their shelter

Module 3

Number of class hours: 8

Suggestive Learning Outcomes

1) Student can explain solar design(K2)
2) Student will be able to calculate HSA VSA(K3)
3) Students will be able to identify the usage of various shading device(K3)

Detailed content of the unit:

3.1 Geometry of solar movement.
3.2 Altitude & azimuth angles. Concept of Sun path diagram/Solar chart.
3.3 Horizontal and vertical shadow angles.
3.4 Types of shading devices.

Module- 4

Number of class hours: 8

Suggestive Learning Outcomes

1) Student will be able to identify various shapes and flow of air around it(K1)
2) Student will be able to formulate the design elements for various climatic zones in India(K5)
3) Students can discuss the concept of thermal comfort and other related matter(K2)

Detailed content of the unit:

4.1 Air flow/wind movement around and through buildings. Natural ventilation.
4.2 Climatic design recommendations for various climatic zones in India.
4.3 Thermal comfort. Indices of thermal comfort & Effective Temperature.

Module-5

Number of class hours: 8

Suggestive Learning Outcomes
1) Student will be able to explain the concept of passive design elements (K2)
2) Student will be able to discuss the concept of green roof(K2)

Detailed content of the unit:

5.1 Passive Design Strategies, , use of evaporative cooling, ground cooling-earth air tunnel, thermal mass-cavity wall,
5.2 Natural ventilation, night time cooling, reflective surfaces and radiant barrier, cool roof and green roof, etc.

References:

1. Crichfield Howard J., "**General Climatology",** Phi Learning, 1998.
2. Keonigsberge O.H., Ingersoll T. G., Mayhew Alan, Szokola S.V.,"**Manual of Tropical Housing and Building",** Orient Blackswan, 1984.
3. Kukreja C. P., "**Tropical Architecture",** Tata Mc Graw-Hill, 1978.
4. Olgyay, Aladar , Olgyay Victor , **"Solar Control and shading Devices**", Princeton UniversityPress, 1957.
5. Sealey, Antony "**Introduction to building Climatology",** C'wealth Assn.of Architects, September 1979.
6. Seshadri T. N., Sharma Mela Ram , Sharafat Ali **"Climatological and Solar Data for India**", Central Building Research Institute, 1969

BUILDING SERVICES

Course code	ARPC402
Course title	Building Services
Number of Credits	2(L:2,T:0,P:0)
Prerequisites	Nil
Course Category	Program Core

Course outcome: By the end of the course, the students are expected

CO-1: To understand the necessities of Building services (K1)
CO-2: To learn the techniques and systems of water supply and sanitation. (K1)
CO-3: To determine the initial requirements of water supply and sanitation in a building (K3)
CO-4: To discuss technically with water supply and sanitation experts. (K2)
CO-5: To draw the basic water-supply and sanitation layout of a building (K3)

Module-1 :- The need and importance of building services. Historical overview of water supply, plumbing and sewerage systems in India and worldwide. Sources of water, standards of purity, impurities in water and its treatment. Recycling of waste water and sewage treatment plants.

Number of class hours: 4
Suggestive Learning Outcomes
1) Describe building services systems(K1)
2) List quality and sources of water.(K1)
3) Outline the importance of building service systems.(K1)

Module 2:- Introduction to the types of water distribution networks, water storage tanks, their capacity and location. Terminology such as flow, pressure, head, etc. and principles of water supply in buildings; Pipes, fittings, fixtures required for the system. Calculation of water consumption and requirements of water supply system as per the Indian standards.

Number of class hours: 8
Suggestive Learning Outcomes
1) Explain the water supply system(K2).
2) Determine the initial requirement of the water supply system(K2).

Module 3:- Sanitation systems like dry, wet carriage systems at various urban scales. sewers and manholes; Terminologies like self-cleaning velocity, gradient, invert level, section area etc. Design calculations of septic tank, soak-pits etc. Study of details of types of traps and chambers (inspection chamber, disconnecting chamber, intercepting trap, S-trap, P-trap, gully trap, grease trap etc; and sanitary fixtures (washbasins, WCs, bathtubs, urinals, flushing cistern, etc. Types of pipes and joints. Design principles of sanitary layout (location and ventilation of chambers, traps, fixtures). Building sanitation systems (separate, combined, single stack, one pipe and two pipe, etc.).

Number of class hours: 8
Suggestive Learning Outcomes
1) Outline the sanitation system(K1)
2) Determine the initial requirement of the sanitation system of a building(K3).

Module 4:- Surface area division for rain water disposal. Details of collection point/*Khurra*. Conveyance network for rain water (catch basin, gully traps, etc). Concepts of rain water harvesting. Types of solid waste, quantity of waste generated, collection and segregation of municipal solid waste.

Number of class hours: 6
Suggestive Learning Outcomes
1) Describe the storm water drainage system(K1)
2) Compute the initial requirement of the drainage system of a building(K3).
3) Illustrate solid-waste management systems(K3).

Module 5:- Market survey for pipes, fittings and fixtures, traps etc. To prepare water supply and sanitary design project for a small building such as a residence, primary school etc. Layout design with details of all chambers and traps for building and site in the form of plans and sectional elevations.

Number of class hours: 6
Suggestive Learning Outcomes
1) Explain the market scenario of materials, fitting etc(K2).
2) Draw the basic water-supply and sanitation layout of a building (K2).

References:

- Rangwala, Water Supply and Sanitary Engineering
- Kshirsagar, Water Supply and Sanitary Engineering
- Shah, Water Supply and Sanitation
- Patil, Plumbing Engineering
- Indian Code Council, International Plumbing Code
- P.N. Khanna, Indian Practical civil Engineers' Handbook

Interior design

Course Code	ARPC-403
Course Title	Interior design
Number of Credits	2 (L: 2, T: 0, P:0)
Prerequisites	Nil
Course Category	Theory

Course Outcome:-

With the successful completion of the course student should have capability to
1. Classify the intricacies of interior space basic knowledge of division of residential building and commercial place (K2)
2. Demonstrate the basic knowledge of colour which are used various space (K3)
3. Choose small and medium sized interior design(K3)
4. Explain interior lighting; types, fixtures, enhancement accessories, selection for different contexts.(K2)
5. Sketch Office and residential interior design layouts and furniture.(K3)

Course Content:-

MODULE 1:
Lecture Hours: 4-6 hrs

Learning Outcomes: 1. Define concepts, themes and types of interior spaces and its basic theory(K1)

Detailed content of the Unit:
Introduction
Definitions, concepts, themes and types of interior spaces and its basic theory

MODULE 2:
Lecture Hours: 4-6 hrs
Learning Outcomes: 1. Explain furniture colour which are used in residential buildings and commercial places(K2).

Detailed content of the Unit:
History
Knowledge of colour ,furniture which are used in residential buildings and commercial places.

MODULE 3:
Lecture Hours: 4-6 hrs

Learning Outcomes: 1. Discuss the measurement of all furniture which are used in residential buildings and commercial places. **(K2)**

Detailed content of the Unit:

Elements of Interior Design - Interior Treatment and Finishes
Measurement of all furniture which are used residential building and commercial place

MODULE 4:
Lecture Hours: 4-6 hrs

Learning Outcomes: 1. Illustrate interior lighting; types, fixtures, enhancement accessories, selection for different contexts(K3)

Detailed content of the Unit:
Elements of Interior Design-Lighting and Interior Landscaping
Study of interior lighting; types, fixtures, enhancement accessories, selection for different contexts.
MODULE 5:
Lecture Hours: 4-6 hrs

Learning Outcomes: 1. Relate human comfort, lifestyle aspirations, and function as context to design of furniture, interior spaces.
2. Prepare office and residential interior design layouts and furniture. Interiors and furniture of various age groups like school children etc

Detailed content of the Unit:

Furniture Design & Interior Layouts and Planning (K4)

Human comfort, lifestyle aspirations, and function as context to design of furniture, interior spaces. Office and residential interior design layouts and furniture. Interiors and furniture of various age groups like school children etc.

References:

Time-Saver Standards for Interior Design and Space Planning / The Silver Bible

The Interior Designer Productivity Toolbox, Phyllis Harbinger

A Field Guide to American Houses, Virginia Savage McAlester

Get Your House Right: Architectural Elements to Use & Avoid, Marianne Cusato

ARCHITECTURAL WORKSHOP-I

Course Code	ARPC-404
Course Title	Architectural Workshop-I
Number of Credits	2 (L: 0, T: 0, P: 4)
Prerequisites	NIL

Course Category	Program core

Course Outcome:-

With the successful completion of the course students will have ability to: -

CO-1 : Express different artistic materials and styles. (k2)

CO-2 : Experiment to solve with your own hands. (k4)

C.O-3: Convert scale down things (k2)

C.O-4: Sketch Different 2-D & 3-D planes & Solids Blocks & their composition in given dimensions. (K3)

C.O-5: Model Block models of different built forms(K4)

Course Content:-

Skill Development : Develop skill in working with own hands in art & craft i.e. Painting, Murals, Sculptures etc. with various materials like Tiles, Bamboo sticks, Threads, Colors, Papers etc.
Working with wood: Knowing different carpentry joint & making it.

Plane & Solid Making: Different 2-D & 3-D planes & Solids Blocks & their composition in given dimensions.

Model: Block models of different built forms .

References:

- Architecture: A Visual History by Jonathan Glancey. ...
- Architecture: Form, Space, and Order by Francis D.K. ...
- The Architecture Reference & Specification Book: Everything Architects Need To Know Every Day by Julia McMorrough.

Architectural design-I and CAD

Course code	ARPC405
Course title	Architectural design-I and CAD
Number of Credits	2(L:0,T:0,P:4)
Prerequisites	Knowledge of Arch graphics and drawing.

Course Category	Program Core
Essential requirement/lab	Design studio with Dedicated Computers

Expected Course outcome: By the end of the course, the students are expected

CO-1: To explain the concept of Design (K2)
CO-2:- To understand the fundamentals of space, form, function, order as basic architectural skill (K2)
CO-3:- To use the drawing as a communication tool for design information (K3)
CO-4:- To prepare a design concept for a small building. (K3)
CO-5:- To use the CAD skills in preparing the architectural design and drawings. (K3)

Detailed content of the unit:

1. Introduction to Design
2. Basic Principles of design - harmony, symmetry, scale and proportion etc. and their application to endow a quality to spaces and forms.
3. The use of architectural drawing as a communication tool for design information.
4. Exercises on the study and application of anthropometrics information.
5. Exercises related to elements of design and perception of space.
6. Preparation of conceptual Design of a 'simple architectural form' or 'a product with specific function'
7. Representation of ideas through sketches, diagrams and architectural drawings
8. Exercises on Design of a simple building for residential use in observable environment.
9. Starting Auto CAD, Auto CAD screen components.
10. Simple exercises in to 2D CAD software (AutoCAD/Revit) specifically for proficiency of drawing/editing objects, text, dimensioning, making and inserting blocks, etc.
10. Understanding of units settings, scale, limits, line type, line weight, layers, colours, and print commands.
11. Layers, Layers Properties Managers, Object Properties Toolbar & Properties windows, LTSCALE factor, Auto Tracking:-REDRAW & REGEN commands etc.
12. Preparation of two dimensional architectural presentation drawings (including plans, elevations and sections) incorporating human figures, plants, car etc.
13. Preparation of two dimensional architectural presentation drawings (including plans, elevations and sections) incorporating grid, column, dimensioning, legend and architectural elements details with proper line weight.
14. Preparing submission in the form of printouts in scale.

References:

1) Gill, Rendering with Pen and Ink
2) Ernst neufert architecture data Jones Vincent, black
3) Francis D. K. Ching, A Visual Dictionary of Architecture.
4) Time saver standard (building type) Joseph de chiara and johahancock publisher McGraw Hill Publication, Singapore

1) AutoCAD Student Version
2) Sketchup
3) Revit

Working Drawing -I

Course Code	ARPC-406
Course Title	Working Drawing-I
Number of Credits	2 (L: 0, T: 0, P: 4)
Prerequisites	Nil
Course Category	Program Core

Course Outcome:-

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

CO 1: Draw plot line, width of foundation trench, construction of wall, proper dimensions and footing details of trench plan (K2)

CO.2: Draw dimensions of all walls, door & windows, width of flight, tread, landing, number of treads, width of stairwell (if any), inner & outer plaster line, overall dimension of floor plan(K2).

CO3: Draw *ghundi*, ridgeline, slope line, position & size of Rain Water Pipe, thickness of parapet wall, roof projection (if any), sectional plan of stair room with its roof projection (if any) of roof plan(K2)

CO4: Draw ONE ROAD SIDE ELEVATION AND LATERAL SIDE ELEVATIONS(K2)

CO5: DRAW Sectional elevations through staircase, kitchen, toilet & front window or veranda – showing Ground Level, Plinth Level, , Roof level, Entrance to roof, Sills, Lintel, Floor slabs at all levels, Flat Brick Soling, Damp Proof Course, Parapet wall(K2)

SHEET NO. 1 TRENCH PLAN

Showing plot line, width of foundation trench, construction of wall, proper dimensions. Footing detail of steps (in 1 : 20 scale) from Ground Level to Plinth Level, staircase, toe beam, load bearing brick wall, schedule of windows – same as that of door with addition of sill height.

SHEET NO. 2 GROUND FLOOR PLAN

Showing dimensions of all walls, door & windows, width of flight, tread, landing, number of treads, width of stairwell (if any), inner & outer plaster line, overall dimension.

SHEET NO. 3 ROOF PLAN

Showing *ghundi*, ridgeline, slope line, position & size of Rain Water Pipe, thickness of parapet wall, roof projection (if any), sectional plan of stair room with its roof projection (if any).

SHEET NO. 4 ELEVATIONS

TOPIC A: ONE ROAD SIDE ELEVATION

TOPIC B: ONE LATERAL ELEVATION

Showing Ground Level, Plinth Level, First Floor level, Roof level, Mumpty Room Roof level, Sill & Lintel levels in one storey only, Height of parapet wall – specification of all other non-structural elevational feature.

SHEET NO. 5 SECTIONAL ELEVATIONS

Two sectional elevations through staircase, kitchen, toilet & front window or veranda – showing Ground Level, Plinth Level, , Roof level, Entrance to roof, Sills, Lintel, Floor slabs at all levels, Flat Brick Soling, Damp Proof Course, Parapet wall.

References:

1. *Design Drawing* by Francis D.K. Ching and Steven P. Juroszek
2. *Architectural Graphics* by Francis D.K. Ching
3. *Architectural Detailing: Function, Constructibility, Aesthetics* by Edward Allen and Patrick Rand

Landscape Architecture

Course code	ARPE407/A
Course title	Landscape Architecture
Number of Credits	3(L:3,T:0,P:0)
Prerequisites	Nil
Course Category	Program Elective

Expected Course outcome: By the end of the course, the students are expected

CO-1: To explain the importance of landscape architecture (K2)
CO-2: To classify various gardens in historical timelines (K4)
CO-3: To explain the various factors of landscape design (K3)
CO-4: To identify the natural components of landscape architecture (K1)
CO-5: To design a micro level landscape area like terrace garden, wall garden (K6)

Module- 1

Number of class hours: 3

Suggestive Learning Outcomes
1) Student can explain importance and scope of landscape architecture (K2)
2) Student will be able to differentiate between landscape and architectural design (K4)

Detailed content of the unit:

1.1 Introduction to Landscape Architecture, definitions, importance, need and scope.
1.2 Levels of landscape planning and design.
1.3 Relationship between landscape design and architectural design.

. **Module-2**

Number of class hours: 8

Suggestive Learning Outcomes

1) Student can discuss about history of development of landscape architecture(K2)
2) Student will able to explain the design principle and elements of landscape(K2)
3) students can explain and differentiate between different landscape design style(K2)

Detailed content of the unit:

2.1 Historical development of landscape architecture.
2.2 Origin of gardens. Design principles, salient features and elements of various gardens in history-like Egyptian, Persian, Japanese, Mughal, Indian etc.

Module- 3
Number of class hours: 6

Suggestive Learning Outcomes
1) Student will be able explain the usages of manmade components of landscape(K2)
2) Student will able to describe the various factors like socio-economical and psychological while designing a space (K2)

Detailed content of the unit:

3.1 Different factors and components of a landscape.
3.2 Social and economical factors. Psychological considerations of spaces and enclosures.
3.3 Brief idea about manmade components like walls, fences, entrances ,gates, barriers, screens, planters, roads & pathway, street furniture, signages, services - electrical, water supply and drainage.

Module -4
Number of class hours: 6

Suggestive Learning Outcomes

1) Student can describe various natural components of landscape architecture (K2)
2) Student recognize all components of landscape in detail(K2)

Detailed content of the unit:

4.1 Basic natural components-land trees, water and climate.
4.2 Land: soils, geology, topography, earth forms, levels
4.3 Plants: trees, shrubs, climbers, hedges, lawns as landscape elements.
4.4 Water: water elements in a landscape - fountains, waterfalls, pools, cascades,
4.5 Climate: Macro and micro-climatic considerations in landscape architecture.
4.6 Relationship between climate, landscape and architecture.

Module 5

Number of class hours: 9

Suggestive Learning Outcomes

1) Student illustrate the micro level usage of landscaping (K3)
2) Student will able to design places like the terrace garden, wall garden windows etc.(K5)

Detailed content of the unit:

5.1 Specially landscaped places like interiors, terrace gardens, wall gardens,
5.2 Window landscaping etc. – their landscape designing and construction detailing.

References:

1. Norman "Residential Landscape Architecture: Design Process for the Private Residence" , Booth,Prentice Hall, 2012
2. M. Laurie, "Introduction to Landscape Architecture" Elsevier, 1986
3. Geoffrey Alan Jellicoe, "The Landscape of Man: Shaping the Environment from Prehistory to the Present Day",Thames and Hudson, 1995
4. J.O. Simonds, "Landscape Architecture- A manual of site planning and design", McGraw Hill Publications,2006.

5. Kevin Lynch, “Site Planning”, MIT Press, 1984.
6. R. Genebrooks, “Site Planning”, Prentice Hall Publication, 1988.
7. Ian McHarg , “Design with Nature”,Turtleback Books, 1995
8. J.O. Simonds “Earthscape”, McGraw Hill Publications,1978.
9. Albert J. Rutledge “Anatomy of a park: The essentials of recreation area planning and design”,McGraw- Hill, 1971
10. Norman “Basic elements of landscape Architectural design” Booth,Waveland press,1990

Eco cities

Course code	ARPE407/B
Course title	Eco cities
Number of Credits	3(L:3,T:0,P:0)
Prerequisites	Nil
Course Category	Program Elective

Expected Course outcome: By the end of the course, the students are expected

CO-1: To explain the concept of an eco city (K2)
CO-2: To describe concepts of urban farming, walkable urbanism etc. (K2)
CO-3: To explain the qualities of different aspect of an eco city (K2)
CO-4: To illustrate the urban eco design (K3)
CO-5: To explain the concept like green urbanism & sustainable design development (K4)

Module 1
Number of class hours: 6

Suggestive Learning Outcomes
1) Student recognize the concept ecocities and renewable energy(K1)
2) Student describe concept of resource management and conservation.(K2)

Detailed content of the unit:

1.1 Introduction to eco-city, carbon-neutral and renewable energy production**,** public transportation systems,
1.2 Resource conservation (water and energy), waste management and its reuse,

Module- 2

Number of class hours: 9

Suggestive Learning Outcomes

1) Student can explain urban farming(K2)
2) Student can illustrate concept of a sustainable cities.(K3)

Detailed content of the unit:

2.1 Urban farming, urban infill,
2.2 walkable urbanism. Obstacles,
2.3 Social factors of sustainable cities,

Module- 3

Number of class hours: 9

Suggestive Learning Outcomes
1) Student will be able to classify environmental and other aspect of an eco cities (K2)

Detailed content of the unit:

3.1 Economic and social qualities of an eco-city
3.2 Environmental qualities of an eco-city.

Module 4

Number of class hours: 9

Suggestive Learning Outcomes

1) Student will be able to describe the environmental and other aspect of an eco cities(K2)

Detailed content of the unit:

4.1 Urban eco-design, integrating nature and urban life,
4.2 Building healthy community systems, transforming community systems.

Module- 5

Number of class hours: 9

Suggestive Learning Outcomes

1) Student will be able to explain sustainable development and other aspect of urban planning (K2)

2) Student will be able to classify green urbanism(K3)

Detailed content of the unit:

5.1 Sustainable city development, participatory planning, land use, poverty and racism, green economy
5.2 Local food systems, nature in the city
5.3 Green urbanism.

Books and References

1. Bio polis: Patrick Geddes and the City of Life by Welter, Volker, MIT Press.
2. Car free Cities by Crawford, J. H., International Books.
3. Cities for a Small Planet by Rogers, Richard, Westview Press.
4. The City After the Automobile: An Architect's Vision by Safdie, Moshe, Westview Press.
5. The City in Mind: Notes on the Urban Condition by Kunstler, James Howard, Touchstone Books.
6. Crabgrass Frontier: The Suburbanization of the United States by Jackson, Kenneth T., Oxford University Press.
7. Eco-City Dimensions: Healthy Communities, Healthy Plants by Roseland, Mark, New Society Publishers.
8. From Eco-Cities to Living Machines: Principles of Ecological Design by Todd, John, North Atlantic Books.
9. The Ecological City: Preserving and Restoring Urban Biodiversity by Platt, Rutherford H., University of Massachusetts Press.
10. Gaviotas: A Village to Reinvent the World Weisman by Alan, Chelsea Green Publishing Company.
11. The Geography of Nowhere: The Rise and Decline of America's Man-Made Landscape Kunstler by James, Touchstone Books.
12. Home from Nowhere: Remaking Our Everyday World for the 21st Century Kunstler by James Howard, Touchstone Books.
13. Human Settlements and Planning for Ecological Sustainability: The Case of Mexico City by Pezzoli, Keith, MIT Press.

CONSTRUCTION MANAGEMENT

Course Code	ARPE 407/C (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: 3-4 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Describe the objectives principles and types of organization (K1)
2) Settle disputes and the role of different personnel in the construction organization(K2).
3) Prepare a detailed project report(K3).

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: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Explain principles of governing site layout (K2).
2) Prepare the site layout(K3)
3) Explain land acquisition procedures (K2)

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: 6-7 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Develop bar charts regarding construction activities (K2)
2) Explain elements of network, CPM network(K2)
3) Describe Material Management, Store management(K1)

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 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)

Module-4: Construction Contracts and Specifications

Number of class hours: 6-7 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Illustrate types of construction contracts(K3)
2) Explain contract documents, specifications, general special conditions (K2)
3) Describe the procedures involved in arbitration and settlement(K1)

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: 4-5 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Explain causes of accidents (K2)

2) Describe remedial and preventive measures of accidents(K1)
3) Apply the labour laws and acts pertaining to civil construction activities(K3).

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 S C and Deodhar S V, Construction Engineering and Management, Khanna Book Pub- lishing, 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. New Delhi
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.

Sharma, S.C., Industrial Engineering and Management, Khanna Publications, New Delhi

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 a job interview. K2 & K3

CO4: Demonstrate effective writing skills for professional excellence. K2

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

Unit – 1 Soft Skills & Personality Development

Number of Class Hours: 06 **Marks: 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 as a signal that others read, mapping different personality types – Perfectionists, Helpers, Achievers, Romantics, Observers, Questioners, Enthusiasts or adventurers, Bosses or asserters, Mediators or peacemakers.

Unit – 2 Looking for a Job

Number of Class Hours: 05 **Marks: 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

Unit – 3 Job Interviews

Number of Class Hours: 05 **Marks: 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 verbal and 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.

Unit – 4 Enhancing Writing skills

Number of Class Hours: 12 **Marks: 08**

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.

Unit – 5 Conversations, Panel Discussion and Public Speaking

Number of Class Hours: 12 **Marks: 08**

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 &PushpLata 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	ARPR-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 (L: 2, T: 0, P: 0)
Prerequisites	NA
Course Category	Mandatory Course

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. ($\mathbf{K_2}$)
CO 2: Understand the Vedic literature and important ideas discussed in the Vedas. ($\mathbf{K_2}$)
CO 3: Describe scientific heritage of ancient India along with comprehending its relevance and application in various modern scientific disciplines. ($\mathbf{K_1}$)
CO 4: Relate the theoretical and practical sides of the science of Yoga and Aurveda with modern knowledge systems. ($\mathbf{K_1}$)
CO 5: Explain the worth of Indian intellectual heritage, traditional practices and Indian lifestyle from scientific lenses. ($\mathbf{K_4}$)

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.

Semester V

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact hrs / week	Credits
				L	T	P		
Theory Subjects								
1.	Program core course	ARPC501	Advance building services	3	0	0	3	3

2.	Program core course	ARPC502	Green Building Technology	2	0	0	2	2
3.	Program core course	ARPC503	Architectural Workshop-II	0	0	2	2	1
4.	Program core course	ARPC504	Interior design & drawing	0	0	2	2	1
5.	Program core course	ARPC505 (CEPC501)	Design of RCC and Steel Structure	3	0	0	3	3
6.	Program Elective course-II (any one to be selected)	ARPE506/A(CEPC502)	Estimating, Costing and valuation	3	0	0	3	3
		ARPE 506/B	Applied arts	3	0	0		
		ARPE 506/C	Site planning and landscape design	3	0	0		
7.	Program Elective course -III(any one to be selected)	ARPE507/A	Building maintenance	2	0	0	2	2
		ARPE507/B	Sustainable architecture	2	0	0	2	
		ARPE507/C(CEPE506/ B)	Solid waste management	2	0	0	2	
8.	Open Elective course-I	(Any one to be selected from Annexure-I)		3	0	0	3	3
				3	0	0	3	
				3	0	0	3	
9.	Summer Internship-II (6 weeks) after IVth Semester	ARSI509		0	0	0	0	3
10	Major Project I	ARPR510		0	0	2	2	1
	Total Credits							**22**

ADVANCE BUILDING SERVICES

Course code	ARPC501
Course title	Advance Building Services
Number of Credits	**3** (L:3,T:0,P:0)
Prerequisites	Nil
Course Category	Program Core

Objective:

To equip the students of architecture about various building services related to mechanical, HVAC, electrical, automation, Fire-fighting etc. so as to enable them to understand and integrate the learning into architectural design.

Expected Course outcome: By the end of the course, the students are expected

CO-1: To understand the necessities of advance building services (K1)
CO-2: To learn the basics of Air-conditioning and electrical installations. (K1)
CO-3: To determine the initial requirements of mechanical services in building (K3)
CO-4: To Interact technically with relevant subject experts. (K2)
CO-5: To understand and relate the provisions in drawings while working for a project. (K2)

Number of class hours: 6
Suggestive Learning Outcomes
1) Student will be introduced to mechanical services systems
2) Student will be acquainted with the safety measures in a building.
3) Students will able to determine the capacity of the elevators etc

Module-1:- The need and importance of mechanical services. Elevators, escalators and travelators - Types of elevators-traction, lobby, provision of elevators for a building, planning considerations - location in building, recommendations of the National Building Code, etc. Safety features and codes. Service requirements: capacity, space and physical requirements, machine room spaces and their typical layout.

.**Number of class hours**: 6
Suggestive Learning Outcomes
1) Student will be introduced to the water HVAC system.
2) Student will be able to determine the appropriate system for a building.

Module 2:- Natural and artificial ventilation. Air-conditioning; Basic-principles, laws and terminologies. Types of air conditioners such as window, split, packaged, direct expansion, central etc. Their selection criteria, design, structural considerations and energy requirements.

Number of class hours: 6
Suggestive Learning Outcomes
1) Student will be introduced to the basics of acoustics
2) Student will be able to apply the fundamentals of acoustics.

Module 3:- Introduction to acoustics and its need and importance. Noise; its transmission (air borne and structure borne), insulation and effects on human. Identification of various sources of indoor and outdoor noise. Methods of sound insulation. Material types for hollow and composite wall construction, floors, ceilings etc.

Number of class hours: 8
Suggestive Learning Outcomes
1) Student will be introduced to the electrical system in a building
2) Student will learn the functions of different electrical equipment.
3) Student will be introduced to building automations and its electrical provisions.

Module 4:- The need and importance of electrical services; Principles of electricity, units and basic terminology. Electricity distribution in buildings, Service wires, meter boards, circuits, switch boards, electrical safety devices in buildings, MCBs, Earthing. Introduction to electric layouts. Concept of Building Automation system.

Number of class hours: 6

Suggestive Learning Outcomes

1) Student will be exposed to the fire safety rules and regulations.
2) Student will learn the functions of fire fighting equipments.
3) Students will know the suitable provision of fire-safety elements in and outside a building.

Module 5:- Fire; causes of fire and spread of fire, fire fighting, protection & fire resistance, equipment & methods of fighting fire, Code of fire safety. Planning of Fire escape routes and elements, wet-risers, dry-risers, sprinklers, smoke-detectors, dampers, fire doors, water curtains etc.

References:

- Egan, Architectural Acoustics
- Kandaswamy, Architectural Acoustics and Noise Control
- J.E. Moore, Design for Good Acoustics and Noise Control.
- National Building Code 2005
- Kothari and Nagrath, Basic Electrical Engineering.
- Grondzik, Kwok, Stein, Mechanical and Electrical Equipment for Buildings
- Raina & Bhattacharya, Electrical Design Estimating and Costing
- Kelly & Connell, Interior Lighting Design - A Student's Guide
- Sadhu Singh, Refrigeration and Air Conditioning
- Ananthanarayana, Basic Refrigeration and Air Conditioning

Green Building Technology

Course code	ARPC 502
Course title	Green Building Technology
Number of Credits	2 (L:2,T:0,P:0)
Prerequisites	Knowledge of climatology
Course Category	Program Core

Expected Course outcome: By the end of the course, the students are expected

CO-1: To explain the concept of green building (K2)
CO-2: Can compare the merits and demerits of green building (K4)
CO-3: Illustrate the various climatic factors related to green building (K3)
CO-4: To explain the rating system of green building (K2)
CO-5:- To describe the concept of water conservations(K2)

Module 1
Number of class hours: 10

Suggestive Learning Outcomes
1) Student can explain the concept of green building(K2)
2) Student can differentiate the merit demerits of green building material(K2)

Detailed content of the unit:
1.1 Introduction of green building, Concept of green building, History of green building,
1.2 Need of green building in present scenario, Importance of green building Merits and demerits, Materials and its applicability,
1.3 Indoor Environmental Quality, physical properties etc. Application of the Eco Friendly/ Green Building materials for different components of the buildings at different level,

Module 2

Number of class hours: 10

Suggestive Learning Outcomes
1) Student can discuss the principal concept of green building (K2)
2) Student can describe the concept of climatic design(K2)

Detailed content of the unit:
2.1 Principles and elements of design of green building;
2.2. Sustainability: concept and reality
2.3 Climate responsive process of design: Climatic zones, design sequence, shelter or form, land form, vegetation, water bodies, street widths, open spaces, ground character, plan form, orientation, roof form

Module -3
Number of class hours: 10

Suggestive Learning Outcomes

1) Student can explain the concept of water conservation(K2)
2) Student will understand and describe the concept of carbon emission.(K2)

Detailed content of the unit:

3.1 Water conservation:, rain water harvesting, low flow fixtures, grey water recycling
3.2 Material conservation: concept of embodied energy, low energy materials, sustainable materials, alternative materials
3.3 Concept of carbon emission and its reduction.

Module -4
Number of class hours: 10

Suggestive Learning Outcomes
1) Student can explain water quality standard(K2)
2) Student can explain the concept 3R's in water conservation(K4)

Detailed content of the unit:
4.1 General idea about water quality standards and its treatment, types of water demand,
4.2 Determination of quantity of sanitary wastewater and storm water,
4.3 3-R (Reduce - Recycle - Reuse) concept,

Module-5

Number of class hours: 10

Suggestive Learning Outcomes
1) Student can interpret the energy conservation building code (K2)
2) Student can discuss about LEED, IGBC etc(K2)

Detailed content of the unit:

5.1 Clean Development Mechanism, Kyoto Protocol, Energy Conservation Building Code.

5.2 Rating Systems: - Leadership in Energy and Environmental Design (LEED), Green Globes, LEED India, Comprehensive Assessment System for Built Environment Efficiency (CASBEE).

Reference Books-

1. Energy Efficient Buildings in India by Milli Mujumdar
2. Green Building Materials by Ross Spiegel and Dru Meadows
3. Solar Energy in Architecture and Urban Planning by Herzog Thomas
4. Solar Heating, Design Process by Kreider Jan F
5. Renewable Energy & Environment - A policy analysis for India (CEE publications)
6. Sustainable Building Design Manual-Volume I and II –TERI Publication
7. Water supply & Sanitary Engineering by G. S. Birdie (Dhanpat Rai Publication)

ARCHITECTURAL WORKSHOP-II

Course Code	ARPC-503
Course Title	Architectural Workshop-II
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Knowledge in Architectural workshop-I
Course Category	Program core

Course Outcome:-

With the successful completion of the course students will have the ability to: -

CO-1:Demonstrate architectural models. (k2)

CO-2: Recognize societal issues related to architecture (k2)

CO-3: Model public architectural structures (k4)

CO.4: Model recreation centres (K4)

Course Content:-

Model making of:- A district library, a community center, a cultural center, a diagnostic center, a higher secondary school, a hostel, a health club, a motel, an old age home, a hotel for around 40 guests with combination of rooms of different categories, an office building, a recreation center, a shopping complex or any other structure of equivalent weightage.

References:

1. Form, Space, and Order (Ching)
2. Architectural Graphics (Ching)
3. Programs and Manifestoes on 20th Century Architecture (Conrads)
4. Lego Architecture Studio Companion book
5. Unbuilding (Macaulay)
6. Underground (Macaulay)
7. Cathedral (Macaulay)
8. Castle (Macaulay)
9. Pyramid (Macaulay)

INTERIOR DESIGN & DRAWING

Course Code	ARPC-504
Course Title	Interior design & drawing
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Nil
Course Category	Project Core

Course Outcome:-

With the successful completion of the course students will be able to
1. Discover the intricacies of interior space planning and its historical background(K3)
2. Identify the modern trends in the field(K2)
3. Design small and medium sized interior design projects(K5)
4. Design furniture for residential and public buildings.(K5)

Course Content:-

1: Introduction
Definitions, concepts, themes and types of interior spaces. Behavioral psychology, perception and the related role of interior spaces.

2: History
A historical overview of the influence of various design movements on interior design. Interior decoration and crafts of various indigenous tribes and communities of the sub-continent.

3: Elements of Interior Design - Interior Treatment and Finishes
Treatment methods, finishes, material selection, design options for floor, ceiling, walls, staircase, openings, interior services elements, etc. in order to achieve certain functional and/or aesthetical demands of the space.

4: Elements of Interior Design-Lighting and Interior Landscaping
Study of interior lighting; types, fixtures, enhancement accessories, selection for different contexts. Interior landscaping elements and significance in enhancing environment visuals and inducing moods; rocks, plants, water, flower, fountains, paving, artifacts etc.

5: Furniture Design & Interior Layouts and Planning
Human comfort, lifestyle aspirations, and function as context to design of furniture, interior spaces. Office and residential interior design layouts and furniture. Interiors and furniture of various age groups like school children etc.

References:

DESIGN OF RCC AND STEEL STRUCTURES

Course Code	ARPC 505(CEPC-501)
Course Title	Design of RCC and Steel Structures
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

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

C.O.1.**:** Identify the design of singly and doubly RC beam with shear, bond & development length. (K2)
C.O.2.**:** Demonstrate the design of short and long RCC columns with column foundation. (K3)
C.O.3.**:** Illustrate the design of one, two way RCC slab and the design of staircase. (K3)
C.O.4.**:** Generalize the design of riveted connection, welded connection and steel beam. (K2)
C.O.5.**:** Prepare the design of steel tension and compression member. (K3)

Detailed Course Content

Unit–I: Design of Reinforced Concrete Beams by Limit State Method

Number of class hours: 08

Learning Outcomes:

1. Illustrate the analysis of reinforced concrete rectangular beam by limit state method.
2. Describe the various steps for the design of singly and doubly RC beam.
3. Compute the minimum shear reinforcement and development length of beam.

Detailed content of the unit:

- Concept of limit state method and working stress method, Stress block diagram, Introduction to singly and doubly reinforced sections, IS 456.
- Design of singly reinforced beam, concept of under reinforced, over reinforced and balanced section, Simple numerical problem on ultimate moment of resistance and design of beam section.
- Design of doubly reinforced sections, stress and strain diagrams, depth of neutral axis, simple numerical problems on ultimate moment of resistance of reinforced beam, Calculation of A_{st} and A_{sc}. Design for RC flanged beam.
- Nominal shear stress in RCC section, Design shear strength of concrete, Design of shear reinforcement of beam and lintel, Minimum Shear Reinforcement, Provisions of IS 456, forms of shear reinforcement.
- Types of bond, bond stress, check for bond stress, Determination of Development length in tension and compression members and check as per codal provisions, Anchorage value of 90^0 hook, Lapping of bars.

Unit–II Design of axially loaded RCC Column and Column Foundation by Limit State Method

Number of class hours: 08

Learning Outcomes:

1. Classification of columns and describe the various steps for the design of RCC column.
2. Compute the reinforcement and dimensions for the column as per load acting on structure.

3. Demonstrate the structure of reinforcement for column foundation.

Detailed content of the unit:

- Definition and classification of column, Limit state of compression members, Effective length of column. Provisions of IS 456 for minimum steel, cover, maximum steel, spacing of ties etc.
- Design of axially loaded short column - Square, Rectangular, and Circular only.
- Functions of foundation, Classification of foundation, Design of isolated column foundation under axial load resting directly on bearing soil, for uniform thickness of the footing slab.

Unit–III Design of RCC Slab and Staircase by Limit State Method

Number of class hours: 08

Learning Outcomes:

1. Distinguish between one way slab and two-way slab.
2. Explain the various types and terminology of staircase.
3. Interpret and draw the design steps of RCC slab and staircase.

Detailed content of the unit:

- Definition of one way slab and two-way slab, Provisions of IS 456 for the slabs.
- Designs of one way slab – simply supported on either end, and also cantilever for flexure.
- Design of two way slab (a) with the edges not held down, (b) with the edges held down by using moment coefficient as per table 26 & 27 of IS 456.
- Definition of staircase, different types of stairs, terminology of staircase, Design of Simply supported on edges at landing levels and Supported on landing panels which spans transversely to the flight.

Unit–IV Design of Riveted Connection, Welded Connection and Steel Beam by Limit State Method

Number of class hours: 08

Learning Outcomes:

1. Interpret the types and failure of riveted joints.
2. Label the classification of welded joints with their symbols.
3. Compute the design of riveted, welded, I-section and channel section.

Detailed content of the unit:

- Different types of riveted joint, failure of riveted joints, design of riveted joint for axial tension, Eccentric riveted connection – application to bracket connected to steel columns with moment in the plane of river and in perpendicular plane, permissible stress in rivet – shearing and bearing.
- Types of weld and their symbols, permissible stresses, fillet weld – throat thickness, size of weld, length of weld. Design of simple lap and butt joints subjected to axial load. Design of eccentric welded connection with moment in the plane of weld and in perpendicular plane.
- Standard beam sections, bending stress calculations. Design of simple I and Channel section. Check for shear as per IS 800.

Unit–V Design of Steel Tension and Compression Members by Limit State Method

Number of class hours: 08

Learning Outcomes:

1. Distinguish between steel tension and compression members.
2. Define the effective length, radius of gyration and slenderness ratio for steel column.
3. Explain the built–up sections, lacing and battening.

Detailed content of the unit:-

- Types of sections used for Tension members. Design of axially loaded single angle and double angle tension members with bolted and welded connections.
- 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, Design compressive stress.
- 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.

Suggested Learning Resources:

- Shah, V. L., and Karve, S.R., Limit State Theory and Design of Reinforced Concrete Structures, Structures Publications, Pune,2014.
- Sinha N.C., and Roy S.K., Fundamentals of Reinforced Concrete, S. Chand & Co., New Delhi.
- Krishna Raju, and N. Pranesh, R.N., Reinforced Concrete Design Principles and Practice, New Age International, Mumbai.
- Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGraw Hill Publications, New Delhi.
- Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Pri- vate Limited, Delhi.
- Shah, V. L., and Gore, V., Limit State Design of Steel Structures, Structures Publications, Pune.
- Dayarathnam P., Design of Steel Structures, S. Chand and Company, Delhi.
- Subramanian N., Design of Steel Structures, Oxford University Press.
- Sairam, K.S., Design of Steel Structures, Pearson Publication, Chennai, Delhi.

ESTIMATING, COSTING AND VALUATION

Course Code	ARPE 506/A(CEPC-502)
Course Title	Estimating, Costing and Valuation
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	Program Elective

Course Outcomes: -

After completing this course, student will be able to:

1) Select modes of measurements for different items of works. **(K2)**
2) Prepare approximate estimate of a civil engineering works. **(K3)**
3) Prepare detailed estimate of a civil engineering works. **(K3)**
4) Use relevant software for estimating the quantities and cost of items of works. **(K3)**
5) Discover the rate for given items of work using rate analysis techniques. **(K3)**

Course Content:-

Module- 1: Fundamentals of Estimating and Costing

Number of class hours: : 3-4 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Describe different types and uses of estimates(K1)
2) Describe the procedure for estimating and costing of Civil Engineering works(K1)
3) Classify roles and responsibility of estimator(K2)
4) Identify standard formats of measurement sheet, Abstract sheet, Face sheet.(K2)

Detailed content of the unit:

1.1 Estimating and Costing – Meaning, purpose, Administrative approval, Technical Sanction and Budget provision.
1.2 Types of estimates – Approximate and Detailed estimate.
1.3 Types and Uses of Estimates: Revised estimate, Supplementary estimate, Repair and maintenance estimate, renovation estimate.
1.4 Roles and responsibility of Estimator.
1.5 Checklist of items in load bearing and framed structure.
1.6Standard formats of Measurement sheet, Abstract sheet, Face sheet.
1.7 Modes of measurement and desired accuracy in measurements for different items of work as per IS:1200.
1.8 Rules for deduction in different category of work as per IS:1200.
1.9 Description / specification of items of building work as per PWD /DSR.

Module- 2: Approximate Estimates

Number of class hours: 3-4 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Explain definition and purpose of approximate estimate(K2)
2) Describe different methods of approximate estimate(K2)
3) Solve numerical problems for roads, railways, bridges/culvert, irrigation projects and water Supply projects using approximate estimate.(K3)

Detailed content of the unit:

2.1 Approximate estimate- Definition, Purpose.
2.2 Methods of approximate estimate - Service unit method, Plinth area rate method, Cubical content method, Typical bay method, Approximate quantity method (with simple numerical)
2.3Approximate estimate for roads, Railways, bridges/culvert, irrigation projects and water Supply projects.

Module-3: Detailed Estimate

Number of class hours: 6-7 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Describe the purpose of detailed estimate and different data required for detailed estimate(K2)
2) Explain long wall and short wall method, centre line method(K2)
3) Demonstrate bar bending schedule for footing, column, beam, Lintel, chajja and slab elements(K3)

Detailed content of the unit: -

3.1 Detailed Estimate- Definition and Purpose, Data required for detailed estimate - Civil cost, GST, Contingencies, Supervision charges, Agency charges, Procedure for preparation of detailed estimate- Taking out quantities and Abstracting.
3.2 Methods of Detailed Estimate- Unit quantity method and total quantity method (with simple numericals)
3.3Long wall and Short wall method, Centre line method.
3.4Bar bending schedule for footing, column, beam, Lintel, chajja and slab elements
3.5Provisions in detailed estimate: contingencies, work charged establishment, percentage charges, water supply and sanitary Charges and electrification charges etc.
3.6Prime cost, Provisional sum, Provisional quantities, Bill of quantities, Spot items or Site items.

Module-4: Estimate for Civil Engineering Works

Number of class hours: 6-7 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Describe different methods for calculating earthwork of roads, embankment and canal.(K2)
2) Explain detailed estimate for septic tank(K2)
3) Discover the use of computer/ softwares/programmes for detailed estimate.(K3)

Detailed content of the unit:

4.1 Earthwork - Quantities for roads, Embankment and canal by – Mid sectional area method, mean sectional area method, Prismoidal and trapezoidal formula method.
4.2 Detailed estimate for septic tank, Community well.
4.3 Use of computer /softwares / programmes for detailed estimate Preparation of Civil Engineering Works.

Module- 5: Rate Analysis
Number of class hours: 5-6 Hours

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

1.Explain the procedure for rate analysis(K2)
2. Describe lead, lift, overhead charges, water charges and contractors profit.(K2)
3. Discover the categories of labours and also types and numbers of labours for different items of works.(K3)
4. Prepare rate analysis of different items of work for building and roads(K3)

Detailed content of the unit: -

5.1 Rate Analysis: Definition, purpose and importance.
5.2 Lead (Standard and Extra), lift, overhead charges, water charges and contractors' profit,
5.3 Procedure for rate analysis.
5.4 Task work- Definition, types. Task work of different skilled labour for different items.
5.5 Categories of labours, their daily wages, types and number of labours for different items of work.
5.6 Transportation charges of materials - Lead and Lift, Hire charges of machineries and equipments.
5.7 Preparing rate analysis of different items of work pertaining to buildings and roads.

References: -

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.
4. Birdie,G.S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd. New 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. PWD Schedule of Rates.
8. Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Sched- ule of Rates.
9. Manual of Specifications and Standards for DBFOT projects, EPC works.

APPLIED ART

Course Code	ARPE-506/B
Course Title	Applied Art
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Nil
Course Category	Program Elective

Applied Arts are those that have a practical use, in addition to the merely artistic, in all its extension.

Course Outcome:-

With the successful completion of the course students will have ability to: -

1. CO-1. Identify ideas about applied art. (k2)
2. CO-2. Recognize the public needs along with creativity. (k2)
3. CO-3. Gain adequate outline knowledge of all kinds of designs. (k1)
4. CO-4. Gain knowledge by operating on materials separately. (k3)
5. CO-5. Predict new designs if the history is well known to the student. (k3)

Course Content: -

Module 1:

Lecture Hour: 6-8 hrs

Learning Outcomes: 1. Define fine arts and applied arts(K1)

Introduction of Applied Arts*: - Applied arts definition* & meaning. difference between fine arts and applied arts.

Module 2:

Lecture Hour: 6-8 hrs

Learning Outcomes: 1. Explain Aesthetics, Consumer Need(K2)

2. Identify design and decoration to create objects useful and aesthetically good (K2)

Importance of applied arts: - Applied arts is a broad subject area that combines aesthetics, design, consumer need, and finding practical solutions to problems. It is an area in which design and decoration come together to create objects and ideas that are both useful and beautiful.

Module 3:

Lecture Hour: 6-8 hrs

Learning Outcomes: 1. Describe* i*ndustrial design – mass-produced objects(K1)

2. Explain fine art, Ceramic art, Automotive design, Fashion design, computer art, photography, Calligraphy, Interior design, Graphic design

Types of applied arts: - Industrial design – mass-produced objects, Architecture – also counted as a fine art, Ceramic art, Automotive design, Fashion design, computer **art**, photography, Calligraphy, Interior design, Graphic design.

Module 4:

Lecture Hour: 6-8 hrs

Learning Outcomes: 1. Design furniture, carpets, tapestry, embroidery, batik, jewellery, precious metalwork, pottery, gold smiting, basketry, mosaic art, and glassware(K5)

Application: - Applied Art give an example - furniture, carpets, tapestry, embroidery, batik, jewellery, precious metalwork, pottery, gold smiting, basketry, mosaic art, and glassware. Illuminated manuscripts and later book illustrations are also classified as applied arts. Architecture too is best viewed as an applied.

Module 5:

Lecture Hour: 6-8 hrs

Learning Outcomes: 1. Describe History of applied arts(K1)

History of applied arts: - Origins of the concept**,** Middle Ages**,** Neoclassicism**,** Industrial Revolution**,** Twentieth century**,** XXI century .

References.

- Architecture: A Visual History by Jonathan Glancey. ...
- Architecture: Form, Space, and Order by Francis D.K. ...
- The Architecture Reference & Specification Book: Everything Architects Need To Know Every Day by Julia McMorrough.

Site planning and Landscape design

Course code	ARPE506/C
Course title	Site planning and landscape design
Number of Credits	3(L:3,T:0,P:0)
Prerequisites	Knowledge of landscape architecture
Course Category	Programe Elective

Expected Course outcome: By the end of the course, the students are expected

CO-1: To explain the natural elements related to landscaping (K2)
CO-2: To describe the concepts of site planning by eminent planners(K1).
CO-3: To discuss the principle of landscape design(K2).
CO-4: To appraise the existing landscape elements of a site (K5)
CO-5: To describe landscape concept and open space structure as a basic component of the site plan(K1)

Module 1

Number of class hours: 9

Suggestive Learning Outcomes
1) Student can describe the process of site analysis(K2)
2) Student will learn how to evaluate the natural elements present in site (K5)

Detailed content of the unit:
1.1 Site analysis: Site analysis with respect to topography and existing features; slopes, drainage; soil types and layers;
1.2 sensitive areas and natural ecosystem; vegetation and tree survey etc

Module 2

Number of class hours: 12

Suggestive Learning Outcomes

1) Student will be able relate with the philosophy of site planning by renowned planners(K3)
Detailed content of the unit:

2.1 Concepts and ideas of Kevin Lynch, Ian Mcharg, Gorden Cullen, Geoffrey Jellicoe on natural and built environment

Module 3

Number of class hours: 12

Suggestive Learning Outcomes

1) Student will be able to describe the principles of landscape design(K2)
2) Student will be able to memorize the history of garden design (K1)

Detailed content of the unit:

3.1 Landscape design: Landscape principles and design elements;

3.2 Historical overview of garden design; principles of landscape construction;

3.3 Introduction to planting design and plant selection

Module 4

Number of class hours: 12

Suggestive Learning Outcomes

1) Student will be able to identify different types of pavements (K1)
2) Student will be able to describe the elements of waterscape (K2)

Detailed content of the unit:

4.1 Paving**:** hard and soft – layout for formal and informal paving – different kinds of paving materials: soil, stabilized murrum, brick & stone,

4.2 Artificial Rock , Artificial Waterfall water efficient landscaping

Module 5

Number of class hours: 12

Suggestive Learning Outcomes

1) Student will learn how to evaluate existing landscape(K5)
2) Student will be able to explain concept of site plan(K2)

Detailed content of the unit:

5.1 Landscape aspects of site planning: Principles of understanding and evaluating and existing landscape.

5.2 Development as a response to constraints and opportunities offered by the site.

5.3 The landscape concept and open space structure as a basic component of the site plan.

R E F E R E N C E B O O K S

1. McHarg, lan, Design With Nature. LaurieM.,1986.
2. An Introduction to Landscape Architecture. Elsevier. Hubbard H.V.,
3. An Introduction to Landscape Design. Bose&Chowdhary,1991
4. Tropical Garden Plantsin Colour. H&A Publishers, Calcutta. Clifford 0,
5. History of Garden Design. Root, James 8.,
6. Fundamentals of Landscape and Site Planning Lynch, Kevin, 1962.
7. Site Planning. The MIT Press, Cambridge. Krishen,Pradip.2006.
8. Trees of Delhi. Dorling Kindersley.
9. GRIHA Manual Volumes 2-4. Adarsh

BUILDING MAINTANANCE

Course code	ARPE507/A
Course title	Building Maintenance
Number of Credits	2(L:2,T:0,P:0)
Prerequisites	NIL
Course Category	Programe Elective

Expected Course outcome: By the end of the course, the students are expected

CO-1: Can define the cause of dilapidation of a building (K1)
CO-2: Student can explain the cause failure of foundation of a building(K2)
CO-3: Student can discuss the defects in masonry wall(K2)
CO-4:Student can explain about the different process of repairs of defects in RCC(K2)
CO-5: Describe causes of failure of RCC framed structures(K1)

Module 1

Number of class hours: 10

Suggestive Learning Outcomes
1) Student can discuss the maintenance and repair part of a building (K2)
2) Student can explain the causes of degradation of a building (K2)

Detailed content of the unit:

1.1 Introduction, Operation, maintenance and repairs of buildings, Determination of approximate age of a building

1.2 Dilapidation; Causes of dilapidation of buildings – Rehabilitation of dilapidated building. Factors influencing the degree of dilapidation of buildings

Module 2

Number of class hours: 6

Suggestive Learning Outcomes

1) Student can explain cause of failure of foundation(K2)
2) Student can describe process of repair of foundation (K2)

Detailed content of the unit:

2.1 Failure of foundation – Causes of settlement of foundation

2.2 Repairs to foundation

Module 3

Number of class hours: 10

Suggestive Learning Outcomes

1) Student can identify the various defects in masonry wall(K1)
2) Student can discuss the remedial process to overcome defects in masonry wall(K2)

Detailed content of the unit:

3.1 Masonry walls, Damp walls – Causes – Effects Remedies – Permanent remedies Condensation

3.2 Efflorescence – Causes – Effects – Eradication of efflorescence Cracks in– Investigation.

3.3 Remedial and preventive measures Precaution while carrying repairs of load bearing walls. Defects in plastering and repair works

Module 4

Number of class hours: 12

Suggestive Learning Outcomes

1) Student can describe the water proofing compound(K2)
2) Student can explain different process of water proofing (K2)

Detailed content of the unit:

4.1 Floors & Roofs RCC roofs with lime terracing leaking – Remedial measures**.**

4.2 Water proofing compounds– Water proofing solutions – Sylvester process of water proofing the surface. Filling cracks in terraced roof – Repairing hair cracks .

4.3 Destroying the vegetation with roots in masonry

Module 5

Number of class hours: 10

Suggestive Learning Outcomes

1) Student can identify about the defects in RCC(K1)
2) Student can describe the different process of repairs of defects in RCC(K2)
3) Student explain about the maintance and protection of steel structure (K2)

Detailed content of the unit:

5.1 R.C.C. & Steel Structures Factors affecting durability of concrete .Remedial measures maintenance and rehabilitation. Repair of concrete structures – Physical examination of common defects and damages – Inspection of the cracks

5.2 Causes of failure of RCC framed structures. Decay of different parts of stair.

5.3 maintenance of steel structures: Maintenance procedure – Protective surface coating

R E F E R E N C E B O O K S

MAINTENANCE AND REPAIRS OF BUILDINGS / P. K. GUHA / NEW CENTRAL BOOK AGENCY (P) LTD. 8/1 CHINTAMONI DAS LANE, KOLKATA – 700 009

Sustainable Architecture

Course code	ARPE507/B
Course title	Sustainable Architecture
Number of Credits	2 (L:2,T:0,P:0)
Prerequisites	Knowledge of Building Materials and Climatology
Course Category	Program Elective

Expected Course outcome: By the end of the course, the students are expected

CO-1: To explain the concept of Sustainability (K2)
CO-2: To memorize the principles of Sustainability (K1)
CO-3: To discuss the sustainable building materials and techniques (K2)
CO-4: To compare the implications of sustainability in the field of Architecture (K2)
CO-5: To apply the understanding of sustainability in design exercises (K3)

MODULE-1:-

Number of class hours: 4-5

Learning Outcomes
1) Discuss the concepts of Sustainable Development(K2)
2) List the historical importance of sustainability(K1)

Detailed content of the unit:

1.1 Introduction to Sustainability – definitions, need and pillars of sustainability.
1.2 History and development of sustainability.
1.3 Climate Change, Global warming- Current Issues and Solutions of sustainability.

Module 2:- Principles

Number of class hours: 6-7

Learning Outcomes
1) Outline the various types of sustainability.(K1)
2) Define the principles for a sustainable approach.(K1)
3) Identify the basics of conservation of resources(K1)

Detailed content of the unit:
2.1 Types of sustainability- Political Sustainability, economic sustainability, cultural sustainability, social sustainability, building sustainability - Co-relationship between all
2.2 Driving factors of sustainable change
2.3 Principles of Sustainability.
2.4 Conservation of resources - water, energy etc.

MODULE-3:-

Number of class hours: 8-9

Learning Outcomes
1) Discuss the environmental impact on buildings.(K2)
2) Summarize the design priorities for sustainability.(K2)
3) Explain the implication of sustainability in various spheres of architecture.(K2)

Detailed content of the unit:
3.1Sustainable Architecture-Definitions and Principles

3.2 Environmental Impact of Buildings and Sustainable Design priorities.
3.3 Selected Examples of Sustainable Architecture – Vernacular, Historical and Contemporary
3.4 Sustainability through Landscape Architecture
3.5 Vernacular architecture and its relevance

MODULE 4:-

Number of class hours: 8-9

Suggestive Learning Outcomes:-
1) Describe various method of sustainable construction (K2)
2) Identify the appropriate material for construction.(K1)

Detailed content of the unit:
4.1 Traditional and vernacular - materials and methods.
4.2 Natural Building Materials - Bamboo , stone, Mud etc
4.3 Manmade /Synthetic Building Materials – Hi-tech glass, polymers, Hi-performance concrete etc.
4.4 Alternate building materials - CLC Blocks (Cellular Light Weight Concrete), Fly ash Bricks, 4.5AAC blocks, Cement Fibre boards etc.

Module 5:-

Number of class hours: 6-7

Learning Outcomes
1) Discuss the application of sustainability in built environment.(K2)
2) Classify the understandings in design process.(K1)

Detailed content of the unit:

5.1 Climate responsive building - Reduction of energy consumption, direct –indirect method
5.2 Carbon footprint and eco footprints of buildings
5.3 New concepts and trends in green buildings - national and international.
5.4 National and International policies and Regulations on sustainability.

References:

1. Renewable Energy & Environment - A policy analysis for India (CEE publications)
2. Sustainable Building Design Manual-Volume I and II –TERI Publication
3. Acharya P. K. 1933, 'Architecture of Mansara,' Oxford University press- Bombay Ch.5, p - 17.
4. Szokolay, S. V., 2004. *Introduction to Architectural Sciences: The Basis of Sustainable Design,* Architectural Press, Oxford.
5. Krishnan, A. (ed.), Baker, N., Yannas, S., Szokolay, S., 2001. *Climate Responsive Architecture – A Design Handbook for Energy Efficient Buildings,* Tata McGraw-Hill Publishing Company Limited, New Delhi.
6. Bob Doppelt, 2010, The Power of Sustainable Thinking, Earthscan, ISBN 9781849710794

7. Gursharan Singh Kainth, Climate Change, Sustainable Development and India, LAP Lambert Academic Publishing, 2011
8. Margaret Robertson, Sustainability Principles and Practice, Routledge, 2014
9. Cairns Regional Council, Sustainable Tropical Building Design- Guidelines for commercial buildings, 2011
10. Energy Conservation and Building Code.
11. Givoni, B., 1969. Man, Climate and Architecture, Elsevier Publishing Company Limited.
12. Koenigsberger, O. H., Ingersoll, T. G., Mayhew, A., Szokolay, S. V., 1973. Manual of Tropical Housing and Building Part 1. Climatic Design, Orient Longman Pvt. Ltd.
13. Energy Efficient Buildings in India by Milli Majumdar.
14. P.K. Singh, Rainwater Harvesting: Low cost indigenous and innovative technologies, Macmillan Publishers India, 2008

SOLID WASTE MANAGEMENT

Course Code	ARPE-507/C (CEPE-506/B)
Course Title	Solid Waste Management
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	NIL
Course Category	Programme Elective

Course Outcomes: -

After completing this course, student will be able to:

1. Identify the sources of solid waste. (K1)
2. Select the relevant method of collection and transportation of solid waste. (K2)
3. Suggest an action plan for composting of solid waste. (K3)
4. Devise suitable disposal technique for solid waste. (K5)
5. Use the relevant method for disposal of Bio-medical and E-waste. (K3)

Course Content:

Module – 1: Introduction

Number of class hours: 8 hours

Suggestive Learning Outcomes:

At the end of module -1, students will be able to:-

7. Define different types of solid waste. (K1)
8. Classify the types of solid waste. (K2)
9. Know the characteristics of municipal solid waste. (K1)

Detailed content of the unit: -

• 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.

Module– 2: Storage, Collection and Transportation of Municipal Solid Waste

Number of class hours: 8 hours

Suggestive Learning Outcomes:

At the end of module -2, students will be able to:-

1. Know about collection, segregation, storage and transportation and its tools and equipments related to solid waste. (K1)
2. Select the relevant method of collection and transportation of solid waste. (K2)
3. Know the various transportation vehicle. (K1)

Detailed content of the unit: -

• 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, location.
• Role of rag pickers and their utility for society.

Module-3: Composting of Solid Waste

Number of class hours: 8 hours

Suggestive Learning Outcomes:

At the end of module -3, students will be able to:-

5. Distinguish the various methods for composting of solid waste. (K2)
6. Suggest an action plan for composting of solid waste. (K3)
7. Know the concepts of composting solid waste. (K1)

Detailed content of the unit: -

• 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.

Module-4: Techniques for Disposal of Solid Waste

Number of class hours: 8 hours

Suggestive Learning Outcomes:

At the end of module -4, students will be able to:-

4. Know the solid waste management and its reduction techniques. (K1)
5. Illustrate various methods of solid waste . (K3)

6. Devise suitable disposal technique for solid waste. (K5)

Detailed content of the unit: -

• 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

Module-5: Biomedical and E-waste management

Number of class hours: 8 hours

Suggestive Learning Outcomes:
At the end of module -5, students will be able to:-

7. Define biomedical waste and E waste. (K1)
8. Illustrate the ill effects of E-waste. (K3)
9. Use the relevant method for disposal of Bio-medical and E-waste. (K3)

Detailed content of the unit: -

• 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.

References: -

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.

Summer Internship-II

Course Code	ARSI-509
Course Title	Summer Internship-II
Number of Credits	3 (L: 0, T: 0, P: 0)
Prerequisites	Fundamental and basic practical skills of relevant discipline/programme
Course Category	Internship

Internships may be full-time or part-time; they are full-time in the summer vacation and part-time during the academic session.

Sl.	Schedule	Duration	Activities	Credits	Hours of

no.					Work
1	Summer Vacation after 4th Semester	6 Weeks	Industrial/Govt./NGO/MSME/ Rural Internship/Innovation / Entrepreneurship ##	3	120 Hours

(##During the summer vacation after 4th Semester, students are ready for industrial experience. Therefore, they may choose to undergo Internship /Innovation /Entrepreneurship related activities. Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry. In case a student want to pursue his/her family business and don't want to undergo internship, a declaration by a parent may be submitted directly to the TPO.)

Course Outcome: -

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

C.O.1: Describe a better understanding of the engineering / technological workplace(K2).

C.O.2: Develop and demonstrate workplace competencies necessary for professional and academic success (K2).

C.O.3: Classify career preferences and professional goals (K3).

C.O.4: Develop preliminary portfolio including work samples from the internship (K2).

C.O.5: Increase competitiveness for full-time engineering employment / start-up (K3).

Course Content:-

Internships are educational and career development opportunities, providing practical experience in a field or discipline. The Summer Internship-II is a student centric activity that would expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship has to be meaningful and mutually beneficial to the intern and the organization. It is important that the objectives and the activities of the internship program are clearly defined and understood. Following are the intended objectives of internship training:

1. Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
2. Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
3. Exposure to the current technological developments relevant to the subject area of training.

4. Experience gained from the 'Industrial Internship' in classroom will be used in classroom discussions.
5. Create conditions conducive to quest for knowledge and its applicability on the job.
6. Learn to apply the Technical knowledge in real industrial situations.
7. Gain experience in writing Technical reports/projects.
8. Expose students to the engineer's responsibilities and ethics.
9. Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
10. Promote academic, professional and/or personal development.
11. Expose the students to future employers.
12. Understand the social, economic and administrative considerations that influence the working environment of industrial organizations
13. Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

Overall compilation of Internship Activities / Credit Framework:

Major Head of Activity	Credit	Schedule	Total Duration	Sub Activity Head	Proposed Document as Evidence	Evaluated by	Performance appraisal/ Maximum points/ activity
Innovation / IPR / Entrepreneurship	3	Summer Vacation after 4th Semester	6 Weeks	Participation in innovation related completions for eg. Hackathons etc.	Certificate	Faculty Mentor	Satisfactory/ Good/ Excellent
				Development of new product/ Business Plan/ registration of start-up	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Participation in all the activities of Institute's Innovation Council for eg: IPR workshop/ Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.	Certificate	President/ Convener of ICC	Satisfactory/ Good/ Excellent
				Work experience at family business	Declaration by Parent	TPO	Satisfactory/ Good/ Excellent
Internship	3	Summer Vacation after 4th Semester	6 Weeks	(Internship with Industry/ Govt. / NGO/ PSU/ Any Micro/ Small/ Medium enterprise/ Online Internship	Evaluating Report	Faculty Mentor/ TPO/ Industry supervisor	Satisfactory/ Good/ Excellent
Rural Internship	3	Summer Vacation	6 Weeks	Long Term goals under rural Internship	Evaluating Report	Faculty Mentor/	Satisfactory/ Good/

		after 4th Semester				TPO/ NSS/ NCC head	Excellent

STUDENT'S DIARY/ DAILY LOG

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day-to-day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed at the end of each day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor visiting the industry from time to time and get ratified on the day of his visit.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

a) Regularity in maintenance of the diary.
b) Adequacy & quality of information recorded.
c) Drawings, sketches and data recorded.
d) Thought process and recording techniques used.
e) Organization of the information.

INTERNSHIP REPORT

After completion of Internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period. The student may contact Industrial Supervisor/ Faculty Mentor/TPO for assigning special topics and problems and should prepare the final report on the assigned topics. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The training report should be signed by the Internship Supervisor, TPO and Faculty Mentor. The Internship report will be evaluated on the basis of following criteria:

a) Originality.
b) Adequacy and purposeful write-up.
c) Organization, format, drawings, sketches, style, language etc.
d) Variety and relevance of learning experience.
e) Practical applications, relationships with basic theory and concepts taught in the course.

Major Project - I

Course Code	ARPR-510
Course Title	Minor Project
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Nil
Course Category	Project Work (PR)

Course Outcome:-

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

C.O. 1: Demonstrate a sound technical knowledge of their selected project topic and the knowledge, skills and attitudes of a professional engineer (K2).

C.O. 2: Develop the skill of working in a Team (K3).

C.O. 3: Design engineering solutions to complex problems utilising a systems approach (K6).

C.O. 4: Design the solution of an engineering project involving latest tools and techniques (K6).

C.O. 5: Develop the skill of effective communication with engineers and the community at large in written an oral forms. (K3)

Course Content:-

The major 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) Develop sound knowledge about the domain of the project work.
2) Perform detailed study about various components of a project.
3) Learn to be an important member of a team for successful execution of a project work.
4) Study about methodologies and professional way of documentation and communication related to project work.
5) Develop idea about problem formulation, finding the solution of a complex engineering problem.
6) Develop project report as per the suggested format to communicate the findings of the project work.
7) Acquire the skill of effective oral communication to the fellow engineers and people in the society at large.
8) Knowledge of how to organize, scope, plan, do and act within a project thesis.
9) Familiarity with specific tools (i.e. hardware equipment and software) relevant to the project selected.
10) Demonstrate the implementation of a major project work.

Semester VI

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact hrs / week	Credits
				L	T	P		
Theory Subjects								
1.	Program core course	ARPC601	Building by laws & regulations	2	0	0	2	2
2.	Program core course	ARPC602	Town planning	3	0	0	3	3

3.	Program core course	ARPC603	BIM	0	0	2	2	1
4.	Humanities and Social Science course-5	HS604	Entrepreneurship and Start-ups	3	1	0	4	4
5.	Open Elective course-II	(Any one to be selected from Annexure-II)		3	0	0	3	3
				3	0	0	3	
				3	0	0	3	
6.	Professional Elective course-IV(any one to be selected)	ARPE 606/A (CEPE-603/C)	Advanced Design of Structures	3	0	0	3	3
		ARPE 606/B	Housing	3	0	0	3	
		ARPE 606/C	Professional Practice	3	0	0	3	
7.	Mandatory Course	AU606	Indian Constitution	2	0	0	2	0
Lab. / Seminar / Project								
8.	Architectural Project II	ARPR607	Major Project II	0	0	6	6	3
9.	Arch Seminar	ARSE608	Seminar	1	0	0	1	1
	Total Credits							**20**

BUILDING BYLAWS AND REGULATION

Course code	ARPC601
Course title	Building by laws & regulation
Number of Credits	2 (L:2,T:0,P:0)
Prerequisites	NIL
Course Category	Program Core

Expected Course outcome: By the end of the course, the students are expected

CO-1: To explain the procedure of submitting a municipality approval drawing (K2) .
CO-2: To design a building following the municipal norms of AMC (K6)
CO-3: students can illustrate the elements of in a barrier free building (K3)
CO-4: students can explain the safety norms as per government directions (K2)
CO-5: Describe wastewater recycling and insurance of functional building(K1)

Module 1

Number of class hours: 6

Suggestive Learning Outcomes

1) Student will be able to select about different format drawing submitted to municipal corporation (K1)
2) Student will be able to describe the standard protocol of color notations in municipal drawing (K2)

Detailed content of the unit:

1.1 Key (Location) Plan – Site Plan – Building Plans –
1.2 Sizes of drawing sheets – Colouring notations for plans – Dimensions

Module 2
Number of class hours: 8

Suggestive Learning Outcomes
1) Student will be able to classify the different terminology related to TBR(K2)
2) Student will be able to explain the duties of professionals in sanctioning a plan(K2)

Detailed content of the unit:

2.1 Definitions as in Tripura Building rules 2017

2.2 Engagement of Technical Personnel – Association of Engineers with Architect – Licensed Building Surveyor – Duties and Responsibilities of Architect and Licensed Building Surveyor

Module 3
Number of class hours: 8

Suggestive Learning Outcomes
1) Student will know how to calculate ground coverage FAR(K3)
2) Student will learn to recommend regulation for a plot having more than one building in it(K5)

Detailed content of the unit:

3.1 Means of access, ground coverage, open space for building ,FAR

3.2 Requirements of Part of Buildings, Regulation for more than one building in plot

Module 4
Number of class hours: 10

Suggestive Learning Outcomes

1) Student will be able to discuss means and requirements of fire exit(K2)
2) Student will be able to illustrate the matter related to building services(plumbing)(K3)

Detailed content of the unit:

4.1 Fire Protection and Exit Requirements and Building and Plumbing Services

Module 5
Number of class hours: 10

Suggestive Learning Outcomes
1) Student will be able to explain the norms on about barrier free design (K4)
2) Student will be able to explain and understand the norms for sustainable building (K2)

Detailed content of the unit:
5.1 Special Provisions on Huts, facilities for physically handicapped persons,
5.2 Green buildings and Sustainability provisions like Roof top solar energy installation, solar assisted water-heating system, rainwater harvesting,
5.3wastewater recycling and insurance of functional building

Reference book

1) Tripura building rules2017 and amended there after
2) Amendment of building rules by AMC
3) National Building Code(NBC) As published by govt of India

Town Planning

Course code	ARPC602
Course title	Town Planning
Number of Credits	3 (L:3,T:0,P:0)
Prerequisites	Nil
Course Category	Program Core

Expected Course outcome: By the end of the course, the students are expected

CO-1: To Remember the stages of evolution of settlement planning (K1)
CO-2: To learn the basic aspects of Town planning (K2)
CO-3: To Understand the various development plans and their preparation (K2)
CO-4: To relate the processes involved in urban planning and development. (K2)
CO-5: To apply the understanding of acts, regulations etc. in design exercises (K3)

MODULE-1:-

Number of class hours: 6-7

Learning Outcomes
1) Identify Town planning.(K1)
2) Describe the evolution of settlement planning.(K1)

Detailed content of the unit:
1.1 Introduction to Town Planning, need, basic term and definitions.
1.2 Town planning in ancient India.
1.3 Development and impact of Industrial revolution on settlement planning.

MODULE 2:-

Number of class hours: 8-9

Learning Outcomes
1) Classify the characteristics of settlement types.(K2)
2) Discuss the importance of planning.(K2)

Detailed content of the unit:
2.1 Urban Areas – characteristics and comparison with rural area.
2.2 Contribution of urban planners-Brief overview of process of urban planning and development.
2.3 Classification of town and cities based on different aspects.

MODULE 3:-

Number of class hours: 10-11

Suggestive Learning Outcomes
1) Identify the process of urban planning.(K1)
2) Recognize the initial requirement of the planning process.(K2)

Detailed content of the unit:
3.1 Introduction to the planning process.
3.2 Physical characteristics, land use, Survey, Zoning, population, employment and industry, housing, 3.3 commercial and transportation in urban planning.

Module 4:-

Number of class hours: 6-7
Learning Outcomes
1) Discuss the scenario of urban planning in India.(K2)
2) Explain the elements of development / master plan of a city.(K2)

Detailed content of the unit:
4.1 Urban planning scenario of India.
4.2 Study of development plan/Master plan for selected towns. Planning of new towns- case study of 4.3 Chandigarh, Gandhinagar, and other towns in India.

Module 5:-

Number of class hours: 10-11

Learning Outcomes
1) Discover the various acts, schemes and regulations.(K3)
2) Apply the understandings in planning and design process(K3)

Detailed content of the unit:
5.1 The various urban institutional bodies and their role and functions (Urban Development Authorities, Municipal authorities).
5.2 The various acts, schemes and regulations in urban development and renewal, SEZ, JNNURM,
5.3 Sustainable regional planning principles, forest zones, etc.

References:

1. Rangwala, Town Planning.
2. Ashok Kumar Jain, Town Planning
3. N.V. Modak, V.N. Ambedkar, Town and Country Planning and Housing
4. Lewis Keeble, Principles of Town and Country Planning
5. Burn, Stanly & Williams, Cities of the world – World Regional Urban Development
6. John Ratcliffe, An Introduction to Town and Country Planning
7. S.C. Garg, City Planning
8. Arthur B. Gallion and Simon Eisner, The Urban Pattern – City Planning and Design

BIM

Course code	ARPC603
Course title	BIM
Number of Credits	1(L:0,T:0,P:2)
Prerequisites	Knowledge of computer and CAD
Course Category	Program Elective
Essential requirement/lab	Dedicated high end Computers with specialised BIM software

Expected Course outcome: By the end of the course, the students are expected

CO-1: The understand of BIM concepts (K2)
CO-2:- Understanding lifecycle of a building from planning, design, construction and operations. (K2)
CO-3:-About BIM for analyzing building energy performance, simulation, construction and administration(K4)
CO-4:- The students will be able to create BIM based estimation of project (K6)
CO-5: Estimate model based Cost Estimating Challenges in cost estimating with BIM (K4)

Module 1:-
Number of class hours: 8

Suggestive Learning Outcomes
1) Student will be able to identify the BIM software(K2)
2) Student will be associated to the concept of BIM(K2)
3) Students will be able to demonstrate the software interface (K2)
4) Students will be able to create different component of buildings (K6)

Detailed content of the unit:

1.1 Key concepts of BIM - reading and manipulating the software Interface
1.2 Navigating within views - selection methods - the importance of levels and grids-
1.3 Create walls, doors, windows, and components - working with essential modification commands and load family.

Module 2

Number of class hours: 8
Suggestive Learning Outcomes

1) Student will be able to choose various parameters of the software(K3)
2) Student will be able to create and import drawing(K6)
3) Student will be able to compose dimension and text to drawing (K6)

Detailed content of the unit:
2.1 Creating floors, ceilings, and stairs - working with type and instance parameters

2.2 Importing drawings - understanding the project browser and type properties palettes

2.3 Adding sheets -inserting views onto sheets - adding dimensions and text

Module 3

Number of class hours: 10

Suggestive Learning Outcomes

1) Student will be able to create curtain wall(K6)
2) Student will be able to develop customized wall style(K6)

Detailed content of the unit:

3.1 Modelling - Creating curtain walls, schedules, details, a custom family, and family types - "flex" a family with family types and work with reference planes

3.2 creating rooms and an area plan – tag components - customize existing wall styles

Module 4:-

Number of class hours: 8

Suggestive Learning Outcomes

1) Student will able to complete the commands as shown in module ((K3)
2) Students will be able to produce customized material for design(K6)

Detailed content of the unit:

4.1 Choosing material for buildings- Creating custom walls, floors, and roofs

4.2 keynoting – working with mass elements - enhancing rendering with lighting

4.3 producing customized materials -Using sun and shadow settings

Module 5

Number of class hours: 10

Suggestive Learning Outcomes

1) Student will able to calculate the costing of a project with software((K3)
2) Student will able to distinguish between CAD and BIM(K4)

Detailed content of the unit:

5.1 BIM for Cost Estimating, Project Phasing and Administration

5.2 Introduction and theoretical information on the following topics- Model based Cost Estimating Challenges in cost estimating with BIM –

5.3 Cad geometrics verses BIM element description.

At the end of semester

Students are expected to create a simple one storied residential project in Rivet (BIM) and calculate the estimation and submit it.

References:

1. BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors
2. Building Information Modeling For Dummies
3. BIG BIM, little BIM: The Practical Approach to Building Information Modelling
4. The BIM Manager's Handbook: Guidance for Professionals in Architecture, Engineering, and Construction

Entrepreneurship and Start-ups

Course Code	:	HS 604
Course Title	:	Entrepreneurship and Start-ups
Number of Credits	:	4 (L: 3, T:1 , P: 0)
Prerequisites (Course code)	:	None
Course Category	:	HS

CO1 Understand the basic concepts of Entrepreneurship and Startups.

CO2 Illustrate skills of discovering business ideas, visualizing and planning a business.

CO3 Analyze market and business risk for strategy development.

CO4 Demonstrate skills of organizational management.

CO5 Exhibit knowledge of financing methods, institutions and skills for communication of ideas.

Course Content:

Unit1-Introduction and Basics of Entrepreneurship and Start–Ups

Suggestive Learning Outcomes:

(1) Describe the Basic Elements of Entrepreneur and Entrepreneurship

(2) Distinguish between Entrepreneur, Manager and Intrapreneur

Content:

- Definitions, Traits of an entrepreneur, Factors influencing entrepreneurship, Types and Functions of Entrepreneurs, Need for promotion of entrepreneurship, Intrapreneur, Motivation
- Role of Entrepreneurs in Economic Development
- Similarities/differences between - Entrepreneur and Manager, Entrepreneur and Intrapreneur.

Unit2–Business Ideas and their implementation

Suggestive Learning Outcomes:

(1) Illustrate different Types of Business Planning and Business Structure
(2) Select specific Institutions Assisting Entrepreneur

Content:

- Discovering ideas
- Visualizing the business
- Business Plan, - Types of planning, Importance of planning, Steps in planning
- Types of Business Structures
- Institutions assisting entrepreneur

Unit3–**Idea to Start-up**

Suggestive Learning Outcomes:

(1) Identify Steps for Starting a SSI
(2) Predict the Target Market and Associated Risk

Content:

- Market analysis – Identifying the target market
- Competition evaluation and Strategy Development
- Steps for starting a small enterprise
- Risk analysis

Unit4–Management of Enterprise

Suggestive Learning Outcomes:

(1) Apply the Basic Accounting Concepts in Business
(2) Demonstrate Knowledge of Pricing, Positioning and Advertising of Products

Content:

- Recruitment and management of talent.
- Determinants of Price, Pricing methods in practice.
- Market Positioning, Advertising and Sales Promotion
- Accounting - Understanding basics of Transaction, Journal, Ledger, Cashbook, Trial Balance, Cost Sheet and Final Accounts through simple problems

Unit5-Financing and Communication of Ideas

Suggestive Learning Outcomes:

(1) Exhibit Knowledge of various Financial Institutions and Financing Methods
(2) Illustrate Business Ideas through Communication Skills

Content:

- Financial Institutions
- Financing methods available for start-ups in India

- Communication of Ideas to potential investors–Investor Pitch

SUGGESTED LEARNING RESOURCES:

S.No.	Title of Book	Author	Publication
1.	The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company	Steve Blank and Bob Dorf	K & S Ranch ISBN–978-0984999392
2.	The Lean Startup: How Today's Entre-preneurs Use Continuous Innovation to Create Radically Successful Businesses	Eric Ries	Penguin UK ISBN–978-0670921607
3.	Demand: Creating What People Love Before They Know They Want It	Adrian J. Slywotzky with Karl Weber	Headline Book Publishing ISBN–978-0755388974
4.	Entrepreneurship	Alpana Trehan	Dreamtech PressISBN: 978-93-5004-026-3
5	Marketing and Sales Management	D C Kapoor	S Chand and Company Ltd. ISBN: 81-219-2430-8
S.No.	**Title of Book**	**Author**	**Publication**
6	Business Economics	H L Ahuja	S Chand and Company Ltd. ISBN: 81-219-1791-3
7	Financial Accounting (Principles and Practice)	Jawahar Lal & Seema Srivastava	S Chand Publishing
8	Accounting for Management	N.P. Srinivasan & Sakthivel Murugan	S Chand Publishing
9	Marketing	Harsh V Verma and Ekta Duggal	Oxford University Press ISBN: 0-19-945910-X
10	Marketing (Asian Edition)	Paul Baines, Chris Fill, Kelly Page and Piyush K. Sinha	Oxford University Press
11	Entrepreneurship	Rajeev Roy	Oxford University Press ISBN: 0-19-807263-5

12	Entrepreneurship Development	Kumar S Anil	New Age Publishers
13	Human Resource Management	Uday Kumar Haldar and Juthika Sarkar	Oxford University Press
14	Fundamentals of Entrepreneurship	S K Mohanty	Prentice Hall of India Private Limited ISBN: 81-203-2867-1
15	Entrepreneurship Development	S S khanka	S Chand and Company Ltd. ISBN: 81-219-1801-4

SUGGESTED SOFTWARE/LEARNINGWEBSITES:

a. https://www.fundable.com/learn/resources/guides/startup
b. https://corporatefinanceinstitute.com/resources/knowledge/finance/corporate- structure/
c. https://www.finder.com/small-business-finance-tips
d. https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/

ADVANCED DESIGN OF STRUCTURES

Course Code	ARPE 606/A(CEPE-603/C)
Course Title	Advanced Design of Structures
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

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

C.O.1.: Design of riveted and welded connections. (K2)

C.O.2.: Design of built up sections. (K2)

C.O.3.: Design of T and L shaped beam sections. (K3)

C.O.4.: Design of one way and two way slabs. (K3)

C.O.5.: Design of RCC column and isolated footings. (K3)

Detailed Course Content

Unit – I: Design of connections in steel structures

Number of class hours: 08

Learning Outcomes:

4. Illustrate the classification, strength and design of riveted joints.(K3)
5. Describe the various types, advantages, disadvantages and design of welded connections.(K1)
6. Compute the design of column bases for axially loaded columns.(K3)

Detailed content of the unit:

- Types of rivets, Riveted connections, Strength of riveted joints, Design of riveted 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.
- Design of column bases for axially loaded columns only.

Unit– II: Steel Beams

Number of class hours: 08

Learning Outcomes:

1. Label the different steel sections, simple and built up sections.(K1)
2. Explain the design of built up sections including shear and deflection.(K1)
3. Outline the components and functions of plate girder.(K2)

Detailed content of the unit:

- Different steel sections, Simple and built up sections, Permissible bending stresses,
- Design of built up sections (symmetrical I section with cover plates only), check for shear and deflection
- Introduction to plate girder: Components and functions (no numericals)

Unit– III: Design of RC flanged beam

Number of class hours: 08

Learning Outcomes:

1. Generalize the features of T and L beams.(K4)

2. Express the design of RC flanged beam.(K2)
3. Sketch the reinforcement details of T and L beams.(K2)

Detailed content of the unit:

- General features of T and L beams, Advantages, Effective width as per BIS 456
- Design of singly reinforcement T beam, Stress and Strain diagram, Depth of neutral axis, Moment of resistance, T and L beams with neutral axis in flange only.
- Simple numerical problems on location of neutral axis, Effective width of flange.

Unit– IV: Design of slab

Number of class hours: 08

Learning Outcomes:

1. Distinguish between different types of RC slab.(K3)
2. Compute the design of one-way cantilever slab and two-way simply supported slab.(K3)
3. Illustrate the design of dog-legged staircases.(K2)

Detailed content of the unit:

- Design of simply supported one-way slab for flexure, shear and deflection and checks, as per the provisions of BIS 456
- Design of one-way cantilever slab, Chajjas, Flexure including checks for Development length and Shear stress.
- Design of two-way simply supported slab,
- Introduction to design of dog-legged staircases.

Unit– V: Design of RCC Column and Footing design: Uni-axial bending

Number of class hours: 08

Learning Outcomes:

1. Define Effective length for various conditions of column.(K1)
2. Discuss the IS 456 provisions for column with uni-axial bending. (K2)
3. Calculate the design of footing for axially loaded column.(K3)

Detailed content of the unit:

- IS 456 provisions, Column with uni-axial moment, Effective length calculations, Minimum eccentricity.
- Design of footing for axially loaded column only.

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
Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Private Limited, Delhi.

Housing

Course code	ARPE606/B
Course title	Housing
Number of Credits	3 (L:3,T:0,P:0)
Prerequisites	Nil
Course Category	Professional Elective

Expected Course outcome: By the end of the course, the students are expected

CO-1: To identify the necessities of housing. (K1)
CO-2: To understand the present housing scenario. (K2)
CO-3: To relate the different aspects involved in housing and its development. (K2)
CO-4: To explain the socio-economic value of housing (K3)
CO-5: To apply the understanding of acts, norms-standards in the design exercises (K3)

MODULE-1 :-

Number of class hours: 7-8

Learning Outcomes:
1) Identify the terminologies related to housing.(K1)
2) Define the urban and rural housing.(K1)
3) Describe the contribution of housing in overall development of the country.(K1)

Detail Content of the unit:-

1.1 Introduction to Housing, need, basic term and definitions.
1.2 Housing as the basic need of architecture, housing as an integral part of urban & rural development.
1.3 Contribution of housing sector to national wealth, GDP and employment creation.

MODULE 2:-

Number of class hours: 6-7

Learning Outcomes

1) Identify the physical characteristics of housing.(K1)
2) Classify the housing.(K2)

Detail Content of the unit:-

2.1 Housing typologies and classifications.
2.2 Structural conditions, materials of construction, housing age, dilapidation, obsolescence, occupancy rate etc.
2.3 Traditional houses, plotted development, group housing, multi-storied housing, villas etc.

MODULE 3:-

Number of class hours: 10-11
Learning Outcomes
1) Discuss the housing scenario of India.(K2)
2) Recognize the factors related to slum(K2)
3) Identify the Govt. Initiatives.(K1)
Detail Content of the unit:-

3.1 Housing statistics and scenario of India.
3.2 Introduction to Slums and squatters settlements. Characteristics of Slum and Its origin; Impact on urban environment; Removal process;
3.3 Govt. policies and outcomes for slums.

MODULE 4:-

Number of class hours: 8-9

Learning Outcomes
1) Discover the housing ecosystem(K3)
2) Relate the effective housing policies and systems.(K1)
3) Express the housing finance mechanism.(K2)

Detail Content of the unit:-

4.1 Housing problems in India.
4.2 Various government policies and programs.
4.3 Objectives and general principles of cooperatives, affordable Housing, self help housing. Housing financing agencies and their functions etc.

MODULE 5:-

Number of class hours: 8-9

Learning Outcomes
1) Illustrate basic norms and standards of Housing.(K3)
2) Apply the standards in housing design.(K3)

Detail Content of the unit:-

5.1 Brief overview on Housing Norms and Standards.
5.2 Green Housing, Sustainable housing. Climatology in Housing, Ventilation & Lighting,
5.3 Housing in various climatic regions. Low-rise and high-rise developments, density considerations, Neighbourhood & cluster considerations in traditional and contemporary housing.

References:

- Rangwala, Town Planning.
- Ashok Kumar Jain, Housing for All
- Habitat Agenda
- N.V. Modak, V.N. Ambedkar, Town and Country Planning and Housing
- Dwyer, D.J., People and Housing in Third World Cities, 1981 Orient Longman
- Abrams, Charles. Man's Struggle for Shelter in an Urbanising World 1964 MIT, Harvard
- Payne, Geofrey. Urban Housing in the Thrid World 1977 Routledge and Keegan Paul, USA
- Douglas Farr. Sustainable Urbanism: Urban Design with Nature John Wiley & Sons
- Aromar Revi. Shelter in India – Sustainable Development Series 1990 StusiusInc / Advent Books Division
- International Institute of Energy Conservation Eco housing Assessment criteria Version II USAID

PROFESSIONAL PRACTICE

Course code	ARPE606/C
Course title	Professional Practice
Number of Credits	3(L:3,T:0,P:0)
Prerequisites	NIL
Course Category	Program Elective

Expected Course outcome: By the end of the course, the students are expected

CO-1: To recognize the COA and its related matter (K1)
CO-2: Student can explain the office structure of an architect (K2)
CO-3: Students can explain the different rules related to architecture profession (K2)
CO-4:- Students can describe the contract, tender, arbitration (K2)
CO-5: Describe Structure of an architect's office. (K1)

Module 1
Number of class hours: 9

Suggestive Learning Outcomes
1) Student will learn about COA and can explain its different activities(K2)

Detailed content of the unit:

1.1 Architectural professional association, its role and responsibilities.

Module 2
Number of class hours: 12

Suggestive Learning Outcomes
1) Student will be able to state the regulations of professional conduct(K1)
2) Student will explain about the services provided and fees taken thereof(K2)

Detailed content of the unit:
2.1 Architects (Professional Conduct) Regulation, 1989 Condition of engagement and scale of professional fees.

2.2 Copyright Act as applicable to architectural work. Architectural competitions

Module 3
Number of class hours: 8
Suggestive Learning Outcomes

1) Student will be able to define learn about contract and tender, (K1)

Detailed content of the unit:

3.1 Contract**:** Definition & Types

3.2 Tender**:** Definition & Types (definitions only) Earnest Money & Security Deposit

Module 4
Number of class hours: 7

Suggestive Learning Outcomes

2) Student will be able to discuss aspects of arbitration act 1940(K2)

Detailed content of the unit:
4.1 Arbitration & Arbitrator (definitions only)

4.2 Different kinds of Arbitration according to Arbitration Act, 1940

Module 5
Number of class hours: 10

Suggestive Learning Outcomes

1) Student will be able to discuss the structure of an architect's office(K2)
2) Student will able to identify the duties and responsibilities of an employer(K2)

Detailed content of the unit:

5.1 Structure of an architect's office. Office and management.
5.2 Architects duties to his employees under labour welfare provision

R E F E R E N C E B O O K S

1. Ethic in Engineering", Mark Martin and Roland Schinzinger, Mecgrew hill,1999
2. "Architects Handbook, A Ready Reckoner", CharanjitS.Shah, 2000
3. "Handbook on Professional Practice". The Indian Institute of Architects.
4. "Professional Practice", Roshan Namavati, 2004
5. "Estimation, Costing and Valuation (Professional Practice)", Rangwala, 2002
6. "Directory of Architects, List of Architects and Professional documents – Council of Architecture
7. Architects Handbook", A Ready Reckoner – Charanjit S.Sha

INDIAN CONSTITUTION

Course Code	:	AU-606
Course Title	:	Indian Constitution
Number of Credits	:	0 (L: 2, T:0; P:0)
Prerequisites (Course code)	:	None
Course Category	:	Mandatory Course

Course Outcomes:

CO1. Illustrate Preamble, Basic Structure, Fundamental Rights and Duties of Indian Constitution(K3).

CO2. Discuss the Structure of The Indian Union Government (K2).

CO3. Memorize the Role and Power of Governor, Chief Minister and Council of Ministers and explain the role of State Secretariat (K2).

CO4. Describe the role of Local Administration (K2).

CO5. Explain the Role and Functioning of Election Commission (K2).

Detailed Course Content:

Unit 1 – **The Constitution – Introduction**

Number of Class hours:06

Learning Outcomes:

1. Describe the History of the Making of the Indian Constitution (K2)
2. Illustrate Preamble and the Basic Structure of Indian Constitution (K3)
3. Illustrate the Fundamental Rights and Duties set by Indian Constitution (K3)

Detailed content of the unit:

1. The History of the Making of the Indian Constitution
2. Preamble and the Basic Structure, and its interpretation
3. Fundamental Rights and Duties and their interpretation
4. State Policy Principles

Unit 2 – **Union Government**

Number of Class hours:06

Learning Outcomes:

1. Discuss the Structure of the Indian Union Government (K2).
2. Memorize the Role and Power of President, Prime Minister and Council of Ministers of India (K1)
3. Explain the role of Lok Sabha and Rajya Sabha (K2)

Detailed content of the unit:

1. Structure of the Indian Union
2. President – Role and Power
3. Prime Minister and Council of Ministers
4. Lok Sabha and Rajya Sabha

Unit 3 – **State Government**

Number of Class hours:06

Learning Outcomes:

1. Memorize the Role and Power of Governor, Chief Minister and Council of Ministers of a state(K1)
2. Explain the role of State Secretariat (K2)

Detailed content of the unit:

1. Governor – Role and Power
2. Chief Minister and Council of Ministers

3. State Secretariat

Unit 4 – Local Administration

Number of Class hours:06

Learning Outcomes:

1. Describe the role of District Administration (K2)
2. Explain the role of Municipal Corporation (K2)
3. Discuss the role of Zila Panchayat (K2)

Detailed content of the unit:

1. District Administration
2. Municipal Corporation
3. Zila Panchayat

Unit 5 – Election Commission

Number of Class hours:06

Learning Outcomes:

1. Explain the Role and Functioning of Election Commission (K2)
2. Classify the role and functioning of Chief Election Commissioner and State Election Commissioner (K2).

Detailed content of the unit:

1. Role and Functioning of Election commission
2. Chief Election Commissioner
3. State Election Commission

Suggested Learning Resources:

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

Suggested Software/Learning Websites:

a. https://www.constitution.org/cons/india/const.html
b. http://www.legislative.gov.in/constitution-of-india
c. https://www.sci.gov.in/constitution

d. https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/

Major Project - II

Course Code	ARPR-607
Course Title	Major Project
Number of Credits	3 (L: 0, T: 0, P: 6)
Prerequisites	Nil
Course Category	Project Work (PR)

Course Outcome:-

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

C.O. 1: Demonstrate a sound technical knowledge of their selected project topic and the knowledge, skills and attitudes of a professional engineer (K2).

C.O. 2: Develop the skill of working in a Team (K3).

C.O. 3: Design engineering solutions to complex problems utilising a systems approach (K6).

C.O. 4: Design the solution of an engineering project involving latest tools and techniques (K6).

C.O. 5: Develop the skill of effective communication with engineers and the community at large in written an oral forms (K3).

Course Content:-

The major 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 provide the scope to develop the following by the students-

1) Develop sound knowledge about the domain of the project work.
2) Perform detailed study about various components of a project.
3) Learn to be an important member of a team for successful execution of a project work.
4) Study about methodologies and professional way of documentation and communication related to project work.
5) Develop idea about problem formulation, finding the solution of a complex engineering problem.
6) Develop project report as per the suggested format to communicate the findings of the project work.

7) Acquire the skill of effective oral communication to the fellow engineers and people in the society at large.
8) Knowledge of how to organize, scope, plan, do and act within a project thesis.
9) Familiarity with specific tools (i.e. hardware equipment and software) relevant to the project selected.
10) Demonstrate the implementation of a major project work.

Seminar

Course Code	ARSE608
Course Title	Seminar
Number of Credits	1 (L: 0, T: 0, P: 1)
Prerequisites	Nil
Course Category	Seminar presentation

Essential requirement:- A multimedia tools equipped dedicated seminar room for the department

Course Outcome:-

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

C.O.1: Demonstrate a thorough and systematic understanding of a seminar topic (K2).

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

C.O.3: Demonstrate the ability to construct a report consistent with expectations of the topic, including an appropriate organization, style, voice, and tone (K3).

C.O.4: Develop the ability to follow discussions, oral arguments, and presentations, noting main points or evidence and tracking through different comments given by the audience (K3).

C.O.5: Developthe communication skill as a speaker (K3).

Course Content:-

The seminar topics may be any aspect of the science and technology, entrepreneurship or any contemporary social issues to be solved by specific branch of engineering and technology (For example, Water logging problems in a particular city may be a seminar topic for Civil Engineering Students) must be approved by the instructor in advance.

The course should have the following-

7) Practice speaking in front of a scientific audience.
8) Explore topics in detail.
9) Research topics and organize presentations.
10) To improve as speakers, each student will receive feedback from the fellow students and the instructor.

11) PowerPoint, Key Note or overheads are acceptable media for Visual aids. Visual aids should look professional and be readable in the entire room; use spell check and proofread for typographical errors.
12) Students have to submit a hard copy contains detailed outline (4-5 pages) of their presentation and also a brief abstract (one or two paragraphs; **250 words max.**) describing their presentation.
13) Each student will give 20-minute presentations followed by 3 minutes of question-answer session.

Proposal Seminar Format for Students:

- Introduce yourself.
- Give an introduction and background information on your topic. What relevant research has been performed previously?
- State the problem(s) that remain unanswered.
- Clearly state your objectives and give the specific hypotheses you wish to test.
- Describe the methodology you will use to test your hypotheses. Be sure you fully understand your chosen methods. Give reasons why you chose these methods over other approaches.
- Present any data you have collected thus far.
- Describe what remains to be done, and what you expect to find.
- Explain the significance of your findings (or potential future findings).

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