



## IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

### Civil Engineering Department

(U.G.NBA Accredited up to June 2023)

#### Minor Certification in Civil Engineering

(To be offered to the students of other departments excluding CE)

#### List of Minors subjects from Semester V to VIII

S.No.	Semester	Subject Code	Subject Name	Contact Hours perweek			Total Credits
				L	T	P	
1	V		Construction Materials	3	-	2	4
2	VI		Building Design and Drawing	3	1	-	4
3	VII		Basics of Transportation Engineering	3	1	-	4
4	VIII		Environmental Engineering and Water Supply	2	-	2	3
<b>Total</b>				<b>11</b>	<b>2</b>	<b>4</b>	<b>15</b>
<b>Total Academic Engagement and Credits</b>				<b>17</b>			<b>15</b>



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	<b>Construction Materials</b>	<b>3L : 0T : 2P (5 hrs.)</b>	<b>4 credits</b>
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### Course Objective:

The objective of this course is to understand different types of construction materials

### Course Contents: (40hrs.)

#### MODULE 1

(10 hrs.)

Stones, Brick, Mortar and Concrete: Stones :Occurrence, Classification of Rocks, varieties, Characteristics and their testing, uses, quarrying and dressing of stones, Deterioration of Stones, Retardation of Decay of Stones, Preservation of Stones, Artificial Stones. Brick : Manufacturing , characteristics, Classification and uses, Improved brick from inferior soils, Hand molding brick table, Clay-fly ash brick table Concrete : Ingredients, Grades of Concrete ,Concrete Production ,Special Concrete

#### MODULE-II

(10 hrs.)

Timber ,Glass , Steel and Aluminium : Timber: Important timbers, their engineering properties and uses, defects in timber, seasoning and treatment, need for wood substitutes, ,Plywood, Particle Board ,Fibre Board, Applications of wood and wood products , Plaster Boards, Adhesives, types of Gypsum Board and their uses Glass: What is glass , Nature of Glass, Structure of Glass, Macro Molecular Structure, Main Oxides in Glass, Thermal and Optical Properties ,Effect of Coating, Steel : Physical Properties of Structural Steel, Grades of Steel Aluminium : Properties ,Forms ,Uses, Advantages

**MODULE–III****(10 hrs.)**

Flooring , Roofing ,Plumbing and Sanitary Material: Flooring and Roofing tiles , Types of Flooring – Marble, Kota stone , wood etc. Type of Roofing , P.V.C. materials, CI , GI, Asbestos pipe , Stone ware pipes

**MODULE–IV****(10 hrs.)**

Paints, Enamels and Varnishes: Composition of oil paint, characteristic of an ideal paint, preparation of paint, covering power of paints, Painting: Plastered surfaces, painting wood surfaces, painting metal Surfaces. Defects, Effect of weather, enamels, distemper, water wash and colour wash, Varnish, French Polish, Wax Polish

**MODULE–V****(10 hrs.)**

Miscellaneous ConstructionMaterials: Bitumen, Tar and Asphalt their characteristics and uses ,Ultra Poly Vinyl chloride Pipes, Thermal and sound insulating materials, and water proofing materials .

**Course Outcome:**

- CO1. To learn about the various conventional construction materials, their properties and utility as building materials.
- CO2. To learn about different advanced construction materials, their properties and feasibility as building materials.
- CO3. To learn about different tools & elements used in roofing, flooring, plumbing and sanitation works in a building and also learn about their types.
- CO4. To understand importance & engineering properties of painting & polishing in construction works and to learn about the agents used as well as their types
- CO5. To study some unconventional & miscellaneous materials and their tests to check their utility as construction materials for specific purposes like insulation, water proofing etc.

**References Books:**

1. Donald R Askeland, Pradeep P Fulay, Wendelin J Wright, The science and Engineering of Materials, Cengage Learning.
2. S K Duggal, Building Materials, New Age International.
3. P C Vaghese, Building Materials, PHI Learning.
4. S.C. Rangwala, Engineering Materials, Charotar.
5. M S Shetty, Concrete Technology, S. Chand Technical.
6. A M Neville, J J Brooks, Concrete Technology, Prentice Hall.



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	<b>Building Design and Drawing</b>	<b>3L : 1T : 0P (4 hrs.)</b>	<b>4 credits</b>
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### Course Objective:

The objective of this course is to understand building design and able to drawing

### Course Contents: (40hrs.)

#### Module 1 (10 Hrs)

Drawing of Sub Structures Elements Drawing of various elements of buildings like various types of footing, open foundation, raft, grillage, pile and well foundation,

#### Module 2 (10 Hrs)

Drawing of Super Structures Elements Drawing of frames of doors, window, various types of door, window and ventilator, lintels and arches, stairs and staircase, trusses, flooring, roofs etc.

#### Module 3 (10 Hrs)

Building Planning Provisions of National Building Code, Building bye-laws, open area, setbacks, FAR terminology, principle of architectural composition (i.e. unity, contrast, etc.), and principles of planning, orientation.

#### Module 4 (10 Hrs)

Building Services Introduction of Building Services like water supply and drainage, electrification, ventilation and lightening and staircases, fire safety, thermal insulation, acoustics of buildings.

## **Module 5**

**(10 Hrs)**

Building Planning & Lay out Details Planning of residential buildings – Load bearing / Framed Structure – (a) Bungalows (b) Row houses, (c) Ownership flats, (d) Apartments. Layout details, Elevation, sectional details. Planning of public buildings - Functional requirements of public buildings.

### **Course Outcome:**

- CO 1. Understand the substructure of building and its drawing
- CO 2. Know about the superstructure elements of building and their drafting.
- CO 3. Understand the basic laws of building codes and principles of building.
- CO 4. Understand about building services like water supply and drainage, electrification fire safety, thermal insulation etc
- CO 5. Understand about building planning and layout details

### **References Books:**

1. Loyal JS, Dongre A, “Building Design and Drawing” Satya Prakashan Edition 2016
2. Ghose D.N. “Civil Engineering Design and Drawing”, CBS publisher. 2nd Edition, 2015
3. Agrawal S. C., Architecture and Town Planning, Dhanpat Rai & Co. 2013
4. Malik & Meo; “Building Design and Drawing” Computech publication 2009
5. Shah, Kale & Patki; Building Design and Drawing; TMH 1st Edition 2001
6. Gurucharan Singh & Jgdish Singh “Building Planning, Design and Scheduling” 2009.

### **Suggested List of Experiment:**

1. Sketches of various building components.
2. One drawing sheet of various building components containing doors, windows ventilators, lintels and arches stairs foundations etc.
3. One drawing sheet each for services and interiors of buildings
4. One drawing sheet containing detailed planning of one/two bed room residential building (common to all students)
5. One drawing sheet each of residential and institutional building (Each student perform different drawing).
6. Use of AutoCAD for preparation of drawings



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	<b>Basics of Transportation Engineering</b>	<b>3L : 1T : 0P (4 hrs.)</b>	<b>4 credits</b>
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### Course Objective:

To provide fundamental knowledge of various types of transportation systems.

### Course Contents: (40hrs.)

#### Module 1

(10 Hrs)

**Introduction to Transportation Engineering:** Importance of Transportation, Different modes of transportation, Overview of Road, Rail, Air and Water Transportation, Comparison of various modes of Transportation. Organizations and their functions - Central Road Research Institute (CRRI), Indian Road Congress (IRC), Railway Board (RB), Inland Waterways Authority of India (IWAI), Airport Authority of India (AAI), International Civil Aviation Organization (ICAO), Directorate General of Civil Aviation (DGCA).

#### Module 2

(10 Hrs)

**Highway Transportation:** Introduction: Highway planning and development in India, Classification of Rural and Urban roads, Highway alignment and surveys, Preparation of Detailed Project Report. Design and Construction of Pavement: Pavement component functions, factors affecting pavement design and basic pavement design of Flexible and Rigid pavement as per IRC guidelines. Traffic Engineering: Traffic characteristics, Traffic studies: Traffic Volume study, Spot speed studies, Travel time - Delay study, PCU, Origin and Destination studies, Parking studies, Road accident studies. Traffic regulations and control devices.

**Module 3****(10 Hrs)**

**Rail Transportation:** Role of Indian Railways in National Development, Basic requirement of railway alignment and functions of Permanent Way, Types of components and functions: Gauge, Rail, Fittings, Ballast, Embankments, Subgrade. Purpose: Coning of wheel, Super-elevation, points and crossing, signalling and interlocking, yard, junction and terminal.

**Module 4****(10 Hrs)**

**Water Transportation:** Harbour: Classification, components, site selection. Definitions: Harbour, Port, Plimsoll Line, Beam, Draft, Hull, Structures and functions: Jetty, Breakwater, Wharf, Dock, Lock, Quay, Mole, Dolphin. Mooring, Dredging. Natural Phenomenon: Tides, Waves, Wind, Currents. Navigational Aids: Lighthouse, Lightships, Buoys.

**Module 5****(10 Hrs)**

**Air Transportation:** Airport: Classification, Master plan, Site selection, Zoning laws, imaginary surfaces. Aircraft Component parts, Importance and Purpose: Wind rose diagram, Runway Orientation, Taxiway, Apron, terminal building, Marking and lighting on Runway, Taxiway and Apron.

**Course Outcome:**

**CO1:** Introduction to transportation engineering and various organizations and their functions.

**CO2:** Illustrate and demonstrate parameters of highway planning and pavement design. Describe basics of traffic flow parameters, parking, marking, signal, and signs.

**CO3:** Solve problems of railway track geometrics and to understand various railway track materials, their properties and use.

**CO4:** Identify various component parts of docks and harbours and apply ship characteristics in planning of harbour.

**CO5:** Identify various component parts of airports and apply aircraft characteristics in planning of airports.

**References Books:**

1. Highway Engineering by Gurucharan Singh
2. Highway Engineering by O'Fleherty
3. Airport Planning & Design by S.K. Khanna & M. G. arora
4. Sharma & Sharma, Principles and Practice of Highway Engg.
5. Haung, Analysis and Design of Pavements
6. Railway Engineering by Arora & Saxena - Dhanpat Rai & Sons
7. Harbour, Docks & Tunnel Engineering - R. Srinivasan
8. Relevant IRC & IS codes



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	<b>Environmental Engineering and Water Supply</b>	<b>2L : 0T : 2P (4 hrs.)</b>	<b>3 credits</b>
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### Course Objective:

To provide an introduction to energy resources and an emphasis on alternative energy sources and their application. Introduction to water supply systems.

### Course Contents: (48hrs.)

#### Module 1

(10 hrs)

Energy: Introduction, conventional and non-conventional energy resources - coal, oil, gas, solar energy, wind energy, geothermal energy, Hydropower, Bio-energy, Nuclear energy. Energy survey in India. Current and future energy requirements in India and across the world including associated environmental problems.

#### Module 2

(10 hrs)

Air pollution and Water Pollution: Definition, Cause, effects and control measures of Air pollution; Mobile and stationary sources of air pollutants, effective stack height concept, CO, CO<sub>2</sub>, H<sub>2</sub>S, SO<sub>x</sub>, NO<sub>x</sub> emissions, and its control. Definition, Classification, Cause, effects and control measures of water pollution, Measurement of levels of pollution such as DO, BOD, COD. Impacts of Soil and Noise Pollution.

#### Module 3

(8 hrs)

Environment Impact & Protection Act Environment: Protection Act; Air (Prevention and Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation; Public



awareness. Environmental Impact Assessment. Measuring environmental impacts and policies for the regulation of environmental impacts.

**Module 4** **(10 Hrs)**

Estimation of ground and surface water resources. Quality of water from different sources, demand & quantity of water, fire demand, water requirement for various uses, fluctuations in demand, forecast of population. Impurities of water and their significance, water-borne diseases, physical, chemical and bacteriological analysis of water, water standards for different uses.

**Module 5** **(10 Hrs)**

Intake structure, conveyance of water, pipe materials, pumps - operation & pumping stations. Water Treatment methods-theory and design of sedimentation, coagulation, filtration, disinfection, aeration & water softening, modern trends in sedimentation & filtration, miscellaneous methods of treatment. Scheme of water supply distribution system.

**Course Outcome:**

- CO 1:** Ability to understand basic concepts conventional and non-conventional energy resources.
- CO2:** To provide knowledge about Air, Water, Soil and Noise pollution.
- CO3:** Ability to understand basic concepts of Environment Impact Assessment & Protection Acts.
- CO4:** To estimate surface and ground water, quality, quantity and analysis of water.
- CO5:** To Understand the types of Intake structure and water treatment methods, collection, construction of water supply system.

**Text/Reference Books:**

1. B.C. Punmia, "Water Supply Engineering" Laxmi Publications Ltd, New Delhi
2. Environmental Engineering - H.S. Peavy & D.R. Rowe-Mc Graw Hill Book Company, New Delhi
3. De A.K., Environmental Chemistry, Wiley Eastern Ltd