

**COURSE NAME : CIVIL ENGINEERING GROUP**

**COURSE CODE : CE/CS/CR/CV**

**SEMESTER/YEAR : SIXTH**

**SUBJECT TITLE : PLUMBING SERVICES ( ELECTIVE)**

**SUBJECT CODE :**

**Teaching and Examination Scheme :**

Teaching scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	--	25@	125
# External			@ Internal	*On line examination				

**NOTE :**

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE
- Total of tests for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)

**RATIONALE :**

A properly systematic course in Plumbing is not available in India. Plumbing though crucial but remained as neglected subject. As a result, there is a great demand to well trained Plumbing Professionals in the building industry.

Plumbing service is necessary for proper water supply & efficient drainage facility in a building . As buildings are becoming more complex and more modern plumbing materials and systems are available in India, it is necessary to include the same in the Civil Engineering curriculum.

Plumbing services are important component of Civil Engineering. Internal plumbing contributes to around 15% of the construction cost.

Indian Plumbing Association (IPA) has adopted, reviewed and revised the Uniform Plumbing Code of International association of Plumbing and Mechanical officials to suit Indian practices, customs and Laws. The code is published as Uniform Plumbing Code – 2008 India (UPC1).

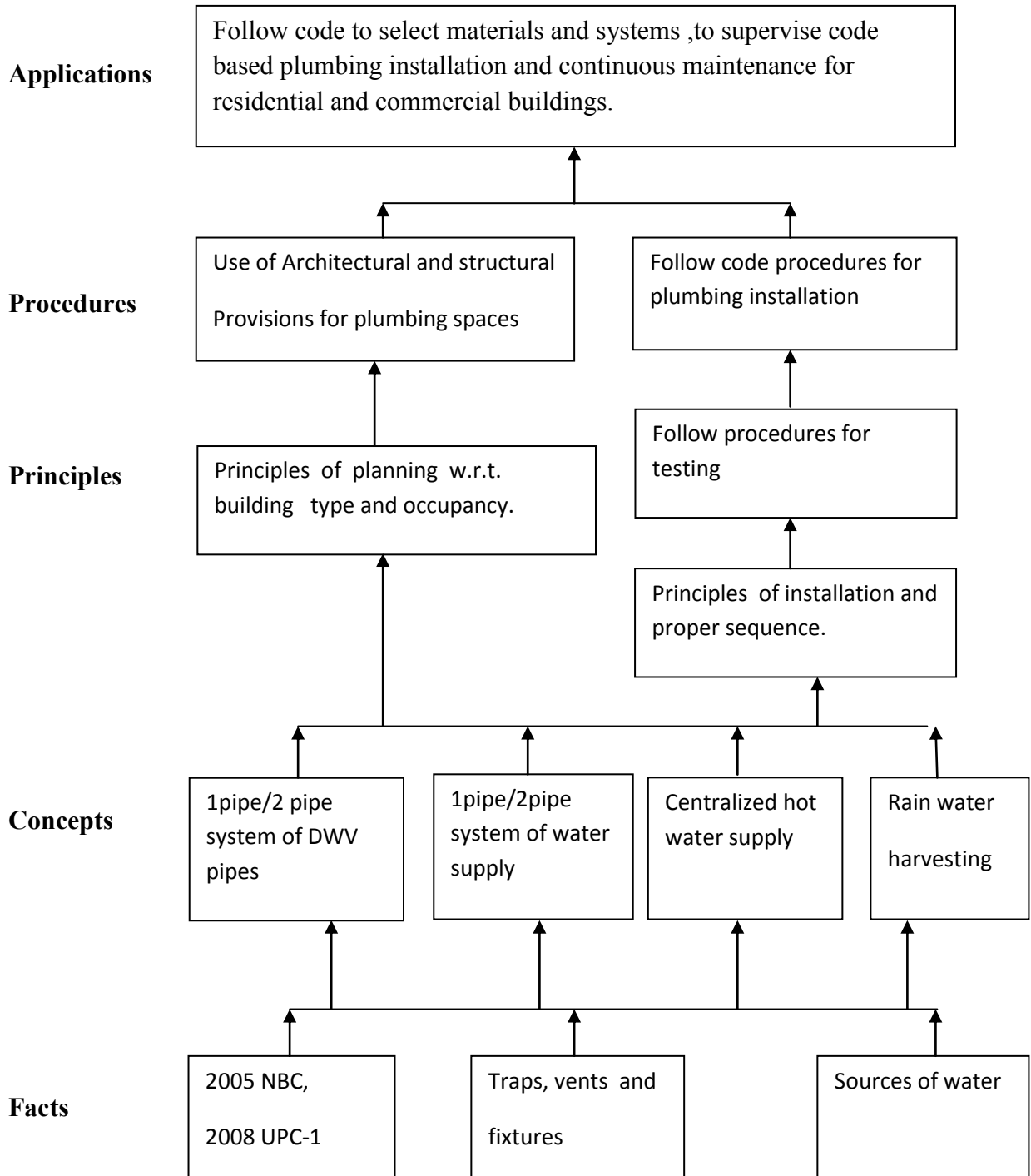
Need of proper use of Plumbing code must be code based education and training in Plumbing will have better job opportunities and improved income. The formal education in Plumbing will improve the plumbing system design and installation standards, thereby ensuring health and safety of people, structure and environment.

## **GENERAL OBJECTIVES :**

The student will be able to,

1. Understand proper coordination of plumbing work with Architects and structural engineers.
2. Interpret plumbing drawings.
3. Select proper plumbing materials & systems.
4. Supervise plumbing installation as per UPC – 2008.
5. Understand methods to conserve water and energy.
6. Follow safety measures at site.
7. Follow standards for installation as per code practice.

**LEARNING STRUCTURE:**



**THEORY:**

<b>Topic and Contents</b>	<b>Hours</b>	<b>Marks</b>
<p><b>Topic 1: Introduction to Codes, Architectural and Structural Coordination.</b></p> <p><b>Specific objectives :</b></p> <ul style="list-style-type: none"><li>➤ Use relevant Code (UPC – 2008).</li><li>➤ Maintain proper coordination amongst different agencies.</li><li>➤ Select proper materials for plumbing.</li><li>➤ Follow local municipal laws.</li></ul> <p><b>Contents:</b></p> <p><b>1.1 :</b> Importance of plumbing, history of ancient plumbing, model code- roles, scope, purpose and use of codes and standards in building industry, approvals, AHJ(Authority Having Jurisdiction) general regulations, minimum standards, labeling, alternative materials, sewers required, damage to drainage system, improper location, workmanship, prohibited fitting and practices, engineered systems, water conservations, protection of pipes and structures, water proofing, rat proofing.</p> <p><b>1.2:</b> Architectural and structural coordination (not included in UPC1 and ITM ) Architectural and Structural provisions for Plumbing systems, coordination required during the planning stage, various agencies involved and their roles, policy decisions, schematic alternatives, planning spaces for plumbing systems, water tanks, pump room, centralized hot water system, toilet locations, toilet planning, plumbing shafts, basement and terraces planning. Structural parameters, sunken toilets, location of columns and beams, post tensioned slabs, importance of ledge walls, waterproofing. Local Municipal laws, domestic and fire static water requirements, water sources, prohibited fittings and systems.</p>	<b>04</b>	<b>10</b>
<p><b>Topic 2 : Plumbing Terminology</b></p> <p><b>Specific objectives:</b></p> <ul style="list-style-type: none"><li>➤ Define terms used in plumbing.</li><li>➤ List plumbing fixtures.</li><li>➤ List drainage system and their joints.</li><li>➤ List different valves used in water supply and drainage with their function.</li></ul>	<b>06</b>	<b>16</b>

Topic and Contents	Hours	Marks
<p><b>Contents:</b></p> <p>Definition , use/ Location purpose and sketches of the following</p> <p><b>2.1:</b>Plumber;Plumbing fixture:- accessible /readily accessible ,aerated fitting , bathroom group, carrier, flood level rim, floor sink, flush tanks, lavatories, macerating toilet system, plumbing appliances ,flushometer valve</p> <p><b>2.2:</b>Traps, indirect waste ,vent blow off ,development length, parts of vent system – stack vent , branch vent , continuous vent , individual vent , dirty arm ,FOG (Fat,Oil and Grease) disposal system receptors, slip joint.</p> <p><b>2.3:</b>Drainage- adapter fitting , adjusted roof area, AAV(Air Admittance Valve), air break ,air gap ,area drain ,bell and spigot joint, building drain, branch, DFU, grease interceptor, roof drain , smoke test , stack, joints .</p> <p><b>2.4:</b>Water supply : angle valve, anti- scald valve, check valve , gate valve , PRE (Pressure Relief Valve ) , back flow, bypass, , cross connection, ferrule , gray water, joints,</p>		
<p><b>Topic 3 Plumbing fixtures and fixture fittings.</b></p> <p><b>Specific objectives :</b></p> <ul style="list-style-type: none"> <li>➤ State use of different plumbing fixtures.</li> <li>➤ Draw plan and elevation of fixture and fitting with standard dimension.</li> <li>➤ State use of different plumbing fittings required for specific situation.</li> <li>➤ Know installation standard for fixtures as per code.</li> </ul> <p><b>Contents:</b> Different types of plumbing fixtures, shapes/ sizes, capacities, situation and where used:</p> <p><b>Ablution fixtures</b> –Wash basin, sinks (, kitchen sinks cleaner sinks) bath tub, flushing cistern, drinking fountain.</p> <p><b>Soil fixtures</b> - water closets, urinal, mop sink, bidets, slop sinks plumbing fittings for Ablution fixtures and Soil fixtures</p> <p><b>water conserving fixtures-</b> Water cooler, cloth washer, hot and cold water system, display fountain. Installation standard for plumbing fixtures , dimension in plan and elevation</p>	<p><b>08</b></p>	<p><b>14</b></p>

Topic and Contents	Hours	Marks
<p><b>Topic 4 : Traps, interceptors, indirect waste and vents.</b></p> <p><b>Specific objectives :</b></p> <ul style="list-style-type: none"> <li>➤ State purpose of different traps and trap seals.</li> <li>➤ Describe proper methods of installing indirect waste piping.</li> <li>➤ State requirement and purpose of venting.</li> <li>➤ State installation standard as per code.</li> </ul> <p><b>Contents:</b></p> <p><b>4.1 :-----06</b> Traps- Definition, function, Requirement of good trap, trap arms, Development length, trap seals, venting to traps, trap primers, Classification of traps. prohibited traps,</p> <p><b>4.2:-----06</b> System of plumbing for building drainage-Two pipe system, one pipe system ,waste receptors, dish washers, drinking fountain.</p> <p><b>4.3:-----08</b> Vent- purpose of venting, trap seal protection, materials, vent connection, flood rim level, , vent stacks, water curtain and hydraulic jump, cleanouts, venting of interceptors, vent sizing.</p>	<b>10</b>	<b>20</b>
<p><b>Topic 5: Sanitary drainage and storm drain.</b></p> <p><b>Specific objectives :</b></p> <ul style="list-style-type: none"> <li>➤ State purpose of single and two pipe systems of plumbing.</li> <li>➤ List different pipe materials and joints.</li> <li>➤ Draw sketches for protection of pipes and structures.</li> <li>➤ State sizing of horizontal and vertical pipes.</li> <li>➤ List storm drains requirements, roof drains, sub drains and sub soil drains.</li> </ul> <p><b>Contents:</b></p> <p><b>5.1: ----- 10</b> Preamble on single and two pipe systems, different pipe materials and jointing methods, special joints, hangers, and supports, protection of pipes and structures, alternative materials, workmanship, prohibited fittings and practices, hydraulic jump, change in direction of flow, T and Y fittings, cleanouts, pipe grading, fixtures below inverted level, suds relief, building sewers, trenching, testing sumps and pumps, sizing of horizontal and vertical pipes.</p>	<b>10</b>	<b>20</b>

Topic and Contents	Hours	Marks
<p><b>5.2: ----- 10</b></p> <p>storms drain required, prohibited connections, subsoil drains, sub drain, gutters/ channels/scuppers, roof drains, strainers, leaders, conductors and connections, collect/ capture storm water, discharging storm water, safety, traps required, prohibited installations.</p>		
<p><b>Topic 6: Water Supply, Gray and Reclaimed Water</b></p> <p><b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>➤ State sources of water.</li> <li>➤ Understand hot and cold water distribution system.</li> <li>➤ Differentiate potable and non potable water.</li> <li>➤ Learn gray water, reclaimed water and rain water harvesting.</li> <li>➤ Understand gray water approvals, specification, drawing and safety signs used.</li> <li>➤ Understand rain water harvesting.</li> </ul> <p><b>Contents :</b></p> <p><b>6.1: -----12</b></p> <p>Preamble on municipal water, sources of water, potable and non potable water, reclaimed water, water storage , hot and cold water distribution system, backflow protection, air gap, cross connection control, pipe materials and jointing method, alternative materials, hangers, and supports, workmanship, prohibited fittings and practices, protection of pipes and structures, pressure control, unions, thermal expansion, types of valves, installation and testing, disinfection, protection of underground pipes, color codes and arrow marking, introduction to wsfu.</p> <p><b>6.2: -----08</b></p> <p>Definition of gray water, approvals, specification, and drawing, safety, total gray water discharge, holding tanks, valves and piping, reclaimed water system, definition of reclaimed water, pipe identification, installation, safety signs, valves, cross connection, approved uses, Rain water harvesting in plumbing systems.</p>	<p><b>10</b></p>	<p><b>20</b></p>
<b>Total</b>	<b>48</b>	<b>100</b>

## SKILLS TO BE DEVELOPED :

### **Intellectual Skills :**

1. To identify plumbing fixtures and fittings.
2. To interpret plumbing installation with UPC-I and ITM.
3. To identify valves used in water supply and drainage system with their function.
4. To interpret plumbing drawings for multistoried buildings.

### **Motor Skills :**

1. Ability to draw plan and elevation of fixtures and fittings with standard dimensions.
2. Ability to learn sizing of horizontal and vertical pipes used in drainage system.
3. Ability to draw toilet layouts , urinals , and different manholes.

**PRACTICALS :term work will be prepared by each student in the form of assignments as below.**

#### **List of Assignments:**

1. Draw sketches of installation details of plumbing fixtures and fittings in plan , elevation and section ; with standard dimensions (minimum 4)
2. Interpretation of sample plumbing drawings for multistoried building.
3. Draw toilet layouts , plans, elevations and sections of selected case. Give dimensions.
4. Prepare layout of internal and external (outside the toilet) DWV pipes and fittings of a selected case. If possible , write pipe diameters.
5. **Seminar:** Students can select any topic from contents by referring codes , text book , professional magazines , technical papers published and websites of manufacturers and make a seminar presentation in 10 minutes using power point. Weightage is assigned for contents and presentation skills.(Students can work in a group of two.)
6. **Site visit report :** Visit any plumbing site and submit a report on observation on plumbing system , architectural and structural provisions , pipe materials work method , safety and recommendations based on the provisions of UPC-I and ITM.



## LEARNING RESOURCES :

### 1. BOOKS :

Sr. No.	Title	Author	Publisher
1	Plumbing Engineering	S. M. Patil	Seema Publication , Mumbai.
2	Plumbing Design and Practice	S. G. Deolalikar	Tata McGraw-Hill
3	Plumbing Technology Design and Practice	Lee Smith	Delmar Publication
4	Practical Plumbing Design Guide	James C. Church	Mgraw-Hill (T)
5	Plumbing and Illustrated Guide to the Plumbing codes.	Michal Casey, Duglas Hannes , Redwood Kardon	

### 2. CDs, PPTs Etc.:

### 3. IS, BIS AND INTERNATIONAL CODES:

- 2008 Uniform plumbing code – India (UPC-I )
- 2008 Illustrated training manual (ITM).
- Extracts from IAPMO India

### 4. WEBSITES:

- [www.plumbing services.com](http://www.plumbing services.com).
- [www.cookandlees.com](http://www.cookandlees.com)
- [www.mepdesignservices.com](http://www.mepdesignservices.com)
- [www.plumbing.1800anytyme.com](http://www.plumbing.1800anytyme.com)
- [www.dyno.com/plumbing](http://www.dyno.com/plumbing).