BABU BANARASI DAS
INSTITUTE OF TECHNOLOGY & MANAGEMENT
Affiliated to Dr A P J Abdul Kalam Technical University (AKTU College Code- 054)
Approved by All India Council for Technical Education (AICTE)
Website: **www.bbditm.ac.in** / e-mail: **director@bbdnitm.ac.in**
Phone Number: +91 – (522) – 6196222 / 6196223 / 6196305 (VPN No. 723)

Vision of the Institute	Mission of the Institute
"To become a leading institute of providing professionally competent and socially responsive technocrats with high moral values."	⇨ To create an eco-system for the dissemination of technical knowledge, to achieve academic excellence. ⇨ To develop technocrats with creative skills and leadership qualities, to solve local and global challenges. ⇨ To impart human values and ethics in students, to make them socially and Eco-friendly responsible.

LAB MANUAL
OF
BUILDING PLANNING & DRAWING LAB

[BCE 351]

B. TECH, 2nd Year, 3rd Sem

Dr. A.P.J. Abdul Kalam Tech. University
Uttar Pradesh

2025-26

Department of Civil Engineering

Faculty Name: Mr. Abhay Yadav
Assistant Professor

Dr. Supriya Phurailatpam
Head of Department

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MANUAL CONTENTS

This practical manual will be helpful for students to modern drafting and Building Information Modeling (BIM) techniques used in civil engineering and architecture. The laboratory focuses on planning, drafting, modeling and visualization of residential buildings using CAD and BIM software.

The laboratory enables students to prepare professional engineering drawings including plans, elevations, sections, staircase details, doors, windows and 3D building models.

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PREFACE

This practical manual will be helpful for students of Civil Engineering for understanding the course from the point of view of applied aspects. Though all the efforts have been made to make this manual error free, yet some errors might have crept in inadvertently. Suggestions from the readers for the improvement of the manual are most welcomed.

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VISION OF THE DEPARTMENT

To impart academic excellence in Civil Engineering field with emphasis on holistic development of the professional, while inculcating ethics, socially and professionally responsive technocrats.

MISSION OF THE DEPARTMENT

Mission-1. To provide a comprehensive platform for the academic expertise and proficiency.

Mission-2. To develop Civil Engineering professionals with creative skills and leadership qualities in order to face regional and global challenges.

Mission-3. To develop ethics in students in order to promote socially responsible environmental awareness with innovative thinking.

Program Educational Objectives (PEOs) of Department

The following are PEOs of the department:

PEO 1: To enhance skill and expertise in field of Civil Engineering with aim of boosting employability and entrepreneurship.

PEO 2: To develop multidisciplinary approach of Civil Engineering system with lifelong learning solutions.

PEO 3: To develop the potential to pursue higher education and research in field of Civil Engineering.

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Program Outcomes:(PO)

Graduates will be able to achieve

PO 1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering Fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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PO 10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear

PO 11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes (PSOs) of the Department

PSO 1: Graduates shall be able to apply critical thinking in research, design, analysis and implementation of Civil Engineering problems.

PSO 2: Graduates shall be able to inculcate the idea of sustainability in engineering solution to meet real world challenges.

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Course Evaluation Scheme

Sr No	Subject Code	Subject Name	Periods			Evaluation Scheme				Total	Credit
						Sessional Assessment			PE		
			L	T	P	CT	TA	PS			
1.	BCE351	Building Planning & Drawing Lab	0	0	2	-	-	50	50	100	1

Course Objectives:

The main objectives of this lab course are:

1. To introduce students to CAD and BIM software.
2. To develop drafting skills using AutoCAD/BIM tools.
3. To prepare architectural drawings of residential buildings.
4. To understand planning principles of buildings.
5. To develop 3D visualization and rendering skills.
6. To prepare working drawings used in construction practice.

Pre- requisite*:*

- Fundamentals of Engineering Drawing
- Basic concepts of Building Planning
- Knowledge of scales, dimensions and projections
- Understanding of plan, elevation and sectional views
- Basic computer operation skills
- Introduction to CAD/BIM environment

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Course Outcomes (COs)

Course Outcomes: The students should be able to:		**Bloom's Level**
CO1	Understand and use basic commands of AutoCAD/BIM software for drafting.	L4
CO2	Prepare 2D drawings (plans, elevations, sections) of building components.	L4
CO3	Develop building drawings such as staircases, doors, windows and residential units.	L5
CO4	Create 3D models and basic rendering of buildings using CAD/BIM tools.	L5
CO5	Prepare complete planning and general arrangement drawings of residential buildings considering functional and basic by-laws.	L4

CO-PO-PSO Mapping

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**2**	**1**	**-**	**-**	**3**	**1**	**-**	**-**	**2**	**-**	**-**	**2**	**2**	**-**
CO2	**1**	**1**	**2**	**-**	**3**	**1**	**-**	**-**	**2**	**-**	**-**	**2**	**2**	**1**
CO3	**1**	**1**	**2**	**-**	**3**	**1**	**-**	**-**	**2**	**-**	**-**	**2**	**2**	**1**
CO4	**2**	**1**	**2**	**1**	**3**	**1**	**-**	**-**	**2**	**-**	**-**	**2**	**2**	**1**
CO5	**1**	**2**	**2**	**1**	**2**	**2**	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**2**
Avg.	**1.4**	**1.2**	**2**	**1**	**2.8**	**1.2**	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**1.25**

The extent of mapping is as follows: 1 for low, 2 for moderate, 3 for high &"-" for No correlation between CO & PO.

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List of Experiments

S. No.	Experiment
1	Introduction to the tools and commands of drafting software
2	Working in layers, blocks, x-ref, drawing layout and print setup.
3	3D drafting and rendering
4	Planning and drafting of elevation and cross section of door and window
5	Planning and drafting of plan and cross section of Dog legged and open well staircase.
6	Planning, drawing and modelling of residential building of 1 room set.
7	Planning, drawing and modelling of 3 room residential building with staircase.
8	Preparation of details general arrangement drawing of 4 room duplex house including planning and drafting.

Beyond the Syllabus

1	Preparation of Electrical Layout Plan
2	Plumbing and Sanitary Layout

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INDEX

S.No.	Name of the Experiment	CO	BTL	Lab Conduction Date	Remark/ Grade/ Marks	Faculty Signature with Date
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

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Do's (What You Should Do)

1. Maintain proper discipline and silence in the laboratory.
2. Come to the lab with record file, notebook and required material.
3. Follow instructions given by the faculty/lab instructor carefully.
4. Save drawing files regularly to avoid data loss.
5. Use proper naming conventions for files and folders.
6. Maintain separate layers for walls, doors, windows, dimensions and text.
7. Use standard dimensions and scales while drafting.
8. Check all drawings for accuracy before plotting/printing.
9. Take backup of important drawing files.
10. Use proper units and drawing limits before starting work.

Dont's (What You Should Avoid)

1. Do not disturb other students during lab work.
2. Do not use unauthorized software or external applications.
3. Do not change computer settings or system configuration.
4. Do not install games or unnecessary files in laboratory systems.
5. Do not remove or disconnect hardware cables.
6. Do not use another student's drawing files without permission.
7. Do not leave the system without saving your work.
8. Do not use incorrect scales or dimensions in drawings.
9. Do not overwrite laboratory template files.
10. Do not eat or drink inside the laboratory.

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EXPERIMENT NO.: 01

AIM: -

To study basic drafting commands and tools used in CAD/BIM software.

Apparatus/Software Required

- Computer System
- AutoCAD/Revit Software

Theory

Drafting software provides commands for creating and modifying engineering drawings. These commands help users prepare accurate architectural and structural drawings.

Important Commands

Drawing Commands

1. LINE
2. CIRCLE
3. ARC
4. RECTANGLE
5. POLYGON
6. ELLIPSE
7. PLINE

Modify Commands

1. MOVE
2. COPY
3. ROTATE
4. SCALE
5. MIRROR
6. OFFSET
7. TRIM
8. EXTEND

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7. FILLET
8. CHAMFER

Annotation Commands

1. DIMENSION
2. TEXT
3. MTEXT
4. LEADER

Procedure

1. Open the drafting software.
2. Create a new drawing file.
3. Practice basic drawing commands.
4. Use modify tools for editing.
5. Add dimensions and annotations.
6. Save the drawing.

Result

Basic drafting commands were studied successfully and Sample sheet is attached with this experiment.

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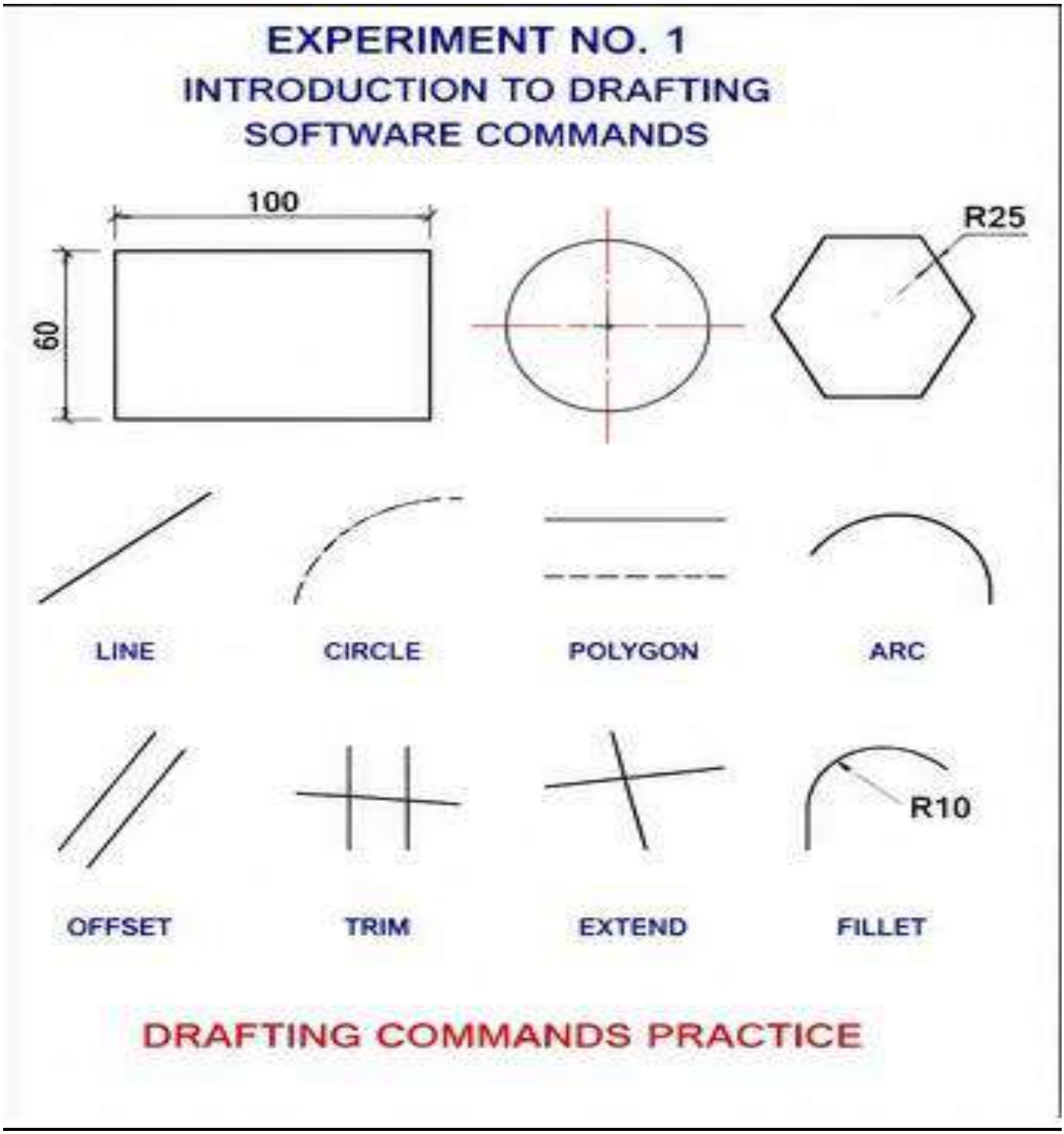

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EXPERIMENT NO.: 02

Aim

To study layer management, block creation, X-reference and layout setup.

Apparatus/Software Required

- Computer System
- AutoCAD/Revit Software

Theory

Layers help organize drawing objects systematically. Blocks are reusable drawing components. X-reference helps attach external drawings. Layouts are used for plotting.

Procedure

1. Create layers for walls, doors, windows and dimensions.
2. Assign different colors and line types.
3. Create blocks for doors and windows.
4. Attach an external reference drawing.
5. Create a drawing layout.
6. Set plotting scale and print settings.

Observations

Different layers improve drawing management and readability.

Result

Layer management and layout preparation were performed successfully and Sample sheet is attached with this experiment.

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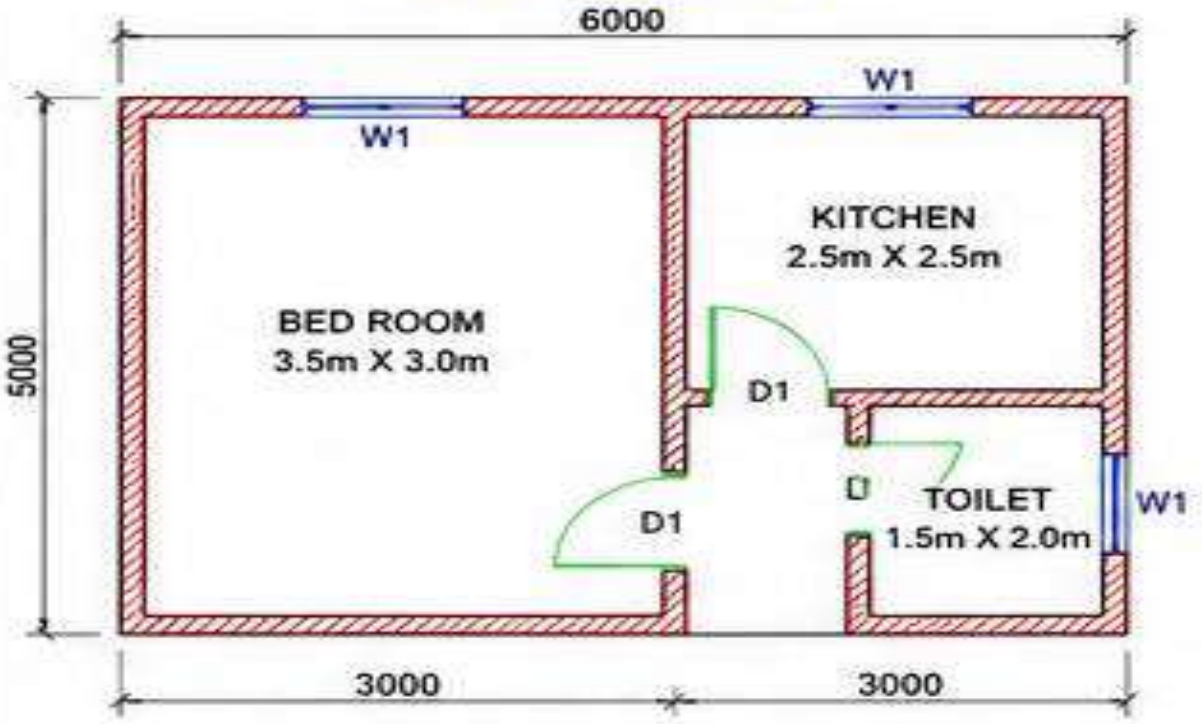
EXPERIMENT NO. 2

WORKING WITH LAYERS, BLOCKS, X-REF AND LAYOUTS



LAYERS				
LAYER NAME	COLOR	LINE TYPE	LINE WEIGHT	PURPOSE
WALL		Continuous	0.50 mm	Walls
DOOR		Continuous	0.30 mm	Doors
WINDOW		Continuous	0.30 mm	Windows
TEXT		Continuous	0.18 mm	Text
DIMENSION		Continuous	0.18 mm	Dimensions

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EXPERIMENT NO.: 03

Aim

To create 3D models and perform rendering using drafting software.

Apparatus/Software Required

- Computer System
- AutoCAD/Revit Software

Theory

3D drafting allows creation of realistic building models. Rendering improves visualization by adding materials, lighting and shadows.

Important 3D Commands

1. EXTRUDE
2. REVOLVE
3. SWEEP
4. UNION
5. SUBTRACT
6. PRESSPULL
7. VIEW
8. RENDER

Procedure

1. Prepare a 2D plan.
2. Convert walls into 3D objects using EXTRUDE.
3. Add doors and windows.
4. Apply materials.
5. Set camera view.
6. Render the model.

Result

3D model and rendered view were created successfully and Sample sheet is attached with this experiment.

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EXPERIMENT NO. 3

3D DRAFTING AND RENDERING

3D ISOMETRIC VIEW

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EXPERIMENT NO.: 04

Aim

To prepare plan, elevation and cross-section of doors and windows.

Apparatus/Software Required

- Computer System
- AutoCAD/Revit Software

Theory

Doors and windows are important components of a building used for access, ventilation and lighting.

Standard Sizes

Doors

- Main door: 1000 mm × 2100 mm
- Internal door: 900 mm × 2100 mm
- Bathroom door: 750 mm × 2000 mm

Windows

1. Standard window: 1200 mm × 1200 mm

Procedure

1. Draw the plan of the door/window.
2. Prepare elevation view.
3. Draw sectional details.
4. Add dimensions.
5. Prepare final layout.

Result

Door and window drawings were prepared successfully and Sample sheet is attached with this experiment.

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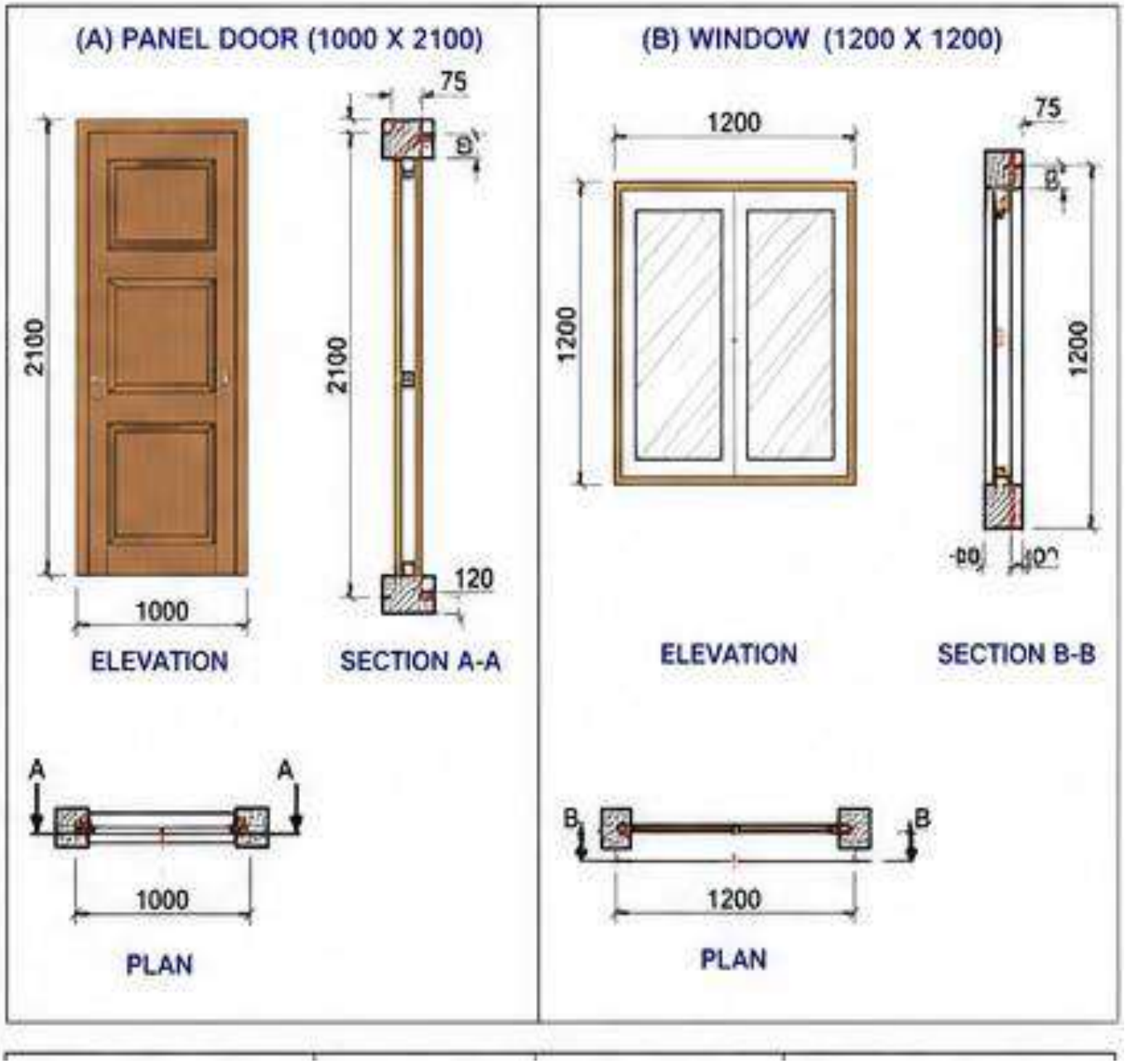
EXPERIMENT NO. 4

PLANNING AND DRAFTING OF DOOR AND WINDOW



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EXPERIMENT NO.: 05

Aim

To prepare plan and section of dog-legged and open well staircase.

Apparatus/Software Required

- Computer System
- AutoCAD/Revit Software

Theory

Staircases provide vertical circulation between floors.

Types of Staircases

1. Dog-legged staircase
2. Open well staircase
3. Spiral staircase
4. Straight staircase

Standard Dimensions

- Rise: 150 mm to 175 mm
- Tread: 250 mm to 300 mm
- Stair width: Minimum 1.0 m
- Headroom: Minimum 2.1 m

Procedure

1. Calculate number of steps.
2. Draw staircase plan.
3. Prepare sectional elevation.
4. Show direction of movement.
5. Add dimensions.

Result

Staircase plan and section were drafted successfully and Sample sheet is attached with this experiment.

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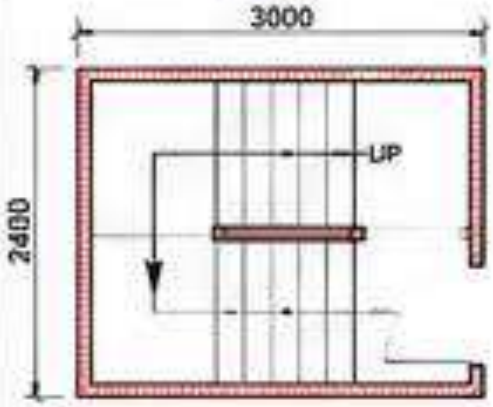
EXPERIMENT NO. 5

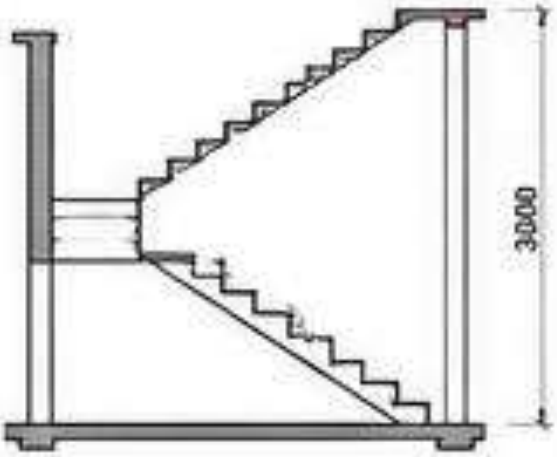
PLANNING AND DRAFTING OF STAIRCASE

(A) DOG-LEGGED STAIRCASE

PLAN



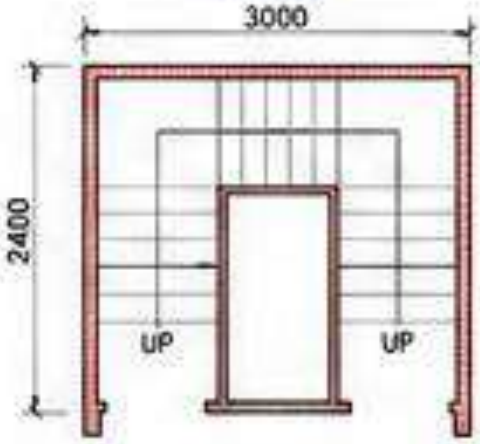
SECTION



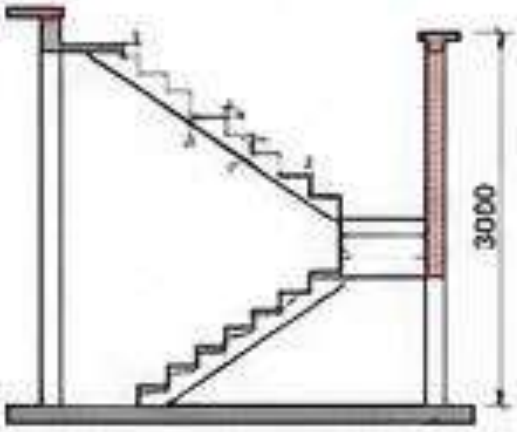
Riser = 150 mm
Tread = 270 mm
Width = 1200 mm

(B) OPEN WELL STAIRCASE

PLAN



SECTION



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EXPERIMENT NO.: 06

Aim

To prepare planning, drafting and 3D model of a one room residential building.

Apparatus/Software Required

- Computer System
- AutoCAD/Revit Software

Requirements of Building

1. One bedroom
2. Kitchen
3. Toilet and bathroom
4. Verandah

Procedure

1. Prepare line plan.
2. Draw walls and openings.
3. Add furniture details.
4. Prepare elevation.
5. Draw sectional elevation.
6. Develop 3D model.

Recommended Dimensions

- Wall thickness: 230 mm
- Room size: 3 m × 4 m
- Kitchen: 2 m × 2.5 m

Result

One room residential building was planned and modeled successfully and Sample sheet is attached with this experiment.

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EXPERIMENT NO. 6

RESIDENTIAL BUILDING (1 ROOM SET)

FLOOR PLAN

FRONT ELEVATION

SECTION A-A

3D VIEW

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EXPERIMENT NO.: 07

Aim

To prepare planning, drafting and modeling of a three room residential building with staircase.

Apparatus/Software Required

- Computer System
- AutoCAD/Revit Software

Requirements

- Drawing room
- Bedrooms
- Kitchen
- Toilet and bathroom
- Staircase
- Balcony

Procedure

1. Prepare architectural plan.
2. Draw staircase details.
3. Prepare front elevation.
4. Prepare cross section.
5. Develop 3D model.
6. Apply rendering.

Result

Three room residential building with staircase was prepared successfully and Sample sheet is attached with this experiment.

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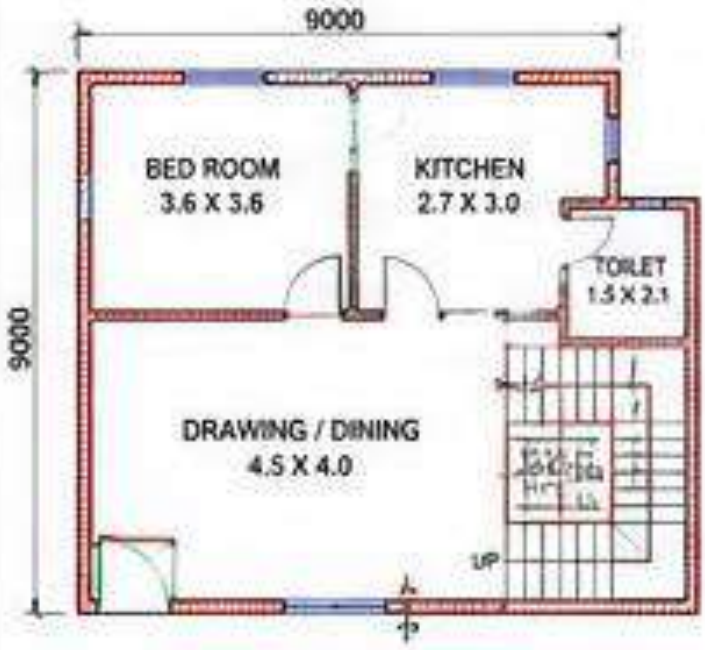
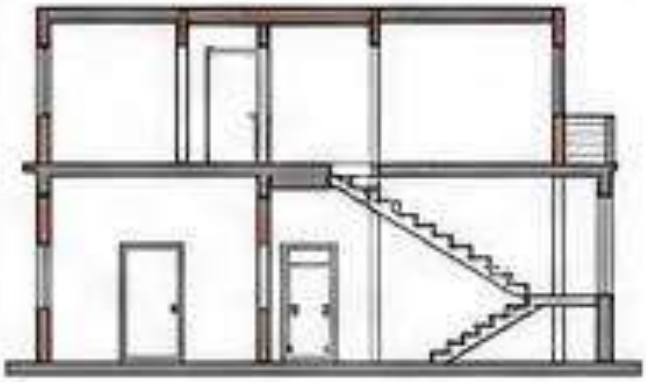
EXPERIMENT NO. 7

RESIDENTIAL BUILDING (3 ROOM SET WITH STAIRCASE)



SECTION A-A

FRONT ELEVATION



SECTION A-A

3D VIEW

Vision of the Institute	Mission of the Institute
"To become a leading institute of providing professionally competent and socially responsive technocrats with high moral values."	⇨ To create an eco-system for the dissemination of technical knowledge, to achieve academic excellence. ⇨ To develop technocrats with creative skills and leadership qualities, to solve local and global challenges. ⇨ To impart human values and ethics in students, to make them socially and Eco-friendly responsible.

EXPERIMENT NO.: 08

Aim

To prepare planning, drafting and general arrangement drawing of a duplex house.

Apparatus/Software Required

- Computer System
- AutoCAD/Revit Software

Requirements

- Ground floor planning
- First floor planning
- Staircase planning
- Elevation
- Section
- 3D model

Procedure

1. Prepare ground floor plan.
2. Prepare first floor plan.
3. Draw staircase.
4. Prepare elevations.
5. Prepare sectional details.
6. Develop BIM model.
7. Render the model.

Result

General arrangement drawing of duplex house was prepared successfully and Sample sheet is attached with this experiment.

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EXPERIMENT NO. 8

DUPLEX HOUSE PLANNING AND DRAFTING

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EXPERIMENT NO.: 01 (BEYOUND SYLLABUS)

Aim

To draft electrical wiring layout for a residential building.

Apparatus/Software Required

- Computer System
- AutoCAD/Revit Software

Drawing Includes

- Switches
- Fans
- Lighting points
- Distribution board
- Socket outlets

Procedure

1. Draw the building plan showing kitchen, bathrooms and water supply points.
2. Prepare separate layers for:
   - Water supply lines
   - Drainage pipes
   - Inspection chambers
   - Septic tank
   - Text and dimensions
3. Draw water supply pipelines connecting overhead tank and plumbing fixtures.
4. Draw drainage pipelines with proper slope toward inspection chambers and septic tank.
5. Mark the positions of inspection chambers at suitable junctions.
6. Prepare septic tank layout with inlet and outlet connections.
7. Add symbols, dimensions and pipe labels in the drawing.
8. Check alignment and connectivity of pipelines carefully.

Outcome

Students understand coordination between civil and electrical drawings and Sample sheet is attached with this experiment.

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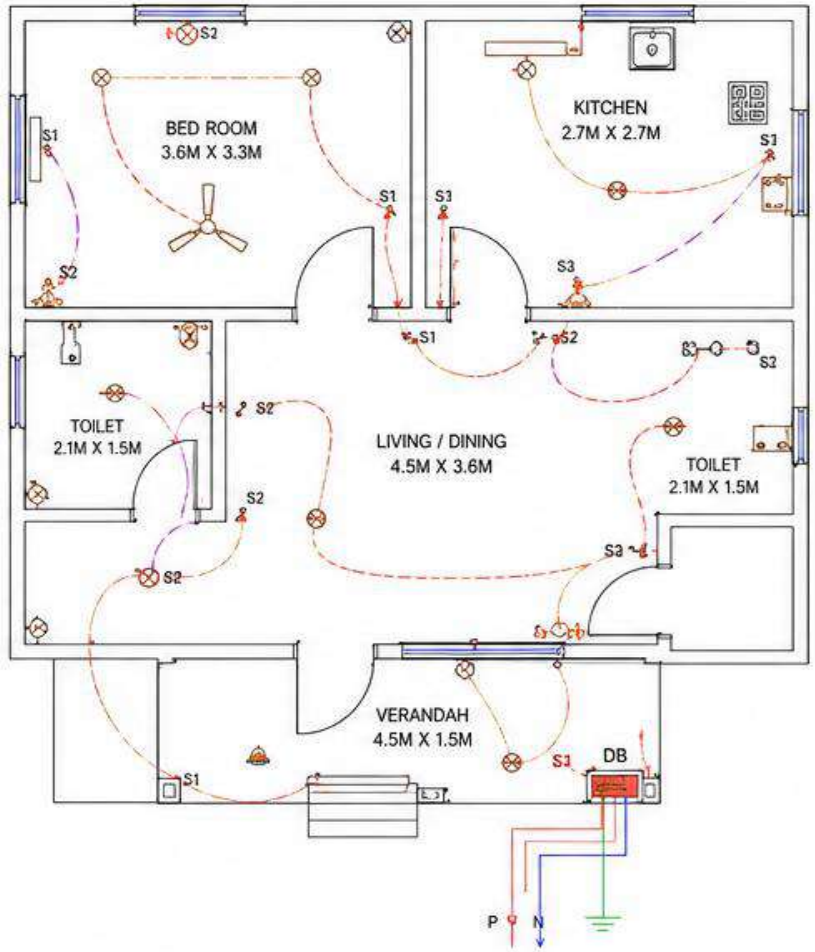
EXPERIMENT 3: PREPARATION OF ELECTRICAL LAYOUT PLAN

AIM: TO DRAFT ELECTRICAL WIRING LAYOUT FOR A RESIDENTIAL BUILDING



NOTES:

1. ALL DIMENSIONS ARE IN METERS.
2. HEIGHT OF SWITCH BOARD = 1.20m FROM FLOOR LEVEL.
3. HEIGHT OF SOCKET OUTLET = 0.45m FROM FLOOR LEVEL.
4. CEILING LIGHT CENTER = 2.75m FROM FLOOR LEVEL.
5. USE 1.5 SQ.mm WIRES FOR LIGHT POINTS AND 2.5 SQ.mm FOR POWER POINTS.

DRAWN BY	STUDENT	DATE __/__/__	SCALE	1:75	SHEET NO.
CHECKED BY	_____	TITLE	ELECTRICAL LAYOUT PLAN		03

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EXPERIMENT NO.: 02 (BEYOUND SYLLABUS)

Aim

To prepare water supply and drainage layouts.

Apparatus/Software Required

- Computer System
- AutoCAD/Revit Software

Components

- Water pipelines
- Drainage pipes
- Inspection chambers
- Septic tank layout

Procedure

1. Draw the floor plan of the residential building showing kitchen, bathrooms, toilets and utility areas.
2. Create separate layers for:

- Water supply lines
- Drainage lines
- Inspection chambers
- Septic tank
- Dimensions and text

3. Draw the water supply system by connecting water pipelines to fixtures such as taps, sinks, wash basins and toilets.
4. Indicate the direction of water flow and provide proper pipe connections from the overhead tank or main supply line.
5. Draw the drainage system connecting sanitary fixtures to drainage pipes with proper slope.
6. Provide inspection chambers at suitable pipe junctions and changes in direction.
7. Draw the septic tank layout and connect it to the drainage network through outlet pipes.
8. Add dimensions, symbols, pipe sizes and labels to complete the layout drawing.
9. Check the drawing for proper alignment, connectivity and standard drafting conventions.

Outcome

Students gain knowledge of service planning in buildings and Sample sheet is attached with this experiment.

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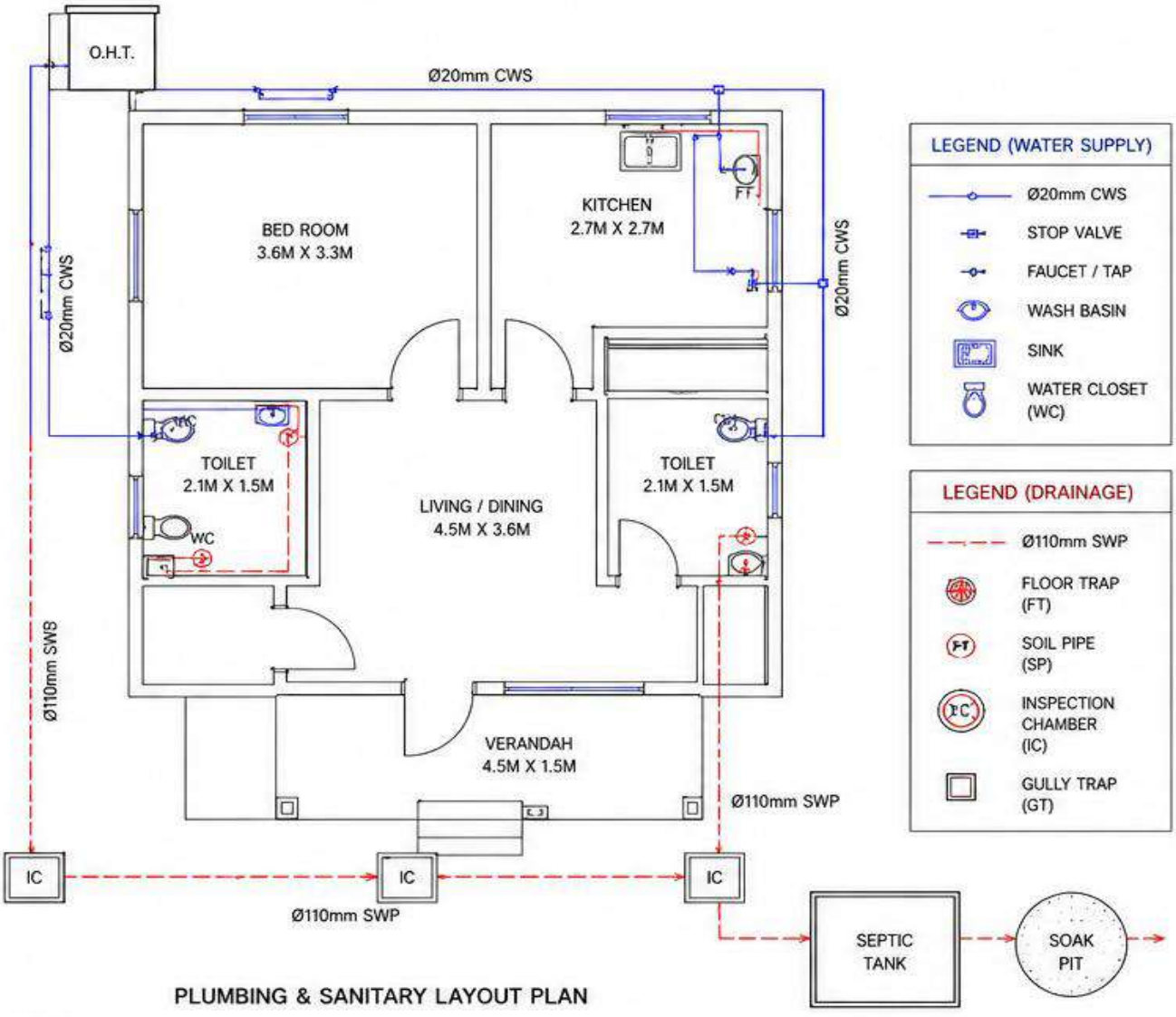
EXPERIMENT 4: PLUMBING AND SANITARY LAYOUT

AIM: TO PREPARE WATER SUPPLY AND DRAINAGE LAYOUTS



PLUMBING & SANITARY LAYOUT PLAN

NOTES:

1. ALL DIMENSIONS ARE IN METERS.
2. CWS - COLD WATER SUPPLY
3. SWP - SOIL WASTE PIPE
4. PROVIDE MIN. SLOPE OF 1:40 IN DRAINAGE PIPES.

DRAWN BY	STUDENT	DATE __/__/__	SCALE	1:75	SHEET NO.
CHECKED BY	_____	TITLE	PLUMBING AND SANITARY LAYOUT		04

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REFRENCES:

1. Building Drawing by M.G. Shah
2. Civil Engineering Drawing by Gurucharan Singh
3. AutoCAD Training Manual
4. National Building Code (NBC)
5. AKTU Syllabus and Guidelines