



# ENGINEERING/ARCHITECTURAL GRAPHICS-PART I- ORTHOGRAPHIC PROJECTION

## PROF. AVLOKITA AGRAWAL

Department of Architecture and Planning

IIT Roorkee

**INTENDED AUDIENCE :** Bachelor of Engineering in any discipline, Bachelor of Architecture

### COURSE OUTLINE :

All phases of manufacturing or construction require the conversion of new ideas and design concepts into the basic line language of graphics. Therefore, there are many areas (civil, mechanical, electrical, architectural and industrial) in which the skills of drafting play major roles in the design and development of new products or construction. Engineering Graphics is the language of architects and engineers. Just like any other language, we need to learn the vocabulary and grammar in order to be able to communicate. Engineering graphics course is the course which imparts vocabulary and grammar for the language of architects and engineers. Engineering graphics has two distinct components- 2D and 3D. In this course we will cover the topics related to 2D in graphics.

This course is designed to address: • to enable you to communicate in engineering/architectural language of drawings • to prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice

The student will learn : • Introduction to engineering design and its place in society • Exposure to the visual aspects of engineering design • Exposure to engineering graphics standards • Exposure to engineering communication

### ABOUT INSTRUCTOR :

Prof. Avlokita Agrawal, I earned Bachelor of Architecture degree from IIT Roorkee in 2003 and PhD from IIT Roorkee in 2010. Right from college, the subject which most interested me were climatology and passive designing which were taught to us by one of the most accomplished teachers of those times, Dr. M R Sharma and Dr. I C Sharma, both from CBRI. After B Arch, I pursued PhD where I studied Impact of Vaastushastra on thermal comfort in traditional Havelis of Rajasthan. While pursuing PhD and post completion of PhD, I worked for companies like Asahi India Glass (where I headed their Green Design Division) and Honeywell international (where I worked in Corporate Affairs division with a focus on building energy efficiency vertical). In corporate jobs, I was mainly working toward various aspects of building energy efficiency. After joining back academics, I have mainly taught subjects like Sustainable Built Environment. I also manage the IGBC student chapter at IIT Roorkee.

### COURSE PLAN :

**Week 1 :** Lecture 1:Introduction to engineering graphics, Principles of Engineering Graphics and their significance,  
Lecture 2:Usage of Drawing instruments, stationary materials required – scales, protractor, French curves, papers, pencils, erasers, drawing pins, drafting machine, T-Pulley  
Lecture 3:Sheet layout, fixing the sheet on board, cleaning the instruments  
Lecture 4:Types of lines, Graphic symbols  
Lecture 5:Lettering,

**Week 2 :** Lecture 1:Dimensioning

Lecture 2:Scales – Plain, Diagonal and Vernier Scales;

Lecture 3:Basic Geometrical construction – perpendicular lines, parallel lines, bisecting an angle etc.

Lecture 4:Curves used in engineering practice

Lecture 5:Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute;

**Week 3 :** Lecture 1:Introduction to orthographic projection, principles of projection, Methods of Projection, Planes of projection, four quadrants

Lecture 2:First angle projection, third angle projection, reference line

Lecture 3:Projection of points in different quadrants

Lecture 4:Loci of points

Lecture 5:Projection of lines - introduction

**Week 4 :** Lecture 1:Projection of lines parallel to both the reference planes

Lecture 2:Projection of line parallel to one and perpendicular to another plane

Lecture 3:Projection of lines inclined to one plane

Lecture 4:Projection of lines inclined to both the planes

Lecture 5: Projection of a point and line on auxiliary plane

**Week 5 :** Lecture 1:Projection of planes perpendicular to both the reference planes

Lecture 2:Projection of planes parallel to both the reference planes

Lecture 3:Projection of planes parallel to one and perpendicular to another plane

Lecture 4:Projection of planes inclined to one plane

Lecture 5:Projection of planes inclined to both the planes

**Week 6 :** Lecture 1:Types of solids

Lecture 2:Projection of solids in simple positions

Lecture 3:Projection of solids with axis inclined to one of the reference planes and parallel to another

Lecture 4:Projection of solids with axis inclined to both the planes

Lecture 5:Projection of spheres

**Week 7 :** Lecture 1:Introduction to section of solids, section planes, true shape of sections

Lecture 2:Sections of Prisms

Lecture 3:Sections of Pyramids

Lecture 4:Sections of Cylinders

Lecture 5:Sections of Cones

**Week 8 :** Lecture 1:Sections of Spheres

Lecture 2:Development of surfaces- cubes, prisms, pyramids

Lecture 3:Development of surfaces- cylinders, spheres

Lecture 4:Intersection of surfaces – two Prisms, two cones, two cylinders

Lecture 5:Intersection of surfaces – one prism and one cone, one cone and one cylinder, one sphere and one prism