TOPIC 4:
LINE PERPENDICULAR TO PLANE
DEFINITION

- If a straight line drawn to a plane is perpendicular to every straight line that passes through its foot and lies in the plane, it is said to be perpendicular to the plane.
- When a line is perpendicular to a plane, the plane is also said to be perpendicular to the line.
THEOREMS

- If a line is perpendicular to each of two other lines at their point of intersection, it is perpendicular to the plane of the two lines.
- Let \( n \) be a line perpendicular to two intersecting lines \( k \) and \( l \) in the plane \( \alpha \). Then \( n \) is perpendicular to every line in \( \alpha \), hence \( n \perp \alpha \).
- For every line \( l \) and every point \( P \) there is a unique plane \( \alpha \) through \( P \) such that \( l \perp \alpha \).
- Two planes \( \alpha \) and \( \beta \) that are perpendicular to the same line \( n \) are parallel.
All the perpendiculars that can be drawn to a given point lie in a plane which is perpendicular to the given line at the given point.

Through a given point in a given line one plane, and only one, can be passed perpendicular to the line.

Through a given external point one plane, and only one, can be passed perpendicular to a given line.

Through a given point in a plane there can be drawn one line perpendicular to the plane, and only one.

Through a given external point there can be drawn one line perpendicular to a given plane, and only one.

The perpendicular is the shortest line from a point to a plane. The length of this perpendicular is called the **distance** from the point to the plane.

Two planes $\alpha$ and $\beta$ that are perpendicular to the same line $n$ are parallel.

A line that meets a plane but is not perpendicular to it is said to be **oblique** to the plane. Oblique lines drawn from a point to a plane, meeting the plane at equal distances from the foot of the perpendicular, are equal; and of two oblique lines, meeting the plane at unequal distances from the foot of the perpendicular, the more remote is the greater.