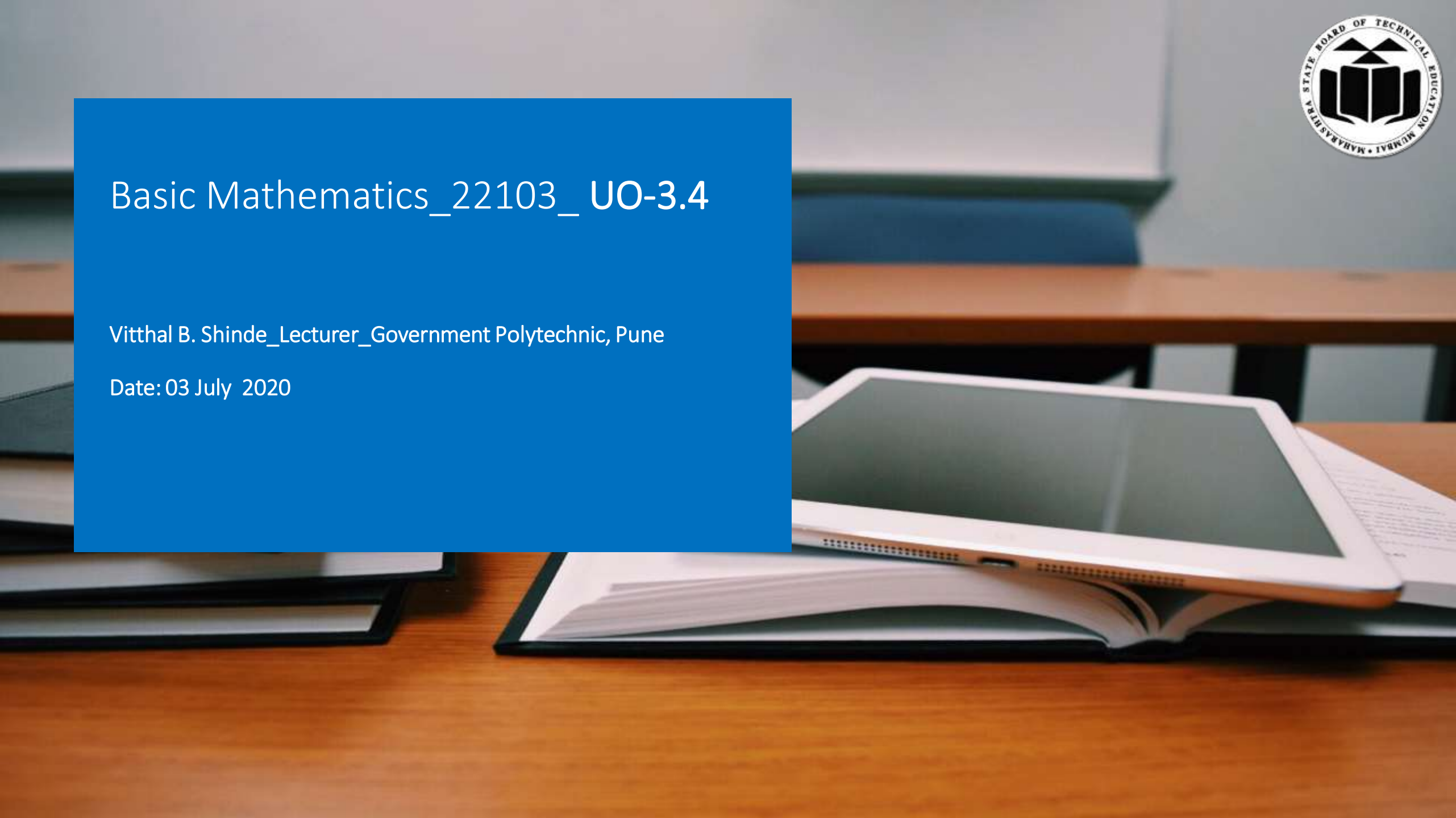

Basic Mathematics_22103_ UO-3.4

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Unit 3: Coordinate Geometry

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Topic : Straight Line

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Learning Objective/ Key learning

- Calculate perpendicular distance between the given two parallel lines

Contents

- Perpendicular Distance between Two Parallel Lines
- Examples based on distance between Two Parallel Lines

Perpendicular Distance between Two Parallel Lines:

The distance between two parallel lines $ax + by + c_1 = 0$ and $ax + by + c_2 = 0$ is given by $d = \left|\frac{c_2 - c_1}{\sqrt{a^2+b^2}}\right|$.

Solved Examples

1) Find the distance between the parallel lines $3x - y + 7 = 0$ and $3x - y + 16 = 0$.

Solution : Given lines are

$3x - y + 7 = 0$, $3x - y + 16 = 0$

$a = 3$, $b = -1$, $c_1 = 7$, $c_2 = 16$

Distance between two parallel lines is

$$\therefore \quad d = \left|\frac{c_2 - c_1}{\sqrt{a^2+b^2}}\right|$$

$$= \left|\frac{16 - 7}{\sqrt{3^2+(-1)^2}}\right|$$

$$= \left|\frac{9}{\sqrt{10}}\right|$$

$$d = \frac{9}{\sqrt{10}} \text{ Units}$$

2) Find the distance between the lines, $3x + 4y + 5 = 0$ and $6x + 8y = 25$.

Solution :

Given lines are

$3x + 4y + 5 = 0$ | $6x + 8y = 25$

$\therefore 2(3x + 4y + 5) = 2 \times 0$ | $\therefore 6x + 8y - 25 = 0$

$\therefore 6x + 8y + 10 = 0$

Here $a = 6$, $b = 8$, $c_1 = 10$, $c_2 = -25$

Distance between two parallel lines is

$$d = \left|\frac{c_2 - c_1}{\sqrt{a^2 + b^2}}\right|$$

$$\therefore = \left|\frac{-25 - 10}{\sqrt{(6)^2 + (8)^2}}\right|$$

$$\therefore = \left|\frac{-35}{\sqrt{36 + 64}}\right|$$

$$\therefore = \left|\frac{-35}{\sqrt{100}}\right|$$

$$\therefore = \frac{35}{10}$$

$$\therefore d = \frac{7}{2} \text{ Units}$$

3) Find the distance between the parallel lines 4x + 3y + 2 = 0 and 4x + 3y – 9 = 0.

Solution : Given lines are

4x + 3y + 2 = 0 and 4x + 3y – 9 = 0

Here a = 4, b = 3, $c_1 = 2$, $c_2 = -9$

Distance between two parallel lines is

$$d = \left|\frac{c_2 - c_1}{\sqrt{a^2+b^2}}\right|$$

$$= \left|\frac{-9-2}{\sqrt{(4)^2+(3)^2}}\right|$$

$$= \left|\frac{-11}{\sqrt{16+9}}\right|$$

$$= \left|\frac{-11}{\sqrt{25}}\right|$$

$$= \left|\frac{-11}{5}\right|$$

$$d = \frac{11}{5} \text{ Units}$$

So today we learn-

- Perpendicular Distance between Two Parallel Lines
- Examples based on distance between Two Parallel Lines

.**Quiz**

1) Which of the following types the straight line represented by $2x + 3y - 7 = 0$, $2x + 3y - 5 = 0$.

a) Parallel to each other b) Perpendicular to each other

c) Inclined at 45° to each other d) Coincident pair of straight lines

2) Find the distance between the parallel lines $y = 2x + 4$, $3y = 6x - 5$

a) 1 b) $\frac{17}{3\sqrt{5}}$ c) $\frac{17\sqrt{5}}{15}$ d) $\frac{17}{\sqrt{3}}$

Ans: 1. a) 2.b)

Thank You