

**Year I, Semester II, Soil Dynamics in Tillage and Traction      2   1   3   6   to   5**

**Course Description & Objective:**

*To acquaint and equip with the dynamic properties of soil, soil failure and design of tillage tools, prediction of traction performance and dimensional analysis of different variables related to soil- tire system.*

**Course outcomes:**

*Upon completion of this course, students will:*

- 1. be able to measure and utilize physical and mechanical properties of soil in order to interpret and predict soil stress-strain behavior.*
- 2. be able to design and implement safe and cost-effective mechanical soil tillage systems for producing desired physical states*
- 3. be able to design and implement and cost-effective mechanical traction/transport systems which produce specified performance and acceptable alteration of affected soil profiles*
- 4. understand the need to learn and apply improved methodologies through continuing education.*

**UNIT I**

Dynamic properties of soil and their measurement, stress-strain relationships, theory of soil failure.

**UNIT II**

Mechanics of tillage tools and geometry of soil tool system, design parameters and performance of tillage tools.

**UNIT III**

Dimensional analysis of different variables related to soil-tyre system; soil vehicle models; mechanics of steering of farm tractor; special problems of wet land traction and floatation.

**UNIT IV**

Introduction of traction devices, tyres-types, function & size, their selection; mechanics of traction devices. Deflection between traction devices and soil, slippage and sinkage of wheels.

**UNIT V**

Evaluation and prediction of traction performance, design of traction and transport devices. Soil compaction by agricultural vehicles and machines.

**Suggested readings**

1. Daniel Hill. 1962. *Fundamentals of Soil Physics*. Academic Press.
2. Gill & Vandenberg. 1968. *Soil Dynamics in Tillage and Traction*. Supdt. Of Documents, U.S. Govt. Printing Office, Washington, D.C.
3. Sineokov GN. 1965. *Design of Soil Tillage Machines*. INSDOC, New Delhi.
4. Terzaghi K & Peck Ralph B. 1967. *Soil Mechanics in Engineering Practices*. John Wiley & Sons.

**Practicals;**

1. Direct shear test.

2. Vane shear test.
3. Field measurement of soil strength.
4. Measurement of cone index by cone penetrometer.
5. Design problems on tillage tools.

Study of tractive performance parameters.

6. Study of tire size, load, and air pressure Relationship.
7. Problems on tire selection.
8. Problems on dimensional analysis.