# 20FM011 ADVANCES IN MECHANICS OF TILLAGE AND TRACTION

Hours Per Week :

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | - | 4 |

Total Hours :

| L | T | P |
|---|---|---|
| 45 | - | - |

| WA/RA | SSH/HSH | CS | SA | S | BS |
|---|---|---|---|---|---|
| - | - | - | - | - | - |

**Course Description and objectives:**

This course deals with the design of tillage and traction devices used in farm machinery. The course aims to present fundamental concepts describing dynamic soil behaviour in response to mechanical elements with methods for designing traction/transport systems.

**Course outcomes:**

After successful completion of this course, the student will be able to:

- measure and utilize physical and mechanical properties of soil.
- interpret and predict soil stress strain behaviour.
- design and implement safe and cost effective mechanical soil tillage systems
- design and implement and cost effective mechanical traction/transport systems
- establish systems that produce specified performance and acceptable alteration of affected soil profiles.

**SKILLS:**

*Performance evaluation of cultivator.*
*Draft measurements of implements.*
*Usage of GIS software.*
*Selection of optimum tyre for traction.*

**UNIT – 1** **L-10**

**DYNAMIC PROPERTIES OF SOILS :** Static and dynamic properties of soil, stress-strain relationship, soil strength, stress and strain distribution, yield in soil, rigid body soil movement, measurement of dynamic properties-independent and composite parameters.

**UNIT – 2** **L-10**

**MECHNICS OF TILLAGE TOOLS :** Design of tillage tools principles of soil cutting, design equation, force analysis, application of dimensional analysis in soil dynamics performance of tillage tools.

**UNIT – 3** **L-10**

**MECHANICS OF TRACTION :** Introduction to traction and mechanics, off road traction and mobility, traction model, traction improvement, traction prediction.

**UNIT – 4** **L-08**

**AGRICULTURE TYRES :** Tyre size, tyre lug geometry and their effects, tyre testing, soil compaction and plant growth.

**UNIT – 5** **L-07**

**APPLCATION OF GIS IN SOIL DYNAMICS :** Variability and geo statistic, application of GIS in soil dynamics.

**TEXT BOOKS :**

1. E. McKyes, “Agricultural Engineering Soil Mechanics”, Elsevier, Amsterdam, 1989.
2. Gill and Vandenberg. “Soil Dynamics in Tillage and Traction”, Superintend of Documents, U.S. Govt. Printing Office, Washington D.C., 1968.

**REFERENCE BOOKS :**

1. G.M.E. Milligan and G.T. Houlsby, ‘Basic Soil Mechanics’. Butterworth-Heinemann, London, 1984.
2. E. McKyes, “Soil Cutting and Tillage”, Elsevier Amsterdam, 1985.
3. T. William Lambe, Whiteman and V. Robert, “Soil Mechanics”, Wiley Eastern Limited, New Delhi, 1969.

**WEB LINKS:**

1. http://ecourses.iasri.res.in/e-Leaarningdownload3_new.aspx?Degree_Id=04
2. http://www.elsevier.com/books/soil-cutting-and-tillage/mckyes/978-0-444-42548-5
3. http://bsesrv214.bse.vt.edu/grisso/ethiopia/books_resources/tillage/soildyn_tableof-contents.pdf
4. http://ecoursesonline.iasri.res.in/course/view.php?id=68

***ACTIVITIES:***

- *Instrumentation in traction measurement.*
- *Performance evaluation of cultivator.*
- *Add on programme on GIS software*
- *Calculation of stress-strain distribution.*
- *Collection of different tyre sizes available and study of traction behaviour with them.*