

# 16AG403 SOIL AND WATER ENGINEERING

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WARA	SSH/HS	CS	SA	S	BS
45	15	-	5	40	5	8	5	-



## Course Description and Objectives :

This course deals with the concepts of conservation techniques of soil and water and design of the structures required for the same under varying conditions. The objective of this course is to enable the student to acquire fundamental knowledge on soil erosion with its control as well as sedimentation. It also enables the student to have sufficient knowledge on soil and water conservation structures.

## Course Outcomes:

The student will be able to:

- design systems to control soil erosion and flooding.
- develop irrigation systems and consult on crop nutrition management.
- design ways to handle storm water and control sediment.
- understand the role of natural ecosystems in agriculture.

## SKILLS:

- ✓ *Design prototype models of drop spillway, drop inlet spillway and chute spillway with standard procedures.*
- ✓ *Prepare an estimation of various costs and benefits of different structures.*
- ✓ *Analyze various soil and water conservation structure designs using software.*

**ACTIVITIES:**

- Identification of gully affected areas and recommendations to control.
- Measurement of sedimentation in rivers using various equipments.
- Construction of windbreaks and shelter belts in farmers fields.
- Structural design of various structures.
- Construction of dugout farm pond.
- Demonstration of flow net through model.

**UNIT - 1****L-05, T-03**

**SOIL EROSION** : Soil erosion - causes, types and agents of soil erosion, Water erosion, Forms of water erosion, Mechanics of erosion, Effect of slope, Slope length, Soil, Vegetation, Topographical features and rainfall on erosion, Gullies and their classification, Stages of gully development, Soil loss estimation- universal soil loss equation and modified soil loss equation, Determination of their various parameters.

**UNIT - 2****L-10, T-03**

**EROSION CONTROL MEASURES** : Agronomic measures: contour cropping, Strip cropping, Mulching, Mechanical measures- terraces – level and graded broad base terraces and their design, Bench terraces and their design, Layout procedure, Terrace planning, Bunds- contour bunds, Graded bunds and their design, Gully and ravine reclamation- principles of gully control, Vegetative and temporary structures, Control measures for stream bank and coastal erosion.

**UNIT - 3****L-10, T-03**

**SEDIMENTATION AND WIND EROSION** : Landslides, Factors causing it, Land slips, Measures for control; Sedimentation in reservoirs and streams; Estimation and measurement, Sediment delivery ratio, Trap efficiency, Land use capability classification, Grassed waterways and their design, Introduction to water harvesting techniques, Introduction to stream water quality and pollution, Wind erosion- factors affecting wind erosion, Mechanics of wind erosion, Soil loss estimation, Wind erosion control measures, Vegetative, Mechanical measures, Wind breaks and shelterbelts, Sand dunes stabilization.

**UNIT - 4****L-10, T-03**

**CONSERVATION STRUCTURES** : Classification of conservation structures, Functional requirements of soil erosion control structures, Flow in open channel, Types of flow, State of flow, Regimes of flow, Energy and momentum principles, Specific energy and specific force, Flow transitions due to hump and width variations, Hydraulic jump and its application, Type of hydraulic jump, Energy dissipation due to jump, Jump efficiency, Relative loss of energy, Straight drop spillway, General description, Functional use, Advantages and disadvantages, Structural parts and functions, Components of spillway, Hydrologic and hydraulic design, Free board and wave free board, Aeration of weirs, Concept of free and submerged flow.

**UNIT - 5****L-10, T-03**

**STRUCTURE DESIGN** : Structural design of a drop spillway, Loads on headwall, Variables affecting equivalent fluid pressure, Determination of saturation line for different flow conditions, Seepage under the structure, Equivalent fluid pressure, Triangular load diagram for various flow conditions, Creep line theory, Uplift pressure estimation, Safety against sliding, overturning, crushing and tension, Chute spillway, General description and its components, Hydraulic design, Energy dissipaters, Design criteria of a SAF stilling basin and its limitations, Drop inlet spillway general description, Functional use, Design criteria; Design of diversions; Small earth embankment, Their types and design principles, Farm ponds, Percolation ponds, Check dams and Reservoirs.

**TEXT BOOK:**

1. R. Suresh, "Soil and water Conservation Engineering", 4<sup>th</sup> Edition, Standard Publishers and Distributors, 1997.

**REFERENCE BOOKS:**

1. V. V. N. Murty and M. K. Jha, "Land and Water Management Engineering", 6<sup>th</sup> Edition, Kalyani Publishers, 2013.
2. G. O. Schwab, R. K. Frevert, T. W. Edminister and K. K. Barnes, "Soil and Water Conservation Engineering", 3<sup>rd</sup> Edition, John Wiley and Sons, 1993.
3. A. M. Michael and T. P. Ojha, "Principles of Agricultural Engineering, Vol. II", Jain Brothers, New Delhi, 1985.

**WEB LINK :**

1. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=124667>