

22SWCE302 WATER HARVESTING AND SOIL CONSERVATION STRUCTURES

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of soil and water conservation measures .

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with water harvesting techniques, runoff harvesting techniques and design of different farm ponds, embankments and spillways. It also helps student to acquaint knowledge in designing and constructing different permanent gully control structures.

MODULE-1

UNIT-1

8L+0T+8P=16 Hours

WATER HARVESTING:

Water harvesting-principles, importance and issues. Water harvesting techniques- classification based on source, storage and use. Runoff harvesting – short-term and long-term techniques. Short-term harvesting techniques-terracing and bunding, rock and ground catchments. Long-term harvesting techniques - purpose and design criteria. Structures - farm ponds - dug-out and embankment reservoir types, tanks and subsurface dykes.

UNIT-2

8L+0T+8P=16 Hours

FARM POND AND EMBANKMENTS:

Farm pond - components, site selection, design criteria, capacity, embankment, mechanical and emergency spillways, cost estimation and construction. Percolation pond - site selection, design and construction details. Design considerations of nala bunds. Soil erosion control structures - introduction, classification and functional requirements.

PRACTICES:

- Study of different types of farm ponds.
- Computation of storage capacity of embankment type of farm ponds.
- Design of dugout farm ponds.
- Design of percolation pond and nala bunds. Runoff measurement using H-flume. Exercise on hydraulic jump.
- Exercise on energy dissipation in water flow.
- Hydrologic, hydraulic and structural design of drop spillway and stability analysis.

MODULE-2

UNIT-1

8L+0T+8P=16 Hours

PERMANENT GULLY CONTROL STRUCTURES:

Permanent structures for soil conservation and gully control – check dams, drop, chute and drop inlet spillways - design requirements, planning for design, design procedures-hydrologic, hydraulic and structural design and stability analysis. Hydraulic jump and its application. Drop spillway-applicability, types-straight drop, box-type inlet spillways-description, functional use, advantages and disadvantages, straight apron and stilling basin outlet, structural components and functions.



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SKILLS:

- ✓ Design prototype models of drop spillway, drop inlet spillway and chute spillway with standard procedures.

UNIT-2**8L+0T+8P=16 Hours****DESIGN OF PERMANENT GULLY STRUCTURES:**

Loads on head wall, variables affecting 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 - description, components, energy dissipaters, design criteria of Saint Antony Falls (SAF) stilling basin and its limitations. Drop inlet spillway-description, functional use and design criteria.

PRACTICES:

- Design of SAF stilling basins in chute spillway.
- Hydrologic, hydraulic and structural design of drop inlet spillway.
- Design of small earthen embankment structures.
- Practice on software's for design of soil and water conservation structures.
- Field visit to watershed project areas treated with soil and water conservation measures/ structures

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the knowledge of short term and long term water harvesting techniques to conserve water.	Apply	1	1, 2, 4, 7
2	Analyse runoff in watershed and different forces acting on different gully control structures.	Analyse	2	1, 2, 3, 4, 5, 6, 7
3	Design and develop farm pond and embankments and optimize its cost.	Evaluate	1	1, 2, 4, 5, 7, 11, 12
4	Propose and estimate hydrologic design and structural design of different gully control structures.	Create	2	1, 2, 3, 4, 5, 6, 7, 12

TEXT BOOKS:

1. Suresh, R. "Soil and Water Conservation Engineering" Standard Publisher Distributors, New Delhi, 2014.
2. Michael, A.M. and T.P. Ojha. "Principles of Agricultural Engineering" Volume II. 4th Edition, Jain Brothers, New Delhi, 2003.
3. Murthy, V.V.N. "Land and Water Management Engineering" 4th Edition, Kalyani Publishers, New Delhi, 2002.

REFERENCE BOOKS:

1. Singh Gurmel, C. Venkataraman, G. Sastry and B.P. Joshi. "Manual of Soil and Water Conservation Practices" Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1996.
2. Schwab, G.O., D.D. Fangmeier, W.J. Elliot, R.K. Frevert "Soil and Water Conservation Engineering" 4th Edition, John Wiley and Sons Inc. New York, 1993.
3. Samra, J.S., V.N. Sharda and A.K. Sikka. "Water Harvesting and Recycling: Indian Experiences" CSWCR&TI, Dehradun, Allied Printers, Dehradun, 2002.
4. Theib Y. Oweis, Dieter Prinz and Ahmed Y. Hachum. "Rainwater Harvesting for Agriculture in the Dry Areas. CRC Press" Taylor and Francis Group, London, 2013.
5. Studer Rima Mekdaschi and Hanspeter Liniger. "Water Harvesting - Guidelines to Good Practice. Centre for Development and Environment" University of Bern, Switzerland, 2013.