B.E. Semester: VII

Department of Civil Engineering

Subject Name: Watershed Management (CV704-N-C)

Course Category: Program Course Elective – III (PCE)

A. Objectives of the Course:

- To study basic concepts of Watershed Management
- To introduce students to basic concepts of Watershed Management Practices
- The study involves Integrated Watershed management, Remedial measures and strategies
- To develop skills relevant Watershed modelling and modern techniques in watershed management, particularly the planning of watershed management projects

B. Teaching & Evaluation Scheme:

Teaching Scheme				Credit	Evaluation Scheme					Total Marks
L hrs	T hrs	P hrs	Total Hrs		Theory		IE	CIA	Pra/Viva	
					Hrs	Marks	Marks	Marks	Marks	
3	2	0	5	5	3	70	30	20	30	150

C. Detailed Syllabus:

1. Introduction and Basic Concepts of Watersheds :

Definition of watershed, Watershed concept, Need & objectives of watershed management, Characteristics of watershed, Benefits of watershed development Causes and effects of degradation. Effects of urbanization on watershed management

2. Watershed Management Practices:

Soil erosion- Definition, Problems of erosion, Types of soil erosion. Land Classification for Watershed Management, Soil conservation, Need & soil conservation technology. Engineering Measures for Erosion Control such as Contour cultivation, Contour bunds,

Design of contour bunds, Graded bunding, Design of graded bunding, Alignment and construction, maintenance, Advantages and limitations of graded bunding, Bench terracing, Design Grassed waterways, shape, planning, construction and vegetation, maintenance, diversion drains. Control of gullies and their reclamation for various lands

3. Integrated Watershed Management:

Use Definition, Need & advantages of rainwater harvesting, Techniques of rainwater harvesting roof water harvesting and surface water harvesting Traditional methods of rainwater harvesting in Gujarat state. Roof water harvesting- techniques as storage and ground water recharge, Types of watershed structures- such as small weir Gully plugging, Khettalawadi, Weir, Percolation tank, Jalbandh, Farm pond and Check dam. Details of watershed structure with neat sketch. Design Considerations of water shed projects. Ground water dykes or Sub surface dykes. State integrated approach

4. Remedial Measures and Strategies:

Best Management Practices for the Sustainable Management of Watershed, Integrated Multi-disciplinary Approach, Socio Economic Aspects, Role of Co-Operative Society in Watershed Management, People's Awareness, Participation and Response

5. Watershed Modelling:

Standard modelling approaches and classifications, system concept for watershed modelling, overall description of different hydrologic processes, modelling of rainfall-runoff process, subsurface flows and groundwater flow

6. Modern techniques in watershed management:

Applications of Geographical Information System and Remote Sensing in Watershed Management, Role of Decision Support System in Watershed Management

D. Lesson Planning:

Unit No	Title of the Unit	Minimum Hours	Weightage (%)
1	Introduction and Basic Concepts of Watersheds	04	09
2	Watershed Management Practices	12	26

3	Integrated Watershed Management	10	22
4	Remedial Measures and Strategies	06	14
5	Watershed Modelling	07	15
6	Modern techniques in watershed management	06	14
	Total	45	100

E. Assignments:

- Minimum 6 theory and/or Examples from each unit

F. Instructional method and pedagogy (Continuous Internal Assessment Scheme CIA):

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures, practical and Tutorial which carries 05 Marks.
- At regular intervals assignments is given. In all, a student should submit all assignments of 05 marks each.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries 05 Marks.
- Viva Voce will be conducted at the end of the semester of 05 Marks.
- One internal exam of 30 marks is conducted as a part of Mid Semester evaluation.

G. Students Learning Outcomes:

On the successful completion of this course

- Basic Concepts of Watershed management
- How to conserve soil and water for Watershed management
- Be able to plan and design Watershed management
- Use Watershed Modelling and Modern techniques in watershed management

H. Recommended Study Materials:

a. Text book & Reference Books:

1. Engineering Hydrology – K. Subramanya
2. Garg, S.K., Irrigation Engineering and Hydraulic Structures, Khanna Publishers, New Delhi.
3. Hydrology & Soil Conservation Engineering – Ghansyamdas
4. Hydrology – Raghunath
5. Integrated Watershed Management through Simulation Modeling by Lodha P P and Gosain A K – Lambert Academic Publishing
6. Introduction to Hydrology – Warren Viessman, Jr. & Garry L. Lewis, Pearson Education
7. Murthy, J.V.S., Watershed Management in India, Wiley Eastern, New Delhi, 1994.
8. Purandare, A.P., Jaiswal A.K., Waterhed Development in India, NIRD, Hyderabad, 1995.
9. Stochastic Water Resources Technology – N.T. Kottegoda
10. Vir Singh, Raj , Watershed Planning and Management, Yash Publishing House, Bikaner, 2000
11. Watershed Hydrology – Peter E. Black, Prentice Hall.Arora, K.R., Irrigation, Water Power And Water Resources Engineering, Standard Publisher Distributors, Delhi

b. Web Materials:

1. http://nptel.iitm.ac.in
2. http://www.academia.edu/1468483/Hydrological_open_source_experiences_using_SWAT_and_OpenMI
3. http://en.wikipedia.org/wiki/Category:Hydraulic_engineering

c. Indian Codes of Practice and Other Standards:

1. Integrated Watershed Management Programme (IWMP)
2. Purandare, A.P., Jaiswal A.K.Waterhed Development in India, NIRD,Hyderabad, 1995.
3. Watershed Management: Guidelines for Indian Conditions