

**COURSE NAME : Civil Engineering Group**  
**COURSE CODE : CE/CS/CR/CV**  
**SEMESTER/YEAR : Sixth Semester**  
**SUBJECT TITLE : Water Shed Management (Elective)**  
**SUBJECT CODE :**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
03	---	2	03	100	--	--	25@	125

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

**RATIONALE: -**

Water resources play a very important role in the overall development of a country like India. Day by day these resources are becoming scarce & users are multiplying in larger numbers. The drinking water and other purpose water problem is becoming very serious day by day in rural as well as urban area. It is need of the hour to adopt scientific approaches for making use of water resources judiciously and intelligently. Water resources need to be conserved at all cost keeping in mind the future demands. This situation may be improved by carrying watershed development works.

Watershed management implies, the judicious use of all the resources i.e land, vegetation and water of the watershed to achieve maximum productivity with minimum hazard to the natural resources and for the wellbeing of mankind..

The topics on runoff and soil erosion will provide necessary guidelines to be followed during planning for watershed management. Topics on water harvesting and ground water recharge will provide the information about different methods for the same.

The topics on water conservation measures will provide construction and location etc. of different measures those can be adopted for water conservation . This will enable further to plan for appropriate measures for water conservation

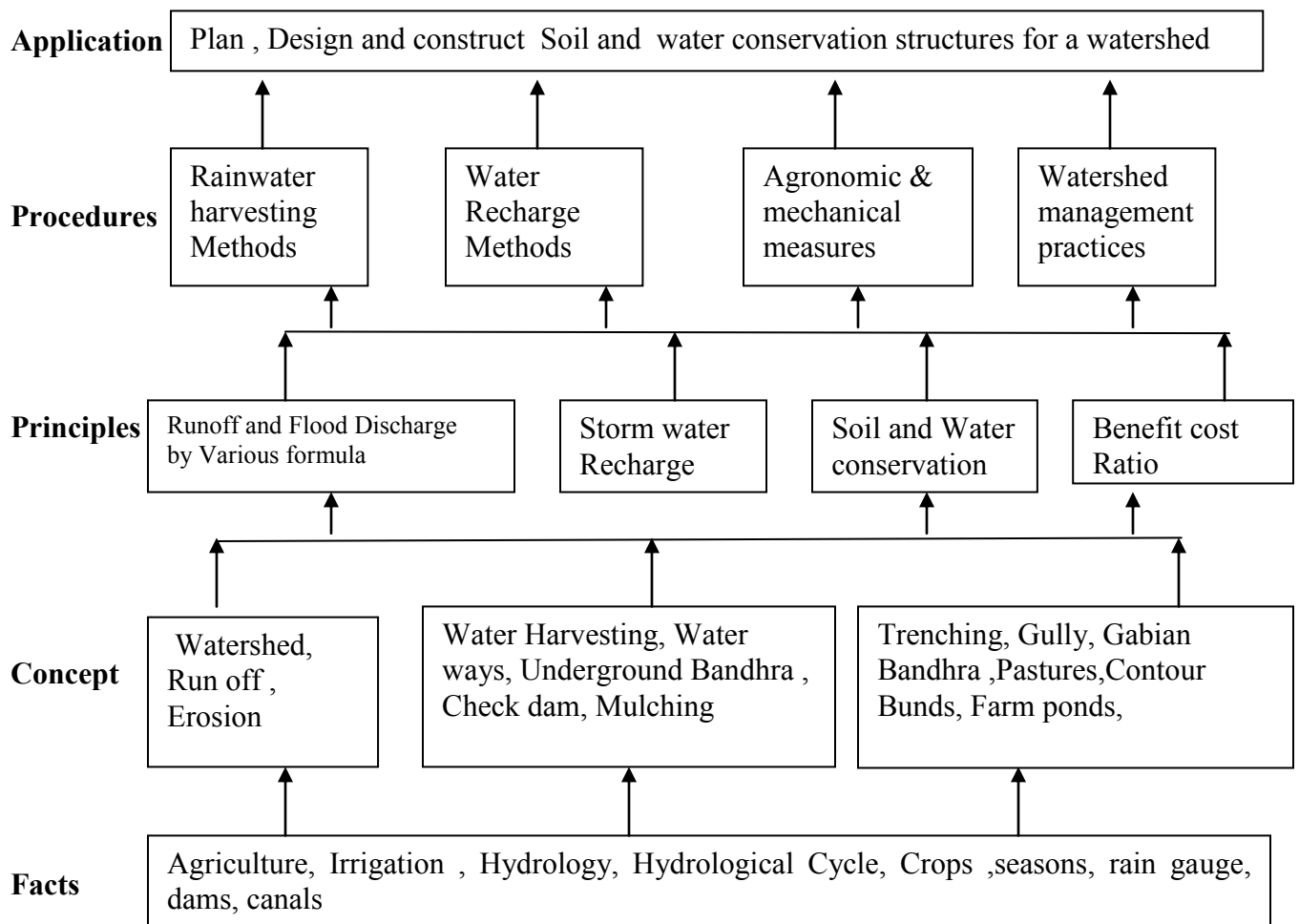
Different water conservation measures undertaken in an integrated manner will be useful to manage the available water resources effectively. Thus the activities related to planning, design, construction and maintenance of different structures associated with soil and water conservation measures will enable the diploma civil engineer to be the professional in that area.

### General Objectives:

The students will be able to,

1. Understand the concept of watershed and its planning aspects.
2. Select suitable site proposing water and soil conservation measure in watershed.
3. Apply the suitable measures for soil or water conservation for a watershed.
4. Prepare project of roof rainwater harvesting of a building.
5. Understand the different aspects in preparation of watershed development project.

### Learning Structure:



**Theory:**

Topics and Contents	Hours	Marks
<p><b>Topics 1; Introduction</b></p> <p><b>Specific objective:</b></p> <ul style="list-style-type: none"> <li>➤ State the types &amp; availability of Water resources</li> <li>➤ State Purpose of watershed management.</li> <li>➤ State meaning of water shed and watershed management</li> </ul> <p><b>Contents</b></p> <ul style="list-style-type: none"> <li>• Water resources-types and its availability, its use, classification of water resources,</li> <li>• Concept of water shed, watershed characteristics,</li> <li>• Watershed management, and practices, factors affecting watershed management</li> <li>• Soil degradation ,causes, effects.</li> <li>• Integrated multi disciplinary approach for watershed ,</li> </ul>	6	12
<p><b>Topics 2; Run off and soil erosion</b></p> <p><b>Specific objective:</b></p> <ul style="list-style-type: none"> <li>➤ Calculate the runoff from water shed.</li> <li>➤ State soil and water erosion causes .</li> <li>➤ Identify suitable method of preventing of water and soil erosion.</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Run off computation- Rational Method, Runoff formula- Inglis formula for ghat and non ghat area, Time of concentration(simple numerical on runoff computation)</li> <li>• Soil erosion- Definition, erosion problem, types of erosion, factors affecting soil erosion.</li> <li>• Water erosion - factors affecting water erosion, gully erosion, rain drop erosion, sheet erosion , rill erosion, Mechanics of water erosion</li> </ul>	8	16
<p><b>Topics 3; Water harvesting and Ground water recharge.</b></p> <p><b>Specific objective:</b></p> <ul style="list-style-type: none"> <li>➤ State suitable water harvesting technique.</li> <li>➤ Design roof rain water harvesting of a building.</li> <li>➤ Describe specific method of recharging of ground water</li> </ul> <p><b>Contents:</b></p> <p>3.1 ..... (08)</p> <ul style="list-style-type: none"> <li>• Water Harvesting - importance , harvesting principles Water Harvesting techniques- Roof harvesting, Runoff harvesting , and Flood water harvesting</li> </ul> <p>3.2 ..... (10)</p> <ul style="list-style-type: none"> <li>• Artificial recharge of ground water –Spreading method , induced recharge method, recharge –well method , subsurface dams, Waste water recharge, recharge by urban storm runoff.</li> </ul>	8	18

<p><b>Topic 4 ; Water Conservation Measures.</b></p> <p><b>Specific objective:</b></p> <ul style="list-style-type: none"> <li>➤ State supportive practices like mulching, pastures, grazing practices,</li> <li>➤ Design suitable water conservation</li> <li>➤ Design, and construct terraces system</li> <li>➤ Design, construction, maintenances of farm ponds.</li> </ul> <p><b>Contents:</b></p> <p><b>4.1 Agronomic measures .....( 08)</b></p> <ul style="list-style-type: none"> <li>• Contour farming, strip cropping and tillage practices.</li> <li>• Supportive practices-mulching, pastures, grazing practices,</li> </ul> <p><b>4.2 Mechanical Measures- ..... (08)</b></p> <ul style="list-style-type: none"> <li>• Bunding- types, contour bunding and graded bunding, design criteria, alignment &amp; construction, surplus arrangement,</li> <li>• Contour trenching-graded trenches and staggered trenches,</li> <li>• Grassed water ways –location, selection of suitable grasses, construction and maintenances,</li> </ul> <p><b>4.3 ..... (08)</b></p> <ul style="list-style-type: none"> <li>• Terraces- Classification, bench terraces- types, design, construction , limitations, maintenance , Terraces system-Planning, construction , maintenances, broad based terraces, conservation ditches,</li> <li>• Gully control measures-Vegetation, Gully control structures-gully plugging</li> </ul> <p><b>4.4 ..... (12)</b></p> <ul style="list-style-type: none"> <li>• Check dam- classification-temporary check dam, semi permanent check dam and permanent check dams -cement bandhara, earthen bandhara, gabion structure, biological bandhara, underground bandhara,</li> <li>• Farm ponds- types, Components, selection of site, design, construction, maintenances.</li> </ul>	18	36
<p><b>Topic 5; Planning of watershed works-</b></p> <p><b>Specific objective:</b></p> <ul style="list-style-type: none"> <li>➤ Sate the problems faced in watershed management</li> <li>➤ Prepare the project proposal for watershed management work</li> <li>➤ List the steps in watershed management.</li> </ul> <p><b>Contents:</b></p> <p><b>5.1 ..... (10)</b></p> <ul style="list-style-type: none"> <li>• Watershed description, watershed problems, proposed watershed management programmes, effect of watershed works, comparison of benefit cost ratio,</li> <li>• Formulation of project proposal for watershed management work, steps of watershed management, evaluation.</li> </ul> <p><b>5.2 ..... (08)</b></p> <ul style="list-style-type: none"> <li>• Integrated approach , socio economic aspects – need awareness, participation , economical upliftment</li> </ul>	8	18

**Skills to be developed for practical:****Intellectual Skills:**

Following intellectual skills will be developed ,

- Review of literature to understand the various suitable watershed works proposed for a specific watershed.
- Collect data , presentation and interpretation of data.
- Identify suitable watershed works.
- Understand the field practices in construction and maintenance of watershed works.
- Draft report for developing a watershed.

**Motor Skills:**

- Use of suitable survey instruments for collection of data
- Prepare drawings for watershed development.

**TERM WORK:**

**Note:** Term work shall consist of file containing the following,  
(Groups of 5-6 students in each group shall be formed for undertaking sr.no.2 and sr.no.3 practical mentioned below. Each group shall be given different project.)

1. Write one case study on watershed development works by carrying out literature survey. (6 Hrs)
2. Design Rain Water Harvesting for a given building and prepare a report. (8Hrs)
3. Visit to a water shed to observe various soil/ water conservation measures & prepare a report. (6 Hrs)
4. Locate and identify the various structures on watershed map and draw sketches of identified structures. (4 Hrs)
5. Prepare a project report on a Case study of planning and design of development of small water shed including data, drawings and simple calculations, with suggestive conservative structures as per various given conditions with its layout. (8 Hrs)

**Learning Resources:****1. Books:**

Sr. No.	Title	Author	Publisher
1	Soil and Water Conservation Engineering	R. Suresh	Standard Distributer, New Delhi
2	Watershed management	J. V. S. Murthy	New Age International publishers New Delhi.
3	Ground water assessment, development & management	R. K. Karanth	Tata Mc Grahil Publication
4.	Watershed management	N.D.Mani	Saujanya Books, 165-E, Kamla Nagar Delhi -7
5	Watershed Planning and management	Rajveer singh	Yash Publishing House
6	Watershed management	V.V.Dhruvnarayan a & G. Shastri	Indian Council Agriculture Research, Krishi anusandhan bhavan , PUSA , New Delhi

2. Websites:

[www.watershedindia.50megs.com](http://www.watershedindia.50megs.com)

[www.watershed.nic.in](http://www.watershed.nic.in)

[www.wotr.org/watersheddevelopment.html](http://www.wotr.org/watersheddevelopment.html)

[www.indiawaterportal.org/channels/watershed-development](http://www.indiawaterportal.org/channels/watershed-development)

[www.raiwaterharvesting.org](http://www.raiwaterharvesting.org)

[www.watershed.org](http://www.watershed.org)