

**Course No. : SWCE-366**

**Course Title: Watershed Planning and Management**

**Semester - VI**

**Credits : 2 (1+1)**

## **Syllabus**

### **Theory**

Watershed - introduction and characteristics. Watershed development - problems and prospects, investigation, topographical survey, soil characteristics, vegetative cover, present land use practices and socio-economic factors. Watershed management - concept, objectives, factors affecting, watershed planning based on land capability classes, hydrologic data for watershed planning, watershed codification, delineation and prioritization of watersheds – sediment yield index. Water budgeting in a watershed. Management measures - rainwater conservation technologies - *in-situ* and *ex-situ* storage, water harvesting and recycling. Dry farming techniques - inter-terrace and inter-bund land management. Integrated watershed management - concept, components, arable lands - agriculture and horticulture, non-arable lands - forestry, fishery and animal husbandry. Effect of cropping systems, land management and cultural practices on watershed hydrology. Watershed programme - execution, follow-up practices, maintenance, monitoring and evaluation. Participatory watershed management - role of watershed associations, user groups and self-help groups. Planning and formulation of project proposal for watershed management programme including cost-benefit analysis.

### **Practical**

Exercises on delineation of watersheds using toposheets. Surveying and preparation of watershed map. Quantitative analysis of watershed characteristics and parameters. Watershed investigations for planning and development. Analysis of hydrologic data for planning watershed management. Water budgeting of watersheds. Prioritization of watersheds based on sediment yield index. Study of functional requirement of watershed development structures. Study of watershed management technologies. Practice on softwares for analysis of hydrologic parameters of watershed. Study of role of various functionaries in watershed development programmes. Techno-economic viability analysis of watershed projects. Visit to watershed development project areas.

**Teaching Schedule- Theory with weightages (%)**

| <b>Lect. No.</b> | <b>Topic</b>  | <b>Book No.</b> | <b>Pages</b>                          | <b>Article No.</b>                 | <b>Weightages (%)</b> |
|------------------|---|-----------------|---------------------------------------|------------------------------------|-----------------------|
| 1                | Watershed - introduction and characteristics.   | 1,<br>2,<br>6   | 267-271<br>785-793,<br>99 to 103      | 24.1-<br>24.2                      | 30                    |
| 2,<br>3          | Watershed development-problems and prospects, investigation, topographical survey, soil characteristics, vegetative cover, Present land use practices and socio-economic factors. | 3,<br>4         | 7-8<br>11-17<br>20 to 26              | 1.10<br>2.1-2.2<br>2.4-2.5         |                       |
| 4                | Watershed management - concept, objectives, factors affecting, Integrated watershed management - concept, components  | 3,<br>2,<br>7   | 4 to 8,<br>714,<br>823- 824<br>1 to 5 | 1.4 to<br>1.10<br>24.8.1,<br>24.11 |                       |
| 5                | Watershed planning based on land capability classes,  | 4               | 161 to<br>164                         |                                    | 30                    |
| 6                | Hydrologic data for watershed planning, Water budgeting in a watershed.   | 5,<br>6         | 516 to<br>525,<br>89 to 91            | 15.1-<br>15.2                      |                       |
| 7                | Watershed codification, delineation and prioritization of watersheds – sediment yield index.  | 2               | 793 to<br>798                         | 24.4 to<br>24.6                    |                       |
| 8                | Management measures - rainwater conservation technologies - <i>in-situ</i> and <i>ex-situ</i> storage,  | 7               | 11 to 19                              |                                    | 20                    |
| 9                | Water harvesting and recycling.   | 7               | 56 to 60                              |                                    |                       |
| 10               | Dry farming techniques - inter-terrace and inter-bund land management.  | 8               | 192 to<br>197                         | 8.2.1 -<br>8.2.3                   |                       |
| 11               | Arable lands - agriculture and horticulture,<br>Non-arable lands - forestry, fishery and animal husbandry.  | 4               | 164 to<br>178                         |                                    | 20                    |
| 12               | Effect of cropping systems, land management and cultural practices on watershed hydrology.  | 8               | 233 to<br>240                         | 9.1                                |                       |
| 13               | Watershed programme - execution, follow-up practices, maintenance, monitoring and evaluation.   | 5,<br>3         | 505-510<br>569,<br>572-576            | 14.10<br>24.1<br>24.2              |                       |
| 14               | Participatory watershed management - role of watershed associations, user groups and self-help groups.  | 3               | 531 to<br>535<br>538 to<br>544        | 21.1 to<br>21.4<br>21.6 to<br>21.7 | 20                    |
| 15, 16           | Planning and formulation of project proposal for watershed management programme including cost-benefit analysis.  | 2,<br>9         | 815 to<br>823<br>146 to<br>148        | 24.9 to<br>24.10                   |                       |

## Practical Exercises

| Exercise No. | Title  |
|--------------|--|
| 1-2          | Surveying and preparation of watershed map.                                |
| 3-4          | Grid survey of watershed area.   |
| 5            | Preparation of contour map and delineation of watershed.                   |
| 6            | Delineation of watersheds using top sheets.                                |
| 7            | Quantitative analysis of Geo-morphological characteristics of watershed.   |
| 8            | Analysis of hydrologic data for planning of watershed development.         |
| 9            | Water budgeting of watersheds.   |
| 10           | Prioritization of watersheds based on sediment yield index.                |
| 11           | Watershed planning and development.  |
| 12           | Study of watershed management technologies.                                |
| 13-14        | Practice on software's for analysis of hydrologic parameters of watershed. |
| 15-16        | Visit to watershed development project                                     |

## Suggested readings

### Text Books

1. Soil Conservation and Land Management. S. K. Datta, International Book Distributors, Dehradun, 1985
2. Soil and Water Conservation Engg. R. Suresh, Standard Publishers Distributors, Delhi-6, Reprint Edition 2006
3. Watershed Planning and Management. Rajvir Singh. Yash Publishing House, Bikaner. 2000
4. Field Manual on Watershed Management. 2013. B. Venkateswarlu, Mohammed Osman, M.V. Padmanabhan, K. Kareemulla, P.K. Mishra, G.R. Korwar & K.V. Rao, CRIDA, Hyderabad
5. Hydrology and Soil Conservation Engineering : Including Watershed Management. Ghanshyam Das, 2008. Prentice-Hall of India Learning Pvt. Ltd., New Delhi.
6. Hydrology. H. N. Raghunath. New Age International Publishers, 2004 reprint.
7. Watershed Management. V.V. DhruvaNarayana G. Sastry & U.S. Patnaik. ICAR, New Delhi, 1997
8. Watershed Management: Guidelines for Indian Conditions. Tideman, E.M., Omega Scientific Publishers, New Delhi. 1996
9. Watershed Management: Design and Practice. P. K. Singh, 2000. E-media Publications, Udaipur.

### Reference Books

1. Katyal, J.C., R.P. Singh, Shriniwas Sharma, S.K. Das, M.V. Padmanabhan and P.K. Mishra. 1995. Field Manual on Watershed Management. CRIDA, Hyderabad.
2. Mahnot, S.C. 2014. Soil and Water Conservation and Watershed Management. International Books and Periodicals Supply Service. New Delhi.
3. Sharda, V.N., A.K. Sikka and G.P. Juyal. 2006. Participatory Integrated Watershed Management: A Field Manual. Central Soil and Water Conservation Research and Training Institute, Dehradun.
4. Singh, G.D. and T.C. Poonia. 2003. Fundamentals of Watershed Management Technology. Yash Publishing House, Bikaner.