**20CE41E8 – INTEGRATED WATERSHED MANAGEMENT**

**(Civil Engineering)**

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| **Course Category**  | Professional Elective  | **Credits**  | 3 |
| **Course Type** | Theory | **Lecture - Tutorial - Practical**  | 3 - 0- 0 |
| **Prerequisite** | None | **Sessional Evaluation**  | 40 |
| **Semester End Exam Evaluation**  | 60 |
| **Total Marks**  | 100 |

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| **Course Outcomes** | CO1 | Demonstrate the basic concepts of watershed management |
| CO2 | Identify and plan for sustainable utilization of available land resources in the watershed. |
| CO3 | Identify and plan for sustainable utilization of available water resources in the watershed. |
| CO4 | Identify various crops patterns, soil condition and water salinity in the watershed and suggest remedial measures. |
| CO5 | Identify various energy resources available in the watershed and plan for sustainable utilization. |
| CO6 | Apply modern technology for effective integrated watershed management. |
| **Course****Content** | **UNIT – I****INTRODUCTION:**Place in Environment - Global Effects, Degradation Trends; Semi-arid Tropics; Status in India - Forests; Soils, Water, Droughts, Cultivation, Irrigation, Power, Food and Nutrition; Neglected Nodes -Social, Technical, Environment, Cooperation, Economy.**WATERSHED CONCEPT:** Watershed; Need; Characteristics. Size, Shape, physiography, Slope, Climate, Drainage, Land Use, Vegetation, Geology and Soils, Hydrology, Management - Degradation Devils; Integrated Multi-Disciplinary Approach - Socioeconomics, Priorities, Tasks, Rural Technological Delivery Systems, Nodes, Economics.**UNIT – II****LAND:** Survey Layout; Preparation and Development, Contour Demarcation, Bush Clearance, Uprooting, Stone Picking and Packing, Levelling, Shaping and Consolidation, Fencing, Ploughing; Soil and Soil Moisture Conservation - Soil Survey; Conservation Measures. Rainwater Management - Stream Head Cutting, River Bank Management, Flow Irrigation, Waterways; Reclamation of Saline Soils. Alkaline Soils, Saline Soils, Acidic Soils, Sulfide Soils.**UNIT – III****WATER:** Investigation. Remote Sensing, Data and Analysis; Exploration, Evaluation and Exploitation; Surface Water. Utilization of Wasted Flows, Salvaging Flood Flows, National Waterway Grid, Dams and Irrigation, Rejected Recharge, Tidal Rivers, Tanks; Rainwater Harvesting. Catchment, Harvesting, Harvesting Structures; Groundwater. Exploitation of Canal Command Areas, Potential Areas, Harvesting; Desalinization of Coastal Saline Stretches, Artificial Recharge; **UNIT – IV****GREENERY:**Agriculture -Crop Husbandry - Soil Enrichment, Inter, Mixed and Strip Cropping, Cropping Pattern; Sustainable Agriculture - Hybrid and Improved Seeds; Biomass Management - Crop Rotation, Legumes, Organic Fertilization, Spider Fanning; Dryland Agriculture - Runoff Agriculture, Micro-catchment Fanning, Irrigation with Saline Water, Reusing Water, Conserving Water, Sprinkler irrigation, Drip Irrigation, Pot Irrigation, Other Systems, Reducing Cropland Percolation Limes, Reducing Transpiration Losses, Selection of Water Use Efficiency Crops; irrigation - Water Losses, Control of Water Levels, Salinity Problem, Water Distribution.**UNIT – V****ENERGY:** Renewable resources, Water Power, Solar Energy, Wind Power; Biomass. Firewood. Synthetic Fuels, Burning of Municipal Garbage; Alternative Strategies; Conservation.**SOCIOECONOMICS:**Awareness, Participation, Response; State and Integrated Approach. Appreciation of the Concept, Training, Transfer of Technology, Research and Development, Agro industrial Infrastructure; Sustainable society - Livestock, Small animal fanning, Pisciculture, Sericulture, Health and Hygiene, Education, Transport, Cues; Economics - Per Hectare Provision, NGOs, International Agencies, Future, Economic Viability; Sustainable Society.**UNIT – VI****TECHNOLOGY**: Farm Equipment; Contour Methods; Check Dams; Water Catchment and Harvesting. Kunds, Depression Harvesting, Harvesting Below Ground Level, Harvesting Below Stream Bed Level, Groundwater Harvesting; Low-Cost Technology. Water Conservation. Utilization of Wasted Natural Resources, Novelties; Rural Technological Delivery Systems.**IMPACT:** Model Watershed; Government Projects. National Projects; World Bank Projects; NGOs Efforts. Society for Promotion of Wasteland Development; ICRISAT. |
| **Textbooks****and****References** | **TEXTBOOKS:**1. J.V.S. Murthy, *Watershed Management*, New Age International Publishers, 2nd edition, 2004
2. V.V.N.Murthy, and M.K. Jha*Land and water management*, Kalyani Publishers, 3rd edition, 2015.
3. Madan Mohan Das and M.D. Saikia, *Watershed management*, Prentice Hall ofIndia, 2nd edition 2013.

**REFERENCE BOOKS:**1. P.E. Black, *Watershed Hydrology*, Prentice Hall Englewood Cliffs, 2nd edition, 2001.
2. R. Suresh, *Watershed Hydrology*, Standard Publishers and Distributors, Delhi, 2nd edition, 2007.
3. A. Ranga Reddy, *Watershed Management for Sustainable Development*, A Mittal Publications, 2005.
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**CO-PO Mapping:** 3-High Mapping, 2-Moderate Mapping, 1-Low Mapping, - -Not Mapping

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|   | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
| **CO 1** | - | - | - | - | - | 1 | 1 | - | - | - | - | 1 | - | - | - |
| **CO 2** | - | - | - | 1 | - | 1 | 1 | 1 | - | - | - | - | - | 1 | 1 |
| **CO 3** | - | - | - | 1 | - | 1 | 1 | 1 | - | - | - | - | - | 1 | 1 |
| **CO 4** | 2 | - | - | 1 | - | 1 | 1 | - | - | - | - | 1 | - | 2 | 1 |
| **CO 5** | 1 | - | - | 1 | 2 | - | 2 | 1 | - | - | - | 1 | - | 2 | 1 |
| **CO 6** | 1 | - | - | 2 | 1 | 1 | 2 | 1 | - | - | - | - | - | 1 | 1 |