I. Course Title   : **Applied Watershed Hydrology**

II. Course Code   : **SWCE 502**

III. Credit Hours   : **2+1**

IV. Aim of the course

To provide in depth knowledge of surface and sub-surface hydrology of watershed including stream flow measurement and computer simulation of hydrological processes in small watersheds.

V. Theory

Unit I

Hydrology in water resources planning, rainfall, surface runoff and sub-surface runoff as components of hydrologic cycle. Runoff phenomena, relationship between precipitation and runoff. Stream flow measurement and analysis of data in detail.

Unit II

Synthetic unit hydrograph. Recent advances in analysis of hydrologic data and flow from small watersheds. Methods of runoff estimation from small watersheds. Use of IUH and various methods of estimation. Runoff estimation models: SCS, CN software.

Unit III

Micro climate, estimation methods of evaporation. Advances and improvements in rational approach. SCS approach criticism and improvements.

Unit IV

Hydrological hazard functions. Methods of estimation of hydrologic parameters. Data transformation.

Unit V

Calibration and evaluation of hydrologic models. Computer simulation of hydrological process in small watersheds.

VI. Practical

Delineation of watershed and study of watershed characteristics. Measurement of rainfall and runoff in a watershed and data analysis. Estimation of infiltration and runoff from a watershed. Analysis and derivation of various types of hydrographs. Flood routing. Reservoir sedimentation. Watershed model components. Visit to a watershed.

VII. Learning outcome

The students will be able to understand and analyze the process and the effect of various climatic parameters on rainfall-runoff relationship. They can also be able to develop the competency for calibration and evaluation of hydrologic models and computer simulation.

VIII. Lecture Schedule

S.No.	Topic	No. of Lectures
1.	Hydrology in water resources planning, rainfall, surface runoff and sub-surface runoff as components of hydrologic cycle	2
2.	Basics of watershed hydrology and processes, global and watershed perspectives	2

S.No.	Topic	No. of Lectures
3.	Runoff phenomena, relationship between precipitation and runoff	1
4.	Synthetic unit hydrograph, Unit hydrograph and its derivation including for complex storm,	3
5.	S-hydrograph and derivation, Use of IUH and various methods of estimation.	3
6.	Runoff estimation models: SCS, CN software	3
7.	Flood routing principles	2
8.	Recent advances in analysis of hydrologic data and flow from small watersheds. Methods of runoff estimation from small watersheds.	3
9.	Micro climate, estimation methods of evaporation. Advances and improvements in rational approach. SCS approach criticism and improvements	3
10.	Process of sedimentation of reservoirs	2
11.	Hydrological hazard functions, Methods of estimation of hydrologic parameters, Data transformation,	3
12.	Hydrologic modeling approaches, component conceptualization, types of watershed hydrologic models and choice of model.	3
13.	Calibration and evaluation of hydrologic models. Computer simulation of hydrological process in small watersheds	2
	Total	**32**

VIII. List of Practicals

S.No.	Topic	No. of Practicals
1.	Delineation of watershed and study of watershed characteristics	1
2.	Measurement of rainfall and runoff in a watershed	1
3.	Analysis of hydrologic data and flow from small watersheds	1
4.	Estimation of infiltration and runoff from a watershed	1
5.	Measurement and analysis of stream flow data	1
6.	Analysis of synthetic unit hydrograph for complex storm	1
7.	Analysis of S-hydrograph for complex storm	1
8.	Use of runoff estimation models: SCS, CN software	2
9.	Study of different types of flood routing methods	2
10.	Computer simulation of hydrological process in small watersheds	1
11.	Study of reservoir sedimentation	1
12.	Study of watershed model components	1
13.	Visit to a watershed	1
	Total	**16**

IX. Suggested Reading
- Haan CT. *Hydrologic Modeling of Small Watershed*.
- Singh VP. 2010. *Rainfall-Runoff Modeling* (Vol. I)—Prentice Hall, New York.
- Singh VP. 2010. *Environmental Hydrology*. Springer, New York.

  I. Course Title   : **Soil and Water Conservation Structures**
 II. Course Code   : **SWCE 503**
III. Credit Hours   : **2+1**

IV. Aim of the course
    To acquaint students with the planning and design of soil and water conservation