WATER RESOURCES MANAGEMENT

SYLLABUS

1. INTRODUCTION TO WATER RESOURCES DEVELOPMENT:

Nature and scope of Water Resources Management - Historical profile on World Water Resources Development – Water Resources and humanities – Development of Water Science – Global water resources – Hydrological Cycle – Watershed: Definition, Concept, Classification and codification of watersheds – Inter-relation of water resources with other natural resources and the environment – Concept of sustainable water resources development – Need of Water Resources Development in India.

2. PROPERTIES OF WATER, USAGE AND AVAILABILITY:

Origin of water on earth - Unique properties of water (Polarity, Cohesion, Density, Surface Tension, Viscosity, Heat capacity, Boiling and freezing points, Temperature, Taste, Odour, Colour) - Climate and water availability - Water availability and consumption patterns: domestic, industrial, and agricultural sectors - Concept of water stress and scarcity - Water footprint – Domestic, agricultural and industrial water demand and consumption in urban and rural India – Water availability and various water usage in Jammu & Kashmir.

3. WATER RESOURCES DISTRIBUTION:

Water as a resources – Concept of valuing water – Types of water resources – Inland water: distribution and its importance – Groundwater: distribution and its importance – Cryosphere: Distribution and its importance – Marine Waters: Distribution and its importance – Water resources distribution in India – Inter-state Water sharing issues and policies in India – Problems and prospects of Linking of rivers in India. - Water Resources distribution in Jammu & Kashmir (River systems and glaciers).

4. INTRODUCTION TO HYDROLOGY:

Hydrological budget — Precipitation: Types and Forms, Measurement, Processing of precipitation data – Water losses: Initial abstraction, Interception and depression storage – Evaporation, Evapotranspiration and infiltration – Estimation by empirical formulae: Penman Monteith method, Horton's equation and Green Ampt method - Runoff process: Runoff – Components of runoff – Factors affecting Runoff – Hydrograph rainfall - Runoff models – SCS method – Yield Estimation.

5. GROUNDWATER:

Origin of groundwater, Rock properties affecting groundwater, Types of aquifer, porosity, yield, specific yield, specific retention, coefficient of storage, specific capacity - Darcy's law measurement of yield of well – Pump test and recuperation test - groundwater exploration: Geo-physical methods, Electrical resistivity method and seismic resistivity method – logs. Laboratory and field measurement of permeability - Groundwater movement – Well Hydrograph Analysis – Groundwater reached methods and policies in India.

6. WATER QUALITY, ENVIRONMENT AND HEALTH:

Physical and biological parameters of water quality – Water pollution: classification of water pollution – surface water pollution : sources of pollution, classification of rivers based on water quality – Lake Pollution : stratification of lake – eutrophication, controlling cultural eutrophication – Groundwater Pollution : Sources of contamination, types of contamination – Ocean Pollution: Types and its impact on coastal communities – Water borne diseases and health effects - Environmental aspects in water resources planning - environmental guidelines for water quality in India - Perspective on Reduce, Recycle and Reuse.

7. HYDRO-METEOROLOGICAL HAZARDS AND DISASTERS:

Flood and Drought, Storms and Heat & Cold Waves and Causes, effects and their impacts - Hydro meteorological hazard monitoring and forecasting: Early warning systems, Risk assessment and Socio-economic responses - Resilience of communities to hydro meteorological hazards - Adaptation and Mitigation measures and considerations - Hydro meteorological hazard studies, mapping and impact assessment – Drought and Flood contingency Plan in India – Hydro-meteorological hazards and disasters in Jammu & Kashmir.

8. INTEGRATED WATERSHED MANAGEMENT:

Integrated approach of watershed management – role of Remote Sensing and GIS in Watershed Management – need of soil and water conservation – soil erosion: causes, effects and remedial measures – Water conservation methods and measures - Integrated Water Resources Management (IWRM) - Water management policy during drought and floods - Water footprint of Crops and its applications - Blue, green and grey water foot print - Watershed management policies and decision making practice in India with special reference to Jammu & Kashmir.

9. WETLAND MANAGEMENT:

Wetland definitions and types - Role of water in wetland structure and function - Introduction to wetland water budgets and hydro-period - Wetland hydrologic assessment: physical and biological processes, Anthropogenic and climate change impacts on wetland hydrology - Modelling of Wetland hydrology: hydraulics, and hydrodynamics - Introduction to wetland treatment systems design – Wetland conservation programmes in India: policies and issues.

10. COMMUNITY INVOLVEMENT IN WATER MANAGEMENT:

Sustainable Development Goal 6 (SDG) - Water access and equity: Urban-Rural and Gender dimensions – Adjusting to Water scarcity – Water allocation principles – upstream-downstream perspectives – Institutions and democracy: Panchayati Raj Institutions, Educational institutions, Media, Political parties – Stakeholders involvement: Participatory Rural Appraisal – Watershed Community - Farmers associations – Best Community Water Management practice in India with reference to Jammu & Kashmir.