

TD-603, Part-II Water Science
Lecture Plan (as in 2011)
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The **Water Science** part of TD 603 aims to familiarize students with the physical science part of water and various interventions and systems connected with water. This is broadly in three parts: (i) watershed related quantities and their modelling (ii) groundwater and modelling, and finally (iii) surface water systems and piped water supply systems.

The detailed lecture plan is as follows and is for roughly 20 hours of contact.

1. Water, its physical properties and its distribution. Basic uses and their statistics. An introduction to the course.
2. The hydrological cycle. Basic groundwater and watershed terminology. Recharge and various global maps. GIS and an example data set.
3. Precipitation and Runoff. Measuring flows and rainfall. Regional rainwater computation.
4. Tutorial on delineating watersheds and a regional rainfall computation.
5. Mathematics of a run-off model. Detailed Scilab program for the model. A modelling exercise for infiltration.
6. Basics of Groundwater—the basic variables and Darcy’s apparatus. Darcy’s law, conductivity, porosity, specific yield. Saturation versus unsaturated flows.
7. Aquifers— definitions, terminology. Indias hydro-geology. The differential form of Darcy’s law. 3-4 basic hydro-geological situations.
8. Mathematics of groundwater. Development of the general differential form. Examples and solutions of the differential equation in special cases.
9. Groundwater simulations. A lecture-demonstration.
10. Tutorial on groundwater.
11. Regional groundwater flows. Regional maps, water table maps. GSDA and its data sets.
12. Tutorial on managing a taluka-level data-set.
13. Wells. Types of wells and pumps. The well equations and draw-down. The yield test.
14. Water in agriculture. The FAO format for crop needs. Soil moisture and its regulation. Drip irrigation and its features.
15. Surface water and interventions. An outline of various interventions and their uses. The check-dam and the Gudwanwadi case-study. its
16. Piped water supply. Basic of the design of piped systems. Simulation.
17. The Karjat case-studies.
18. Tutorial on design and simulation.
19. The water sector-a survey. A techno-economic survey of various sectors such as rural and urban drinking water, irrigation and so on.