

## Course syllabus

Department of Civil Engineering, Indian Institute of Technology Madras

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# CE5022W - Geotechnical Engineering, and Hydrology & Hydraulics of Bridges

**Credit Distribution:** C:9 L:3 T:0 P:0 E:0 O:6 TH:0

**Course Type:** Theory

**Description:** To provide students with understanding of: Geotechnical aspects that influence the foundation design of bridges, and Hydrological design of bridges.

**Course Content:** Geotechnical Site Investigation Techniques; sampling methods; stiffness and strength properties in ideal geotechnical test report Basic Soil Properties Determination; index properties; identification and classification of soils; intermediate geomaterials Strength and Compressibility of Soil Shear strength; elastic deformation; consolidation settlement; usage of soils parameters in modelling Field Tests and Monitoring In-situ measurements; shear wave velocity; modulus of subgrade reaction; liquefaction evaluation; interpretation of geotechnical data and results Excavations and Support Systems Earth pressure theories; retaining walls; anchors Ground Improvement Techniques Methods and applications Estimation of Design Flood Gauged streams and un-gauged streams; rational method; case studies Estimation of Maximum Flow Depth Rating Curve Method; Use of HEC-RAS Model Hydrodynamic Analysis Simulation of flow structure using hydrodynamic models Estimation of Scour Conditions for scour; Contraction and Local Scour; Empirical formulae; IRC and FH methods; Abutment Scour; Control Measures; Anticipated maximum scour; Non-scourable bed Design of River Training Works Abutments; Guide Bunds, Dykes Physical Model Studies Design of mobile bed models; Methods and Materials; Scale Effects; Interpretation of model results.

**Text Books:** None

### Reference Books

- Holtz, R.D., Kovacs, W.D., and Sheahan, T.C., (2015), An Introduction to Geotechnical Engineering, Prentice Hall, New Jersey, USA
- Knappett, J.A., and Craig, R.F., (2012), Craig's Soil Mechanics, Spon Press, Abingdon, UK
- Mitchell, J.K., and Soga, K., (2005), Fundamentals of Soil Behaviour, John Wiley & Sons Inc., New York, USA
- Ranjan, G. and Rao, A.S.R., (2016), Basic and Applied Soil Mechanics, New Age International Publishers, New Delhi
- Hingray, B., Picouet, C., Musy, A., (2014), Hydrology: A Science for Engineers, CRC Press, USA
- Zovenbergen, L.W., Arneson, L.A., Hunt, J.H., Miller, A.C., (2012), Hydraulic Design of Safe Bridges, Publication No. FHWA - HIF -12-018, April 2012

**Prerequisite:** NIL