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Hydraulics — Complete Syllabus

BTEUP Diploma in Civil Engineering • 4th Semester • Session 2026-27

Subject 4.1 (Theory) + 4.2 (Lab) • Total 200 Marks • 3 Credits

About this document: Hydraulics appears twice in the 4th semester — as a theory paper (4.1) and as a lab (4.2). Both are covered here, completely, in the official order.

Examination Scheme

Code	Paper	Type	L - P	Credits	Internal	External	Total
4.1	Hydraulics	Theory	2 - 0	2	Theory 40	Theory 60 (3 hrs)	100
4.2	Hydraulics Lab.	Practical	0 - 2	1	Practical 60	Practical 40 (3 hrs)	100
Hydraulics Total				3	100	100	200

What This Subject Aims To Do

To understand the parameters associated with fluid flow and hydrostatic pressure, know head loss and water hammer in fluid flowing through pipes, and learn the different types of pumps and their uses — so that you can measure pressure, work out head loss, find flow in open channels, and select the right pump for a job.

Unit-Wise Complete Topic List

Unit	Topic	Periods	Marks Share
1	Pressure Measurement and Hydrostatic Pressure	6	20%
2	Fluid Flow Parameters	4	15%

3	Flow through Pipes	8	25%
4	Flow through Open Channel	5	20%
5	Hydraulic Pumps	5	20%

Unit 1 — Pressure Measurement and Hydrostatic Pressure (6 Periods, 20%)

Topics: Technical terms used in hydraulics — fluid, fluid mechanics, hydraulics, hydrostatics and hydrodynamics — ideal and real fluid, application of hydraulics; physical properties of fluid — density-specific volume, specific gravity, surface tension, capillarity, viscosity — Newton's law of viscosity; various types of pressure — atmospheric pressure, gauge pressure, absolute pressure, vacuum pressure; concept of pressure head and its unit, Pascal's law of fluid pressure and its uses; measurement of differential pressure by different methods; variation of pressure with depth, pressure diagram, hydrostatic pressure and centre of pressure on immersed surfaces and on tank walls; determination of total pressure and centre of pressure on sides and bottom of water tanks, sides and bottom of tanks containing two liquids, vertical and inclined surface in contact with liquid on either side.

Unit 2 — Fluid Flow Parameters (4 Periods, 15%)

Topics: Types of flow — gravity and pressure flow, laminar, turbulent, uniform, non-uniform, steady, unsteady flow; stream line, stream tube, streak line, path line; Reynolds number; discharge and its unit, continuity equation of flow; energy of flowing liquid: potential, kinetic and pressure energy; Bernoulli's theorem: statement, assumptions, equation (without proof of theorem).

Unit 3 — Flow through Pipes (8 Periods, 25%)

Topics: Major head loss in pipe: frictional loss and its computation by Darcy's Weisbach equation, use of Moody's diagram and nomograms; critical velocity and velocity distribution in a pipe for laminar flow; minor losses in pipe: loss at entrance, exit, sudden contraction, sudden enlargement and fittings; flow through pipes in series, pipes in parallel and Dupuit's equation for equivalent pipe; hydraulic gradient line and total energy line; water hammer in pipes: causes and remedial measures; discharge measuring device for pipe flow: venturimeter — construction and working; discharge measurement using orifice, hydraulic coefficients of orifice.

Unit 4 — Flow through Open Channel (5 Periods, 20%)

Topics: Geometrical properties of channel section: wetted area, wetted perimeter, hydraulic radius for rectangular and trapezoidal channel section; determination of discharge by Chezy's equation and Manning's equation; conditions for most economical rectangular and trapezoidal channel section; discharge measuring devices: triangular and rectangular notches; velocity measurement devices: current meter, floats and Pitot tube; specific energy diagram, Froude's number, hydraulic jump.

Unit 5 — Hydraulic Pumps (5 Periods, 20%)

Topics: Concept of pump, types of pump — centrifugal, reciprocating, submersible; centrifugal pump: components and working; reciprocating pump: single acting and double acting, components and working; suction head, delivery head, static head, manometric head; power of centrifugal pump; selection and choice of pump; introduction of impulse and reaction turbine.

Practical Work

- Use piezometer to measure pressure at a given point.
- Use U-tube differential manometer to measure pressure difference between two given points.
- Use Reynold's apparatus to determine type of flow.
- Use Bernoulli's apparatus to apply Bernoulli's theorem to get total energy line for a flow in a closed conduit of varying cross sections.
- Determine minor losses in pipe fittings due to sudden contraction and sudden enlargement.
- Calibrate venturimeter to find out the discharge in a pipe.
- Calibrate the orifice to find out the discharge through a tank.
- Use current meter to measure the velocity of flow of water in open channel.
- Use Pitot tube to measure the velocity of flow of water in open channel.
- Use rectangular and triangular notch to measure the discharge through open channel.

Reference Books (as listed in the syllabus)

- Modi, P. N. and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.
- S.S. Rattan, Fluid Mechanics & Hydraulic Machines, Khanna Book Publishing Co., New Delhi.
- Ramamrutham, and Narayan, R., Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat Rai Publishing, New Company Delhi.
- Khurmi R S, Hydraulics, Fluid Mechanics, Hydraulic machines, S. Chand Publishers.
- Rajput, R K, Fluid Mechanics, S Chand, New Delhi.

- Ojha, C S P, Berndtsson, R, and Chandramoulli P. N., Fluid Mechanics and Machinery, Oxford University Press, New Delhi.

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Source: BTEUP 2nd Year curriculum (folder2627), approved in C.D.C. meeting held on 16.07.2026. Topic lists follow the official syllabus; short explanations are the author's own plain-English summaries, not syllabus text.

Please confirm with your own polytechnic for any local changes.

