

EARTH AND EARTH RETAINING STRUCTURES

Lectures / Tutorials : 4 Periods/Week
Semester End Exam. : 3 Hours

Sessional marks : 40
Semester End Exam. marks : 60
Credits : 4

Course objectives:

- To understand lateral earth pressure theories and pressure theories and design of retaining walls.
- To design anchored bulkheads by different methods.
- To understand pressure envelopes and design of various components in braced cuts and cofferdams.
- To understand stability of earth dams and its protection and construction.

Course Outcomes:

- Students will be able to design retaining walls, anchored bulkheads, braced cuts, coffer dams and earth dams.

UNIT-I

Lateral Pressure:

Basic concepts, Rankine and Coulomb earth pressure theories, graphical methods. Determining active and passive pressures: Culmann's, Rebhan's, logarithmic spiral methods, friction circle method. Consideration of surcharge, seepage, earth quake, wave effect, stratification, type of backfill, wall friction and adhesion.

Retaining walls:

Uses, types, stability and design principles of retaining walls, backfill drainage, settlement and tilting.

UNIT-II

Anchored bulkheads:

Classification of anchored bulkheads, free and fixed earth support methods. Rowe's theory for free earth supports and equivalent beam methods for fixed earth supports. Design of anchored rods and dead man

Braced cuts and Cofferdams:

Braced excavations and stability of vertical cuts, lateral pressures in sand and clay, Braced and cellular cofferdams: uses, types, components, stability, piping and heaving. Stability of cellular cofferdams, cellular cofferdams in rock and in deep soils.

UNIT-III

Earth dams- Stability analysis:

Classification, seepage control in embankments and foundations, seepage analysis, stability analysis: upstream and down stream for steady seepage, rapid draw down, end of construction, method of slices and Bishop's method.

UNIT-IV

Earth dams -Protection & Construction:

Slope protection, filters, embankment construction materials and construction, quality control, grouting techniques. Instrumentation and performance observations in earth dams.

NOTE

Two questions of 12 marks each will be given from each unit out of which one is to be answered. Twelve questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOKS:

1. Basic & Applied soil mechanics – Gopal Ranjan & ASR Rao, New Age International Publishers, 2011.
2. Embankment Dams by Sharma Hd, Publisher: India Book House (IBH) Limited, 1991
3. Engineering for Embankment Dams By B. Singh & R. S. Varshney, A A Balkema Publishers, 1995

REFERENCE BOOKS:

1. Foundation design by W. C. Teng, Prentice Hall, 1962
2. Analysis and design of foundations by Bowles. J. W McGraw Hill, 4th edition, 1955.
3. Earth and Rock-Fill Dams: General Design and Construction Considerations
by United States Army Corps of Engineers, University Press of the Pacific, 2004
4. Soil mechanics in engineering and practice by Karl Terzaghi, Ralph B. Peck, Gholamreza Mesri, 3rd Edition. Wiley India Pvt Ltd, 2010.