GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Geotechnical Engineering

Subject Code: ME02076061

Subject Name: Earth and Rockfill Dams

w.e.f.Academic Year:	2024-25
Semester:	2
Category of the Course:	Professional Elective Courses

Prerequisite:	Geotechnical Engineering and Fluid Mechanics.
Rationale:	The course on Earth and Rock-fill Dams provides the students basic knowledge on dam selection, analysis & design, stability checks, instrumentation and maintenance of dams for proper functioning and utility acquainted with latest field practices and codal guidelines.

Course Outcome:

After Completion of the Course, Student will able to:

No.	Course Outcomes
01	Select the most suitable site for the construction of the earth dam based on fundamental principles and concepts of earth and rockfill dam engineering
02	Analyise the various components of earth dams and rockfill dams as per codal guidelines and design this components
03	Design and calculate the dimensions, cross-section, and stability of earth and rock fill dams using appropriate methods including computational methods.
04	Understand about the dam instrumentation for distress.
05	Identify and assess potential risks and hazards associated with earth and rockfill dams and monitor performance so as to suggest safety measures and quality control methods.

Teaching and Examination Scheme:

Teaching Scheme(in Hours)			Total Credits L+T+(PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial/Practical		
L	T	PR	C	ESE (E)	PA/ CA (M)	PA/CA(I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No.of Hours	% of Weightage
1.	Basics of Earth and Rockfill Dams: Classification of dam w.r.t material, construction technique, purpose, etc; selection of basic dam section and factors affecting it, classification and selection of construction materials and construction technique. Special problems pertain to foundation treatment and related case studies.	10	20
2.	Earthen dams: Design of earth dam (small and large) as per general practice and codal guidelines, seepage analysis, flow nets, seepage control measures, stability analysis for various conditions (Bishop's Analysis, Bishop and Morgenstern Analysis, Non-circular Failure Surfaces: Janbu Analysis), design of filters for slope protections, relief well and upstream blanket, quality control, failure of dams (Case studies)	16	40
3.	Rock-fill dams: Selection of materials, design details and modern construction techniques of rock-fill dam, special problems, settlement, core and transition zone, limitations of laboratory parameters evaluations, rock-fill and spillway operation, routing of floods, gate operation , Case studies.	09	20
4.	Dam Maintenance & Quality control: Need of instrumentation, classification of instrumentation, location of in dam section, monitoring of dam, maintenance and dam safety measures, distress and remedial measures in earth and rock-fill dams, earth pressure problems at interface of earth fills and abutments; guidelines for dam maintenance.	10	20
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	**20**	**25**	**25**	**10**	**10**

WhereR:Remember;U:Understanding;A:Application,N:AnalyzeandE:EvaluateC:Create(asperRevisedBloom'sTaxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Sherard, Woodward, Gizienski and Clevenger. Earth and Earth-Rock Dams. John Wiley &. Sons. 1963.
2. Bharat Singh and Sharma, H. D. – Earth and Rockfill Dams, 1999.
3. Sowers, G. F. and Salley, H. I. – Earth and Rockfill Dams, Willams, R.C., and Willace, T.S. 1965.
4. Abramson, L. W., Lee, T. S. and Sharma, S. - Slope Stability and Stabilization methods – John Wiley & sons. (2002).
5. Bromhead, E. N. (1992). The Stability of Slopes, Blackie academic and professional, London.
6. Christian, Earth & Rockfill Dams – Principles of Design and Construction, Published Oxford and IBH.
7. Ortiago, J. A. R. and Sayao, A. S. F. J. - Handbook of Slope Stabilisation, 2004.
8. Kutzner, C., Earth and Rockfill Dams Principles for Design and Construction, Routledge, 1997.
9. Creager, W.P., Justin, J. De. W, and Hinds, J. "Design of Dams" J. Wiley & Sons, Incorporated
10. Indian Standard Codes and ASTM codes.

(b) Open source software and website:

1. https://nptel.ac.in/courses/
2. https://ocw.mit.edu/courses/civil-and-environmental-engineering/

List of Experiments/ Tutorials:

1. Tutorial on Dam classification
2. Tutorial on soil Investigation for Dam site selection/sections based on materials and geometry
3. Tutorial on Seepage analysis and stability of dams using methods recommended by IS code.
4. Tutorial on Components of Rockfill Dams and construction methods
5. Tutorial on Dam maintenance and Quality control measures as per IS code

. **Suggested Project List:** ---

Apart from above tutorials/experiments a group of students has to undertake one open ended problem/design problem. Few examples of the same are given below:

1. Design of Dam sections – Homogenous/heterogeneous

2. Design of Filters/Riprap/Drainage systems

3. Stability Analysis of Slopes using Software's; GEO5/GEOSLOPE/PLAXIS/FLAC /Select any earthen dam of Gujarat and perform its slope stability analysis

Suggested Activities for Students: --- Refer periodicals/journals/handbooks and Visit to any Dam site of Gujarat/Ukai Dam/Sardar Sarovar Dam

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