GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Construction Engineering & Management

Course / Subject Code: ME01014021

Course / Subject Name : Advanced Construction Techniques

w. e. f. Academic Year:	2024-25
Semester:	1st Semester
Category of the Course:	PCC

Prerequisite:	Conventional Construction Techniques and Civil Engineering
Rationale:	To explore and comprehend the latest construction techniques in engineering, focusing on substructures, superstructures, special structures, as well as advanced methods for rehabilitation, strengthening, and demolition. This includes studying innovative & cutting-edge technologies and best practices in modern construction projects.

No	Program Outcomes
01	Engage in critical thinking and research to develop solutions to multifold real-world problems.
02	Communicate effectively with the engineering community at large level on complex design tasks & prepare best workouts and deliverables.
03	Demonstrate a high level of professionalism in handling multidisciplinary and complex Construction engineering and management problems.
04	Plan, Schedule, Manage and Control the complex construction and infrastructure projects in a sustainable local and global context.
05	Address technical, societal issues pertaining to Construction engineering & management by offering state of art and robust, sustainable and practical solutions while upholding high standards of ethics and professionalism.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
1.	Understand, State & Discuss the prevailing construction practices , methods and general fundamentals applied there within.	U, R
2.	Explain, Classify and Discussion of applied knowledge of the advanced construction techniques at super and sub structure stages of construction, Demolition and Rehabilitation techniques,	U, R,A

3.	Demonstrate and discuss about the application of various construction equipment, their suitability	U,N

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.	**Fundamentals of Construction Methods** Form work Design & scaffolding: slip form, moving forms, shoring, reshoring Steel construction: shop/in-situ techniques, connections, bolts, erection, clearance & tolerances . Prestressing, Steel and composites construction methods :- Fabrication and erection of structures, Prefab construction, Industrialized construction, Modular coordination. Special Construction Methods: High-rise, bridge, segmental, incremental, push launching, box pushing, top-to-bottom construction. Erection of lattice towers, transmission line rigging, cooling towers, silos, bridges, and box decks; methods for jetties, domes, and heavy equipment support.	10	25
2.	**Advanced Construction Methods** Sub Structure :- Box and pipe jacking, underwater diaphragm walls and basements, tunneling, piling, well and caisson driving, cofferdam sinking, cable anchoring, grouting, driving diaphragm walls and sheet piles, offshore system laying, deep cutting shoring, large reservoir construction, well points, and dewatering for underground open excavation. Super Structure: Vacuum dewatering of concrete floors, concrete paving, continuous concreting in tall buildings of various shapes and sections, erection techniques for tall and large span structures, launching heavy decks, in-situ prestressing, post-tensioning slabs, aerial transport, and handling lightweight components.	18	40
3.	**Demolition & Rehabilitation/ Strengthening**	10	25

	Demolition by Machines, Demolition by Explosives, Advanced techniques using Robotic Machines, Demolition Sequence, Dismantling Techniques, Safety precaution in Demolition and Dismantling. Seismic retrofitting, beam, column, slab, and masonry wall strengthening. Protection methods, mud jacking, grouting for foundations, micro piling, underpinning for floor and shallow profile strengthening. Subgrade waterproofing and soil stabilization techniques.		
4.	**Construction Equipment** Factors in equipment selection: technical and economic. Analyze production outputs and costs. Equipment characteristics and performance for earth moving, erection, material transport, pile driving, dewatering, and concreting, including ready mix concrete plants.	6	10
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
30	**40**	**20**	**10**	**--**	**--**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources

1. Harris, F (1989) Modern construction equipment and methods. Longman Scientific & Technical.
2. Jerry Irvine, Advanced Construction Techniques, CA Rocketr, 1984
3. Jha K N (2012) Formwork for Concrete Structures, Tata McGraw Hill, New Delhi.
4. Jha, K N (2015) Construction Project Management: Theory and Practice, Second Edition, Pearson Publishers, New Delhi.
5. Patrick Powers. J., "Construction Dewatering: New Methods and Applications", John Wiley & Sons, 1992.
6. Peter.H.Emmons, "Concrete repair and maintenance illustrated", Galgotia Publications Pvt.Ltd., 2001.Press, 2008.
7. Robertwade Brown, "Practical foundation engineering hand book", McGraw Hill Publications,1995.
8. Sankar, S.K. and Saraswati, S., "Construction Technology", Oxford University.

9. Smith, R C, and Andres, C K (1993) Principles and practices of heavy construction. Prentice Hall.

Suggested Course Assignment /Tutorial List:

Practical Work Assignments Based on :

1. Site visits and reporting of construction methods and equipment's observed there.
2. Comparison of various construction methods for various types of projects.
3. Preparation of presentation on various construction techniques.
4. Web based demonstration of various construction practices carried out across the world special context to India.
5. Site visits and reporting of rehabilitation /strengthening work site.
6. Referring NBC guidelines on structural safety, design, and construction practices.

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