GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3160617
Construction Equipment and Automation
Semester VI

Type of course: Professional Elective course

Prerequisite: Building construction Technology,

Rationale: In the last decade, technology is updated very fast. In construction sector also various equipments and automation have made the construction work with speed, accuracy and quality. This subject covers various equipments and automation used in the construction industries and help the students to know the current & latest trends of construction.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	1	0	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	**Introduction:** Unique features of construction equipment, Need of construction Equipment, past history. **Construction Equipment*:*** Capacity, Feasibility, owning and operating cost and Productivity of Different Equipment: Excavators, Pavers, Plastering machines; Pre-stressing jacks and grouting equipment; Cranes and Hoists, Concrete Batching Plants, etc..	08
2	**Automation in Construction Industry**: Need and Benefit of automation: Automation in Canal lining, Automation in Construction of Highway, Automation in concrete technology.	14
3	**Drones:** Photogrammetry, Project Monitoring- real time data, aerial mapping, land survey, quantity survey, quality survey, structural health monitoring survey, under water survey.	08
4	**Robotics in Construction:** Introduction, Benefits of robots in construction industry with respect to time, cost, quality, safety. Use of robots for construction activities like Brick laying, Demolition, Material Handling, Structural steel cutting, Rebar tying/bending, Form work mould making, 3D printing- print complex, layered, parts and objects of homes, buildings, bridges and roads 3D Scanner for surveying and project management	10
5	Introduction to Advanced Technologies: Virtual Reality, Augmented Reality, Building Information Modeling (BIM).	05

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	**20**	**30**	**20**	**15**	**--**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1) Construction Planning, Methods and Equipment, R.L Peurifoy, McGraw Hill, 2011
2) Construction Project management, Theory & Practice, Kumar Neeraj Jha,., Pearson Education India.
3) BIM and Construction Management: Proven Tools, Methods, and Workflows By Brad Hardin, Dave McCool, John Wiley & Sons
4) Construction equipment and its planning and application Mahesh Varma Metropolitan Book Co
5) Robotics and Automation in Construction, Open access peer- reviewed edited volume
6) Automation in Construction Management: Automated management of Construction Materials Using RFID Technology, Javad Majrouhi Sardroud, Scholars' Press
7) Enhancing BIM Methodology with VR Technology, Open access peer

Course Outcome:

After learning the course the students should be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Derive feasibility of specific equipment in different project conditions	25
CO-2	Selection of Automation techniques in construction industry	25
CO-3	Select suitable Drone technology for surveying and project management	20
CO-4	Analyze benefits of robotics versus conventional construction equipment	20
CO-5	Classify application of Virtual Reality, Augmented Reality, BIM in construction industry	10

List of Tutorials:

Tutorials based on:

1. Construction Equipment
    - Capacity, Feasibility, owning and operating cost and Productivity of pavers
    - Capacity, Feasibility, owning and operating cost and Productivity of cranes

- Capacity, Feasibility, owning and operating cost and Productivity of Excavators
- Capacity, Feasibility, owning and operating cost and Productivity of Concrete Batching Plants

2. Automation in Construction
3. Robotics in construction
4. Drones application in construction
5. Application of Virtual Reality and Augmented Reality in construction

Student should do Power Point presentation and assignment based on above topics.

Site Visit :

1. A site visit of heavy construction project should be arranged to show the working of construction equipment's like dragline, bull dozers, clamshell, belt conveyors, scrappers, compactors, etc.

Major Equipment: Computer with all supported software.

List of Open Source Software/learning website:

softwares:

1. Revit for BIM modeling

learning website

https://www.youtube.com/watch?v=wOsZk13UlO0
https://www.youtube.com/watch?v=T_CMr2KFSd4
https://www.youtube.com/watch?v=8lY4qaVvR8c