GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3170614
SUBJECT NAME: Construction Engineering and Management
SEMESTER-VII

Type of course: Management

Prerequisite: Building construction

Rationale: Knowledge of construction project plans, allocate resources and analyze workload, track work progress, estimation of project costs and manage budgets etc. are very important aspects of construction project management. In addition to these, various skill sets such as management of complex construction works, safety and quality in construction projects etc. needs to be required for successful execution of any project. This subject covers all above aspects required to know by the students of civil engineering.

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	0	0	3	70	30	00	00	100

Content:

Sr. No.	Content	Total Hrs
1	**Introduction:** Features of Construction Projects, phases of construction project, Stakeholders of construction management.	2
2	**Construction project planning**- Stages of project planning: Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data; **Techniques of planning**- Bar charts, Line of balance, Mile stone charts. **Planning and organizing construction site and resources**- **Site:** Site layout including enabling structures, developing site organization; **Manpower:** Planning, organizing, staffing, motivation; **Materials:** Concepts of planning, procurement and inventory control; **Equipment**: Basic concepts of planning and organizing; **Funds:** Cash flow, sources of funds; Histograms and S-curves, resource scheduling, allocation, smoothening and leveling, common good practices in construction **Networks:** Basic terminology, types of precedence relationships, preparation of CPM networks: activity on arrow and activity on node representation, computation of float	18

	values, critical paths, and calendaring networks. PERT analysis, calculation of probability of completion.	
3	**Project Monitoring & Control** - Network crushing and cost time trade off, Periodic progress reports, and periodical progress meetings, purpose, frequency and methods of updating plans. **Modern project management Systems**: Lean construction; use of Building Information Modeling (BIM) in project management.	8
4	**Quality control:** Concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control, CONQUAS- Construction Quality Assessment System **Safety, health and environment on project sites**: Accidents; their causes, effects and preventive measures, costs of accidents, Health and Safety Policies/Standards: OSHA, ISO 45001, occupational health & safety hazards in construction.	5
5	**Construction equipment:** Conventional construction methods Vs Mechanized methods **Equipment:** Capacity, Feasibility, owning and operating cost and Productivity of Different Equipment: Earthmoving, dewatering, concrete mixing, lifting, transporting & placing, pile boring/driving equipment, tunnel boring machines.	12

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
5	**10**	**25**	**30**	**30**	**--**

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) Project Planning with PERT and CPM, B. C. Punmia, K. K. Khandelwal, Laxmi Publications.
4) Construction Planning and Management, P. S. Gehlot and B. M. Dhir, Wiley Eastern Ltd.
5) A management guide to PERT/ CPM by Weist and Levy, Prentice Hall
6) Construction of Structures and Management of Works, S. C. Rangwala, Charotar Publications.
7) Construction Engineering & Management By S. Seetharaman, Umesh Publication
8) Lean Construction Management by Shang Gao · Sui Pheng Low, Spinger
9) Construction Project Management by K. K. Chitkara, Tata McGraw-Hill Education
10) BIM and Construction Management: Proven Tools, Methods, and Workflows By Brad Hardin, Dave McCool, John Wiley & Sons

11) CONQUAS: The CIDB Construction Quality Assessment System by Singapore. Construction Industry Development Board
12) Occupational Safety, Health & Environment And Sustainable Economic Development by By Pradeep Chaturvedi (ed.), Concept Publishing Company Delhi
13) Construction Health and Safety Management by By Alan Griffith, Tim Howarth, Routledge.
14) Construction Equipment and its Planning and Application, Mahesh Varma, Metropolitan Book Co.

Course Outcome:

After learning the course the students should be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Outline components and phases of construction project.	10
CO-2	Infer types of project plans, Work break down structure, Planning techniques, CPM and PERT techniques project scheduling & management.	40
CO-3	Illustrate periodic progress reports, Updating of plans, Cost Optimization,	25
CO-4	Derive evaluation criteria and attributes for Construction Projects	25

List of Experiments / Tutorials:

1. Develop a WBD structure for the construction of one storied building; Develop a bar chart for the construction of this building, including finishing activities, assuming reasonable activity durations.
2. Develop a CPM chart for a 5 span bridge on open foundations. Develop a comparative table for a 10-storeyed building constructed by at least three different methods, listing their pros and cons.
3. Develop a Gantt chart for the construction of a two storied precast framed structure, including open foundations, along with list of equipment resources, assuming reasonable quantities and productivities. Calculate cost optimization and updating of the same structure.
4. Develop a bar chart for concreting 1500 sqm of a 15cm thick slab using various equipment for production to placing of concrete at 3 m eight above ground level; show all equipment resources required, along with a site layout.
5. For the construction of a typical 3 storied, framed structure with 400 sqm area per floor develop the histograms for the various resources required, showing all intermediate calculations; also, draw S-curves for concrete placing and block work done over the period.
6. Write a 500-word note on the advantages of Lean construction method over conventional project management systems.
7. Write a 500-word note on the Safety and health precautions you would take for a typical 3 storied building with 400 sq. m. plinth area.
8. 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:

Open source softwares:

1. Geniebelt
2. Buildtools
3. Knowify
4. CIMS - Construction Information Management System

Other softwares

1. MS Project
2. Primavera
3. Revit for BIM modeling
4. Visilean

learning website

https://nptel.ac.in/courses/105104161/
https://www.youtube.com/watch?v=JcwqysQ1jRU