

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)**Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)**
Semester-VI**COURSE TITLE: CONSTRUCTION PROJECT MANAGEMENT**
(COURSE CODE: 4360603)

Diploma programme in which this course is offered	Semester in which offered
Civil Engineering	six

1. RATIONALE:

The construction project has numerous necessities that include a thorough understanding of the design/planning and the entire construction process, as well as modern business management tools/methods. Project management skills are important for overall planning, coordination, and control of a project from commencement to accomplishment of the project efficiently and effectively. The awareness of various project management techniques is very essential to ensure that construction projects are completed within time and budget which is a biggest challenge. To overcome this challenge, project management team has to manage various resources with the objective to complete the construction project with predetermined scope, cost, time and quality, and the constraints imposed on human, material and financial resources. This course is therefore redesigned in such a way that after learning this course the students will be able to plan, organize and control construction operations by using various management techniques and software. Thus, students would be able to complete the project in time & within the allocated budget and as per desired quality. This course is therefore very important course for diploma holders in civil engineering since they have to manage construction projects on their own.

2. COMPETENCY:

The course content should be taught and with the aim to develop different types of managerial skills so that students are able to acquire following competencies.

- **This course provides an understanding of construction management, including contracts, subcontracting, tendering and scheduling, cost control, claims, safety and quality and project closeout.**
- **Manage various resources and activities, effectively and efficiently using appropriate techniques and software to complete the construction project within stipulated time and allocated budget according to desired quality.**

3. COURSE OUTCOMES (COs)

The theory should be taught and exercises should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- a) Describe construction project management and roles of various construction agencies.
- b) Explain contracts and tendering process.

- c) Develop the CPM and PERT network of various construction activities.
- d) Show leadership skills required to manage various construction resources and achieve targets.
- e) Apply safety measures and legal aspects at various construction works.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T/2+P/2)	Examination Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
			C	CA	ESE	CA	ESE	
2	-	2	3	30*	70	25	25	150

(*): Out of 30 marks under the theory CA, 10 marks are for assessment of the micro-project to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessing the attainment of the cognitive domain UOs required for the attainment of the COs.

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P -Practical; C – Credit, CA - Continuous Assessment; ESE -End Semester Examination.

5. SUGGESTED LIST OF EXERCISES/PRACTICAL

The following practical outcomes (PrOs) are the sub-components of the COs. Some of the PrOs marked '*' are compulsory, as they are crucial for that particular CO at the 'Precision Level' of Dave's Taxonomy related to 'Psychomotor Domain'. Following is the list of practical exercises for guidance.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1.	Prepare the list of roles and responsibilities of various personnel in any Private Construction organization.	1	2*
2.	List the reasons of project failure from a given case study.	1	2*
3.	Study given tender documents and formulate report containing terms and conditions.	2	2*
4.	Study given contract document & analysis its strengths and weaknesses and write a report on it. (Given contraction documents should be comprehensive covering all terms and conditions).	2	2*
5.	Prepare tender notice for given construction work.	2	2*
6.	Prepare a Bar Charts and prepare CPM and PERT for Project scheduling for given project data.	3	4*
7.	Carry out cost optimization for given project.	3	2*
8.	Prepare material and labor schedule for given project data.	4	2*
9.	Prepare the organization chart of any one government/public sector organization executing any major civil engineering projects.	4	2*

10.	Prepare the action plan to reduce the accident on given construction project.	5	2*
11.	Prepare the chart/ power point Presentation on various safety devices used at construction site.	5	2
12.	Study different labor laws applicable for construction project and prepare a report.	4	2*
13.	To visit nearby constructions site and to prepare a report on investment and operating cost, output of various equipment.	5	2
14.	Prepare a presentation on relevant topic and present a seminar.	1,2,3,4,5	4*
Total			28

Note

i. More **Practical Exercises** can be designed and offered by the respective course teacher to develop the industry relevant skills/ outcomes to match the COs. The above table is only a suggestive list.

ii. The following are some **sample** 'Process' and 'Product' related skills (more may be added/ deleted depending on the course) that occur in the above listed **Practical Exercises** of this course required which are embedded in the COs and ultimately the competency.

S. No.	Sample Performance Indicators for the PrOs	Weightage in %
For PrOs 1, 2,3, 4,5,6,7,8,9,10,11		
1	Collecting information	10
2	Interpretation of data collected	10
3	Preparing the drawing/report/chart	40
4	Answer the question	10
5	Submission of drawing/report/chart in time	20
6	Attendance and punctuality	10
Total		100

S. No.	Sample Performance Indicators for the PrOs	Weightage in %
For PrOs12,13		
1	Discipline	10
2	Involvement during site visit	20
3	Data collection at site	20
4	Organization of report	20
5	Answer the question	10
6	Timely submission of report	20
Total		100

S. No.	Sample Performance Indicators for the PrOs	Weightage in %
For PrOs 14		
1	Initiative	20
2	Data Collection	20
3	Content of Presentation (Use of multi media)	20
4	Presentation (Body Language- Gesture, Posture etc.)	20
5	Answer the question	20
Total		100

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

This major equipment with broad specifications for the PrOs is a guide to procure them by the administrators to usher in uniformity of practical’s in all institutions across the state.

S. No.	Equipment Name with Broad Specifications	PrO. No.

7. AFFECTIVE DOMAIN OUTCOMES

The following *sample* Affective Domain Outcomes (ADOs) are embedded in many of the above mentioned COs and PrOs. More could be added to fulfill the development of this competency.

- a) Work as a team member/ individual.
- b) Follow ethical practices.
- c) Follow safe practice on site/ lab.
- d) Practice good housekeeping.
- e) Maintain tools and equipment.

The ADOs are best developed through the laboratory/field based exercises. Moreover, the level of achievement of the ADOs according to Krathwohl’s ‘Affective Domain Taxonomy’ should gradually increase as planned below:

- i. ‘Valuing Level’ in 1st year
- ii. ‘Organization Level’ in 2nd year.
- iii. ‘Characterization Level’ in 3rd year.

8. UNDERPINNING THEORY

Only the major Underpinning Theory is formulated as higher level UOs of Revised Bloom’s taxonomy in order development of the COs and competency is not missed out by the students and teachers. If required, more such higher level UOs could be included by the course teacher to focus on attainment of COs and competency.

Unit	Unit Outcomes (UO’s)	Topics and Sub-topics
UNIT-I Construction Industry and Management	1a. Project Management 1b. Identify the roles of different agencies in the given construction industry with justification 1c. Identify the functions of specified personnel in the given organization with justification.	1.1 Project Definition and formulation. 1.2 Construction Project Management.: objective and Functions 1.3 Causes of Project failure. 1.4 Agencies associated with construction work-owner, promoter, builder, designer, architects. 1.5 Qualities, role and responsibilities of project manager, Role of Project Management Consultants.

<p>UNIT-II</p> <p>Tendering</p>	<p>2a. Explain various features of Contract document.</p> <p>2b. Prepare a Tender document for the construction project</p> <p>2c. Describe standard tendering process in Government.</p> <p>2d. Explain various technical terms used in government organizations.</p>	<p>2.1 Contract-Introduction, requirement and types.</p> <p>2.2 Contract documents and conditions of contract, Contract agreement</p> <p>2.3 Tender-Types, Terms and Conditions, Tendering procedure, Scrutiny, Acceptance, Rejecting.</p> <p>2.4 Prepare tender notice.</p> <p>2.5 Technical terms- Administrative approval, Technical Sanction, Issue rate, Competent Authority, Earnest money deposit (EMD) and Security deposit(SD).</p> <p>2.6 Standard Bidding Process in state government.</p>
<p>UNIT-III</p> <p>Time Management Methods and Tools in Construction</p>	<p>3a. Project Scheduling.</p> <p>3b. Draw the bar chart for the given construction project.</p> <p>3c. Draw CPM and PERT network for construction work.</p> <p>3d. Describe the features of construction planning software.</p>	<p>3.1 Method of Construction Scheduling, Development of bar chart, Merits and limitations of bar chart.</p> <p>3.2 Elements of Network: Event, activity, dummy activities, Precautions in drawing Network, Numbering the events.</p> <p>3.3 Workbreakdown structure, activity cost and time estimation in CPM and PERT techniques. Type of Floats and their significance.</p> <p>3.4 Critical path method-Important terms, Basic Rules, Advantages and disadvantages.</p> <p>3.5 Examples of CPM and PERT network.</p> <p>3.6 PERT analysis-Important terms, Advantages and disadvantages.</p> <p>3.7 Cost optimization.</p> <p>3.8 Introduction to Project Management software.</p>

<p>UNIT-IV</p> <p>Construction Resource management</p>	<p>4a. Describe features of material, labor and equipment management.</p> <p>4b. Prepare Job layout.</p> <p>4c. Prepare material, labour and equipmentschedule.</p>	<p>4.1 Material management-Purpose, Objective, material Scheduling, material handling, Storage, safety precautions, Economy Order Quantity.</p> <p>4.2 Job layout</p> <p>4.3 Equipment Management : Equipment Scheduling, Factors affecting selection of equipment.</p> <p>4.4 Various costs associated with equipment, Maintenance Management, Replacement of Equipment, Economic life of Equipment.</p> <p>4.5 Manpower Management : Objectives, Labour schedule, output.</p> <p>4.6 Suitable organization structure for construction industry.</p> <p>4.7 Information Management : MIS – its concept and need.</p>
<p>UNIT-V</p> <p>Safety Aspect and Legal aspects in Construction Industry.</p>	<p>5a. Identify causes of accidents at construction site in the given situation with justification.</p> <p>5b. Suggest safety measures to avoid accidents for the given construction site.</p> <p>5c. Apply relevant labor law/s in the given situation of a construction industry.</p>	<p>5.1 Concept of Safety in Construction Industry, Importance of Construction Safety.</p> <p>5.2 Safety Benefits to Employers, Employees and Customers, Construction Safety Problems, Approaches to improve Construction Safety.</p> <p>5.3 Safety measures in construction as per IS code</p> <p>5.4 Workers Compensation</p> <p>5.5 Labor laws related to construction industry.</p>

Note: The UOs need to be formulated at the ‘Application Level’ and above of Revised Bloom’s Taxonomy’ to accelerate the attainment of the COs and the competency.

9. SUGGESTED SPECIFICATION TABLE WITH HOURS&MARKS(Theory)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Construction Industries and Management	03	02	03	02	07
II	Tendering.	06	04	04	04	12

III	Time Management Methods and Tools in Construction	08	06	07	08	21
IV	Construction Resource management	07	04	10	08	22
V	Safety Aspect and Legal aspects in Construction Industry.	04	02	04	02	08
Total		28	18	28	24	70

Legends: R=Remember, U=Understand, A=Apply and above (Revised Bloom's taxonomy)

Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and question paper designers/setters to formulate test items/questions assess the attainment of the UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary slightly from above table.

10. SUGGESTED LIST OF EXERCISES/PRACTICAL

Other than the classroom and laboratory learning, following are the suggested student-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- a) Give seminar on relevant topic.
- b) Undertake micro-projects.
- c) Collect organizational set up of various departments.
- d) Collect and interpret the bar charts or networks from construction sites.
- e) Solve the numerical on bar chart, CPM, PERT and cost optimization.
- f) Collect and interpret various store forms from PWD, WRD and MIP.
- g) Download the labour laws documents from internet and write a brief summary on it.
- h) Compile various safety slogans displayed at various sites with sources and write a brief summary on it.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- a) Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- b) Guide student(s) in undertaking micro-projects.
- c) '**L**' in **section No. 4** means different types of teaching methods that are to be employed by teachers to develop the outcomes.
- d) About **20% of the topics/sub-topics** which are relatively simpler or descriptive in nature is to be given to the students for **self-learning**, but to be assessed using different assessment methods.
- e) With respect to **section No.11**, teachers need to ensure to create opportunities and provisions for **co-curricular activities**.
- f) Guide students on how to address issues on environ and sustainability.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project is group-based. However, in the fifth and sixth semesters, it should be preferably be **individually** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should **not exceed three**.

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than **16 (sixteen) student engagement hours** during the course. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs.

A suggestive list of micro-projects is given here. This has to match the competency and the COs. Similar micro-projects could be added by the concerned course teacher:

- a) Use any software of Construction Management to prepare the scheduling of a project.
- b) Use any software of Construction Management to determine the critical path for the given construction project.
- c) Interpret the network figures used in given civil engineering projects.
- d) Prepare a report on different forms of inventory storage along with your interpretation.
- e) Collect the information about latest safety measures adopted at construction project.
- f) Compare various construction management software.
- g) Use relevant software to collect information about modern techniques of material management like JIT/SAP/ERP.
- h) Prepare a report on "Site planning and mobilization" for a given site.
- i) Study of BOT Road Project.
- j) Study of standard Bidding process in State Government.
- k) Study of procurement policies and procedures for a given construction company.
- k) Collect the information about labour management practices in construction industry.
- l) prepare a report on owning and operating cost of the given construction equipments.

13. SUGGESTED LEARNING RESOURCES

No.	Title	Author	Publisher
1	Construction Project Management	K.K.Chitkara	Tata McGraw-Hill
2	Project Planning and Controlling with PERT And CPM	Dr. B.C.Punmia K.K.K handelwal	Laxmi Publications (P)Ltd.
3	Construction Management and accounts	Harpalsingh	Tata McGraw-Hill
4	Construction of Structures and Management work	S.C.Rangwala	Charotar Publication
5	Construction Management practice	V.K.Raina	Tata McGraw-Hill

6	Project Planning, Scheduling and Control in Construction: An Encyclopedia of Terms and Applications	Calin M.Popescu, ChotchaiCharo enngam	Wiley, New York, 1995
7	Construction Equipment and its Management	S.C.Sharma	Khanna Publication, New Delhi,1988.
8	Construction Planning and Management	P.S.Gahlot B.M.Dhir	Willey Eastern Ltd
9	Construction Project planning & Scheduling	Charles Patrick, Pearson	-
10	Construction Management and Planning	Sengupta and Guha	Tata McGraw Hill publication
11	Project Management-Planning and Control	Rory Burkey	Wiley,India 4th ed
12	Construction Planning, Equipment and Methods	Peurifoy, L., Schexnayder, C.J. and Shapira, A	McGraw Hill, New Delhi, 8th Edition, 2010
13	Construction Project Management Planning, Scheduling and Controlling	Chitakara	Tata McGraw Hill, New Delhi
14	Construction Engineering and Management	Seetharaman.S	Umesh Publication
15	Construction Equipment and its planning and Application.	Dr.Mahesh Varma	Metropolitan Book Company, New Delhi. 1983.

14. LIST OF SOFTWARE/LEARNING WEBSITES

- PrimaveraP6b
- www.slideshare.net
- www.civil.iitm.ac.in

15. PO-COMPETENCY-CO MAPPING

Semester VI	CONSTRUCTION PROJECT MANAGEMENT(Course Code: 4360603)									
	POs and PSOs									
Competency & Course Outcomes	PO 1Basic& Discipline specific knowledge	PO 2 Problem Analysis	PO 3Design/ development of solutions	PO 4Engineering Tools, Experimentation &Testing	PO 5Engineering practices for society, sustainability & environment	PO 6 Project Management	PO 7Life-long learning	PSO 1	PSO 2	PSO 3 (If needed)
<u>Competency</u>	<ul style="list-style-type: none"> • This course provides an understanding of construction management, including contracts, subcontracting, tendering and scheduling, cost control, claims, safety 									

	<p>and quality and project closeout.</p> <ul style="list-style-type: none"> • Manage various resources and activities, effectively and efficiently using appropriate techniques and software to complete the construction project within stipulated time and allocated budget according to desired quality. 									
Course Outcomes										
CO a) Describe construction project management and roles of various construction agencies	3	2	2	-	3	3	3	-	-	-
CO b) Explain contracts and tendering process	2	2	2	-	2	3	3	-	-	-
CO c) Develop the CPM and PERT network of various construction activities.	2	3	3	2	2	3	3	-	-	-
CO d) Show leadership skills required to manage various construction resources and achieve targets	2	2	2	2	3	3	3	-	-	-
CO e) Apply safety measures and legal aspects at various construction works.	2	3	1		3	2	3	-	-	-

17. COURSE CURRICULUM DEVELOPMENT COMMITTEE

GTU Resource Persons

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