Program Name : **Civil Engineering Program Group**

Program Code : **CE/CR/CS**

Semester : **Sixth**

Course Title : **Construction Management**

Course Code : 22061

1. RATIONALE

Civil engineering projects are costly and involve various resources like men, materials, machinery, time and money. Therefore these projects need to be efficiently managed to utilize the resources to the optimum so that they are completed at least cost and within stipulated time duration. Civil engineers at the site and office are responsible to manage the projects efficiently. Therefore Civil engineering diploma holders working in the projects should be conversant with the various aspects of managing the resources. This course is designed to develop competencies in the diploma holders and enable them to manage the resources efficiently and use specialized, project management techniques to oversee the planning, design, and construction of a project, from its beginning to its end. at construction projects. The purpose of Construction Management is to control a project's time, cost and quality.

2. COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Manage various resources for optimised completions of construction projects.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following ***industry oriented*** COs associated with the above mentioned competency:

a) Organize the human resources for the Civil engineering project.
b) Prepare networks and bar charts for the given construction project.
c) Apply safety measures at construction projects

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme													
				Theory							Practical						
L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
1	-	2	3	--	--	--	--	--	--	--	25@	10	25~	10	50	20	

(*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment 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,* ***ESE*** *- End Semester Examination;* ***PA*** *- Progressive Assessment.*

5. COURSE MAP (with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

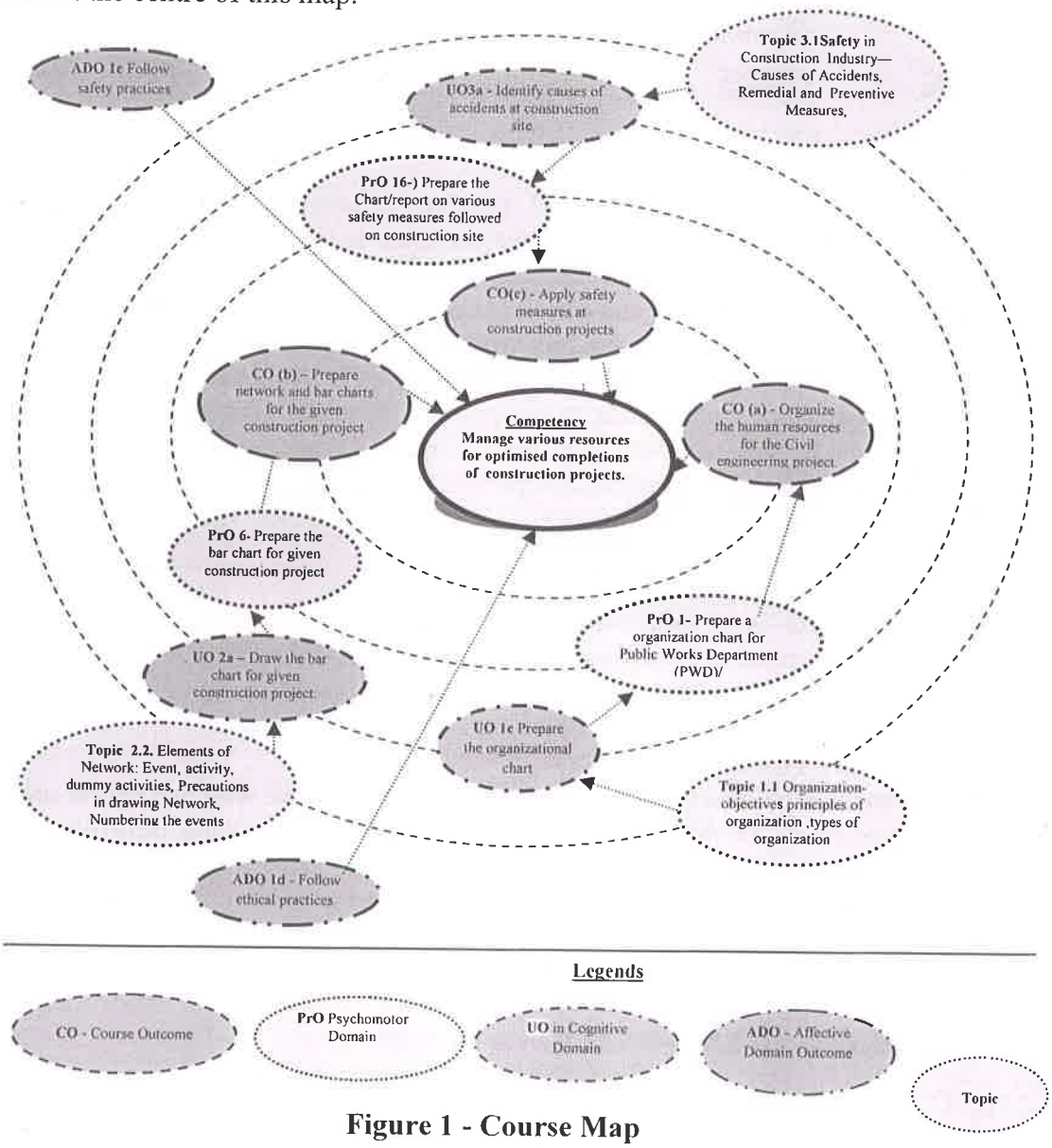

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Prepare the organization chart of any one government/public sector organization executing any major civil engineering projects in your area.	I	02*
2	Prepare the organization chart of any one private organization executing any major civil engineering projects in your area.	I	02
3	Prepare the list of roles and responsibilities of various personnel in any Government Construction organization.	I	02

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
4	Prepare the list of roles and responsibilities of various personnel in any Private Construction organization.	I	02
5	Check the breakdown structure of the given typical construction project to justify its role in managing its relevant activities.	II	02*
6	Prepare the bar chart for given construction project.	II	02*
7	Prepare the time schedule of different activities for practical no 5	II	02
8	Prepare a network for given construction project to identify the critical activity in a project.(to develop the critical path)	II	02*
9	Compute activity times, event times and floats for network drawn in above practical number 8	II	02
10	Carry out cost optimization of the given project.	II	02
11	Carry out labor resource levelling for the given project	II	02*
12	Prepare Job layout for the given construction site	II	02*
13	Carry out the ABC analysis of the given items in a store.	II	02
14	Determination of EOQ (Economic order quantity) based on the given data.	II	02*
15	Prepare the action plan to reduce the accidents on given construction project.	III	02
16	Prepare the charts/power point presentation on various safety devices used at construction site.	III	02*
			32

Note

i. *A suggestive list of **PrOs** is given in the above table. More such PrOs can be added to attain the COs and competency. A judicial mix of minimum 12 or more practical UOs/tutorials need to be performed, out of which, the practicals marked as '*' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.*

ii. *The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:*

S.No.	Performance Indicators	Weightage in %
1	Collecting information.	20
2	Interpretation of data collected	20
3	Preparing the report.	30
4	Answer to sample questions.	10
5	Submission of report in time.	10
6	Attendance and punctuality	10
Total		**100**

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

a) Follow safety practices on site.
b) Work as a leader/a team member.
c) Follow ethical practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of

practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year.
- 'Organization Level' in 2nd year.
- 'Characterization Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

Not applicable.

8. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to develop UOs in cognitive domain for achieving the COs to attain the identified competency. More UOs could be added.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Construction industry and management	1a Identify the roles of different agencies in the given construction industry with justification. 1b Prepare organizational chart for the given organization 1c Identify the functions of specified personnel in the given organization with justification. 1d Prepare job layout for the given construction site.	1.1 Organization-objectives principles of organization ,types of organization government/public and private construction industry roles of various personnel in construction organization 1.2 Agencies associated with construction work-owner, promoter, builder, designer, architects. 1.3 Job layout for construction site
Unit- II Planning and scheduling	2a Draw the bar chart for the given construction project. 2b Draw the network for the given construction project. 2c Compute activity times, event times, floats and duration of the given construction project. 2d Calculate optimum cost and duration of the given project. 2e Carry out resource levelling for the given project. 2f Calculate EOQ in the given situation. 2g Identify the ABC analysis for the given items of store. 2h Identify the forms pertaining to the given store item with justification.	2.1 Identifying broad activities in construction work & allotting time to it based on rate analysis, Methods of Scheduling , Development of bar charts, Merits & limitations of bar chart 2.2 Elements of Network: Event, activity, dummy activities, Precautions in drawing Network, Numbering the events. 2.3 CPM networks, activity time estimate, Event Times by Forward Pass & Backward Pass Calculation, start and finish time of activity, project duration, Floats, Types of Floats-Free, independent and total floats, critical activities and critical path , 2.4 Purpose of crashing a network. Normal Time & Normal Cost, Crash Time and Crash Cost, Cost slope. Optimization of cost and duration. 2.5 Material management- Ordering cost, inventory carrying cost, EOQ 2.6 Store management various records related to store management, inventory control by

		ABC technique.
Unit– III Safety in Construction	3a Identify causes of accidents at construction site in the given situation with justification. 3b Suggest safety measures to avoid accidents for the given construction site 3c Apply relevant labor law/s in the given situation of a construction industry	3.1 Safety in Construction Industry—Causes of Accidents, Remedial and Preventive Measures, 3.2 Labor laws related to construction industry.

***Note**: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' and above of Bloom's 'Cognitive Domain Taxonomy'.*

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

-Not applicable –

10. SUGGESTED STUDENT ACTIVITIES

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) Prepare journals based on practical performed in laboratory.
b) Give seminar on relevant topic.
c) Undertake micro-projects.
d) Collect organizational set up of various departments.
e) Collect and interpret the bar charts or networks from construction sites.
f) Solve the numerical on bar chart, CPM and cost optimization
g) Collect and interpret various store forms from PWD, WRD, MJP.
h) Download the labour laws documents from internet and wrote a brief summary on it.
i) 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) ***'L' in item No. 4*** does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
c) About ***15-20% of the topics/sub-topics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the COs through classroom presentations (see implementation guideline for details).
d) With respect to item No.10, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
e) Guide student(s) in undertaking micro-projects.
f) Arrange visit to nearby industries and workshops for understanding various construction materials.

g) Use video/animation films to explain various processes like Manufacturing of construction materials, concrete mixing, and base preparation for painting, mortar laying, carpentry work, false ceiling.
h) Use different instructional strategies in classroom teaching.
i) Display various technical charts related to construction management process.

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 are 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. Similar micro-projects could be added by the concerned faculty:

a) Use any software of Construction Management to prepare the scheduling of a project.
b) Use any software of Construction Management to determine the ctitical 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 a relevant software to collect information about modern techniques of material management like JIT/SAP/ERP

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Construction planning and management	Gahlot,P.S. Dhir, B.M.	New Age International (P) Ltd., New Delhi. 2016, ISBN 978-81224-04111
2	Construction planning and management	Shrivastava, U.K.	Galgotia Publication Pvt Ltd. New Delhi ISBN 10: 817515246X
3	The A To Z of Practical Building Construction and its Management	Mntri, Sandip	Satya Prakashan New Delhi, 2015 ISBN-8176842052
4	Industrial engineering and management	Khanna, O.P.	Dhanpat Rai New Delhi ISBN-10: 818992835X
5	Project Planning and Controlling with PERT And CPM	Punmia, B.C. Khandelwal, K.K.	Laxmi Publications (P)Ltd. New Delhi, ISBN 9788170083092
6	Construction Management and accounts	Harpal, Singh	Mc-Graw Hill, New Delhi ISBN: 978-0070966437
7	Industrial engineering and	Bangal, T. R.	Khanna Publications, New Delhi

S. No.	Title of Book	Author	Publication
	management	Sharma, S.C.	ISBN: 978-9386173072

IS, BIS and International Codes:

8	IS 4082:1996	Recommendations on stacking and storage of construction materials and components at site
9	IS 7293:1974	Safety code for working with construction machinery
10	IS 7969:1975	Safety code for handling and storage of building materials
11	IS 10067:1982	Material constants in building works
12	IS 15883-1:2009	Construction project management - Guidelines, Part 1: General
13	IS 15883-2:2013	Construction project management - Guidelines, Part 2: Time Management

14. SOFTWARE/LEARNING WEBSITES/LEARNING RESOURCES

a) https://docs.google.com/spreadsheets/d/e/2PACX-1vQOHER38F_mi8Nj0n4NOrrvIigNWQcyBiPtSRjj1gvRiaxL4py3UYem0o8nP0LLKk78qfC2bdedBTaw/pubhtml
b) Prima-Vera P6b
c) MS Project