CONSTRUCTION MANAGEMENT **Course Code : 313010**

Programme Name/s	**: Civil Engineering/ Civil & Rural Engineering/ Construction Technology/ Civil & Environmental Engineering/**
Programme Code	**: CE/ CR/ CS/ LE**
Semester	**: Third**
Course Title	**: CONSTRUCTION MANAGEMENT**
Course Code	**: 313010**

I. RATIONALE

The construction industry is in continuous need of skilled professionals, capable of managing projects efficiently in the capacity of project engineers,construction managers, site supervisors, and project coordinators, among others. It is required for a civil engineer to plan, manage and execute Civil Engineering works with utmost precision within the time frame so as to optimize the resources.Therefore, it is necessary to develop a perfect blend of knowledge, skills, and attitudes in the form of the competencies among the learners to tackle with such engineering projects effectively and efficiently leading towards sustainable development.This course will help in developing these basic competencies among the students which will enable them to get an employment in the market.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Manage the given construction project using the relevant techniques of construction management.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Conduct the project feasibility analysis of the given project.
- CO2 - Apply the relevant scheduling technique in the given situation to decide the ethical element of the project.
- CO3 - Manage the inventory using relevant inventory control techniques.
- CO4 - Execute the project as per the prevailing safety practices

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme												
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical							
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
313010	CONSTRUCTION MANAGEMENT	CMA	DSC	1	-	2	1	4	2	-	-	-	-	-	25	10	-	-	25	10	50

Total IKS Hrs for Sem. : 0 Hrs
Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination
Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Explain the term, “Project Life Cycle” with its importance. TLO 1.2 Identify the characteristics of the given project with relevant constraints. TLO 1.3 Select the project from the available options based on feasibility analysis. TLO 1.4 Justify the importance of project management frameworks and standards. TLO 1.5 Select the relevant type of equipment for the given type of activity of project.	**Unit - I Project Initiation and its feasibility** 1.1 Project: Basic Definitions, management functions, ethics, project life cycle- Project Initiation, Project Planning, Project Executing, Project Monitoring and Controlling, Project Closing. 1.2 Project Characteristics and Constraints- Scope, time, cost, Quality; Stakeholder. 1.3 Project Feasibility Analysis- Market analysis, Financial analysis- Net Present Value(NPV), Payback Period, Examine the business problem/opportunity, Identify the requirements, undertake a feasibility study, Rank the feasibility results- Define the criteria, give ranking scores, Identify the feasibility outcome. 1.4 Project Management Frameworks and Standards, Project Management consultant (PMC)- roles & responsibilities. 1.5 Equipment used in executing the Civil Engineering projects- •Earth moving equipment (Tractor, Bulldozer, Scrapers, Excavators), • Hauling Equipment (Drum trucks, Front end loader, Conveyor belt), • Concreting Equipment (RMC mixer, Concrete pump), • Hoisting Equipment (Lifting & lowering equipments, Cranes).	Lecture Using Chalk-Board Presentations Site/Industry Visit

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
2	TLO 2.1 Identify the broad activities involved in given construction project. TLO 2.2 Apply the relevant technique of analysis to get the required information about the given project. TLO 2.3 Explain the process of developing the critical path line in solving the given problem.	**Unit - II Project Management and Scheduling** 2.1 Broad activities in construction work – Earthwork, Foundation, RCC Work, Brick work, Scaffolding, Plastering, Painting etc & duration required for complete the activity 2.2 Methods of Scheduling-Gantt Chart, Bar chart, Development of Bar charts and Gantt chart, Merits & limitations of Bar chart & Gantt chart. 2.3 Concept of CPM & PERT: Introduction to Critical path method (CPM), Program evaluation & review techniques (PERT), Network Diagramming of Projects Activity-on-arrow (AOA) Diagrams- Concept of Activity and Event, Time-Analysis of Networks- Forward Pass, Backward Pass, Probabilistic Durations- Optimistic Time, Pessimistic Time, Most Likely Time, Project Scheduling- ES and LS Schedules as Limits, Resource Scheduling, Time/Cost Trade-off	Lecture Using Chalk-Board Video Demonstrations Hands-on Presentations
3	TLO 3.1 Apply the relevant material management techniques in the given construction project. TLO 3.2 Apply the material management technique for rebar in the given construction project..	**Unit - III Material Management** 3.1 Material Management-Introduction, Inventory and inventory control, EOQ (Economic order of quantity), ABC technique, V-E-D analysis, Just in Time Strategy (JIT), Store management & various records related to store management 3.2 Rebar Management: Wastage of steel on site, Preventive measures to avoid the wastage of steel. Rebar, Importance of rebar, Fabrication and transportation of Rebar. Understanding rebar drawings.	Lecture Using Chalk-Board Video Demonstrations Presentations Site/Industry Visit
4	TLO 4.1 Explain the remedial measures with preventative strategies for the relevant identified cause of accidents on construction sites. TLO 4.2 Follow the relevant legal provisions related to labor laws in project execution.	**Unit - IV Safety and labour laws in construction** 4.1 Importance of Safety in construction work, causes of accidents on construction site & remedial measures, precautions to avoid accidents at site, safety policies. 4.2 Introduction to Labour laws related to construction-Workman Compensation Act, Minimum Wages Act, The Building and Other Construction Workers' (Regulation of Employment and Conditions of Service) Act, Janshree Vima Yojna	Lecture Using Chalk-Board Video Demonstrations Presentations Site/Industry Visit

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Identify the roles and responsibilities of manpower required for a construction project	1	*Draw the flow chart of manpower required for a given type of project	2	CO1

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 2.1 Select the relevant resources required for foundation or RCC or Brickwork for given construction project/data	2	*Draw the resource allocation plan for Foundation or RCC or Brickwork activity on construction site	2	CO1
LLO 3.1 Select the relevant resources required for Structural members of beam or column for given construction project/data	3	Draw resource allocation plan for Structural members for beam or column or slab for G+5 activity on site	2	CO1
LLO 4.1 Select the relevant resources required for plastering or flooring for given construction project/data	4	Draw resource allocation plan for plastering or painting or flooring activity on site	2	CO1
LLO 5.1 Select different equipments used to carry out the construction of building	5	Write a brief report of site inspection with special reference to construction equipments used in the project with relevant photographs, video etc	2	CO1
LLO 6.1 Apply the concept of bar chart/Gantt chart to get the required information about the given project.	6	Draw the bar chart / Gantt chart for the activities of given construction project by using MS Excel/MS Project	2	CO2
LLO 7.1 Apply the concept of network diagram to get the required information about the given project.	7	Forecast the time duration required for various activities of the given construction project to represent them through a network diagram	2	CO2
LLO 8.1 Determine/Find the duration of the project and the sequence of critical activities.	8	*Solve the numerical on CPM for finding duration of project and Critical path of the any one problem for the given data	2	CO2
LLO 9.1 Apply the concept of PERT technique to get the required information about the given project.	9	*Solve the numerical on PERT to represent the sequence of activities and critical path of the any one problem for the given data.	2	CO2
LLO 10.1 Determine the Economic Order Quantity (EOQ) based on the given data	10	*Determination of EOQ (Economic order quantity) based on the given data. (Solve one Numerical)	2	CO3
LLO 11.1 Identify the most important product in given construction project/data	11	*Carry out the ABC analysis for the given problem/data (Solve one Numerical)	2	CO3
LLO 12.1 Apply the principles of management for rebar procurement on the given site.	12	Develop rebar procurement plan for the given construction site. (Manually or by using any open-source software)	2	CO3
LLO 13.1 Select the causes and remedial measures for given construction project/data	13	*Prepare a report on minimum five expected causes of accidents on construction sites with their remedial measures. (Visit any one Industrial/Residential/Public construction building)	2	CO4
LLO 14.1 Select the action plan measures for given construction project/data	14	*Prepare a brief report of the observation made on site with respect to safety on site (Visit any one Industrial/Residential/Public construction building)	2	CO4

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 15.1 Select various safety devices used at given construction site	15	Prepare the charts/report on various safety devices used at given construction site (Visit any one Industrial/Residential/Public construction building)	2	CO4

Note : Out of above suggestive LLOs -

- '*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Micro project

- Prepare a report on different forms of inventory storage along with your interpretation.
- Collect the information about latest safety measures adopted at construction project.
- Collect information and prepare a report on any one top construction companies in India.
- Compare any 3 construction management software.
- Use any one free open ware software to collect information about modern techniques of material management like JIT/SAP/ERP/MSP/MSEXCEL/Primavera.
- Collect information and prepare a report on various construction equipments used in construction industry.
- Use any one free open ware software of Construction Management to prepare the scheduling of a project.
- Use any one free open ware software of Construction Management to determine the critical path for the given construction project.
- Interpret the network figures used in given civil engineering projects.

Assignment

- • Prepare a brief report on overview of Construction Professional Practice in India
- Solve the numerical on bar chart, CPM and cost optimization for the given data.
- Collect and interpret various store forms from PWD, WRD, MJP.
- Download the labour laws documents from internet and write a brief summary on it.
- Learn material management module from free open ware website.
- Visit to a Site to study the construction technique and use of major construction equipment.
- Student should watch any 3 learning website link given in XIII learning websites & portal and prepare a brief report on it.
- Prepare a brief report on role of construction industry in national development.
- Compile minimum 10 safety slogans displayed at various sites with sources and write a brief summary on it.
- Prepare project cost analysis for small construction project.
- Collect & interpret bar chart/CPM network for existing construction project.

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Free Open ware software-1. Just-In-Time (JIT), 2. System Application & Product in data processing (SAP), 3. Microsoft Project (MSP)4. Microsoft Excel (MS Excel)5. Primavera6. Enterprise Resource Planning (ERP)	2,3

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Project Initiation and its feasibility	CO1	6	0	0	0	0
2	II	Project Management and Scheduling	CO2	5	0	0	0	0
3	III	Material Management	CO3	2	0	0	0	0
4	IV	Safety and labour laws in construction	CO4	2	0	0	0	0
Grand Total				**15**	**0**	**0**	**0**	**0**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Term work, Self Learning Assessment (Assignment & Microproject). Note:Each Practical will be assessed considering-60% weightage to process related and 40 % weightage to product related

Summative Assessment (Assessment of Learning)

XI. SUGGESTED COS - POS MATRIX FORM

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Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	2	1	2	2	2	2			
CO2	3	3	1	2	2	2	2			
CO3	3	3	1	2	1	2	2			
CO4	2	1	2	2	2	2	2			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	S.C. Sharma, S.V. Deodhar	Construction Engineering and Management	Khanna Book Publishing Co (P) Ltd. ISBN 9789386173980
2	IGNOU	Project Management	Indira Gandhi National Open University(eKumbh-AICTE)
3	K. K. Chitkara	Construction Project Management-Planning, Scheduling & Controlling	McGraw Hill Education ISBN-10 0070680752, ISBN-13 978-0070680753
4	L. S. Srinath	PERT And CPM Principles And Applications	East-West Press (Pvt.) Ltd. ISBN-10 8185336202 ISBN-13 978-8185336206
5	Jack Gido, Jim Clements, Rose Baker	Successful Project Management	Cengage Publication ISBN: 9781337363853

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://archive.nptel.ac.in/courses/105/103/105103206/	Construction Method and Equipment Management
2	https://www.youtube.com/watch?v=Cx7i2wXB0kA&list=PLWnoy5z_3BObBvFtBlowxM05D-q0VAWEs&index=16	Project Scheduling
3	https://www.youtube.com/watch?v=j6VIllXT0Vs&list=PLWnoy5z_3BObBvFtBlowxM05D-q0VAWEs&index=22	Accidents in Construction Industry
4	https://www.youtube.com/watch?v=EVsi1QamfU0&list=PLWnoy5z_3BObBvFtBlowxM05D-q0VAWEs&index=26	Safety Organization and Safety Officer

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Sr.No	Link / Portal	Description
5	https://www.youtube.com/watch?v=QoXvRBrFWyI&list=PLWnoy5z_3BObBvFtBlowxM05D-q0VAWEs&index=25	Implications of Construction Accidents
6	https://archive.nptel.ac.in/courses/105/104/105104161/	Introduction to planning and scheduling, resource levelling and allocation,crashing of networks
7	http://www.cidc.in/	Construction Industry Development Council (CIDC)
8	https://onlinecourses.nptel.ac.in/noc22_ce39/preview	Safety in Construction Industry
9	https://www.youtube.com/watch?v=Tm2HhqMu5Jg	PERT and CPM
10	https://www.youtube.com/watch?v=GAGoqqZSPh4&list=PLWnoy5z_3BObBvFtBlowxM05D-q0VAWEs&index=3	Overview of steps in execution of a project
11	https://www.youtube.com/watch?v=kuCHsNXeNMc&list=PLWnoy5z_3BObBvFtBlowxM05D-q0VAWEs&index=5	Resource Management in Construction Projects
12	https://www.youtube.com/watch?v=Bh_LYZh3KH4&list=PLWnoy5z_3BObBvFtBlowxM05D-q0VAWEs&index=21	Introduction to construction safety

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students