

Program Name : Civil Engineering Program Group
Program Code : CE/CR/CS
Semester : Sixth
Course Title : Contracts and Accounts
Course Code : 22601

1. RATIONALE

For infrastructure development various construction projects are required to be undertaken. These projects are to be executed by entering into a legal contract. The diploma student shall have adequate knowledge of different types of contract and accounting procedures of organization about the projects are to be executed by entering in to legal contract. The procedure of execution of work by various organizations will be useful while working as an engineer in organization to execute various works. Concept of Tender and knowledge about preparation of tender documents, writing specification for different items of work will be helpful to prepare actual Tender papers and contract documents which are required before execution of construction. The information on procedures and different types of forms used by department will be useful to prepare bills and different modes of payment to contractors. This Course will help the student in implementing actual field practices, which will make student further more competent in the execution of civil engineering works.

2. COMPETENCY

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

- Prepare tender documents for civil engineering 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:

- Execute the method of PWD for initiating the works.
- Execute the contract for civil engineering works.
- Prepare the tender documents for civil engineering work.
- Use the relevant type of form used in PWD to pay the bill of the executed work
- Prepare the detailed specification for various items of construction.
- Justify the rent fixation of civil structures.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme												
L	T	P		Theory						Practical						
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
			Max		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	5	3	70	28	30*	00	100	40	25@	10	25	10	50	20

(*): Under the theory PA; Out of 30 marks, 10 marks of theory PA 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 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.

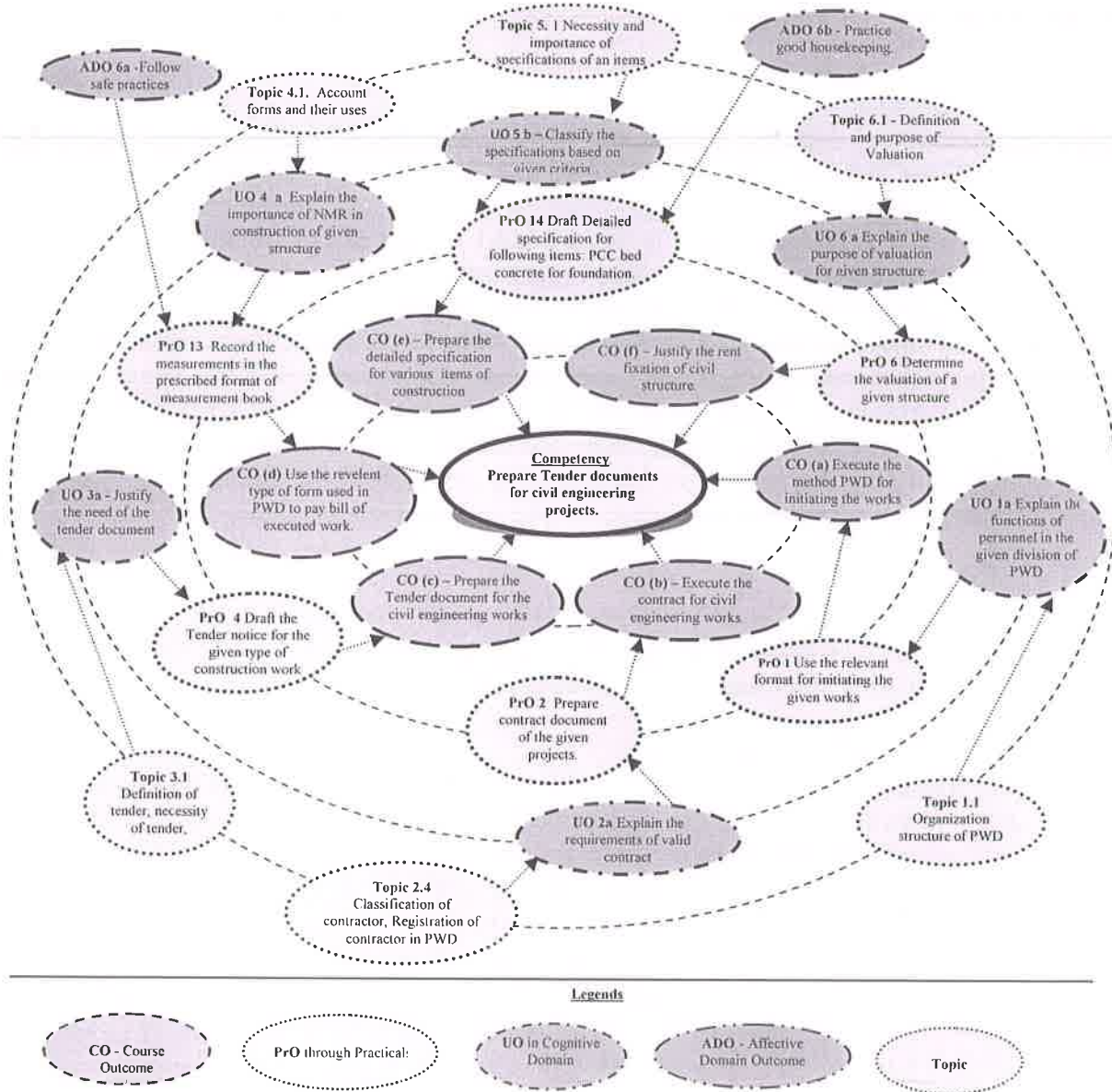
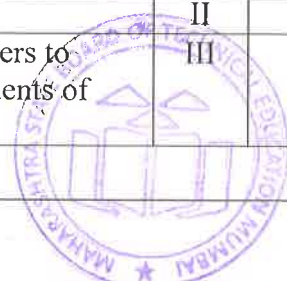


Figure 1 - Course Map

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	Use the relevant format for initiating the given works	I	02*
2	Prepare contract documents of the given project.	II	02*
3	Examine any five tender notices published in news papers to write your comments with reference to various constituents of tender notice.	III	02*



S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
4	Draft the Tender notice for the given type of construction work.	III	02*
5	Draft the Tender notice for the given type of construction work to be executed by adopting the process of E-tendering.	III	02*
6	Interpret the given set of tender document to comment on the components reflected in it.	III	02*
7	Interpret the conditions and data furnished for E-tendering of the given project.	III	02*
8	Prepare a power point presentation on the topic, " E-Tendering and its Evaluation"	III	02
9	Prepare Tender document for the given civil engineering structure in a group of five students on the basis of detailed estimate provided/collected by teacher/student.(Part 1)	III	02*
10	Prepare Tender document for the given civil engineering structure in a group of five students on the basis of detailed estimate provided/collected by teacher/student.(Part 2)	III	02
11	Prepare Tender document for the given civil engineering structure in a group of five students on the basis of detailed estimate provided/collected by teacher/student.(Part 3)	III	02
12	Interpret the given case study on, 'Contract litigation resolution through arbitration' and submit your comments.	III	02
13	Record the measurements in the prescribed format of measurement book for the given items of works with abstract, completion certificate for payment.	IV	02*
14	Draft Detailed specification for following items – a) P.C.C. bed concrete for foundation b) U.C.R.masonry in foundation and plinth c) Burnt brick masonry in CM in superstructure. d) RCC work M20 grade. e) Internal plaster in CM .	V	02*
15	Draft Detailed specification for one item from each of the following system : a) Irrigation Engineering. b) Transportation engineering. c) P. H. Engineering.	V	02
16	Determine the valuation of a given structure and submits the valuation report in prescribed formats	VI	02*
17	Determine the monthly rent of the given building/quarter as per PWD method/norms.	VI	02*
Total			34

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 judicious 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:
- iii.



S. No.	Performance Indicators	Weightage in %
1	Collection of data.	30
2	Analysis of data	20
3	Preparation of report.	30
4	Answer to sample questions	10
5	Submit report in time	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) Practice good housekeeping.
- 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

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by administrators.

S. No.	Equipment Name with Broad Specifications	PrO S. No.
1.1	Computer systems with internet connection	02,06,07,08,13

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 PWD Procedure to execute the work	1a. Explain the functions of personnel in the given division of PWD. 1b. Explain the procedure adopted by the given government department for the construction of the given civil work. 1c. Explain the specified method used in PWD to carry out the given work. 1d. Select the relevant method of	1.1 Organization structure of Public Works Department (PWD). 1.2 Functions of their personnel, Financial powers if any. 1.3 PWD Procedure of initiating the work 1.4 Administrative approval, Technical sanction, budget provision, Expenditure sanction. 1.5 Methods used in PWD for carrying out works- contract method, departmental method -rate list method, piece work method, day's work method, employing

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	contracting for the given type of work with justification.	labours on daily wages basis.
Unit -II Contracts	2a. Explain the requirements of valid contract in the given situation. 2b. Classify the civil engineering Contracts based on the given criteria. 2c. Select the type of contract for the given type of work with justification. 2d. Outline the Registration process of contractor in Public Works Department (PWD) in the given type of division office. 2e. Justify the importance of Built operate transfer (BOT) contract in the given situation. 2f. Explain the provisions of FIDIC contract relevant to the given situation.	2.1 Definition of contract, Objects of contract, requirements of valid contract, Overview of Indian Contract Act 1872. 2.2 Types of engineering contract with advantages , disadvantages and their suitabilities- Lump sum contract, item rate contract, percentage rate contract, cost plus percentage, cost plus fixed fee, cost plus variable percentage and cost plus variable fee contract, labour contract, demolition contract, target contract, negotiated contract, All in contract, Engineering Procurement Construction Contract (EPC), Annuity Contract. 2.3 Introduction of FIDIC Conditions of contract. 2.4 Classification of contractor on basis of financial limits, Requirement of documents for registration of contractor in Public Works Department (PWD). 2.5 Built operate transfer (BOT) Project: Objectives, scope, advantages, Disadvantages, Nature of agreement, mode of payment, examples.
Unit-III Tender and Tender Documents	3a. Justify the need of the tender document for the given situation. 3b. Draft tender notice for the given type of work. 3c. Explain the relevant provision of contract in the given situation as per Contract act 1872. 3d. Justify the provision of liability period in tender document of the given work. 3e. Explain the process of arbitration used in the given case of dispute. 3f. Justify the necessity of E-Tendering system for the given type of civil work.	3.1 Definition of tender, necessity of tender, Types of tender-local, Global, open Limited and negotiated tender 3.2 Notice to invite Tender (NIT)- Points to be included while drafting tender notice, Drafting of tender notice. 3.3 Meaning of terms: - Earnest money Deposit (EMD), Security deposit, Additional Performance Security Deposit, Validity period, right to reject one or all tenders, corrigendum to tender notice and its necessity. 3.4 Tender documents – Index, tender notice, general instructions, special instructions, schedule A, Schedule B, schedule C, Terms related to tender documents – contract conditions- time limit, time extension, penalty, defective material and workmanship, termination of contract, suspension of work, subletting of contract, extra items, , price variation clause(escalation), defect liability Period, liquidated and un-liquidated Damages. 3.5 Arbitration- Meaning, Qualification of

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
		<p>an arbitrator, appointment, Causes and Settlement of disputes, Powers and duties of Arbitrator, Award of result.</p> <p>3.6 Procedure of submitting filled tender Document (Two envelope system), procedure of opening tender, comparative statement, scrutiny of tenders ,award of contract, acceptance letter and work order.</p> <p>3.7 E -Tendering System – Online procedure of Submission of Tender in PWD.</p> <p>3.8 Unbalanced tender, ring formation.</p>
Unit –IV Accounts in PWD	<p>4a. Explain the importance of Nominal Muster Role (NMR) in the construction of the given structure.</p> <p>4b. Record the measurements in the measurement book for the given items of works for payment.</p> <p>4c. Explain the specified terms used in interim payment of the given civil work.</p> <p>4d. Select the criteria for granting advances to the Contractor in the given situation with justification.</p> <p>4e. Select the relevant bill form in the given situation with justification.</p>	<p>4.1 Various account forms and their uses – Measurement Books, E- Measurement book(E-MB) ,Nominal Muster Roll(NMR), imprest Cash, Indent, Invoice, Bill, Vouchers, Hand receipt Cash Book, Temporary Advance. Heads of Accounts.</p> <p>4.2 Mode of Payment to the contractor and its necessity -Interim Payment, Advance Payment, Secured Advance, Petty advance, Mobilization advance, First And Final, Final bill, Running account bill ,Retention money, Reduced rate payment, E- Payment.</p>
Unit –V Specifications	<p>5a. Draft the specifications for the given type of an item.</p> <p>5b. Classify the specifications based on the given criteria.</p> <p>5c. Propose the specifications for the construction of the given item of work.</p> <p>5d. Formulate the detailed specifications for the given item of irrigation work.</p> <p>5e. Draft a detailed specification for a given items of transportation engineering work.</p>	<p>5.1 Necessity and importance of specifications of an items, points to be observed in framing specifications of an item,</p> <p>5.2 Types of specification - Brief and Detailed, Standard and Manufacturers Specification.</p> <p>5.3 Preparing Detailed Specifications of items in civil engineering works from each of following- Building construction, Irrigation Engineering ,Transportation Engineering , Public health Engineering</p>
Unit –VI Valuations	<p>6a. Explain the purpose of valuation of the given structure in the given situation.</p> <p>6b. Classify the value of the given structure based on the given</p>	<p>6.1 Definition and purpose of Valuation, role of valuer. Define - Cost, Price and Value, Characteristics of Value, Factors Affecting Value.</p> <p>6.2 Types of Value - Book Value, Scrap Value, Salvage Value, Speculative Value,</p>

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	criteria. 6c. Calculate depreciation of the given structure using relevant method for the given data. 6d. Classify the term, 'outgoings' in the given situation. 6e. Calculate monthly rent of the given building from the given data as per PWD norms.	Distress Value, Market Value, monopoly Value, Sentimental Value. Factors affecting value. 6.3 Depreciation, Obsolescence, Sinking Fund. Methods of Calculation of Depreciation – Straight Line Method, Sinking Fund Method, Constant Percentage Method. 6.4 Computation of capitalized value, Gross income, Outgoings, Net Income, Year Purchase, Types of outgoings. 6.5 Fixation of rent as per PWD Practice. 6.6 Lease – types of lease, lease hold property and free hold property, Mortgage – Mortgage deed, precautions to be taken while making mortgage.

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

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	PWD Procedure to execute the work	04	-	04	04	08
II	Contracts	12	02,02	04	04	12
III	Tender and Tender Documents	12	02	06	04,04	16
IV	Accounts in PWD	04	02	08	-	10
V	Specification	06	04	-	06	10
VI	Valuations	10	02	06	06	14
Total		48	14	28	28	70

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

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

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:

- Prepare journals based on practical performed in laboratory.
- Give seminar on relevant topic.
- Undertake micro-projects.
- Write a brief summary on procedure of opening of tenders.
- Write a brief summary on procedure of filling online tender.



- f) Preparing report on BOT type contract works executed at nearby location.
- g) Preparing report on procedure of registration as a contractor in different organizations.
- h) Preparing report on procedure of Indent and Invoice at the site.
- i) Preparing report on GST procedure in construction project.

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) Procure various materials required for practical exercises.
- g) Arrange visit to nearby industries and workshops for understanding various construction materials.
- h) 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.
- i) Use different instructional strategies in classroom teaching.
- j) Collect different samples of various construction materials like Stone, aggregate of different sizes, timber, lime, bitumen, Bricks, tiles, precast concrete products, Water proofing material, Termite proofing material, Thermal insulating material, plaster of Paris, paints, distemper, and varnishes.
- k) Display various technical brochures of recent building materials.
- l) Visit the PWD office to demonstrate the procedure adopted for the payment of the work to the contractor and present the report on PWD Account forms with details of measurement book (M.B.), cash book, indent, RA bill, first and final bill, and final bill.

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

- a) Compare the tender documents of three different organizations.



- b) Refer different websites related E- tendering and prepare report on it.
- c) Draft detailed specification for different items of work other than PWD.
- d) Prepare the report on online bids/auction through internet.
- e) Prepare valuation report of any residential.
- f) Collect relevant information about the software used in preparation of tender documents and write report on it.
- g) Visit to ongoing project and study various aspects related to contracts and tender document.
- h) Visit to ongoing project and study various aspects related to accounting process (MB, RA bill, various advances).

13. SUGGESTED LEARNING RESOURCES :

S. No.	Title of Book	Author	Publication
1	Estimating and Costing in Civil engineering	Datta, B.N.	UBS Publishers Pvt. Ltd. New Delhi. ISBN:9788174767295
2	Construction Management and Contract Practices	Raina, V. K.	Shroff Publishers & Distributers Pvt. Ltd. New Delhi ISBN: 9788184047875,
3	Estimating and Costing	Rangawala, S.C.	Charotar Publishing House PVT. LTD., Anand (Gujrat) Reprint -2011
4	Estimating and Costing	Birdie,G.S.	Dhanpat Rai. New Delhi 2016 ISBN : 978-93-84378-13-4
5	Civil Engineering Contracts and Estimates	Patil, B.S.	Orient Longman, Mumbai, Ed.2010 ISBN: 9788173715594, 8173715599
6	Estimating and costing, specification and valuation in civil engineering	Chakraborti, M.	Monojit Chakraborti, Kolkata ISBN: 818530436.

14. SOFTWARE/LEARNING WEBSITES

- a) www.mahapwd.com
- b) <https://mahatenders.gov.in>
- c) http://cpwd.gov.in/cpwde_tender.aspx
- d) <https://gem.gov.in>



