GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)
Semester-IV

Course Title: Estimating, Costing & Valuation
(Course Code: 4340603)

Diploma programme in which this course is offered	Semester in which offered
Civil Engineering	4th Semester

1. RATIONALE

Construction industry projects are typically cost intensive. Specifications of the construction items greatly influence the project cost. Further, construction equipment hire charges wherever applicable and labour costs also play a significant role in cost estimation of construction projects. Hence, accurate calculation of quantities of works, proper framing of specifications becomes even more important.

Likewise resale of properties holds a significant market in Real estate industry. Real estate prices historically have always followed an upward trajectory. Predicting the market value of pre-existing property especially in a volatile market is very difficult. Knowledge of valuation and factors affecting valuation of property becomes handy in dealing in pre-existing construction projects. Further there is a large scope of personnel with expertise in valuation in today's times especially from banking credit finance point of view.

Lastly, in recent times, green building concept is need of the times and in trend too. For a diploma civil engineer, basic knowledge of costs of green building related construction items will be very useful.This course provides the necessary knowledge and skills in developing the competency in the areas mentioned above in professional manner.

2. COMPETENCY

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

- **Prepare the quantities, cost estimate and rate analysis of civil engineering works.**
- **Illustrate factors affecting valuation of property.**

3. COURSE OUTCOMES (COs)

The practical exercises, the underpinning knowledge and the relevant soft skills associated with this competency are to be developed in the student to display the following COs:

a) Select the modes of measurements for different items of works.
b) Prepare detailed estimate of a civil engineering works.
c) Justify the rate for given items of work using rate analysis techniques.
d) Illustrate the factors affecting the value of property and rent fixation.
e) Prepare rate analysis of construction items involving green building materials.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T/2+P/2)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	CA	ESE	CA	ESE	
3	-	4	5	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 PRACTICAL EXERCISES

The following practical outcomes (PrOs) are thesub-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'*.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Prepare the check list of items to be executed with units for detailed estimate of the given structure from the given drawing.	I	2
2	Prepare a comparative report on market rates and rates as per SOR (forbasic materials, labour wages, hire charges of tools & equipment. At least 10 items of each.)	IV	2*
3	List of various items to be provided to learn the modes of measurements according to prevailing IS	I	2*
4	Draft detailed Specification for any eight construction items.	II	4*
5	Estimate in detail for load bearing single floor residential building	III	8*
6	Estimate in detail for RCC beam	III	4*
7	Estimate in detail for RCC column	III	4*
8	Estimate in detail for RCC footing	III	4*
9	Estimate in detail for RCC lintel with weather shed	III	4*
10	Estimate in detail for RCC retaining wall	III	4*
11	Estimate in detail for RCC culverts	III	4
12	Estimate in detail for earthwork for road works using all four methods.	III	6*
13	Calculate the reinforcement quantities from the given set of drawings for a room size of 3 m X 4 m with bar bending schedule (footing, column, beam, lintel with weather shed , slab)	III	2*
14	Prepare the rate analysis for any five construction items.	IV	4*
15	Solve at least 10 examples related to various form of value, depreciation, loan amount, annual rent, capitalized value, year purchase, etc.	V	4*
16	Use the MS excel to prepare detailed estimate of a Septic Tank	III	2

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
	well.		
	Total		**56**

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 5 to 12	
1	Calculation of quantities	40
2	Preparing measurement sheet	30
3	Preparing Abstract sheet	10
4	Submission of report in time	10
5	Neatness in work and drawings	10
	Total	**100**

S. No.	Sample Performance Indicators for the PrOs	Weightage in %
	For PrOs1 to 4 and 13 to 15	
1	Initiative of work allotted	10
2	Neatness in work	10
3	Answer the question related to exercises	30
4	Followed formula and methods sequentially	30
5	Timely completion and submission of given work	10
6	Attendance & Punctuality	10
	Total	**100**

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

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

S. No.	Equipment Name with Broad Specifications	PrO.No.
1	Computer system (An computer system with basic configuration)	16

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 fulfil the development of this competency.

a) Work as a leader/a team member.
b) Follow ethical practices.
c) Practice environmental friendly methods and processes. (Environment related)

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 isformulatedashigher 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 (UOs) (4 to 6 UOs at Application and above level)	Topics and Sub-topics
Unit – I Basics of Estimating & Costing	1a. Describe the terminologies related to estimating and costing; types of estimates. 1b. Illustrate the role of estimator. 1c.Select the mode ofmeasurements for givenitems of work as per IS code 1d. Apply the rules of deduction as per IS code for calculating the quantities of a structure.	1.1. Estimating and Costing — definition, purpose and related terminologies like: provisional sum, prime cost, spots item, day work, administrative approval and technical sanction of civil works, etc. 1.2. Types of estimates -Approximate estimate and detailed estimate. 1.3. Roles and responsibility of Estimator. 1.4. Modes of measurement, measurement units, Rules for deduction in Masonry work, Plastering and Pointing and Painting work of different items of work as per IS code.
Unit – II Specifications of civil engineering works	2a.Describe the Importance, types and principles of specifications 2b. Write detail specifications of basic constructions items	2.1. Importance of specifications 2.2. Types of specification 2.3. Principle of writing specification 2.4. Detailed specifications of different construction items: Excavation, cement concrete, Brick masonary, R.C.C. Work, Plastering Work, Painting, Flooring etc.
Unit– III Detailed Estimate of	3a. State the various methods of detailed estimation 3b. Prepare Bar bending schedule	3.1. Methods of detailed estimation: Individual wall method (Long wall-short wall), centre-line method

Unit	Unit Outcomes (UOs) (4 to 6 UOs at Application and above level)	Topics and Sub-topics
civil engineering works	3c. Prepare estimate of quantities for different civil construction works using different methods of estimation. 3d. Prepare abstract of estimated cost. 3e. Calculate the earthwork quantity for the given civil engineering works	3.2. Steel requirement for footing, column, beam, Lintel, weather shade and slab 3.3. Bar bending schedule 3.4. Detailed estimation of a. Two rooms b. RCC footings, Column, beams, slab, lintel with weather shade c. RCC retaining wall and culvert 3.5. Estimate of earthwork quantities for roads/canal by: a. Mid-sectional area method b. Mean sectional area method c. Prismoidal method d. Trapezoidal method
Unit– IV Rate Analysis	4a. Explain Basic terminologies related to rate analysis. 4b. State the factors affecting task work 4c. Describe importance and use of SOR. 4d. Prepare the rate analysis of various types of work 4e. Select suitable type of construction item based on their rate analysis comparison.	4.1. Rate Analysis: Definition, purpose, importance and factors affecting. 4.2. Lead (Standard and Extra), lift, overhead charges, water charges and contractor's profit 4.3. Task work- Definition, factors affecting, types. Task work of different skilled labours for different items. 4.4. Importance and use Schedule of Rates (SOR) 4.5. Categories of labours, their daily wages as per SOR, types and number of labours for different items of work 4.6. Preparing rate analysis of different items of work-Earth work in excavation, PCC,RCC work in (column, beam, lintel, slab), brick masonry, Vitrified tile flooring, plastering, pointing, white washing, painting with stiff paint
Unit– V Valuation	5a. Differentiate between cost, price and value 5b. Differentiate between depreciation and obsolescence 5c. Describe different forms of value 5d. Illustrate the factors affecting	5.1 Cost, Price and Value 5.2 Types of property and Objects of valuation 5.3 Depreciation and Obsolescence 5.4 Different forms of Value 5.5 Valuation tables and Valuation methods for property and land

Unit	Unit Outcomes (UOs) (4 to 6 UOs at Application and above level)	Topics and Sub-topics
	the value of property. 5e. Calculate rents forthe property using different methods.	5.6 Types of rents and fixing standard rents 5.7 Numerical of valuation and rent fixation
Unit– VI Rate analysis of Green-Building items	6a. Describe green building concept 6b. Select appropriate green building material for apt item. 6c. Prepare rate analysis of construction items involving green building materials	6.1. Green building concept 6.2. Green building material 6.3. Use of Green building material in Construction items 6.4. Rate analysis of following items using green building material: a. Plain cement concrete using fly ash b. Distempering with 1st quality Acrylic distemper having low VOC(Volatile Organic Compounds) c. Brick work with clay fly ash bricks d. Fly ash as filling material e. Thermal insulation of roofing with exposed polystyrene

***Note**:TheUOs 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 FOR QUESTIONPAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A	Total Marks
I	Basics of Estimating & costing	4	4	3	-	7
II	Specifications of civil engineering works	6	2	2	3	7
III	Detailed Estimateof civil engineering works	16	4	3	21	28
IV	Rate Analysis of civil engineering works	6	-	3	4	7
V	Valuation	8	2	4	8	14
VI	**Rate analysis of Green-Building items**	2	4	3	-	7
Total		**42**	**16**	**18**	**36**	**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 theUOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may varyslightly 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:

a) Prepare seminar on relevant topic
b) Collect current DSR from PWD and prepare report on it.
c) Undertake micro 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) 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
g) Expert lecture by practicing valuer on Valuation techniques, methods and criteria of any property.
h) Expert lecture on latest software for Estimating and costing

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. This has to match the competency and the COs. Similar micro-projects could be added by the concerned course teacher:

a) Prepare detailed estimate of any load bearing structure using available software.
b) Prepare cost estimate for dismantling of plaster, flooring, walls and doors and windows ofone room load bearing structure using latest SOR
c) Prepare estimate for Renovation of an existing building (any five items).
d) Prepare cost estimate for waterproofing of given size existing bathroom using any one prevalent material and methods of water proofing.
e) Prepare the report on the salient provisions made in IS:1200 with special reference to load bearing structure.
f) Prepare valuation report of own/any house as per prevalent jantri.
g) Prepare detailed estimate of W.B.M.Road of one kilometre length from the given drawing
h) Prepare detailed estimate of C.C. Road of one kilometre length from the given drawing

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Estimating and Costing in Civil Engg.	B.N.Dutta	UBS Publishers Distributor Pvt. Ltd. New Delhi ISBN:9788174767295
2	Estimating and Costing in Civil Engg.	S.C.Rangwala	Charotar Publishing House PVT. LTD., Anand (Gujrat) Pin 388001 ISBN: 9789385039058
3	Estimating and Costing	G.S.Birdie	DhanpatRai Publishing Company(P) Ltd.NewDelhi-110002 ISBN : 9789384378134
4	Estimating and costing, specification andvaluation in civilengineering	M. Chakraborti	MonojitChakraborti, Kolkata (2006) ISBN-10: 818530436X ISBN-13: 9788185304366
5	Civil Engineering Contracts and Estimates	B.S.Patil	Orient Longman, Mumbai, Ed.2010 ISBN: 9788173715594, 8173715599
6	Estimating and Costing	Prof. V.N. Vazirani and Prof. S.P. Chandola	Khanna Publishers ISBN-10 : 8174091270 ISBN-13 : 978-8174091277
7	CPWD SOR (2012)	CPWD	Published under the Authority of Director General, CPWD, New Delhi

14. SOFTWARE/LEARNING WEBSITES

a) www.ensoftindia.com
b) www.newtonindia.com
c) www.estimator.com

d) www.cpwd.gov.in › Publication

15. PO-COMPETENCY-CO MAPPING

Semester IV	ESTIMATING, COSTING & VALUATION(Course Code: .....)									
	POs and PSOs									
Competency & Course Outcomes	**PO 1** Basic & Discipline specific knowledge	**PO 2** Problem Analysis	**PO 3** Design/ development of solutions	**PO 4** Engineering Tools, Experimentation &Testing	**PO 5** Engineering practices for society, sustainability & environment	**PO 6** Project Management	**PO 7** Life-long learning	**PSO 1**	**PSO 2**	**PSO 3** (If needed)
Competency	• *Prepare the quantities, cost estimate and rate analysis of civil engineering works.* • *Illustrate factors affecting valuation of property.*									
Course Outcomes CO a) Select the modes of measurements for different items of works.	3	-	-	-	-	-	-	-	-	-
CO b) Prepare detailed estimate of a civil engineering works.	2	3	3	1	2	3	2	3	2	-
CO c) Justify the rate for given items of work using rate analysis techniques.	1	1	2	2	2	1	1	1	2	-
CO d) Illustrate the factors affecting the value of property and rent fixation	2	3	2	-	1	-	2	3	2	-
CO e) Prepare rate analysis of construction items involving green building materials	1	1	2	2	3	1	1	1	2	-

Legend: '**3'** for high, '**2**' for medium, **'1'** for low or **'-'** for the relevant correlation of each competency, CO, with PO/ PSO

17. COURSE CURRICULUM DEVELOPMENT COMMITTEE

GTU Resource Persons

S. No.	Name and Designation	Institute	Contact No.	Email
1	Dr. A.K. Patel	G.P. Ahmedabad	079-26301285	ashutech.asp@gmail.com
2	Shri M.L. Patel	G.P. Himatnagar	02772-229285	mlpatel504@gmail.com
3	Smt. M.A. Milisia	G.P. Kheda	9558066245	margee.milisia@gmail.com
4	Shri K.P. Jasodani	G.P. Himatnagar	02772-229285	jasodani_kamalkumar1@gtu.edu.in
5				