

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

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

Semester-IV

Course Title: Estimating, Costing and Engineering Contracting

(Course Code: 4341901)

Diploma programmer in which this course is offered	Semester in which offered
Mechanical Engineering	4 th Semester

1. RATIONALE

This course is designed to develop the ability in the students to evaluate materials, consumables and process costs in the monetary units. Hence, it will help to increase the productivity of the organization and conservation of valuable resources. This course will also help in developing the skills required in the process of decision making and to plan, use, monitor and control resources optimally and economically. This will also be helpful in budgeting and contracting.

2. COMPETENCY

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

3. COURSE OUTCOMES (COs)

CO-1	Understand the concept of estimation, costing and depreciation.
CO-2	Apply break even analysis to get optimum production level.
CO-3	Estimate cost for various conventional manufacturing processes.
CO-4	Estimate the cost of special process plant.
CO-5	Prepare budgets and engineering contracts related to mechanical domain.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P/2)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	CA	ESE	CA	ESE	
2	0	0	2	30	70	00	00	100

(*): 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: N.A.

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED: N.A.

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 course

competency.

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

8. UNDERPINNING THEORY

The major underpinning theory is given below based on the higher level UOs of *Revised Bloom's taxonomy* that are formulated for development of the COs and competency. If required, more such UOs could be included by the course teacher to focus on attainment of COs and competency.

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
Unit – I Introduction	1a. Explain terminology and importance of ECC in industries. 1b. Explain the methods of costing 1c. Calculate elements of cost 1d. Find depreciation	1. Introduction of Estimation, Costing and contracting and their importance in industries. 2. Methods of costing (Explain actual examples for these methods) A. Specific order costing <ul style="list-style-type: none"> - Job costing - Contract costing - Batch costing B. Continuous operation costing <ul style="list-style-type: none"> - Process costing - Service costing - Operation costing - Unit costing 3. Calculation of catalogue price, selling price and various over heads (Only numerical). 4. Depreciation methods (1) Straight line method (2) Sinking fund method (Only numerical)
Unit – II Break even analysis	2a. Construct break even chart and find various parameters. 2b. Determine break even quantity for given data	1. Calculation of Break-even Quantity analytically and graphically (Only real time examples). 2. Safety Margin and it's importance. 3. Assumptions and Limitations of BEA.
Unit - III Costing in forging and casting	3a. Estimate material cost 3b. Estimate cost for a forging component 3c. Estimate cost for a casting component	1. Calculate volume of shapes of various combinations of cylinder, square, prism and sphere. 2. Calculate mass and material cost of given component (shape of component should be combination of above basic shapes like I-section, T-section, L-section, etc.). 3. List and calculate various forging losses for given data. 4. Estimate forging cost (for given data) 5. Estimate pattern making cost (for given data) 6. For a given component, Estimate casting

		cost including all losses.
Unit – IV Costing in Fabrication shop	4a. Estimate material and welding cost for a given component 4b. Estimate sheet metal work cost	1. Estimation of fabrication cost of real time object like safety grill (e.g. windows, doors, etc.), gate, various shades, etc. (Sizes are given) 2. Estimate Solar Roof Top costing for various capacities. It includes, cost of welding, framing, solar panel, labour, taxes, subsidies, etc. 3. Estimate ONLY material cost in sheet metal work for various jobs. (Concept of development of solid surfaces to be used. Consider regular shapes like cylinder and prism only) (ONLY numerical to be covered in this chapter)
Unit – V Costing in Production shop	5a. Calculate machining cost in lathe, drilling, milling, shaping and grinding machines	1. Calculate cost of various lathe operations like turning, facing, knurling etc. 2. Calculate cost of various drilling operations like drilling, boring, reaming, etc. 3. Calculate cost of shaping, grinding and milling operations. (ONLY numerical to be covered in this chapter)
Unit – VI Costing of various processes	6a. Identify various elements to estimate the process cost 6b. Estimate the cost of various processes	1. Estimate the cost of furniture work for given data. 2. Calculate running cost of power plant. 3. Calculate running cost of refrigerator, air conditioners, lift, cold storage, DG set, etc. (ONLY numerical to be covered in this chapter)
Unit VII Budget and Contracting	4a. Explain various Terminologies of budget. 4b. Prepare simple budget. 4c. Interpret parameters of given budget. 4d. Explain various terminologies of Contracting 4e. Prepare contract document 4f. Interpret given contract terms and conditions. 4g. Prepare data for tendering	1. Define budget. Objectives and advantages of budget. 2. Explain industrial budget with actual example. 3. Discuss Rail budget, Financial budget of State/country. 4. Budgetary control and it's advantages. 5. Explain actual contracts. e.g. Housekeeping contract, Labour contract, Security contract, Annual Maintenance contract like CCTV, Lift, Diesel Generator set, water purifier, vehicle, computer system, etc. 6. Explain Tendering process and E-tendering

	process.	with real time example. 7. Explain about GeM (Government E Market). How to become seller or buyer on GeM.
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9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory marks			
			R Level	U Level	A Level	Marks
1	Introduction	4	4	6	0	10
2	Break even analysis	3	0	4	4	8
3	Costing in forging and casting	5	0	6	6	12
4	Costing in Fabrication shop	5	4	2	6	12
5	Costing in Production shop	5	2	4	6	12
6	Costing of various processes	3	0	2	6	8
7	Budget and Contracting	3	4	0	4	8
	Total	28	14	24	32	70

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

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom 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 perform following activities in group and prepare reports of about 5 pages for each activity. They should also collect/record physical evidences for their (student's) portfolio which may be useful for their placement interviews:

- Do market survey and find prevailing hourly rates of CNC, Hacksaw cutter, lathe, milling, drilling, grinding and shaping machines and price of these machines.
- Do market survey and find prevailing hourly rates of renting diesel generating sets. Specify output (HP or kW).
- Do market survey and find prevailing rates of commonly used engineering materials like MS, brass, copper, stainless steel, Aluminum, etc.
- Calculate cutting fluid cost. e.g. cost of lubricating oil, coolant, packaging oil, etc.
- Calculate cutting tool cost. e.g. cost of drill, tips, carbide cutter, reamer, honing stick, etc.
- Do market survey and find prevailing rates of boiler, furnace, condenser, evaporator etc.

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:

- Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- Guide student(s) in undertaking micro-projects.
- 'L' in section No. 4** means different types of teaching methods that are to be employed by teachers to develop the outcomes.
- 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.
- With respect to **section No.10**, teachers need to ensure to create opportunities and

provisions for **co-curricular activities**.

12. SUGGESTED MICRO-PROJECTS:

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 duration of the micro project should be about **14-16 (fourteen to sixteen) student engagement hours** during the course. The students ought to submit micro-project by the end of the semester to develop the industry-oriented COs.

13. SUGGESTED LEARNING RESOURCES

Sr.	Title of Book	Author	Publication with place, year & ISBN
1	Mechanical estimating and costing	Banga and Sharma	Khanna Publishers. New Delhi.
2	Learning package in ECC	NITTTR, Bhopal	NITTTR, Bhopal
3	Mechanical estimating and costing	Shrimali and Jain	Khanna Publishers, New Delhi.

14. SOFTWARE/LEARNING WEBSITES

Refer following links to learn this subject in Gujarati Language.

- <https://www.youtube.com/c/MechanicalEnggSubjectsGTU>
- <https://youtu.be/7F1n5OqnK4I>
- <https://youtu.be/btrxpqk4F-Q>
- https://youtu.be/aTnDZF_C-XM
- <https://youtu.be/hnfhU3iYb4>

15. PO-COMPETENCY-CO MAPPING

Semester IV		Estimating, Costing and Engineering Contracting (Course Code: 4341901) POs						
Competency & Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7
		Basic & discipline specific knowledge	Problem Analysis	Design/Development of solution	Engineering tools, experimentation and contracting	Engineering Practices for society	Project Management	Life long learning
Competency	Students are able to evaluate materials, consumables and process costs for increasing the productivity of the organization and conservation of valuable resources.							
CO-1	Understand the concept of estimation, costing and depreciation.	2	-	-	-	-	-	2
CO-2	Apply break even analysis to get optimum production level.	3	3	-	-	-	1	2
CO-3	Estimate cost for various conventional manufacturing processes.	3	-	2	-	-	2	2
CO-4	Estimate the cost of special process plant.	2	1	2	-	-	-	1
CO-5	Prepare budgets and engineering contracts related to mechanical domain	3	-	-	-	2	2	2

Legend: '3' for high, '2' for medium, '1' for low and '-' for no correlation of each CO with PO.

16. COURSE CURRICULUM DEVELOPMENT COMMITTEE**GTU Resource Persons**

Sr.	Name and Designation	Institute	Contact No.	Email
1.	Dr. S S Sonigra Lect. Mech. Engg.	Government Polytechnic, Jamnagar.	9427322129	sssonigra@gmail.com
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BOS Resource Persons

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1.	Dr. S. H. Sundarani, BOS (Chairman HOD Mechanical Engg.)	Government Polytechnic Ahmadabad	9227200147	gpasiraj@gmail.com
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