GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

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

Course Title: **Estimation Costing & Budgetary Control**
(Course Code: 4385502)

Diploma programmer in which this course is offered	Semester in which offered
Fabrication Technology	Eight

1. RATIONALE

Diploma Fabrication Engineer is supposed to know the concept and apply their skills and understanding of Estimation, Costing and budgeting in the field of work after passing Diploma Course. Estimation, costing, and budgeting are essential for effective financial management in any project. Estimation provides an initial forecast of resources, time, and expenses required, enabling informed decision-making and feasibility assessment. Costing involves calculating the actual expenses, ensuring transparency and accuracy in financial planning. Budgeting allocates financial resources, setting limits and priorities to control costs and prevent overspending. Together, these processes ensure financial discipline, aid in risk management, and facilitate successful project completion within the planned financial framework. Accurate estimation, costing, and budgeting are critical for maximizing value, minimizing waste, and achieving strategic objectives. This will enable pass outs Students in getting placements in Techno-Commercial Departments in Fabrication Industry.

2. COMPETENCY

The course content should be taught and curriculum should be implemented with the aim to develop required skills in the students so that they are able to acquire following competency:

- **Calculate Estimation and Costing of Fabricated Products.**
- **Use effective cost management, budget and budgetary control.**

3. COURSE OUTCOMES (COs)

The practical exercises, the underpinning knowledge and the relevant soft skills associated with the identified competency are to be developed in the student for the achievement of the following COs:

a) Calculate material cost of given component/product.
b) Estimate manufacturing cost in Machine shop, Sheet Metal Shop, Forging shop, Welding Shop for given object.
c) Describe Material costing, Labor Costing, Material Cost Economics, Indirect Expenses and Depreciation.
d) Describe Cost Accounting, Cost Control and Cost Reduction in industry.
e) Describe Budget, Budgeting and Budgetary Control concept.

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	
3	0	2	4	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 the sub-components of the COs. *These PrOs need to be attained to achieve COs.*

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	Prepare mensuration chart of standard areas and volumes.	1	02
2	Calculate material cost from the given data.	1	02
3	Estimate cost of machine shop product from given data.	2	04
4	Calculate estimated cost of sheet metal shop product from given data.	2	02
5	Calculate estimated cost of forging shop product from given data.	2	02
6	Calculate estimated cost of welding shop product from given data.	2	04
7	Calculate estimated cost of process equipment product from given data.	2	02
8	Prepare list of various methods of valuation of materials issued from stores, and Calculate valuation of materials issued from stores in tabulated form.	3	02
9	Prepare list of various methods of wage payment, and Calculate financial incentives with different methods.	3	02
10	To study various overheads expenses, and Calculate Depreciation value of a given component/equipment.	3	02
11	To study cost accounting, cost control and cost reduction.	4	02
12	To study budget, budgeting and budgetary control.	5	02
	Total		**28**

Note

**** Any two / three practical to be performed of six practical hours.***

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. *Boiler suit, safety shoes and necessary tools & instruments are compulsory while attending laboratory and has to be brought by students (Annexure-1).*

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 No. 1 To 12		
1	Knowledge	30
2	Quality of Report	30
3	Participation	20
4	Punctuality	10
5	Originality	10
Total		**100**

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

These major equipment/ instruments with broad specifications for the PrOs is a guide to procure them by the administrators to user in uniformity of practical's in all institutions across the state.

No.	Equipment Name with Broad Specifications	PrO. No.
1	-	-

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) Follow safety practices in laboratory.
b) Practice good housekeeping.
c) Work as a leader/a team member.
d) Maintain tools/equipment
e) Follow ethical practices
f) 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 and 4th year.

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 **Estimation**	1a. Describe meaning of Estimating, Costing and Management 1b. Describe meaning of Capital, Estimating Costing and Bill of Material 1c. Describe Organization of Estimation Department 1d. Describe Mensuration concept for different Shapes of Objects 1e. Estimate Material Cost of a product	**Basics of estimating, costing and management** 1.1 Meaning of Administration, Management and Organization 1.2 Meaning of Capital, Estimating Costing and Bill of Material **Estimation** 1.3 Definition and Importance of Estimation 1.4 Aims and Functions of Estimation 1.5 Organization of Estimation Department 1.5.1 Qualities of Estimator 1.5.2 Functions of Estimator 1.5.3 Estimating Procedure 1.5.4 Sources of Errors in Estimating 1.5.5 Constituents of Estimation 1.6 Mensuration 1.6.1 Areas of plane figures 1.6.2 Areas of Irregular figures 1.6.3 Volume and surface areas of solids 1.7 Estimation of Material Cost 1.7.1 Introduction 1.7.2 Procedure
Unit– II **Estimation in Various Shops**	2a. Describe estimation concept of machine shop, sheet metal shop, forging shop and welding shop 2b. Calculate machining cost in lathe, drilling 2c. Estimate sheet metal work cost 2d. Estimate cost for a	2.1 Estimation in Machine Shop 2.1.1 Introduction 2.1.2 Machine shop operations 2.1.3 Cutting speed, Feed, Depth of cut 2.1.4 Lathe operation 2.2 Estimation in Sheet Metal Shop 2.2.1 Introduction 2.2.2 Operations in sheet metal shop 2.2.3 Sheet metal joints 2.2.4 Blank layout

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
	forging component 2e. Estimate material and welding cost for a given component 2f. Estimate cost of a process equipment	2.3 Estimation in Forging Shop 2.3.1 Forging - Hand forging, Machine forging 2.3.2 Forging operations 2.3.3 Estimation procedure - Estimation of Net Weight, Losses and Time 2.4 Estimation in Welding Shop 2.4.1 Welding, type of welding joints 2.4.2 Gas welding 2.4.3 Electric welding 2.4.4 Estimation of arc welding cost 2.4.5 Factor Affecting Welding Cost 2.5 Estimation of Process Equipment 2.5.1 Estimation of shell, Dish end, cone and nozzle
Unit-III **Costing**	3a. Describe Costing and its types 3b. Describe material costing and labour costing 3c. Describe Material Cost Economics 3d. Describe Indirect Expenses and Depreciation	3.1 Costing Definition, Aims 3.2 Difference between Estimating and Costing 3.3 Procedure for costing 3.4 Costing methods 3.5 Advantage of efficient costing 3.6 Classification of cost 3.7 Material costing 3.7.1 Cost of materials 3.7.2 Control over material cost 3.7.3 Waste control 3.7.4 Valuation of materials issued from stores 3.8 Labour Costing 3.8.1 Objectives of labour costing 3.8.2 Wages and Incentives 3.8.3 Wage differentials 3.8.4 Methods of wage payment 3.8.5 Bonus system 3.8.6 Fringe – Benefits 3.8.7 Non – Financial Incentives 3.9 Material Cost Economics 3.9.1 Analysis of costs and usage 3.9.2 Check purchasing practices 3.9.3 Use of value Analysis 3.9.4 Simplification, Standardization,

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
		Rationalization 3.9.5 Update old ideas 3.10 Indirect Expenses and Depreciation 3.10.1 Introduction 3.10.2 Factory expenses 3.10.3 Administrative expenses 3.10.4 Selling and distribution expenses 3.10.5 Depreciation 3.10.6 Method of Calculating Depreciation
Unit-IV **Cost Accounting, Cost Control and Cost Reduction**	4a. Describe cost accounting and standard costing 4b. Describe cost control and cost reduction 4c. Describe variance analysis and cost audit	4.1 Cost Accounting 4.2 Standard Costing 4.3 Cost Control 4.4 Cost Reduction 4.5 Variance Analysis 4.6 Cost Audit
Unit-V **Budget and Budgetary Control**	5a. Describe Budget and Budgeting 5b. Classify Budget on the basis of Flexibility, Mechanism and functions 5c. Describe budgetary control	5.1 Budget 5.2 Budgeting 5.3 Budget Classification 5.4 Budgetary Control 5.5 Essential Conditions for Applying Budgetary Control

9. SUGGESTED SPECIFICATION TABLE FOR QUESTIONPAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Estimation	6	3	0	7	10
II	Estimation in Various Shops	14	3	8	14	25
III	Costing	12	3	18	0	21
IV	Cost Accounting, Cost Control and Cost Reduction	5	3	4	0	7
V	Budget and Budgetary Control	5	0	7	0	7
Total		**42**	**12**	**37**	**21**	**70**

Legends: *R=Remember, U=Understand, A=Apply and above (Revised Bloom's taxonomy)*
Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks and marks at different taxonomy levels (of R, U and A) in the question paper may vary slightly 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 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:

a) Prepare solutions of different assignments given by subject faculty.
b) Report writing on various topics from syllabus and beyond syllabus.
c) Prepare sketchbook of Mensuration Chart for standard Areas and Volumes.
d) PPT presentation (10 minutes) on given Sub-topic of subject beyond the syllabus.
e) Prepare chart showing Organization of Estimation Department (Qualities and Functions of Estimator, Estimating Procedure, Sources of Errors in Estimating, Constituents of Estimation).
f) Prepare chart showing Mensuration shapes, Figures, formulas of areas and volumes of different shapes.
g) Prepare chart showing different Machine shop operations.
h) Prepare chart showing sheet metal shop operations, Sheet metal joints and Blank layout of sheet metal shop.
i) Prepare chart showing Forging process, forging operations, Estimation procedure of Net Weight, Losses and Time in forging shop.
j) Prepare chart showing Welding process, factor Affecting Welding Cost and estimation process of welding shop.
k) Prepare chart showing Procedure for costing and Costing methods.
l) Prepare chart showing Valuation of materials issued from stores.
m) Prepare chart showing Methods of wage payment.
n) Prepare report on Factory expenses, Administrative expenses, and Selling-distribution expenses.
o) Prepare report on Depreciation and Method of Calculating Depreciation.
p) Prepare report on Cost Accounting, Cost Control and Cost Reduction of any organization.
q) Prepare report on Budget and Budgetary Control of any organization.
r) Arrange visit to any industry and identify various cost incurred to manufacturing of a product.

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 is 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.10***, teachers should create opportunities and provisions for ***co-curricular activities***.

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 (group of 3 to 5). However, **in the fifth and eighth semesters**, 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 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.

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) **Chart making:** Prepare chart of various topic of Estimation, Costing, Cost Accounting, Cost Control and Cost Reduction, Budget and Budgetary Control etc. given by the subject teacher.
b) **Video Preparation:** Student have to prepare his/her video on concept, theory, principles and application of Estimation, Costing, Cost Accounting, Cost Control and Cost Reduction, Budget and Budgetary Control etc. given by the subject teacher.
c) **E-learning projects:** Students have to use internet and other online resources for preparation of report and/or download video on the topic given by the subject teacher within the syllabus or beyond the syllabus.
d) **Report preparation:** Student has to use different books, technical magazine, journals etc. for preparation of a report on the topic given by the subject teacher within the syllabus or beyond the syllabus.
e) **Power point presentation**: Students has to prepare a power point presentation of 10 to 15 slides on the topic given by the subject teacher within the syllabus or beyond the syllabus. In the end of presentation student has to ask at least 3 to 5 MCQ based question to identify the gain of listeners at the end presentation.

13. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1	Mechanical Estimating and Costing	T. R. Banga & S.C. Sharma	Khanna Publishers, Seventeenth Edition, ISBN-10-8174092668
2	Mechanical Estimating and Costing	B. P. Sinha	Tata McGraw Hill Pub. Co. Ltd. ISBN-0074624113, 9780074624111
3	Learning package in ECC,	NITTTR, Bhopal	NITTTR, Bhopal

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
4	Mechanical Estimating and Costing	Shrimali and Jain	Khanna Publishers
5	Mechanical Estimating and Costing	C. K. Singh and I. M. Khan	Standard Publishers Distributors, Delhi-6, ISBN : 9788180141096
6	A Text-Book of Mechanical Estimating and Costing	O. P Khanna	Dhanpat Rai Publications ISBN: 9788189928384, 8189928384
7	Process Planning & Cost Estimation	R. Kesavan, C. Elanchezian, B. Vijay Ramnath	New Age International Pub., N. Delhi ISBN:-81-224-1588-1

14. SOFTWARE/LEARNING WEBSITES

- https://nptel.ac.in/courses/
- https://en.wikipedia.org/wiki/
- http://www.calculatoredge.com/
- https://youtu.be/InjmqETuJ8w
- https://archive.nptel.ac.in/courses/110/101/110101132/
- https://archive.nptel.ac.in/courses/110/101/110101132/
- https://archive.nptel.ac.in/courses/110/107/110107127/
- https://archive.nptel.ac.in/courses/110/101/110101003/
- https://archive.nptel.ac.in/courses/110/101/110101132/#
- https://www.youtube.com/playlist?list=PLu139Vojyr5Q0EaqKktQvtg8ED1CZCWVx
- https://nptel.ac.in/content/storage2/courses/110101004/downloads/Lecture%20Notes/module12/lec1.pdf

15. PO-COMPETENCY-CO MAPPING

Semester VIII	Estimation Costing & Budgetary Control (Course Code: 4385501)						
	POs						
Competency & Course Outcomes	PO 1 Basic & Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design/ develop-ment of solutions	PO 4 Engineering Tools, Experimen-tation&Testing	PO 5 Engineering practices for society, sustainability & environment	PO 6 Project Manage-ment	PO 7 Life-long learning
Competency	• **Calculate Estimation and Costing of Fabricated Products.** • **Use effective cost management, budget and budgetary control.**						
Course Outcomes **CO1)**Calculate material cost of given	3	2	-	-	-	1	3

component/product.							
CO2) Estimate manufacturing cost in Machine shop, Sheet Metal Shop, Forging shop, Welding Shop for given object.	3	1	-	-	-	1	3
CO3) Describe Material costing, Labour Costing, Material Cost Economics, Indirect Expenses and Depreciation.	3	1	-	-	-	2	2
CO4) Describe Cost Accounting, Cost Control and Cost Reduction in industry.	3	-	-	-	1	1	1
CO5) Describe Budget, Budgeting and Budgetary Control concept.	3	-	-	-	1	1	1

*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

S. No.	Name and Designation	Institute	Contact No.	Email
1.	Shri Kapilkumar B. Pipavat, Lecturer in Fabrication Technology	Sir Bhavsinhji Polytechnic Institute, Bhavnagar	9427343525	Kbpipavat.bpti@gmail.com
2.	Shri Rohankumar B. Zapadiya, Lecturer in Fabrication Technology	Sir Bhavsinhji Polytechnic Institute, Bhavnagar	9033219351	rohan.zapadiya@gmail.com
3.	Shri Jasminkumar M. Bhanderi, Lecturer in Fabrication Technology	Sir Bhavsinhji Polytechnic Institute, Bhavnagar	9723496425	Bhanderi.jasmin.bpti@gmail.com

ANNEXURE-1

❖ SAMPLE SEFTY CONTRACT:

(To be filled by the students and submitted to concerned faculty/staff)

-- Use for reference purposes only –

1. You have to read and sign the safety contract.
2. The safety contract says that you understand that safety is your responsibility.
3. The safety contract to be signed before you carry out any work in the laboratory and if you don’t observe and obey the safety rules, you will not be allowed in the laboratory.

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Safety Contract

Date: ________________

Name of Institute: ____
Name of Course with Code: Estimation Costing & Budgetary Control (4385501)
Name of Faculty/Staff with Designation: 1. ______________________________________
2. ______________________________________
3. ______________________________________

I RECOGNIZE THAT:

1. Safety is my responsibility when using a tool.
2. Safety regulations have been provided to me.
3. The possibility of accident and injury increases if I do not follow all the safety guidelines.
4. I must act responsibly to ensure my own safety & the safety of others in the work area.

I AGREE TO:

1. Never work in the shop without my faculty’s/ instructor’s supervision.
2. Read and practice all the safety regulations that have been distributed to me in this course or have been posted in the work areas.
4. Act in a responsible manner at all times in the laboratory.
5. Follow all instructions given by the faculty.
6. Immediately report any unsafe condition or activity to my faculty / instructor.
7. Wear eye protection at all times when working with tools or working anywhere near someone who is using tools.
8. Cut or Tie back long hair, remove jewellery, secure loosed clothing, and wear boiler suit & safety shoes in the laboratory.
9. Clean all work areas and put equipment away before leaving the laboratory.

I, ____, have read and agree with all the safety instructions.

Particulars:

Programme: ______________________ Student Signature
Batch No.: ______________________ ________________________
Enrollment No.: ___________________