

Subject Code: 1ET4020505	Subject Title: Estimating, Costing & Contracting
Pre-Requisite:	--

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. The realm of this course is enlarged to estimate the process costs for fluid and thermal applications also.

COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competencies:

- Plan, use and control resources optimally and economically.
- Estimate production/operation cost for budgeting and analysis.

COURSE OUTCOMES

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

- Calculate material cost of given component/product.
- Identify and estimate elements of cost in various processes.
- Perform break even analysis to calculate break even quantity.
- Investigate the problem of cost and suggest their solution using cost reduction techniques.
- Interpret given model of balance sheet and profit loss account.
- Prepare simple engineering contracts.

TEACHING AND EVALUATION SCHEME:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)			
Lecture	Tutorial	Practical	Credit	Theory		Practical	
				University Assessment	Continuous Assessment	University Assessment	Continuous assessment
3	-	2	4	60	40	20	30

COURSE DETAILS.

Sr. No	Topic	Total hours	Weightage (%)
1	Introduction 1.1 Need, Scope & importance of ECC in industries. 1.2 Need of attitude, knowledge & skill required for ECC. 1.3 Difference between costing and estimating.	4	10

2	Elements of Cost and Overhead Allocation 2.1 Terminology associated with various cost elements and their classification. 2.2 Terminology associated with overheads, their classification and allocation. 2.3 Determination of selling price and catalogue price. 2.4 Depreciation and Obsolescence: Definition, Types Different methods of calculating depreciation. 2.5 Determination of cost of production. 2.6 Concept of Machine Hour Rate (MHR). 2.7 Method to calculate MHR for any machine / machine tool. 2.8 Example to calculate MHR of Lathe, Milling, Drilling, Grinding.	7	20
3	Cost Estimation of Welding 3.1 Elements of cost in welding. 3.2 Factors effecting welding cost. 3.3 Estimating cost elements in gas and arc welding. 3.4 Estimation of production cost of given welding job for above methods.	6	10
4	Cost Estimation of Forging and Casting 4.1 Cost terminology associated with forging shop. 4.2 The procedure of calculating material cost of a product for forging shop (including input weight, cut weight, forged weight etc.). 4.3 Procedure of estimating cost of forging dies. 4.4 Procedure of estimating forging cost. 4.5 Given the forged component, estimate forging cost. 4.6 Cost terminology associated with foundry shop. 4.7 The procedure of calculating material cost of a product for foundry shop. 4.8 Procedure of estimating cost of pattern making. 4.9 Procedure of estimating foundry cost. 4.10 Given the casting component, estimate foundry cost.	12	25
5	Cost Estimation of Machined Part 5.1 The terminology associated with machine shop estimation. 5.2 Procedure to estimate material cost. 5.3 Procedure of estimating cost of machined part for following operations: i. Lathe operations (Facing, outside/inside turning, boring, drilling on lathe, grooving and outside threading). ii. Drilling operations (Drilling, reaming, tapping) iii. Shaping operations. iv. Milling operations (Face milling, side and face cutting, end milling, key way milling and gear forming). v. Cylindrical grinding operations (Plain cylindrical grinding). 5.4 For given machined part, estimate material cost and machining cost.	5	15

6	Break Even Analysis 6.1 Classification of costs as fixed and variable costs. 6.2 Relationship between the costs and quantity of production 6.3 Break Even Chart: i. Definition of Break Even Point (BEP) and its needs in industry. ii. Procedure of construction of Break Even Chart. iii. Assumptions made in constructing Break even chart. iv. Calculation of BEP analytically and graphically. v. Margin of safety, its importance and its derivation. vi. Effect of changing various parameters on BEP. vii. Numeric examples.	4	10
7	Budgeting and Contracting 7.1. Define budget and budgetary control. 7.2. Purpose of budget. 7.3. Various types of budgets. 7.4. Benefits of budget. 7.5. With given example, interpret industrial budget. 7.6. Prepare simple budget given required input data. 7.7. Explain various accounting terminology like book value, Net Present Value, Work in progress, Gross Domestic Product (GDP), balance sheet terminology, etc. 7.8. Define contracts, its characteristics and advantages. 7.9. Types of contract. 7.10. Tendering, manual tendering and E-tendering. 7.11. Provision of different conditions in a contract. 7.12. Documents required in an engineering contract (explain). 7.13. Prepare a contract for a given input situation	4	10

SUGGESTED LIST OF EXERCISES/PRACTICALS

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills (outcomes in psychomotor and affective domain) so that students are able to acquire the competencies/programme outcomes.

Following is the list of practical exercises for guidance.

Sr. No.	Practical Exercises	Approx. Hours. required
1	Preparatory activity: a. Write various equations to calculate area and volume of commonly used shapes. b. List densities of commonly used materials. c. Machining process parameters of various manufacturing processes (Covered in this course) for commonly used materials. d. Collect market rates for various consumables like diesel, welding rods, gas, cutting tools, electricity rates, etc. to be used in this course.	04

2	Collection of parts: a. Collect the finished parts from industries/market/scrap merchants consisting: i. Welded parts (Minimum THREE). ii. Casted parts (Minimum THREE). iii. Forged parts (Minimum TWO). iv. Parts having five to six machining operations like cutting, turning, threading, grinding, milling, shaping, drilling, etc.(Minimum FIVE). b. Measure and prepare production drawings of all the parts using A4 size paper (Manually). Note: Each student will be assigned to bring at least one specified part so that all varieties of about 13 parts get collected in a batch. All parts must be brought in first week duration only. After getting approval of part, each student will prepare production drawing of the part he/she has brought on an A4 size paper (manually) and then the batch will interchange these drawing so that all students will have drawing of all physical parts collected by the batch.	04
3	Welding Estimation: a. Determine raw material volume for all welded parts. b. Select welding rod to be used. Estimate quantity of welding rod required. c. Determine material and consumables costs. d. For each part, estimate welding cost. Show the assumptions and steps followed to estimate welding cost. e. Derive total cost of the part.	04
4	Casting Estimation: a. Determine raw material volume for all casted parts (calculate input weight, cut weight, net weight, losses etc.). b. Prepare pattern drawings (production drawings with all dimensions, surface finishes, allowances, etc.) for all parts. c. Estimate pattern cost. d. Determine material and consumables costs. e. For each part, estimate casting cost. Show the assumptions and steps followed to estimate casting cost. f. Derive total cost of the part	04
5	Forging estimation: a. Determine raw material volume for all forged parts. b. Prepare die drawings (production drawings with all dimensions, surface finishes, allowances, etc.) for all parts. c. Estimate dies cost. d. Determine material and consumables costs. e. For each part, estimate forging cost. Show the assumptions and steps followed to estimate forging cost. f. Derive total cost of parts.	06
6	Machining estimation: a. Determine raw material volume for all machined parts. b. For each part, tabulate operation, cutting tool/s to be used and cutting parameters (speed, feed and depth of cut) to be used. c. Estimate raw material cost. d. For each part, estimate machining cost. Show the assumptions and steps followed to estimate machining cost. e. Derive total cost of parts.	06
Total Hours		28

SUGGESTED LEARNING RESOURCES:

A. List of Books:

Sr. No.	Title of Book	Author	Publication
1.	Mechanical estimating and costing	Banga and Sharma	Khanna Publishers

2.	Mechanical estimating and costing	Shrimali and Jain	Khanna Publishers
3.	Mechanical costing and estimation	Singh and Khan	Khanna Publishers
4.	Learning package in ECC	NITTTR, Bhopal	NITTTR, Bhopal

B. List of Major Equipment/ Instrument with Broad Specifications.

- i. Vernier caliper, 150mm.
- ii. Micrometer, 0-25mm and 25-50mm.
- iii. Bevel protector.
- iv. Thread gauges.

C. List of Software/Learning Websites.

- i. <http://calculatoredge.com/index.htm#mechanical>