



Government of Karnataka
DEPARTMENT OF COLLEGIATE AND TECHNICAL EDUCATION

Programme	Mechanical Engineering	Semester	IV
Course Code	20ME41P	Type of Course	Programme Core
Course Name	Operations Management	Contact Hours	8 hours/week 104 hours/semester
Teaching Scheme	L:T:P :: 3:1:4	Credits	6
CIE Marks	60	SEE Marks	40

1. Rationale: The success of any organisation not only depends on quality of its products and services but also depends on the people within it. Thus, an operational manager has to play a prominent role in an organisation with human capital and machines. Therefore, managerial skills are essential for enhancing their employability and carrier growth. This course is therefore designed to provide basic concepts in operations management, forecasting techniques, capacity planning, aggregate planning, master production schedule, quality, and inventory and supply chain management for effective utilisation of resources and competitive advantage through operational excellence

2. Course Outcomes: On Completion of course, the student will be able to:

CO-01	Prepare a production capacity utilization plan based on demand forecast and available production capacity for a given product.
CO-02	Prepare a master production plan based on a production capacity utilization plan and a material management plan for a given product.
CO-03	Prepare a process plan using time study, motion study and other appropriate methods to ensure process efficiency.
CO-04	Prepare a quality assurance plan based on a given quality model which is suitable for either a product or a service organisation.

3. Course Content

Week	CO	PO*	Lecture (Knowledge)	Tutorial (Activity)	Practice (Skill)
			3 hours/week	1 hour/week	4 hours/week (2 hours/batch twice in a week)
1	01	01	Introduction to Operation Management 1. Introduction to Operation Management - Operation Functions	Ref Table 1	<ul style="list-style-type: none"> •Virtual Tour Organization (You tube) •Problems on Productivity
			2. Evolutions and Historical Events in Operational Management		
			3. Productivity and Competitiveness, Strategy and operation		
2	01	01	DEMAND FORECASTING 1.Demand Forecasting- Demand Behavior-Trend Cycle - Seasonal Background - Steps in Forecasting Process	Ref Table 1	Problems on <ul style="list-style-type: none"> •Qualitative Forecast - Delphi method, Market Research method •Quantitative Forecast - Time series Method <ul style="list-style-type: none"> a) Moving average (Naive forecast , Simple moving
			2. Short range and Long Range Forecast		
			3. Qualitative Forecast methods		

					Average, Weighted moving Average)
3	01	01	1. Quantitative Forecast methods	Ref Table 1	Problems on b) Exponential smoothing
			2. Seasonal Adjustments		
			3. Forecast Accuracy		
4	01	01	CAPACITY AND AGGREGATE PLANNING 1. Need for Capacity Planning – Capacity expansion Strategies – Capacity planning Models.	Ref Table 1	Problems on •Capacity Planning, •Aggregate planning •Master production Schedule
			2. Aggregate planning- Methods		
			3. Master production Schedule		
5	01	01	PROCESS PLANNING 1. Make or Buy Decision Outsourcing- Factors for Outsourcing decision- Process Selection – Batch , Mass ,Continuous	Ref Table 1	•Virtual Tour on Batch, Mass and continuous Process •Develop an Operation Sheet indicating Process Plan and Process flow chart for a given component.
			Components of e-manufacturing		
6	03	01	1.Motion Study	Ref Table 1	•Develop Job Process chart with Process Symbols for a given Process. •Develop Man- Machine chart for a given Process. •Case study on Time Study Principles for a given process.
			2. Man- Machine chart		
			3. Concepts on Time Study		
7	02	01	INVENTORY MANAGEMENT 1. Elements of Inventory Management- Inventory Costs- Carrying, Ordering and Shortage Costs	Ref Table 1	Problems on •ABC Classification System •Economic Order Quantity Models •The Production Quantity Model
			2.Inventory Control Systems- Continuous Inventory System (Fixed-Order-Quantity System) Periodic Inventory System (Fixed-Time-Period System)		
			3. Concept on ABC Classification, Economic Order Quantity Models, Production Quantity Model		
8	02	01,02	1. Order Quantity for A Periodic Inventory System Order Quantity with Variable Demand	Ref Table 1	Case study on JIT (Eg:Toyoto Production System)
			2. JIT -Pull System		
			3 Kanban's System		
9	02	01	Supply Chain Management 1.Supply Chains Supply Chains for Service Providers	Ref Table 1	Study on •The Bullwhip Effect •Risk Pooling •Green Supply Chains
			2.Value Chains The Management of Supply Chains		
			3.Vendor Selection- Vendor		

			evaluation and Vendor Development, Negotiations		
10	02	01	1.Supply Chain Uncertainty and Inventory	Ref Table 1	Study on •Information Technology: Supply Chain Enabler •Bar Codes •Radio Frequency Identification •Build-To-Order (BTO)
			2.E-Business, Electronic Data Interchange		
			3.Supply Chain Integration- Collaborative Planning, Forecasting, And Replenishment		
11	02	01,07	1.Material Requirements Planning (MRP) Enterprise Resource Planning (ERP),		Case study on Procurement- Outsourcing. •E-Procurement •E-Market places •ERP MODULES
			2. Warehouse Management Systems Collaborative Logistics, Distribution Outsourcing		
			3.Finance/Accounting- Sales/Marketing- Production/Materials Management- Human Resources		
12	04	01,04,07	QUALITY MANAGEMENT 1. Quality from The Customer’s Perspective Dimensions of Quality for Manufactured Products Dimensions of Quality for Services	Study the latest technological changes in this course and present the impact of these changes on industry	Practice on Quality Tools •Process Flowcharts •5 Whys, Cause-And-Effect Diagrams •Check sheets And Histograms •Pareto Analysis •Scatter Diagrams
			2. Quality from The Producer’s Perspective A Final Perspective On Quality The Cost of Quality The Cost of Achieving Good Quality		
			3. The Cost of Poor Quality The Quality–Productivity Ratio Quality Management System		
13	04	04,05,07	1. TQM and QMS The Focus of Quality Management— Customers		Practice on The Deming Wheel (PDCA Cycle) •Process Control Charts •Statistical Quality Control •ISO 9000 •ISO14000
			2. Quality Management in The Supply Chain The Role of Employees in Quality Improvement Kaizen and Continuous Improvement Quality Circles		
			3. Process Improvement Teams Six Sigma The Breakthrough Strategy: DMAIC		
Total in hours			39	13	52

- *PO= Program Outcome as listed and defined in year 1 curriculum
- Course Co-Ordinator must prepare PO – CO mapping with strength (Low/Medium/High) before course planning

Table 1: Suggestive Activities for Tutorials: (The List is only shared as an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic and on the availability of such resources at their institution)

Sl.No.	Suggestive Activities for Tutorials						
01	Below are monthly sales of light bulbs from the lighting store.						
		Jan	Feb	March	April	May	June
	MONTH						
	SALES	50	200	80	40	360	
	Forecast sales for June using the following						
	<ul style="list-style-type: none">• Naive method• Three- month simple moving average• Three-month weighted moving average using weights of 0.5, 0.3 and 0.2• Exponential smoothing using an alpha of 0.2 and a May forecast of 350.						
02	Delph Manufacturing Company is going to purchase an auto parts component from one of two competing suppliers. Delph is going to base its decision, in part, on the supply chain performance of the two suppliers. The company has obtained the following data for average raw materials, work-in-process, and finished goods inventory value, as well as cost of goods sold for the suppliers						
	Items		Supplier 1		Supplier 2		
	Cost of goods sold		Rs 8,360,000		14,800,000		
	Raw materials		270,000		870,000		
	Work-In-Progress		62,000		550,000		
	Finished goods		33,000		150,000		
	Each company operates 52 weeks per year. Determine which supplier has the best supply chain performance according to inventory turns and weeks of supply. What other factors would the company likely take into account in selecting a supplier?						
03	The maintenance department for a small manufacturing firm has responsibility for maintaining an inventory of spare parts for the machinery it services. The parts inventory, unit cost, and annual usage are as follows						
	Part		Unit Cost(Rs)		Annual Usage		
	1		100		90		
	2		350		40		
	3		30		130		
	4		20		180		
	5		320		50		
	The department manager wants to classify the inventory parts according to the ABC system to determine which stocks of parts should most closely be monitored						
04	The design capacity for engine repair in our company is 80 trucks/day. The effective capacity is 40 engines/day and the actual output is 36 engines/day. Calculate the utilization and efficiency of the operation. If the efficiency for next month is expected to be 82%, what is the expected output?						
05	County school buses are inspected every month for “defects.” In a recent monthly inspection, 27 worn or torn seats were found, 22 buses had dirty floors, there were 14 cases of exterior scratches and chipped paint, there were 8 cracked or broken windows, the engines on 4 buses had trouble starting or were not running smoothly, and 2 buses had faulty brakes. Develop a Pareto chart for the bus inspections and indicate the most significant quality-problem categories. What does this tell you about the limitations of applying Pareto chart analysis? How might these limitations be overcome in Pareto chart analysis						
06	Study and prepare a report on Inventory management in A Super Bazaar						
07	Case study on Supply chain Management in Amazon, Flikart etc						
08	Case study on use of ERP in An Education Institution (From Admission to Award of Degree)						
09	Case study on logistics management in Swiggy, Zomoto, Dunzo etc						

4. CIE and SEE Assessment Methodologies

Sl. No	Assessment	Test Week	Duration In minutes	Max marks	Conversion
1.	CIE-1 Written Test	5	80	30	Average of three tests 30
2.	CIE-2 Written Test	9	80	30	
3.	CIE-3 Written Test	13	80	30	
4.	CIE-4 Skill Test-Practice	6	180	100	Average of two skill test reduced to 20
5.	CIE-5 Skill Test-Practice	12	180	100	
6.	CIE-6 Portfolio continuous evaluation of Tutorial sessions through Rubrics	1-13		10	10
Total CIE Marks					60
Semester End Examination (Practice)			180	100	40
Total Marks					100

5. Format for CIE written Test

Course Name	Operation Management	Test	I/II/III	Sem	IV
Course Code	20ME41P	Duration	80 Min	Marks	30
Note: Answer any one full question from each section. Each full question carries 10 marks.					
Section	Assessment Questions		Cognitive Levels(R/U/A)	Course Outcome	Marks
I	1				
	2				
II	3				
	4				
III	5				
	6				
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, Cognitive level and course outcomes.					

5 . (a) For CIE Skill Test -4

Duration: 240Min

SL. No.	CO	Particulars/Dimension	Marks
1	01	One Question- Problems/Case study on Demand forecasting/Master Scheduling/Capacity Planning	45
2	01,03	Based on the given Case Study, Prepare a Job Process chart with Process Symbols/Develop a Man- Machine chart	45
3	01,03	Portfolio evaluation based on the average of all Practice Sessions (1-6 Weeks)	10
Total Marks			100

5 . (b) For CIE Skill Test -5

Duration: 240 Min

SL. No.	CO	Particulars/Dimension	Marks
1	02	One Question on Inventory Management and Supply Chain Management (JIT/ Kanban System /E- Business/)	45
2	04	For the given case study , Prepare the Cost of achieving good Quality using any quality Tools	45
3	02,04	Portfolio evaluation based on the average of all Practice Sessions (7-12 weeks)	10
Total Marks			100

6. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		2	4	6	8	10	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	6
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
Average Marks= (8+6+2+2)/4=4.5							5

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

7. Reference:

Sl. No.	Description
1	Production and Operations Management – Creating Value along the Supply Chain By Russel and Taylor , Wiley Publications , 7 Edition
2	Modern Production and Operation Management By Buffa and Sarin, Wiley Publications, 8 edition
3	Production and Operations Management By Chary, Tata Mc Graw Hill Publications
4	Production and Operations Management- Concepts, Models and Behaviour By Adam and Ebert, Prentice Hall Publications

8. LIST OF SOFTWARES/ LEARNING WEBSITES:

1. www.youtube.com/watch?v=SF53ZZsP4ik
2. www.youtube.com/watch?v=iPZlQ3Zx5zc

9. SEE Scheme of Evaluation

Duration :180 Min

SL. No.	CO	Particulars/Dimension	Marks
1	01,02,03	One Question- Problems/Case study on Demand forecasting/Master Scheduling/Capacity Planning OR Based on the given Case Study, Prepare a Job Process chart with Process Symbols/Develop a Man- Machine chart	40
2	03,04	One Theory Question on Inventory Management and Supply Chain Management (JIT/ Kanban System /E- Business/) OR For the given case study , Prepare the Cost of achieving good Quality using any quality Tools	40
3	01,02,03,04	Viva voce	20
	Total Marks		100

10. Tools/ Equipment/ Software's Required

- 1.ERP Software