PRODUCTION PLANNING AND CONTROL

Subject code: MT832OE/ME854PE
Regulations: R16-JNTUH
Class: II Year B. Tech MECH II Sem

Department of Mechanical Engineering
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PRODUCTION PLANNING AND CONTROL
(MT832OE/ME854PE)
COURSE PLANNER

Objective & Relevance:

Production is an organized activity carried out by manufacturing organization with basic objective of converting raw materials into useful products. To do so effectively and efficiently, before starting the work of actual production, production planning should be done in order to anticipate possible difficulties and decide in advance as to how the production should be carried out in the best and economical way.

Production Planning and Control (PPC) is the process of planning the production in advance, setting the exact route of each item, fixing starting and finishing dates for each item, authorizing shop activity by release of production order to shops and lastly to follow-up the progress of production and expediting as required. The principle of production planning and control can be stated in a simple statement as, "First plan the work, and then work the plan". Since mere planning of production is not sufficient, the management should take all possible steps to see that project or plan chalked by the planning department are properly adhered to and control over production is exercised in order to meet the standards set.

Planning and control are two basic and interrelated managerial functions. Planning is the preparation activity while control is the post-operation function. Planning sets the objectives, goals, targets on the basis of available resources with their given constraints, while control involves assessment of the performance, based on standards set in advance during planning. The controlling is done by comparing the actual performance with the set standards and deviations are ascertained and analyzed and rectification is carried out.

Course purpose:

Production Planning and Control departments' objective is to produce goods and services of the right quality, in the right quantities, according to the time schedule and at a minimum cost by using the best and least expensive methods. As a prospective executive one needs to understand methods, plans, various techniques that are essential to operate an organization effectively and efficiently. For this purpose, one must have the knowledge of production planning and control. The techniques of production planning and control are not only applicable to manufacturing firms but also to service industry.

Scope of course:

Production Planning and Control departments uses scientific methods, tools and techniques on complex problems arising in the direction and management of large scale integrated systems of men, machines, materials, methods and money in an industry. Towards the end of the course it is expected that the students would be skilled to become member of production planning and control department of any manufacturing organization and envision the applicability of the same for service industry. The course in general is designed to impart the following skills,

1. Understand the requirement of production planning and control for manufacturing organizations.
2. Develop skills to estimate and use appropriate planning and control techniques.

3. Ability to evaluate, analyze and make decisions for short term as well as long term organizational growth, and
4. Develop skills to perform production planning and control operations for any manufacturing organization.

Pre-requisites:

1. Knowledge in basic manufacturing processes – Job shop and Flow shop
2. Machine Tool
3. Industrial Management
4. Machine Drawing
5. Production Drawing
6. Linear Regression and Correlation
7. Operations Research

Course Contents – As per JNTUH Syllabus:

UNIT-I Introduction: Definitions – objectives of production planning and controlfunctions of production planning and control-elements of production controltypes of production- organization of production planning and control – internal organizations department

UNIT-II Forecasting – Importance of forecasting – types of forecasting, their usesgeneral principles of forecasting techniques- Qualitative methods and quantitative methods.

UNIT-III Inventory management – Functions inventory- Relevant inventory cost- ABC analysis- VED Analysis- EOQ model – Inventory control systems – P- Systems and Q – Systems Introduction to MRP And ERP, LOB(Line of balance), JIT inventory, Japanese concepts.

UNIT- IV Routing – Definition – routing procedure- Route sheets – Bill of materialfactors affecting routing procedure. Schedule – definition – difference with loading. Scheduling polices – techniques, standard scheduling methods- job shop, flow shop,. Line balancing, aggregate planning- methods for aggregate planning- Chase planning, expediting, control aspects.

UNIT-V Dispatching – Activities of dispatcher- Dispatching procedure - follow up – definition – reasons for existence of functions – types of follow up, applications of computer in production planning and control

Relevant syllabus for GATE:

Forecasting models, Aggregate production planning, Scheduling, Materials Requirement Planning, Inventory control.

Relevant syllabus for IES:

Forecasting models - Moving average, exponential smoothing, Capacity planning, Scheduling, Materials Requirement Planning, Inventory control - ABC analysis, EOQ model; Assembly line balancing, Product development, Break-even analysis.

On completion of this Subject / Course the Student shall be able to:

1.Understand the role Production Planning and control activities in Manufacturing and Services.

2.Understand and perform various Forecasting techniques and problems

3.Understand and perform various Inventory Management techniques and apply in real manufacturing scenario

4.Demonstrate various Scheduling procedures

5.Evaluate and perform various line balancing concepts

6.Understand and analyse Dispatching procedures

	Course Outcome	Bloom's Taxonomy
CO1	Understand the role Production Planning and control activities in Manufacturing and Services.	L2-Understand
CO2	Understand and perform various Forecasting techniques and problems	L2-Understand
CO3	Understand and perform various Inventory Management techniques and apply in real manufacturing scenario/How to use MRP/ERP	L2-Understand
CO4	Demonstrate various Scheduling procedures/Balancing concepts	L3-Demonstrate
CO5	Understand and Evaluate Dispatching procedures	L3-Evalute

1. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (PO)		Level	Proficiency assessed by
PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems related to Mechanical Engineering.	2	Assignment/End term examination
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems related to Mechanical Engineering and reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	2	Assignment/End term examination
PO3	**Design/development of solutions**: Design solutions for complex engineering problems related to Mechanical Engineering and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	2	Assignment/End term examination
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	1	Assignment/End term examination

Program Outcomes (PO)		Level	Proficiency assessed by
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	1	Assignment/End term examination
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the Mechanical Engineering professional engineering practice.	None	
PO7	**Environment and sustainability**: Understand the impact of the Mechanical Engineering professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	None	
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	1	Assignment/End term examination
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	N	
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	N	
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	None	
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	N	

1: Slight (Low) **2: Moderate (Medium)** **3: Substantial (High)** **- : None**

2. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED

Program Specific Outcomes (PSO)		Level	Proficiency assessed by
PSO1	**Foundation of mathematical concepts:** To use mathematical methodologies to crack problem using suitable mathematical analysis, data structure and suitable algorithm.	1	Assignment/End term examination
PSO2	**Foundation of Computer System:** The ability to interpret the fundamental concepts and methodology of computer systems. Students can understand the functionality of hardware and software aspects of computer systems.	1	Assignment/End term examination
PSO3	**Foundations of Software development:** The ability to grasp the software development lifecycle and methodologies of software systems. Possess competent skills and knowledge of software design process. Familiarity and practical proficiency with a broad area of programming concepts and provide new ideas and innovations towards research.	None	

Program Specific Outcomes (PSO)	Level	Proficiency assessed by

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) - : None

3. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Objectives	Program Outcomes (PO)												Program Specific Outcomes (PSO)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	N	N	N	N	N	1	N	N	N	N	N	N	N	N	N
CO2	2	2	2	N	N	N	N	N	N	N	N	N	N	N	N
CO3	2	2	2	N	N	N	N	N	N	N	N	N	N	N	N
CO4	2	2	N	N	N	N	N	N	N	N	N	N	N	N	N
CO5	2	2	N	N	N	N	N	N	N	N	N	N	N	N	N

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) - : None

Lesson Plan:

The course will proceed as follows for all sections. Please note that the week and the classes in each week are relative to each section.

Lecture No.	WEEK NO	TOPIC	Teaching Learning Outcome	Teaching Methodology	REFERENCE
UNIT – 1					
1.	1	Introduction: Definition, Objectives of PPC	Understand	Chalk & Talk,PPT	T1&T2
2.		Functions of PPC		Chalk & Talk,PPT	
3.		Types of production & PPC applicability		Chalk & Talk,PPT	
4.		PPC Department Organization: Internal & Organizational level		Chalk & Talk,PPT	
5.	2	Elements of production control		Chalk & Talk,PPT	
UNIT – 2					
6.	2	Forecasting- Introduction, General principles, Importance	Understand	Chalk & Talk,PPT	T1&T2
7.		Types of forecasting - their uses		Chalk & Talk,PPT	
8.		Forecasting techniques – qualitative methods		Chalk & Talk,PPT	
9.	3	Forecasting techniques – quantitative methods		Chalk & Talk,PPT	

10.		Problems		Chalk & Talk,PPT	]
11.		Problems		Chalk & Talk,PPT	
12.		***Mock Test – I***		Chalk & Talk,PPT	
13.	4	Review	Understand	Chalk & Talk,PPT	
14.		Review		Chalk & Talk,PPT	T1&T2
15.		Review		Chalk & Talk,PPT	
16.		Review		Chalk & Talk,PPT	
UNIT – 3					
17.	5	Inventory management, Functions of inventories		Chalk & Talk,PPT	
18.		Relevant inventory costs, EOQ model		Chalk & Talk,PPT	
19.	6	Inventory control systems: P–Systems and Q-Systems		Chalk & Talk,PPT	
20.		Problems		Chalk & Talk,PPT	
21.		ABC Analysis, VED Analysis		Chalk & Talk,PPT	
22.		Problems		Chalk & Talk,PPT	T1&T2
23.	7	Introduction to MRP, Bill of material (BOM)	Understand	Chalk & Talk,PPT	
24.		MRP, Problems		Chalk & Talk,PPT	
25.		Problems		Chalk & Talk,PPT	
26.		Problems		Chalk & Talk,PPT	
27.	8	Case Analysis on MRP		Chalk & Talk,PPT	
28.		Review		Chalk & Talk,PPT	
29.		Review		Chalk & Talk,PPT	
30.		Review		Chalk & Talk,PPT	
MID-1					
UNIT – 3 Cont.					
31.	8	Problems		Chalk & Talk,PPT	
32.	9	ERP		Chalk & Talk,PPT	
33.		JIT inventory and Japanese concepts		Chalk & Talk,PPT	T1&T2
34.		LOB (Line of Balance)		Chalk & Talk,PPT	
UNIT – 4					
35.	10	Routing: Definition, Routing procedure		Chalk & Talk,PPT	

36.		Factors affecting routing procedure	Evaluate	Chalk & Talk,PPT	T1&T2
37.		Route sheets		Chalk & Talk,PPT	
38.		Scheduling – definition, Difference between loading and scheduling		Chalk & Talk,PPT	
39.	11	Problems		Chalk & Talk,PPT	
40.		Scheduling Policies		Chalk & Talk,PPT	
41.		Problems		Chalk & Talk,PPT	
42.		Standard scheduling methods & techniques for flow shop		Chalk & Talk,PPT	
43.	12	Standard scheduling methods & techniques for job shop		Chalk & Talk,PPT	
44.		Problems		Chalk & Talk,PPT	
45.		Line Balancing		Chalk & Talk,PPT	
46.		Problems		Chalk & Talk,PPT	
47.	13	Aggregate planning: Intro, Methods		Chalk & Talk,PPT	
48.		Chase Planning, Level Planning		Chalk & Talk,PPT	
49.		***Mock Test - II***		Chalk & Talk,PPT	
50.		Problems		Chalk & Talk,PPT	
51.	14	Controlling Aspects, Expediting		Chalk & Talk,PPT	
UNIT – 5					
52.	14	Dispatching: Intro, Activities of dispatcher	Evaluate	Chalk & Talk,PPT	T1&T2
53		Dispatching procedure		Chalk & Talk,PPT	
54	15	Follow-up: Definition, Reason for existence of follow-up, Types		Chalk & Talk,PPT	
55		Applications of computer in production planning and control		Chalk & Talk,PPT	
56		Problems		Chalk & Talk,PPT	
57	16	***Supply Chain Management- Overview (Beyond syllabus)***		Chalk & Talk,PPT	
58		***KanBan system of Storing -Beyond***		Chalk & Talk,PPT	

		Syllabus			
59		Review		Chalk & Talk,PPT	T1&T2
60		Review		Chalk & Talk,PPT	
MID-II					

Suggested Books:

a. Textbooks:

1. K C Jain and L N Agarwal, Production Planning and Control, 6th edition, Khanna Publishers, 2008.
2. M Mahajan, Production Planning and Control, Dhanpat Rai & Co., 2010.

b. Reference Books:

3. R Paneerselvam, Production & Operations Management, 2nd edition, PHI Publications, 2006.
4. E S Baffa and R K Sarin, Modern Production & Operation Managements, 8th edition, Wiley Publications, 2009.
5. O P Khanna, Industrial Engineering and Management, Dhanpat Rai & Co., 2009.
6. Samuel Eilon, Elements of Production Planning and Control, The Macmillan Company, New York, 1962.
7. S D Sharma, Operations Research, Kedarnath Ramnath Publishers, 1996.
8. J K Sharma, Operations Research, 4th edition, Macmillan India Limited, 2009.
9. P Ramamurthy, Production and Operations Management, New Age International Publications, 2007
10. K L Narayana, P Kannaiah and K Venkata Reddy, Machine Drawing, 3rd edition, New Age Publications, 2006.

Question Bank:

a. Descriptive questions:

Unit -I

Questions	CO mapping	Bloom's taxonomy
1(a) Define: (i) Production (ii) Production Planning (iii) Production Planning and Control. (b) Write about the principles of Production Planning and Control.	CO1	L2=Understand
2(a) Explain how the terms quality, quantity, time and price influences the Production system. (b) Explain "Pre Planning" stage.	CO1	L2=Understand
3(a) Explain the four M's of Production. (b) Explain the Production Control function.	CO1	L2=Understand
4(a) What are the objectives for which PPC department is established in a factory system? (b) List out the planning functions and controlling functions separately	CO1	L2=Understand

5(a) List out at least 10 various functions of PPC department. (b) Explain any two functions in the above list detail.	CO1	L2=Understand
6(a) Explain the functions of production planning. (b) Explain the aims of production planning and control	CO1	L2=Understand
7Explain how PPC manager executes the following functions (i) Scheduling, (ii) Inventory control, (iii) Routing.	CO1	L2=Understand
8 Distinguish inventory control and scheduling functions	CO1	L2=Understand
9 Explain various functions of production control department. Draw internal organization chart of Production planning department	CO1	L2=Understand
10 (a) Explain various objectives of production planning and control. (b) Explain production control.	CO1	L2=Understand

Unit -II

Questions	CO mapping	Bloom's taxonomy
1) (a) What are the requirements of a good forecasting method? (b) What are the steps in forecasting process?	CO2	L2=Understand
2(a) Explain the importance of forecasting in an industry. (b) List and explain the qualitative methods of forecasting	CO2	L2=Understand
3 Explain various types of forecasting and their uses.	CO2	L2=Understand
4Discuss various approaches in forecasting demand for new products.	CO2	L2=Understand
5What is time series analysis? How the forecast is made from the time series? Explain its advantages and limitations	CO2	L2=Understand
6List out the various quantitative techniques for forecasting. Explain any three of them in detail.	CO2	L2=Understand
7Explain the following types of forecasts and their uses: (a) Long Range Forecasts (b) Medium Range forecasting (c) Short range forecasting.	CO2	L2=Understand
8Explain the methods used for short-range forecasting and long term forecasting	CO2	L2=Understand

9(a) Explain when judgmental techniques are used in forecasting. (b) Explain when casual forecasting method is used.	CO2	L2=Understand
10Explain the Delphi method of forecasting.	CO2	L2=Understand

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Unit –III

Questions	CO mapping	Bloom's taxonomy
1) (a) Explain the inventory structure. (b) Illustrate the objectives of inventory control.	CO3	L2=Understand
2) (a) Explain the relationship between inventory levels and profitability. (b) How profitability is achieved by controlling inventory?	CO3	L2=Understand
3) (a) What are the reasons for carrying inventories? (b) How are the inventory costs estimated and normally expressed?	CO3	L2=Understand
4) (a) Explain various motives behind carrying inventory. (b) Explain various components of carrying costs and order costs.	CO3	L2=Understand
5) (a) What are inventory associated costs? (b) Explain the factors affecting the inventory costs.	CO3	L2=Understand
6) What are the relevant costs that management should try to balance in deciding on the size of purchase orders? How do they vary with order size?	CO3	L2=Understand
7) (a) What factors do you consider in fixing the maximum and minimum stock levels? (b) Why do we balance the conflicting objectives of minimizing cost and maximizing service levels in inventory models (c) What are some of the benefits and costs associated with safety stock?	CO3	L2=Understand
8) Classify inventory models? Discuss briefly each one of them?	CO3	L2=Understand
9) (a) What are the basic assumptions in the EOQ model? Explain the significance of EOQ formula. What are its Limitations? (b) Derive expression for basic Economic Order Quantity (EOQ).	CO3	L2=Understand
10) (a) Define P - System? When you recommend this for controlling inventory? (b) How is the reorder point determined? What is the	CO3	L2=Understand

significance of the reorder point to the production manager?		
(a) Define material requirement planning (MRP) (b) What are the inputs to material requirement planning (c) What are the objectives of MRP.	CO3	L2=Understand
12)Explain the following inputs of MRP system: (a) Master production schedule (b) Bill of Material (c) The inventory records file.	CO3	L2=Understand
13)(a) Explain the terminology involved in MRP system. (b) Explain the principles of MRP system.	CO3	L2=Understand
14)Explain the logic of Material Requirement Planning System? Explain with example.	CO3	L2=Understand
15)(a) Explain, in detail the procedural steps involved in MRP. (b) State and explain the functions served by MRP.	CO3	L2=Understand
16)(a) Explain various steps involved in MRP system. (b) What are the outputs of MRP system?	CO3	L2=Understand
17)Describe the MRP process, including netting, exposing and time phasing.	CO3	L2=Understand
18)(a) What information is contained in the BOM file? (b) How can load reports be used to develop material requirement plans? (c) What does it mean for an MRP system to be nervous?	CO3	L2=Understand
19)Discuss the terms “product structure tree” and “bill of materials” with an example of a clip board having the parts as press board, top part of clip, bottom of clip, spring, pivot and rivets.	CO3	L2=Understand
20) Explain Enterprise Resource Planning (ERP) logic in detail. Distinguish between RFP and COP approaches for ERP selection.	CO3	L2=Understand

Unit –IV

Questions	CO mapping	Bloom’s taxonomy
1) (a) Define routing? (b) Discuss routing procedure.	CO4	L3=Demonstrate
2) Describe the following with respect to routing: (i) Job order (ii) Move order and (iii) Tool order.	CO4	L3=Demonstrate
3) Discuss in detail the following functions of routing: (a) Interpretation of detailed drawings (b) Methods analysis and (c) Work standards.	CO4	L3=Demonstrate

4) Write about the affect of the following on routing: (a) Manufacturing process (b) Equipment and (c) Man power.	CO4	L3=Demonstrate
5) Discuss the importance of the following functions of routing: (a) Specification of machine tools and cutting tools and (b) Estimation of manufacturing tolerances.	CO4	L3=Demonstrate
6) How does routing in job shop production differ from continuous production system?	CO4	L3=Demonstrate
7) (a) Explain the importance of routing in production planning. (b) What are the factors affecting routing procedure? Explain.	CO4	L3=Demonstrate
8) (a) Explain in detail about the Process Plan of a product. (b) Explain the common steps which are generally followed by all process planners.	CO4	L3=Demonstrate
9) Explain the role of: (a) Production planning engineer and (b) Industrial engineer in the preparation of process planning sheet.	CO4	L3=Demonstrate
10) Explain the role of: (a) Tool engineer (b) "Estimator" in the preparation of process planning sheet.	CO4	L3=Demonstrate
(a) Define Scheduling. (b) Explain different methods of scheduling.	CO4	L3=Demonstrate
Write the guidelines, which assist the preparation of schedules.	CO4	L3=Demonstrate
What are the differences in decision variables for scheduling in a job shop and in a batch shop?	CO4	L3=Demonstrate
How does scheduling in Job shops differ from High volume continuous systems? Explain in detail.	CO4	L3=Demonstrate
Explain the terms forward scheduling and back ward scheduling.	CO4	L3=Demonstrate
)Explain the following techniques used for loading and scheduling: (a) Perpetual schedule and (b) Order schedule.	CO4	L3=Demonstrate
17)(a) Explain master scheduling with suitable example. (b) Explain how graphs are useful for scheduling and control problems	CO4	L3=Demonstrate
18)Explain the following devices used for loading and scheduling: (a) Produc-Trol Board and (b) Sched-U-Graph.	CO4	L3=Demonstrate
(a) Explain the use of Gantt charts. (b) Explain the schedule boards and commercial devices.	CO4	L3=Demonstrate
20)Explain with a neat sketch how Gantt chart is used to show schedules. Explain the symbols used in drawing Gantt chart.	CO4	L3=Demonstrate
21)Explain: (a) Line balancing (b) Expediting (c) Chase planning (d)	CO4	L3=Demon

Capacity balance		strate
22)Distinguish between capacity balance and line balance.	CO4	L3=Demonstrate
23)Describe any one quantitative technique used for Assembly line balancing.	CO4	L3=Demonstrate
24)Define line balancing problem. Explain Ranked Positional Weight (RPW) method for solving it	CO4	L3=Demonstrate
25)What is Aggregate Planning? How does it differ from Long range Planning and short period planning? Explain with an example	CO4	L3=Demonstrate
26)What is the meaning of Aggregate plan? What are the objectives of aggregate plans? What are the inputs and the nature of the outputs?	CO4	L3=Demonstrate
27)(a) Define aggregate planning. (b) What is its objective? (c) List out various strategies it uses and explain one in detail.	CO4	L3=Demonstrate
28)Place Aggregate planning in context with the term planning horizon. What is the appropriate planning horizon for aggregate planning? Explain the procedure involved in Aggregate plan.	CO4	L3=Demonstrate
29)Under what conditions would a single-stage aggregate planning decision system be appropriate?	CO4	L3=Demonstrate
30) (a) List out the guide lines for aggregate scheduling (planning) (b) Discuss the relevant cost components involved in Aggregate planning decisions	CO4	L3=Demonstrate

Unit –V

Questions	CO mapping	Bloom's taxonomy
1) (a) What is meant by Dispatching? (b) Enumerate the duties of a Dispatcher. (c) Give a list of records maintained by Dispatching Department?	CO5	L3=Evaluate
Discuss in detail the sequential steps involved in dispatching	CO5	L3=Evaluate
2) (a) Explain briefly the dispatching activities. (b) Explain the necessity of close control in dispatching activities?	CO5	L3=Evaluate
3) Describe the following forms used in dispatching: (a) Move order (b) Production ticket.	CO5	L3=Evaluate
4Discuss the following forms used in dispatching: (a) Tool order and (b)	CO5	L3=Ev

Job order		aluate
5Why is dispatching required on shop floor? Write about dispatching rules used in shop floor	CO5	L3=Ev aluate
6a) With the help of an Organizational Chart, explain the Centralized and Decentralized System of Dispatching. (b) List the merits and demerits of Centralized and decentralized system of dispatching.	CO5	L3=Ev aluate
7Differentiate between centralized and decentralized dispatching procedures	CO5	L3=Ev aluate
8(a) What is follow-up? (b) Explain the reasons for existence of follow-up functions.	CO5	L3=Ev aluate
9Describe the types of follow-up in detail.	CO5	L3=Ev aluate

b. Objective questions

Unit-I (Relevant to JNTU)

1) In jobbing production, (a) High skilled worker (b) Unit cost is high (c) Both (d) None
2) Job evaluation is method of determining the (a) Relative values of Job (b) Workers performance on job (c) Both (d) None
3) In general, automobiles (heavy vehicles) body building is (a) Batch production (b) Job order production (c) Mass production (d) none
4) Vehicle manufacturing assembly line is an example of (a) product layout (b) process layout (c) manual layout (d) fixed layout
5) Military organization can be categorized as (a) Line organization (b) Functional organization (c) Both (d) None.
6) BEA stands for _____.
7) A plant layout is an arrangement of _____ in the plant.
8) Future course of action is called _____.
9) P.P.C stands for _____.
10) The ratio of output to input is called _____.

Unit-II (Relevant to JNTU, GATE & IES)

1) Forecasts are usually classified by time horizon into three categories _____ (a) short-range, medium-range, and long-range (b) finance/accounting, marketing, and operations (c) strategic, tactical, and operational, (d) exponential smoothing, regression, and time series
2) The two general approaches to forecasting are (a) mathematical and statistical (b) judgmental and qualitative (c) historical and associative (d) qualitative and quantitative
3) Which of the following is not a step in the forecasting process? (a) determine the use of the forecast (b) eliminate any assumptions, (c) determine the time horizon (d) select a forecasting model(s)

4) Which of the following forecasting methods takes a fraction of forecast error into account for the next period forecast? (a) Simple average method (b) moving average method (c) weighted moving average method (d) exponential smoothening method
5) The demand and forecast for February are 12000 and 10275 respectively. Using single exponential smoothening method (smoothening coefficient = 0.25), forecast for the month of March is (a) 431 (b) 9587 (c) 10706 (d) 11000
6) The data for 5 consecutive periods is 1, 2, 3, 4 and 5. Then as per 5 period moving average, the forecast for 6^{th} period is (a) 1 (b) 2 (c) 3 (d) 4
7) In simple exponential smoothing forecast, to give higher weightage to recent demand information, the smoothing constant must be close to (a) -1 (b) zero (c) 0.5 (d) 1
8) In a time series forecasting model, the demand for 5 time periods was 10, 13, 15, 18 and 22. A linear regression fit resulted in an equation F=6.9+2.9*t where F is the forecast for period t. The sum of absolute deviations for the five data is: (a) 2.2 (b) 0.2 (c) -1.2 (d) 24.3
9) When using a simple moving average to forecast demand, one would (a) give equal weight to all demand data (b) assign more weight to the recent demand data (c) include new demand data in the average without discarding the earlier data (d) include new demand data in the average after discarding some of the earlier demand data
10) The predicted demand during certain period is 150 units and actually found to be 125 units. If alpha = 0.4, the forecast for next period is ____
11) _____ is the estimation of the value of a variable (or set of variables) at some future point in time.
12) A number of factors have to be taken into account in what is called a _____ analysis.
13) Planning policy is based on _____.
14) Delphi method is suitable for _____ range of forecast.
15) The forecasting approach suitable for new product is _____.

Unit-III (Relevant to JNTU, GATE & IES)

1) Usable but presently idle resource is generally called as (a) Reserves (b) Material in Hand (c) Inventory (d) none
2) Materials and components being worked on or waiting between operations in the organization is called as (a) Raw material (b) Components (c) Finished products (d) Work in progress
3) _____ Analysis is based on the level of difficulty in the procurement of inventory (a) ABC (b) VED (c) SDE (d) XYZ
4) In VED analysis 'V' stands for _____ items (a) Vital (b) Very good (c) very poor (d) none
5) If we increase or decrease the EOQ by twice, the increase in total cost is (a) 100% (b) 75% (c) 50% (d) 25%
6) _____ is also called as optimal order quantity (a) JIT, (b) EOQ, (c) ABC, (d) none
7) A.B.C analysis stands for (a) Always better control (b) Alternate better control (c) either (d) None
8) A-B-C analysis is used in (a) CPU (b) PERT (c) Inventory control (d) All of those.
9) _____ includes variety of techniques for managing the inventory of a firm.

10) Always better control (ABC) analysis is a _____ tool for selective control.
11) Define buffer stock _____.
12) Example for finished goods inventory is _____.
13) Holding cost is also called _____.
14) One of the important tools in inventory control is the _____ order quantity formula.
15) Raw material which is kept in stock for use in the production of goods is called _____.

Unit-III (Relevant to JNTU, GATE & IES)

1) _____ approach is to have less in-process inventory on hand (a) EPR, (b) ABC, (c) JIT, (d) none
2) _____ is a computerized information system that integrates and coordinates the operations of a firm (a) ABC analysis, (b) EOQ, (c) ERP, (d) none
3) _____ is an inventory model that can handle dependent demand (a) material requirements planning (b) just in time (c) EOQ (d) none
4) J.I.T stands for (a) Just in time (b) Juran In Time (c) Both (d) None
5) In an MRP system, component demand is: (a) forecasted (b) established by the master production schedule (c) calculated by the MRP system from the master production schedule (d) ignored
6) The word 'kanban' is most appropriately associated with (a) economic order quantity (b) just-in-time production (c) capacity planning (d) product design
7) In KAIZEN muda means (a) Waste (b) Strain (c) Discrepancy (d) None
8) In KAIZEN mura means (a) Waste (b) Unevenness (c) Standard (d) None
9) In KAIZEN muri means (a) Unreasonable (b) Overburden (c) Immoderation (d) All the above
10) _____ is a computational technique that converts the master schedule for end products into a detailed schedule for the raw materials and components used in the end products.
11) Just-In-Time (JIT) is one of the fundamental approaches used in the _____ production system.
12) Material requirement planning (MRP) is often thought of as a method of _____ control.
13) MRP stands for _____.
14) One technique of implementing JIT is a manual procedure called ____.
15) KAIZEN is a Japanese word KAI and ZEN means _____ and _____.

Unit-IV (Relevant to JNTU)

1) _____ loading is carried out in conjunction with routing to ensure smooth work flow (a) machine (b) production (c) axial (d) longitudinal
2) _____ does play role in production orders with specifications of feeds, speeds (a) estimation (b) planning (c) sequence (d) control
3) _____ step/s is/are involved in routing (a) Type of work to be done on product or its parts (b) Operations required to do the work (c) Sequence of operations required (d) All the above

4) Operation sheet can compute _____ production quantities (a) worst (b) economic (c) simple (d) complicate
5) Routing is affected by _____ factors (a) Nature of manufacturing (b) Type of machines (c) Availability of machines and other resources (d) All the above
6) An assembly activity is represented on an Operation Process Chart by the symbol (a) □ (b) A (c) D (d) O
7) The production orders and detailed operation sheets are available with specifications of (a) feeds (b) speeds (c) attachments (d) all of these
8) _____ indicates the material used during manufacturing and their progress from one operation to another
9) _____ may be defined as the selection of path which each part of the product will follow while being transformed from raw materials to finished products
10) Routing is a fundamental _____ function on which all subsequent planning is based.
11) The bill of material (BOM) provides the _____ and content of each parent item or final product.
12) The operation sheet is filled in the records of the _____ department and can be used again when the order is repeated.
13) In the production planning _____ estimation can be made by operation sheets.
14) A common mathematical approach to loading for infinite capacity loading is Assignment problem whose solution can be obtained by _____.
15) For finite capacity loading where the capacities of the work-centers are given, heuristics like _____ can be used.

Unit-IV (Relevant to JNTU, GATE & IES)

1) _____ process is defined as establishing of times at which to begin and complete each event or operation comprising a procedure (a) Routing (b) Scheduling (c) Manufacturing (d) None
2) _____ scheduling determines the start and finish times for waiting jobs by assigning them to the latest available time slot that will enable each job to be completed just when it is due, but done before (a) backward (b) forward (c) a & b (d) none
3) _____ scheduling determines the start and finish times for waiting jobs by assigning them to the latest available time slot irrespective of due dates (a) Backward (b) Forward (c) Both a & b (d) None
4) The objective of sequencing problem is (a) To find the order in which jobs are to be made (b) To find the time required for completing all the jobs on hand (c) To find the sequence in which jobs on hand are to be processed to minimize the total time required for processing the jobs (d) To maximize the effectiveness
5) In solving 2 machine and ‘n‘ jobs problem, the following assumption is wrong: (a) No passing is allowed (b) Processing times are known, (c) Handling time is negligible, (d) The time of processing depends on the order of machining

6) The processing time in days for six jobs arrived in a sequence is 4, 9, 5, 10, 6 and 8. Average flow time (in days) for the above jobs using Shortest Processing Time rule is (a) 20.83 (b) 23.16 (c) 125.00 (d) 139.00
7) The processing time in days on a machine for four jobs 1, 2, 3 and 4 are 4, 7, 2 and 8 days respectively. The due date is 6, 9, 19 and 17 respectively for the four jobs. Using the shortest processing time (SPT) rule, total tardiness is _____ and if the earliest due date (EDD) rule is used to sequence the jobs, the number of jobs delayed is _____.
8) _____ is/ are the principle/s of scheduling (a) principle of optimum task size (b) principle of optimum production plan (c) principle of optimum sequence (d) a, b, & c
9) Loading and scheduling improves _____ in the production planning (a) efficiency (b) i/p (c) o/p (d) performance
10) _____scheduling is commonly used in job shops where customers place their orders on “needed as soon as possible" basis
11) An interval of two for which a detailed production program is prepared is called as _____.
12) Types of scheduling of scheduling can be categorized as _____
13) _____ is a visual aids used for a variety of purposes related to loading and scheduling.
14) _____ is intended to organize and show the actual use or the intended use of resources on a time-scaled chart.
15) Gantt charts have become a common technique for representing the phases and activities of a project _____.

Unit-IV (Relevant to JNTU, GATE & IES)

1) Dependence on an external source of supply is found in which of the following aggregate planning strategies? (a) Varying production rates through overtime or idle time, (b) subcontracting (c) using part-time workers (d) backordering during high demand periods
2) The planning tasks associated with staffing, production, inventory, and sub-contracting levels typically fall under _____ (a) short-range plans (b) intermediate-range plans (c) long-range plans (d) demand options
3) When producing batches of large units are spread over a period of several months it is called as _____ planning. (a) Short-term (b) middle-term (c) immediate-term (d) long-term
4) Which of these aggregate planning strategies adjusts capacity to match demand? (a) Backordering (b) using part-time workers (c) counter-seasonal product mixing (d) changing price
5) For an assembly line, total task time at the workstation I, II, III, IV, V and VI in minutes are 7, 9, 7, 10, 9 and 6 minutes respectively. What is the line efficiency of the assembly line? (a) 70% (b) 75% (c) 80% (d) 85%
6) An electronic equipment manufacturer has decided to add a component subassembly operation that can produce 80 units during a regular 8-hrs shift. The operation consist of three activities namely M-Mechanical assembly, E- Electric wiring and T-Test taking Standard time in minutes 12, 16 and 3 respectively. For line balancing, the number of work stations required for the activities M, E and T would respectively be (a) 2, 3, 1 (b) 3, 2, 1 (c) 2, 4, 2 (d) 2, 1, 3

7) Capacities of production of an item over 3 consecutive months in regular time are 100, 100 and 80 and in overtime are 20, 20 and 40. The demands over those 3 months are 90, 130 and 110. The cost of production in regular time and overtime are respectively Rs. 20 per item and Rs. 24 per item. Inventory carrying cost is Rs. 2 per item per month. The levels of starting and final inventory are nil. Backorder is not permitted. For minimum cost of plan, the level of planned production in overtime in the third month is (a) 40 (b) 30 (c) 20 (d) 0
8) Which one of the following is NOT a decision taken during the aggregate production planning stage? (a) Scheduling of machines (b) Amount of labor to be committed (c) Rate at which production should happen (d) Inventory to be carried forward
9) Aggregate planning is a _____ corporate planning activity.
10) An option for altering the availability of capacity is _____
11) If the cycle time is 'T' minutes, the theoretical output is _____.
12) In line balancing problem for the given network, if 25 assemblies are required per day, having an eight hour per day effective work time then the cycle time is _____ minutes.
13) The typical time horizon for aggregate planning is _____
14) Machine output is _____ to the cycle time.
15) _____ is concerned with determining the labor and equipment resources needed to achieve the master schedule.

Unit-V (Relevant to JNTU)

1) _____ is the process of setting production activities in motion through release of orders and instructions. (a) Routing (b) dispatching (c) manufacturing (d) scheduling
2) _____ activity/s are involved in dispatching (a) To assign definite work to definite machines, work centers and men (b) To issue required materials from stores (c) Release necessary work orders, time tickets, etc., to authorize timely start of operations (d) All the above
3) The expediting or follow up function in production control is an example of (a) LIFO (b) FIFO (c) SIRO (d) Pre-emption.
4) _____ authorizes the start of production activities by releasing materials, components, tools, fixtures and instruction sheets to the operator.
5) _____ with an on–board control panel represents the lowest level of sophistication among the possible methods.
6) _____ is a logical step after dispatching.
7) Dispatching is the _____ of setting productive activities in motion through release of orders.
8) Expediting as it is sometimes called is a _____ after dispatching.
9) The word GO means _____ the flow of information and instructions.
10) This communication system can mark the success or failure of the schedule _____.
11) Dispatching function is concerned with the execution of the _____ function.
12) It is the duty of the _____ function to issue requisition for material and tools on a production order.

Websites Addresses:

1) www.informs.org
2) http://nptel.iitm.ac.in/video.php?subjectId=112102106
3) http://nptel.iitm.ac.in/video.php?subjectId=112107143
4) http://www.youtube.com/watch?v=zlZaOnBbpUg
5) http://www.youtube.com/watch?v=b143Y7dTfIA
6) http://www.poms.org/chapters/india_chapter/
7) *www.isye.gatech.edu/*
8) *www.cors.ca/*
9) *www.orie.cornell.edu/*

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19) Prof. Hani S Mahmassani, Northwestern University, Evanston, IL
20) Prof. Sunil Chopra, Northwestern University, Evanston, IL

Journals (National & International):

1) Computers and Industrial engineering
2) Decision sciences
3) Engineering Management
4) European Journal of Industrial Engineering
5) IIE transactions
6) Journal of Operations Management
7) Production and Operations Management
8) International Journal of Operations & Production Management

9) International Journal of Production Economics
10) International Journal of Production research
11) International Journal of Forecasting
12) International Journal of Productivity and Quality Management
13) International Journal of Production Planning & Control
14) Journal of Advances in Management Research
15) Management Science (USA)
16) Manufacturing & Service Operations Management
17) Production Planning & Control
18) Interfaces
19) Vikalpa

List of Topics for Student Seminars:

1) Manufacturing Systems
2) Production Planning & Control
3) Production Planning
4) Production Control
5) Forecasting
6) Aggregate Planning
7) Just-In-Time
8) Inventory Control
9) Materials Resource Planning
10) Enterprise Resource Planning
11) Routing
12) Scheduling
13) Assembly Line Balancing
14) Line of Balance
15) Dispatching
16) Follow up & Expediting

Case Studies / Small Projects:

1) Loading Problem
2) Vehicle Routing Problem
3) Capital Budgeting Problem
4) Facility Location Problem
5) Forecasting
6) Inventory Control Problems
7) Multi-echelon inventory system
8) Materials Resource Planning
9) Enterprise Resource Planning
10) Lean Manufacturing
11) Job Routing
12) Flow Shop Sequencing
13) Job Shop Sequencing
14) Planning & Scheduling Applications

15) Assembly Line Balancing
16) Three-dimensional cutting/packing of container loading
17) Production Planning Problem
18) Capacity Planning Problem
19) Aggregate Production Planning Problem
20) Assortment Planning Problem