**Unit II PROCESS PLANNING**

**Session 1**

**Recap:**

 Addressing the concept of Time study, Ergonomics, objective of Ergonomics.

**Session objective:**

 After studying this session the learner will be able to understand the concept of

Process planning, objective of process planning.

**Suggested activity:**

 **PPT**

**PROCESS PLANNING—DEFINITION**

Process planning can also be defined as the systematic determination of the methods by which a product is to be manufactured economically and competitively. It consists of devising, selecting and specifying processes, machine tools and other equipment to convert raw material into finished and assembled products.

**2.1.1 Purpose of Process Planning**

The purpose of process planning is to determine and describe the best process for each job so that,

1. Specific requirements are established for which machines, tools and others equipment can be designed or selected.

2. The efforts of all engaged in manufacturing the product are coordinated.

3. A guide is furnished to show the best way to use the existing or the providing facilities.

**OBJECTIVES OF PROCESS PLANNING**

The systematic determination of the engineering processes and systems to manufacture a product competitively and economically is called operations planning. It is the stage between design and

Production. The plan of manufacture considers functional requirements of the product, quantity, tools and equipment, and eventually the costs for manufacture.

**Conclusion:**

 At the end of this session the learners should understand the concept of process planning, purpose and objective of process planning.

**Website URL:**

<http://www.engr.sjsu.edu/sobi/Process%20Planning.htm>

<http://training.fema.gov/EMIWeb/is/ICSResource/assets/PlanningP.pdf>

**Session 2**

**Recap:**

 Addressing the concept of Process planning, objective of process planning.

**Session objective:**

 After studying this session the learner will be able to understand the concept of approaches of Process planning.

**Suggested activity:**

 **PPT**

**INFORMATIONS REQUIRED TO DO PROCESS PLANNING**

1. Quantity of work to be done along with product specifications.

2. Quality of work to be completed.

3. Availability of equipments, tools and personnel’s.

4. Sequence in which operations will be performed on the raw material.

5. Names of equipment on which the operations will be performed.

6. Standard time for each operation.

7. When the operations will be performed?

**APPROACHES OF PROCESS PLANNING**

 **Manual Process Planning**

This type of planning is known as non-variant process planning. It is the commonest type of planning used for production today. Planning the operations to be used to produce a part requires knowledge of two groups of variables.

*(a)* The part requirements, and

*(b)* The available machines and processes and the capabilities of each process.

**Computer Aided Process Planning**

Computer Aided Process Planning (CAPP) has been investigated for more than

20 years; it can be categorized in two major areas; variant planning, where library retrieval procedures are applied to find standard plans for similar components, and generative process planning, where plans are generated automatically for new components without reference to existing plans. The latter system is most desirable but also the most difficult way of performing CAPP.

**Conclusion:**

 At the end of this session the learners should understand the concept of Approaches of Process planning.

**Website URL:**

web.iitd.ac.in/~pmpandey/Process\_engg\_html/CAPP.pdf‎

**Session 3**

**Recap:**

 Addressing the concept of manual Process planning, CAPP.

**Session objective:**

 After studying this session the learner will be able to understand the concept of

Approaches of CAPP.

**Suggested activity:**

 **PPT**

***Retrieval Type Approach***

Variant process planning explores the similarities among components and searches through a database to retrieve the standard process plan for the part family in which the component belongs. A standard process plan is a process plan that applies to an entire part family when a standard plan is retrieved; a certain degree of modification follows in order to accommodate the details of the design. In general, variant process planning has two operational stages, a preparatory stage

and a production stage.

***Generative Approach***

Generative process planning synthesizes manufacturing information, particularly regarding the capabilities of different manufacturing process, and creates process plans for new components. An ideal generative process planning system receives information about the design of the part and generates the process plan, including processes to be used and their sequences, without human intervention. Unlike the variant approach, this uses standardized process-grouped family plans; the generative approach is based on defining the process planning logic using methods like.

 ***Process planning logic***

• Decision trees.

• Decision tables.

• Artificial intelligence based approach.

• Axiomatic approach.

Generative process planning systems are to be rapid and consistent in generating process.

**Conclusion:**

 At the end of this session the learners should understand the concept of Approaches of Computer aided Process planning.

**Website URL:**

web.iitd.ac.in/~pmpandey/Process\_engg\_html/CAPP.pdf‎

**Session 4**

**Recap:**

 Addressing the concept of CAPP, Approaches of CAPP.

**Session objective:**

 After studying this session the learner will be able to understand the concept of

Process planning activities.

**Suggested activity:**

 **PPT**

**PROCESS PLANNING ACTIVITIES**

 **Concept of Process Planning**

The concept of process planning is to determine

1. The operations involved in the manufacture of each product.

2. The machines on which operations are to be done.

3. The tools, jigs and fixtures required.

4. The material requirements including scrap.

5. The speeds and feeds that are to be used.

6. The type of labor required.

7. The time required for each operation.

The above information’s are made available on process sheet. The main objective of process Planning is to find the most economic method of performing an activity.

**Process Planning Procedure**

1. Preparation of working drawings.

2. Deciding to make or buy.

3. Selecting manufacturing process.

4. Machine capacity and machine selection.

5. Selection of material and bill of materials.

6. Selection of jigs, fixtures and other attachments.

7. Operation planning and tooling requirement.

8. Preparation of documents such as operation sheet and route sheet etc.

**Conclusion:**

 At the end of this session the learners should understand the concept of Process planning activities.

**Website URL:**

<http://faculty1.aucegypt.edu/farag/presentations/Chapter9.pdf>

**Session 5**

**Recap:**

 Addressing the concept of process planning procedure, operating sequence.

**Session objective:**

After studying this session the learner will be able to understand the concept of Material selection in a Process planning activities.

**Suggested activity:**

 **PPT**

***Determination of material requirements***

The materials required are worked out and arrangements to procure them are made. The procedure for examining the material requirements are given below.

1. Existing requirements for works on hand.

2. The new or extra material required. It is to be calculated from bill of materials.

3. Total material required.

4. Existing stock of materials.

5. Additional materials to be produced.

**Selection of material, jigs, fixtures etc.**

The selection of material has become complicated by the great increase not only in the kinds of materials but also in the various forms. The material should be of right quality and chemical composition as per the product specifications. The shape and size of material should restrict the scrap.

**Bill of material**

The most common method of analyzing a product into component parts is through the use of bills of material or specification sheets. Bill of material is a means of determining, purchasing and production order requirements. It should indicate if the part is to be manufactured or purchased. The production control department uses the bill of material to determine manufacturing and scheduling dates.

Process engineering uses it as a check list to complete their work. Methods engineering uses it in the preparation of time allowances for assembling operations. Accumulations are made by the stores department according to the bills of materials. The releases by assembly units are made by the finished stores department in accordance with the bills of material.

**Conclusion:**

 At the end of this session the learners should understand the concept of material selection in a Process planning activities.

**Website URL:**

<http://homepages.cae.wisc.edu/~me349/lecture_notes/material_selection.pdf>

**Session 6**

**Recap:**

 Addressing the concept of material selection and machine selection in a process planning activities.

**Session objective:**

 After studying this session the learner will be able to understand the concept of Important document used in a Process planning activities.

**Suggested activity:**

 **PPT**

 **Operation Planning Sheet**

The following information are required to do the process planning effectively:

1. Quantity of work to be done along with product specifications.

2. Quality of work to be completed.

3. Availability of equipment, tools and personnel.

4. Sequence in which operations will be performed on the raw material.

5. Names of equipments on which the operations will be performed.

6. Standard time for each operation.

7. When the operations will be performed?

8. Cutting speed

9. Feed

10. Material specification.

11. Job rating of labors.

**Operation planning sheet**

|  |
| --- |
| Part Name: ………… Material: ……….... Part No.: ………... Material Specification: ………… |
| Operation No  | Description of operation | Machine | Tools | Jigs | Gauges | Time Analysis |
|  |  |  |  |  |  |  |

**Conclusion:**

 At the end of this session the learners should understand the concept of planning sheet in process planning activities.

**Website URL:**

<http://namac.org/strategic-planning-steps>

**Session 7**

**Recap:**

 Addressing the concept of opration sheet or process sheet in process planning activities.

**Session objective:**

 After studying this session the learner will be able to understand the concept of

Manufacturing logic and knowledge process planning activities.

**Suggested activity:**

 **PPT**

 ***Process planning logic***

* Decision trees.
* Decision tables.
* Artificial intelligence based approach.
* Axiomatic approach.

Generative process planning systems are to be rapid and consistent in generating process plans. They should create process plans for entirely new components, unlike variant systems, which always need a standard plan for entirely new components, unlike variant systems, which always need a standard plan of previously existing components; and they must allow the integration.

* Flow chart
* Decision table
* Expert system shell

**Conclusion:**

 At the end of this session the learners should understand the concept of manufacturing logic and knowledge process planning activities.

**Website URL:**

<http://www.erbamannheim.com/Manufacturing%20Setup/M__8>

**Session 8**

**Recap:**

 Addressing the concept of manufacturing logic and knowledge in process planning activities.

**Session objective:**

 After studying this session the learner will be able to understand the concept of

Importance of production time and production time calculation for lathe operation.

**Suggested activity:**

 **Board presentation/PPT**

**Machining time:**

* Machining time in time during when the work pieces or job is being changed to the desired size,shape or form on the machine tool. Machining time can be computed after determining the revolutions per minute feed of tool number of cuts etc.

**Conclusion:**

 At the end of this session the learners should understand the concept of production time calculation for lathe operation.

**Website URL:**

<http://www.folkgroup.com/leanmanufacturing.pdf>

http://tejc.tripod.com/jit.htm

**Session 9**

**Recap:**

 Addressing the concept of Importance of production time and production time calculation for lathe operation.

**Session objective:**

 After studying this session the learner will be able to understand the concept of

Production time calculation for Shaping, planning operation.

**Suggested activity:**

 **Board presentation/PPT**

**Conclusion:**

 At the end of this session the learners should understand the concept of production time calculation for shaping and planning operation.

**Website URL:**

<http://www.folkgroup.com/leanmanufacturing.pdf>

http://tejc.tripod.com/jit.htm

**Session 10**

**Recap:**

 Addressing the concept of Production time calculation for Shaping, planning operation.

**Session objective:**

 After studying this session the learner will be able to understand the concept of

 Production time calculation for Milling operation.

**Suggested activity:**

 **Board presentation/PPT**

**Conclusion:**

 At the end of this session the learners should understand the concept of production time calculation for milling operation.

**Website URL:**

<http://www.folkgroup.com/leanmanufacturing.pdf>

http://tejc.tripod.com/jit.htm

**Session 11**

**Recap:**

 Addressing the concept of Production time calculation for milling operation.

**Session objective:**

 After studying this session the learner will be able to understand the concept of

 Production time calculation for Grinding operation and selection of cost optimal process.

**Suggested activity:**

 **Board presentation/PPT**

**SELECTION OF COST OPTIMAL PROCESS**

In some cases, a number of alternative processes may be available and a process planner has to choose a particular manufacturing process. For instance, the turning operation on a part of component may be performed on an automatic lathe, an engine lathe or turret lathe. Process research may have to be carried out to select the best process. Decisions regarding select of manufacturing process depend upon both economic and non-economic considerations. The incremental cost of each alternative and the volume of manufacture are important economic considerations. On-economic considerations may differ from situation to situation. For example, machine availability may be an important consideration in the intermittent production of custom built parts. Similarly, in case of very difficult job, a machine that holds closer tolerance may be a better choice. In addition to the selection of manufacturing process, the process planner, is expected to specify

the machines to be used, the type of tools required, the speed under which process should be carried out.

**Conclusion:**

 At the end of this session the learners should understand the concept of production time calculation for grinding operation and selection of cost optimal process.

**Website URL:**

<http://www.folkgroup.com/leanmanufacturing.pdf>

http://tejc.tripod.com/jit.htm