

**FR. Conceicao Rodrigues College of Engineering**  
 Father Agnel Ashram, Bandstand, Bandra-west, Mumbai-50  
**Department of Production Engineering**

**T.E. (Production) (semester VI) (2020-2021)**

**Theory Lecture Plan**

**Subject: Process Engineering and Tooling (PEC601)**

**Credits-04**

**Faculty: Dr. A.B.Rane**

**Syllabus.**

Module	Contents	Hrs.
01	<b>Process Engineering</b> Differentiation between Product Engg and Process Engg. Role of process engineering in a manufacturing setup, organization chart, functions of process engineering. Determining machining sequences - criteria and manufacturing sequence.	04
02	<b>2.1 Preliminary Part Print Analysis</b> General characteristics, determining the principal processes, alternate processes, functional surfaces of the work piece, areas for processing, Nature of work to be performed, Finishing and identifying operations, Case study for understanding preliminary part print analysis.  <b>2.2 Work piece control</b> Causes of work-piece variations, variables influencing work-piece control, work piece control techniques - Equilibrium theories, concept of location, geometric control, dimensional control, mechanical control, alternate location theory.	
03	<b>Tolerance Design</b> <b>Dimensional Analysis:</b> Types of dimensions, concept of baseline dimension, basic geometric dimensioning and tolerance (GD & T). <b>Tolerance Analysis:</b> Rules for adding and subtracting tolerance, tolerance stacks, design and process tolerance stacks, tolerance chart, purpose and use of tolerance chart, definitions and symbols, determining lay-out of Tolerance chart, stock removal, constructing and balancing of tolerance chart.	08
04	<b>Process planning</b> 4.1 Classifying operations (Study of Basic Processes Operations, Principal Processes and Auxiliary Processes, identification of major, critical, qualifying, re-qualifying and supporting operations), product and process critical area, selection of equipment and Tooling.	06

	<b>4.2 Computer Aided Process Planning (CAPP):</b> CAPP -variant approach and generative approach. (Detail)	
<b>05</b>	<b>5.1 Operation Planning</b> Process plan sheet design for complete manufacturing part with details of sequence of operations, machine or equipment used, Process pictures, machining parameters i.e. cutting speed, feed, depth of cut, tooling and gauge details, cutting tools specifications and gauge details machining time calculations. Tool layout for turning on production lathe. <b>5.2 Other aspects of Process Engineering</b> Introduction to high speed machines, SPM, transfer line and other mass production machines-Elementary treatment only, in-process gauging and multiple gauging. ERP SOFTWARE (PPC module -only introduction).	<b>12</b>
<b>06</b>	<b>Cam Design for Automat</b> Automats major classification & types, tools and tool holders, magazines, and hoppers for feeding. Single spindle automats and its tooling, tool layout and cam design for part production on Single spindle automat.	<b>10</b>

### CO Statements.

Learner will be able

PEC602.1: To analyse Part print.

PEC602.2: To prepare Tolerance chart.

PEC602.3: To design Cams for single spindle automat.

PEC602.4: To develop process sheet.

### CO-PO-PSO Mapping.

CO# / PO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEC602.1	3	0	3	-	-	-	-	-	-	-	-	2
PEC602.2	3	2	3	-	-	-	-	-	-	-	-	2
PEC602.3	3	2	3	-	-	-	-	-	-	-	-	2
PEC602.4	3	2	3	-	-	-	-	-	-	-	-	2

CO# / PSO#	PSO1	PSO2
PEC602.1	3	-
PEC602.2	3	-
PEC602.3	3	-
PEC602.4	3	-

## CO Assessment

Final CO achievement = 80 % of Direct assessment + 20 % of Indirect assessment

Direct assessment = 60 % of UT + 40 % of End semester result

In-direct assessment = Course exit survey

## Curriculum Gap/Content beyond syllabus (if any).

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### Lecture Plan

Week No.	Topics	Module	Hours
<b>Week 1</b> (08/3/2021 to 13/3/2021)	Differentiation between Product Engg and Process Engg. Role of process engineering in a manufacturing setup, functions of process engineering. Determining machining sequences - criteria and manufacturing sequence. Determining machining sequences - criteria and manufacturing sequence.	1	4
<b>Week 2</b> (01/2/2021 to 06/2/2021)	General characteristics, determining the principal processes, Alternate processes, functional surfaces of the work piece	2	4
<b>Week 3</b> (08/2/2021 to 13/2/2021)	Areas suitable for processing, nature of work to be performed, finishing and identifying operations, Variables affecting manufacturing processes need for work piece control.	2	4
<b>Week 4</b> (15/2/2021 to 20/2/2021)	Work piece control techniques, Importance of geometric, dimensional and mechanical control and case studies for explaining work piece control. Dimensional Analysis: Types of dimensions, concept of baseline dimension, Basic geometric dimensioning and tolerance (GD & T).Rules for adding and subtracting tolerance	3	4
<b>Week 5</b> (22/2/2021 to 27/2/2021)	Tolerance stacks, design and process tolerance stacks, Tolerance chart, purpose and use of tolerance chart definitions and symbols	3	4
<b>Week 6</b> (01/3/2021 to 06/3/2021)	<b>Unit Test 1</b>		
<b>Week 7</b> (08/3/2021 to 13/3/2021)	Determining lay-out of tolerance chart, stock removal, constructing and balancing of tolerance chart, Study of Basic Processes Operations, Principal Processes and Auxiliary Processes	4	4
<b>Week 8</b> (15/03/2021 to 20/3/2021)	Identification of major, critical, qualifying, re-qualifying and Supporting operations, product and process critical area, selection of equipment and Tooling.	4	4

<b><u>Week 9</u></b> (22/03/2021 to 27/3/2021)	Computer Aided Process Planning (CAPP): CAPP -variant approach and generative approach, Process plan sheet design for complete manufacturing part with details of sequence of operations machine or equipment used, Process pictures	<b>4</b>	<b>4</b>
<b><u>Week 10</u></b> (29/03/2021 to 3/04/2021)	Cutting process parameters, machining parameters i.e. cutting speed, feed, depth of cut, tooling and gauge details, cutting tools specifications	<b>5</b>	<b>4</b>
<b><u>Week 11</u></b> (05/4/2021 to 10/4/2021)	Gauge details machining time calculations, Tool layout for turning on production lathe, Introduction to high speed machines, SPM, transfer line and other mass production machines-Elementary treatment only	<b>5</b>	<b>4</b>
<b><u>Week 12</u></b> (12/4/2021 to 17/4/2021)	In-process gauging and multiple gauging, ERP SOFTWARE (PPC module -only introduction), Process sheet, Single spindle automat and its tooling	<b>5</b>	<b>3</b>
<b><u>Week 13</u></b> (19/4/2021 to 24/4/2021)	Tool layout, Cam design for parts production on Single spindle automat, Process sheet, Single spindle automat and its tooling	<b>6</b>	<b>4</b>
<b><u>Week 14</u></b> (26/4/2021 to 30/4/2021)	<b>Unit Test 2 and Term End</b>		