

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

**S.E. (Production) (semester IV) (2018-2019)**

**Lecture Plan**

**Subject: Product Design and Development (PDD-PEC8018)**

**Credits-3+1 = 4**

**1. Syllabus.**

<b>Module</b>	<b>Details</b>	<b>Hrs.</b>
<b>01</b>	1.1 Introduction: Definition of product design, Classification of products, Design by evolution, Design by innovation, Various phases in product development and Design, Morphology of Design, Considerations in product design, Product specifications. 1.2 Conceptual Design: Market research, Need based origin of product, Technology driven products, Analysis of ideas from various angles of design methodology and user needs, Function analysis and component process study, 2-D and 3-D representations in the form of concept drawing, Computer generated images, dummy and prototypes. 1.3 Materials: Overview of materials including new generation materials, Tailor made material concepts, Material selection process.	<b>05</b>
<b>02</b>	2.1 Design for manufacturing (DFM): Producibility requirements, Accuracy and Precision requirements, Forging and casting design, Design for pressed, mechanical components, powder metallurgical components, Die cast and special cast components, expanded metals and wire forms. 2.2 Design for Assembly (DFA): Analysis of assembly requirements, Standardization, Ease of Assembly and disassembly, Design for bolted, welded and riveted components, Design for hinge and snap fit assemblies, maintenance, consideration of handling and safety, Modular concepts.	<b>05</b>
<b>03</b>	3.1 Strength considerations in Design: Criteria and objectives, Designing for uniform strength, Designing for stiffness and rigidity, Practical ideas for material saving in design of ribs, corrugations, rim shapes, bosses, laminates, etc. 3.2 Designing with plastics: Mechanical behavior, special characteristics and considerations, Design concepts for product features to be manufactured by various production process technologies, Special considerations for designing of components for load bearing applications, Designing for safety, Reliability and environmental considerations.	<b>06</b>

04	Value Engineering: Product value and its importance, Value analysis job plan, Steps to problem solving and value analysis, Value analysis tests, Value Engineering idea generation check list, Material and process selection in value engineering, Cost reduction, case studies and exercises.	04
05	5.1 Product Ergonomics: Anthropometry, Environmental conditions, thermal, noise, vibration, displays, illusions, Psycho and psychological aspects in design, Man-machine information exchange. 5.2 Product Aesthetics: Visual awareness, Form elements in context of product design, Concepts of size, shape and texture, Introduction to colour and colour as an element in design, Colour classifications and dimensions of colour, Colour combinations and colour dynamics, Interaction / communication of colours, Psychological aspects of colours, generation of products forms with analogies from nature. 5.3 Product Graphics: Graphics composition and layout, Use of grids in graphics composition, Study of product graphics and textures. 5.4 Creativity: Role of creativity in problem solving, Vertical and lateral thinking, Brain storming, Synectics, Group working dynamics, Adaptation to changing scenarios in economics, social, cultural and technological fronts, Anticipation of new needs and aspirations.	10
06.	6.1 Software solutions: Software for drafting, modeling, assembly, detailing, CAM interfacing, Rapid tooling/rapid prototyping, etc. 6.2 Modern Applications: Concurrent Engineering, QFD, Robust Design, Sustainable Design, Rapid Prototyping, Rapid Tooling, Product Life Cycle Management techniques and application areas.	06

## 2. CO Statements.

Learner will be able to

PEC8018.1 Develop competency in designing and developing products right from the conceptual level incorporating cost effective solutions.

PEC8018.2 Design products based on various DFX principles

PEC8018.3 Develop Industrial Designs considering ergonomic and aesthetic aspects

PEC8018.4 Get familiarized with computer aided product design approach

## 3. CO-PO-PSO Mapping.

CO# / PO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEC8018.1	3	3	3	-	-	-	-	-	-	-	-	-
PEC8018.2	3	3	3	-	-	-	-	-	-	-	-	-
PEC8018.3	3	2	2	-	-	-	-	-	-	-	-	-
PEC8018.4	3	2	2	-	-	-	-	-	-	-	-	-

CO# / PSO#	PSO1	PSO2
PEC8018.1	2	-
PEC8018.2	2	-
PEC8018.3	2	-
PEC8018.4	2	2

4. CO Assessment tools with target.

Co Statement #	Target for Assessment Tools			
	Unit Test	Mini Project	End Semester Exam	Course Exit Survey
PEC8018.1	50%	60%	60%	60%
PEC8018.2	50%	60%	60%	60%
PEC8018.3	50%	60%	60%	60%
PEC8018.4	50%	60%	60%	60%

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

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6. Lecture/Lab/Mini Project/Assignment Plan.

Week	Duration (Hrs.)	Topic	Module
1 (2.07.18 - 8.07.18)	3	1.1 Introduction: Definition of product design, Classification of products, Design by evolution, Design by innovation,	1
		Various phases in product development and Design	
		Morphology of Design, Considerations in product design, Product specifications.	
2 (9.07.18 - 15.07.18)	3	Conceptual Design: Market research, Need based origin of product, Technology driven products,	1
		Analysis of ideas from various angles of design methodology and user needs	
		Function analysis and component process study, 2-D and 3-D representations in the form of concept drawing, Computer generated images, dummy and prototypes	1
3 (16.07.18 - 22.07.18)	3	Materials: Overview of materials including new generation materials, Tailor made material concepts, Material selection process	

		2.1 Design for manufacturing (DFM): Producibility requirements, Accuracy and Precision requirements, Forging and casting design, Design for pressed, mechanical components, powder metallurgical components, Die cast and special cast components, expanded metals and wire forms.	
4 (23.07.18 - 29.07.18)	3	2.2 Design for Assembly (DFA): Analysis of assembly requirements, Standardization, Ease of Assembly and disassembly, Design for bolted, welded and riveted components, Design for hinge and snap fit assemblies, maintenance Consideration of handling and safety, Modular concepts.	
5 (30.07.18 - 5.08.18)	3	3.1 Strength considerations in Design: Criteria and objectives, Designing for uniform strength, Designing for stiffness and rigidity, Practical ideas for material saving in design of ribs, corrugations, rim shapes, bosses, laminates, etc 3.2 Designing with plastics: Mechanical behavior, special characteristics and considerations, Design concepts for product features to be manufactured by various production process technologies	
6 (6.08.18 - 12.08.18)	3	Special considerations for designing of components for load bearing applications, Designing for safety, Reliability and environmental considerations. Value Engineering: Product value and its importance, Value analysis job plan, Steps to problem solving and value analysis, Value analysis tests, Value Engineering idea generation check list, Material and process selection in value engineering, Cost reduction, case studies and exercises.	
7 (13.08.18 - 19.08.18)		Unit Test I	
8 (20.08.18 - 26.08.18)	3	5.1 Product Ergonomics: Anthropometry, Environmental conditions, thermal, noise, vibration, displays, illusions, Psycho and psychological aspects in design Man-machine information exchange	
9 (27.08.18 - 2-09.18)	3	5.2 Product Aesthetics: Visual awareness, Form elements in context of product design Introduction to colour and colour as an element in design, Colour classifications and dimensions of colour, Colour combinations and colour dynamics, Interaction / communication of colours,	

		Psychological aspects of colours, generation of products forms with analogies from nature	
10 (3.09.18 - 9.09.18)	3	Product Graphics: Graphics composition and layout	
		Use of grids in graphics composition, Study of product graphics and textures	
		Creativity: Role of creativity in problem solving, Vertical and lateral thinking	
11 (10.09.18 – 16.09.18)	3	Brain storming, Synectics, Group working dynamics	
		Adaptation to changing scenarios in economics, social, cultural and technological fronts, Anticipation of new needs and aspirations.	
		Software solutions: Software for drafting, modeling, assembly, detailing	
12 (17.09.18 - 23.09.18)	3	CAM interfacing, Rapid tooling/rapid prototyping	
		Modern Applications: Concurrent Engineering, Sustainable Design	
		QFD, Robust Design, Product Life Cycle Management techniques and application areas	
13 (24.09.18 - 30.9.18)	3	Mini Project Presentations	
14 (1.10.18 - 7.10.18)	3	Mini Project Presentations	

## 1. Lab Plan.

<b>Week No.</b>	<b>Topics</b>	<b>Hours (Per Batch)</b>
3 (16.07.18 - 22.07.18)	Design Procedure and documentation	2
4 (23.07.18 - 29.07.18)	Concept generation, selection and evaluation	2
5 (30.07.18 - 5.08.18)	Redesign of a component	2
6 (6.08.18 - 12.08.18)	Modern Tools in PDD	2
7 (13.08.18 - 19.08.18)	Unit Test	-
8 (20.08.18 - 26.08.18)	Seminar 1	2
9 (27.08.18 – 2-09.18)	Modelling of Redesigned component	2
10 (3.09.18 - 9.09.18)	Design Procedure and documentation	2
11 (10.09.18 – 16.09.18)	Concept generation, selection and evaluation	2
12 (17.09.18 - 23.09.18)	Redesign of a component	2

13 (24.09.18 - 30.9.18)	Modern Tools in PDD	2
14 (1.10.18 - 7.10.18)	Seminar 2	2