PRODUCT DESIGN AND DEVELOPMENT

Course Code		Year	IV	Semester	I
Course Category	Open Elective – III	Branch	ME	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Nil
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

Course Outcomes: Upon successful completion of the course, the student will be able to

	Statement	Skill	Level
CO1	Understand drawing interpretation, BOM structure, Gantt charts, QFD, and industrial MIS tools like SAP and Oracle ERP		
CO2	Identify material standards, manufacturing methods, and apply DFMEA, PFMEA, and FEA fundamentals in product evaluation		
CO3	Demonstrate the ability to process RFQs, select tools/machines, plan manufacturing, and prepare PPAP documents.		
CO4	Evaluate product performance using testing methods and apply lessons learned for NPD improvement		
CO5	Prepare comprehensive reports (PPAP, APQP), utilize prototyping/RPT tools, and apply RE & CE to enhance product development		

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (H: High (3), M: Medium (2), L:Low (1))

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2					3		3		3	2	3	2
CO2	2					3		3		3	2	3	2
CO3	2					3		3		3	2	3	2
CO4	2					3		3		3	2	3	2
CO5	2					3		3		3	2	3	2

Syllabus

UNIT	Content	Mapped CO
I	**FUNDAMENTALS OF PRODUCT DESIGN AND DEVELOPMENT**: Introduction – Reading of Drawing – Grid reading, Revisions, ECN (Engg. Change Note), Component material grade, Specifications, customer specific requirements – Basics of monitoring of NPD applying Gantt chart, Critical path analysis – Fundamentals of BOM (Bill of Materials), Engg. BOM & Manufacturing BOM. Basics of MIS software and their application in industries like SAP, MS Dynamics, Oracle ERP Cloud – QFD.	CO1
II	**MATERIAL SPECIFICATIONS, ANALYSIS & PROCESS**: Material specification standards – ISO, DIN, JIS, ASTM, EN, etc. – Awareness on various manufacturing process like Metal castings & Forming, Machining	CO2

	(Conventional, 3 Axis, 4 Axis, 5 Axis,), Fabrications, Welding process. Qualifications of parts mechanical, physical & Chemical properties and their test report preparation and submission. Fundamentals of DFMEA & PFMEA, Fundamentals of FEA, Bend Analysis, Hot Distortion, Metal and Material Flow, Fill and Solidification analysis.	
III	**ESSENTIALS OF PRODUCT DESIGN AND DEVELOPMENT**: RFQ (Request of Quotation) Processing – Feasibility Studies & reporting – CFT (Cross Function Team) discussion on new product and reporting – Concept design, Machine selection for tool making, Machining – Manufacturing Process selection, Machining Planning, cutting tool selection – Various Inspection methods – Manual measuring, CMM – GOM (Geometric Optical Measuring), Lay out marking and Cut section analysis. Tool Design and Detail drawings preparation, release of details to machine shop and CAM programing. Tool assembly and shop floor trials. Initial sample submission with PPAP documents.	**CO3**
IV	**CRITERIONS OF PRODUCT DESIGN AND DEVELOPMENT**: New product qualification for Dimensions, Mechanical & Physical Properties, Internal Soundness proving through X-Ray, Radiography, Ultrasonic Testing, MPT, etc. Agreement with customer for testing frequencies. Market Survey on similar products, Risk analysis, validating samples with simulation results, Lesson Learned & Horizontal deployment in NPD (New Product Development).	**CO4**
V	**REPORTING & FORWARD-THINKING OF NPD**: Detailed study on PPAP with 18 elements reporting, APQP and its 5 Sections, APQP vs PPAP, Importance of SOP (Standard Operating Procedure) – Purpose & documents, deployment in shop floor. Prototyping & RPT - Concepts, Application and its advantages, 3D Printing – resin models, Sand cores for foundries; Reverse Engineering. Cloud points generation, converting cloud data to 3D model – Advantages & Limitation of RE, CE (Concurrent Engineering) – Basics, Application and its advantages in NPD (to reduce development lead time, time to Market, Improve productivity and product cost.)	**CO5**

Learning Recourse(s)

Text Book(s)

1. Product Development – Sten Jonsson
2. Product Design & Development – Karl T. Ulrich, Maria C. Young, Steven D. Eppinger

Reference books

1. Revolutionizing Product Development – Steven C Wheelwright & Kim B. Clark
2. Toyota Product Development System – James Morgan & Jeffrey K. Liker
3. Winning at New Products – Robert Brands 3rd Edition
4. Product Design & Value Engineering – Dr. M.A. Bulsara &Dr. H.R. Thakkar