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Product Design & Development — Complete Syllabus

BTEUP Diploma in Mechanical Engineering (Production) • 6th Semester • Session 2026–27

Subject 6.4.4 (Theory) • Elective Specialization • Total 100 Marks • 3 Credits

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About this document: Product Design & Development is subject 6.4.4 of the 6th semester of the Diploma in Mechanical Engineering (Production). It is one of the four Elective Specialization options — a student picks any ONE of the four: Green Energy & Engineering (6.4.1), Maintenance of Machine Tools (6.4.2), Non-Destructive Testing (6.4.3) and Product Design & Development (6.4.4). This document gives the complete unit-wise syllabus, the examination scheme and the reference books from the official curriculum.

Examination Scheme

Code	Paper	Type	L – P	Credits	Internal	External	Total
6.4.4	Product Design & Development	Theory	3 – 0	3	Theory 40	Theory 60 (3 hrs)	100
Product Design & Development Total				**3**	**40**	**60**	**100**

What This Subject Aims To Do

To teach students how an idea becomes a product that customers buy — the product life cycle, planning, customer needs, concept development and prototyping — from the perception of a market opportunity to production, sale and delivery.

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Unit-Wise Complete Topic List

Unit	Topic	Periods	Marks
1	Introduction	6	12
2	Product Planning	8	12
3	Identifying Customer Needs	10	12
4	Concept Generation	10	12
5	Prototyping	8	12

Total: 42 periods, 60 marks (external theory). Each of the five units carries 12 marks in the external theory paper, as per the suggested distribution of marks in the official syllabus.

Unit 1 — Introduction (6 Periods, 12 Marks)

Topics: Product life cycle, product policy of an organization, selection of a profitable product, product design process, new product strategy, idea generation, screening, concept development, testing, business analysis, product development testing and analysis, commercialization, collaboration, Gantt chart, product life-cycle management.

In simple words: How a product lives and dies — the product life cycle, product policy, and the journey from idea to commercialisation.

Unit 2 — Product Planning (8 Periods, 12 Marks)

Topics: The product planning process, identify opportunities, evaluate and prioritize projects, allocate resources and plan timing, pre-project planning.

In simple words: How opportunities are found, projects are chosen and ranked, and resources and timing are planned before a project starts.

Unit 3 — Identifying Customer Needs (10 Periods, 12 Marks)

Topics: Gather raw data from customers, interpret raw data in terms of customer needs, organize the needs into a hierarchy, establish the relative importance of the needs and reflect on the results and the process. Product specifications: what are specifications, when are specifications established, establishing target specifications, setting the final specifications.

In simple words: How customer needs are found, organised and turned into product specifications with targets.

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Unit 4 — Concept Generation (10 Periods, 12 Marks)

Topics: Product implications of the architecture, establishing the architecture, variety and supply chain considerations. Industrial design: assessing the need for industrial design, the impact of industrial design, industrial design process, managing the industrial design process, assessing the quality of industrial design.

In simple words: How concepts are generated and chosen, how product architecture is set, and how industrial design and the design process are managed.

Unit 5 — Prototyping (8 Periods, 12 Marks)

Topics: Prototyping basics, principles of prototyping, technologies, planning for prototypes. Product development economics, elements of economic analysis, base case financial model, sensitivity analysis, project trade-offs, influence of qualitative factors on project success, qualitative analysis.

In simple words: How prototypes are planned and used, what a product costs to develop, and how a project is analysed — qualitatively and quantitatively.

Learning Outcomes

- Study the product life cycle, product policies, and the new product design and development process including commercialization.
- Apply product planning methodologies to identify opportunities, evaluate projects, allocate resources, and manage pre-project planning.
- Identify and analyze customer needs to translate them into product specifications and establish targets.
- Develop product concepts and architecture, assess industrial design requirements, and manage the design process effectively.
- Study prototyping principles, technologies, and economic considerations in product development and conduct qualitative and quantitative project analyses.

Reference Books (as listed in the syllabus)

- Karl T. Ulrich, Steven D. Eppinger, Product Design & Development, Tata McGraw-Hill, New Delhi, 2003.
- B. Hollins & S. Pugh, Successful Product Design, Butterworths, London.
- J. G. Bralla, Handbook of Product Design for Manufacture, McGraw-Hill, New York.
- A. K. Chitale and R. C. Gupta, Product Design and Manufacturing, 6th Edition, PHI, New Delhi, 2003.
- G. Boothroyd, P. Dewhurst and W. Knight, Product Design for Manufacture and Assembly, 2nd Edition, Marcel Dekker, New York, 2002.

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Source: IRDT Kanpur NEP-2020 curriculum for the Diploma in Mechanical Engineering (Production), updated and approved by the Board of Technical Education, U.P., Lucknow, in the C.D.C. meeting held on 16.07.2026. Topic lists follow the official syllabus; short explanations are the author's own plain-language summaries, not syllabus text. Please confirm with your own polytechnic for any local changes.

