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Reverse Engineering — Complete Syllabus

BTEUP Diploma in Mechanical Engineering (Production) • 5th Semester • Session 2026–27

Subject 5.6.2 (Open Elective-III, Qualifying) • 50 Marks Internal Only • 2 Credits • L 2 – P 0

Qualifying subject — read this first: you must PASS this subject, but its marks are **not** added to your awarded division or final marks. It is assessed internally for 50 marks only, with no external examination. It is an Open Elective-III option: you choose ONE of Computer Aided Design & Manufacturing, Reverse Engineering, Artificial Intelligence, Automobile Engineering, or any minimum-2-credit course (NPTEL/SWAYAM/AICTE-ELIS/C-DAC/IIT-NIT/ISRO/Tata Tech).

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Examination Scheme

Code	Paper	Type	L – P	Credits	Internal	External	Total
5.6.2	Reverse Engineering	Qualifying	2 – 0	2	50	—	50†

What This Subject Aims To Do

To meet globalisation and technological advances, and to sustain them, we have to explore the knowledge about machine tools covering the various operations and maintenance skill sets required for the development of a nation and its people. Reverse engineering is the skill of taking an existing part or product apart — measuring it, understanding its material and its design — so it can be rebuilt, improved or replaced when no drawings exist.

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Detailed Contents — 3 Units

Unit I — Introduction

Definition; uses; the generic process; phases; computer aided reverse engineering; surface and solid model reconstruction; dimensional measurement; prototyping. Material specification, composition determination, microstructure analysis, manufacturing process verification.

Unit II — Material Characteristics, Part Durability and Life Limitation

Alloy structure equivalency; phase formation and identification; mechanical strength; hardness; part failure analysis; fatigue; creep and stress rupture; environmentally induced failure.

Unit III — Industrial Applications

Reverse engineering in the automotive industry; aerospace industry. Case studies and solving industrial projects in reverse engineering. Legality: patent; copyrights; trade secret; third-party materials.

Course Outcomes

At the end of the subject, the students will be able to:

- **CO1:** Explain the principles, processes, phases, and tools of reverse engineering including dimensional measurement, surface/solid model reconstruction, and material characterization.
- **CO2:** Analyze material characteristics, alloy structures, mechanical properties, and failure mechanisms to assess part durability and life limitations.
- **CO3:** Apply reverse engineering techniques to solve industrial problems in automotive and aerospace sectors.

The Five Study Units in the Notes

The official syllabus has only three units, but the matching notes and practice paper split them into five study units so the practice paper follows the board's five-question pattern. Nothing is added and nothing is dropped: **Study Unit 1** = Syllabus Unit I, introduction, process and phases; **Study Unit 2** = Syllabus Unit I, computer aided reverse engineering and material study; **Study Unit 3** = Syllabus Unit II, alloy structure, strength and hardness; **Study Unit 4** = Syllabus Unit II, failure, fatigue, creep and environment; **Study Unit 5** = Syllabus Unit III, applications and legality.

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Note: the official syllabus prints no unit-wise periods and no marks-distribution table for this subject, so no weightage is shown here.

How to Prepare

This is a qualifying subject — you must pass it, so take the internal assessment seriously even though the marks do not count towards your division. Unit I rewards the generic process and its phases in order; Unit II rewards the failure mechanisms (fatigue, creep, stress rupture, environmentally induced failure) with one example each; Unit III rewards the automotive and aerospace applications plus the four legality points (patent, copyright, trade secret, third-party materials). Revise from the notes unit by unit, then write the likely question at the end of each unit.

Text and Reference Books (as listed in the syllabus)

- Reverse Engineering: An Industrial Perspective by V. Raja and K. Fernandes, Springer Verlag.
- Kevin Otto, “Product Design: Techniques in Reverse Engineering and New Product Development”, ISBN-13: 9788177588217, Dorling Kindersley.
- Robert Messler, “Reverse Engineering: Mechanisms, Structures, Systems & Materials”, McGraw Hill Education, ISBN: 9780071825160.
- Reverse Engineering by K. A. Ingle, McGraw-Hill.
- Raja, Vinesh, Fernandes, Kiran J., “Reverse Engineering: An Industrial Perspective”, ISBN 978-1-84628-856-2, Springer.

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Source: BTEUP IRDT Kanpur NEP-2020 curriculum for Diploma in Mechanical Engineering (Production), effective session 2026-27, approved by the Board of Technical Education U.P. Lucknow in the C.D.C. meeting held on 16.07.2026 (urise.up.gov.in). Topic lists follow the official syllabus; short explanations are the author's own plain-English summaries, not syllabus text. Please confirm with your own polytechnic for any local changes.