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Additive Manufacturing — Complete Syllabus

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

Subject 6.3.2 (Theory) • Elective Pathway • Total 100 Marks • 3 Credits

About this document: Additive Manufacturing is subject 6.3.2 of the 6th semester of the Diploma in Mechanical Engineering (Production). It is one of the five Elective Pathway options — a student picks any ONE of the five: Advanced Engineering Mathematics (6.3.1), Additive Manufacturing (6.3.2), Project Management (6.3.3), Finance Fundamentals (6.3.4) and Industry 4.0 (6.3.5). 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
6.3.2	Additive Manufacturing	Theory	3 – 0	3	Theory 40	Theory 60 (3 hrs)	100
Additive Manufacturing Total				**3**	**40**	**60**	**100**

What This Subject Aims To Do

To give students a complete working knowledge of additive manufacturing technologies — one of the nine pillars of Industry 4.0 — from materials and design for AM to the main processes and their industrial and biomedical applications.

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Unit-Wise Complete Topic List

Unit	Topic	Periods	Marks
1	Introduction to Additive Manufacturing	8	12
2	Design for Additive Manufacturing	8	12
3	Extrusion and Sheet Metal Based Processes	8	12
4	Photo Polymerization and Powder Based Processes	8	12
5	Applications of Additive Manufacturing	10	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 to Additive Manufacturing (8 Periods, 12 Marks)

Topics: Additive manufacturing: overview, need, history, classification, working principles (concepts only), materials for AM: PLA, ABS, PMMA, ceramics, composites and liquid resins, AM processes, advantages, limitations and challenges, rapid prototyping, rapid tooling.

In simple words: What additive manufacturing is, how it grew, which materials it uses, and where it beats — and where it loses to — conventional making.

Unit 2 — Design for Additive Manufacturing (8 Periods, 12 Marks)

Topics: Basic concept, CAD model preparation, file formats, part orientation, support material generation, model slicing, honeycomb structure, digitization techniques, model reconstruction, slicing software, reverse engineering, reverse engineering application in AM.

In simple words: How a CAD model is prepared, oriented, supported and sliced for printing, and how reverse engineering rebuilds a model from a real part.

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Unit 3 — Extrusion and Sheet Metal Based Processes (8 Periods, 12 Marks)

Topics: Fused deposition modeling (FDM): construction, working principle, advantages, process parameters involved. Laminated object manufacturing (LOM): construction, working principle, advantages. Gluing and adhesive bonding. PolyJet: construction, working principle, advantages.

In simple words: The extrusion and sheet processes: FDM, LOM and PolyJet — how each machine is built and how it works.

Unit 4 — Photo Polymerization and Powder Based Processes (8 Periods, 12 Marks)

Topics: Stereo lithography process (SLA): construction, photo curable materials, working principle, advantages. Selective laser sintering (SLS): construction, working principle, advantages. Electron beam melting (EBM): construction, working principle, advantages. Laser engineered net shaping (LENS): construction, working principle, advantages.

In simple words: The light and powder processes: SLA, SLS, EBM and LENS — how each one builds a part layer by layer.

Unit 5 — Applications of Additive Manufacturing (10 Periods, 12 Marks)

Topics: Applications of additive manufacturing technologies, new product development, after sales and service, automobile, aerospace, consumer products, healthcare industries, customized implants, bio-organs, bio-bones.

In simple words: Where additive manufacturing is actually used — new product development, automobiles, aerospace, consumer goods and healthcare, including custom implants.

Learning Outcomes

- Familiarise the fundamentals, evolution, materials, and classification of Additive Manufacturing technologies.
- Apply Design for Additive Manufacturing (DfAM) principles including CAD preparation, slicing, support generation, and reverse engineering.
- Explain the construction, working principles, and process parameters of extrusion and sheet metal based AM processes.
- Analyze photo-polymerization and powder-based AM processes and compare their advantages and limitations.

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- Identify and evaluate applications of Additive Manufacturing in various industrial and biomedical sectors.

Reference Books (as listed in the syllabus)

- C. K. Chua, K. F. Leong and C. S. Lim, Rapid Prototyping: Principles and Applications, Third Edition, World Scientific Publishers, 2010.
- A. Gebhardt, Rapid Prototyping, Hanser Gardner Publications, 2003.
- L. W. Liou and F. W. Liou, Rapid Prototyping and Engineering Applications: A Tool Box for Prototype Development, CRC Press, 2007.
- A. K. Kamrani and E. A. Nasr, Rapid Prototyping: Theory and Practice, Springer, 2006.
- P. D. Hilton and P. F. Jacobs, Rapid Tooling: Technologies and Industrial Applications, CRC Press, 2000.
- Tom Page, Design for Additive Manufacturing, LAP Lambert Academic Publishing, 2012.

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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.