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Advanced Manufacturing Processes — Complete Syllabus

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

Subject 5.5 (Practicum) • Total 100 Marks • 4 Credits

About this document: Advanced Manufacturing Processes is subject 5.5 (Program Specific Subject, Practicum) of the 5th semester of the Diploma in Mechanical Engineering (Production). It is a practicum subject with a 60-mark external theory paper in 3 hours and 40 internal practical marks. (The Automobile sub-branch takes Automobile Maintenance Servicing & Repair as its 5.5 subject instead.) This document gives the complete unit-wise syllabus, the list of practicals, the examination scheme and the reference books from the official curriculum.

Examination Scheme

Code	Paper	Type	L – P	Credits	Internal	External	Total
5.5	Advanced Manufacturing Processes	Practicum	3 – 3	4	Practical 40	Theory 60 (3 hrs)	100
Advanced Manufacturing Processes Total				**4**	**40**	**60**	**100**

What This Subject Aims To Do

To give diploma students the knowledge of advanced manufacturing processes that modern industry needs: high precision, productivity, quality and cost-effectiveness in manufacturing,

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where traditional machining methods are often inadequate for modern engineering materials or for the specifications required.

Unit-Wise Complete Topic List

Unit	Topic	Periods	Marks
1	Cutting Tools; Cutting Tool Materials	6	12
2	Plastic Processing; Powder Metallurgy	6	12
3	Modern Machining Processes; Hybrid Machining Processes	10	12
4	CNC Machining and Operations	10	12
5	Automation and Robotics	10	12

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

Unit 1 — Cutting Tools; Cutting Tool Materials (6 Periods, 12 Marks)

Topics: Cutting Tools: Various types of single point cutting tools and their uses, Single point cutting tool geometry, tool signature and its effect, Heat produced during cutting and its effect, Cutting speed, feed and depth of cut and their effect, multipoint cutting tools, reamer, drill, milling cutter, throw-away inserts, chip breaker, tool and cutter maintenance, regrinding and lapping of tools. Cutting Tool Materials: Properties of cutting tool material, Study of various cutting tool materials viz. High-speed steel, tungsten carbide, cobalt steel, cemented carbides, stellite, ceramics and diamond.

In simple words: How cutting tools are shaped and kept sharp, what cutting speed, feed and depth of cut do, and which tool material suits which job.

Unit 2 — Plastic Processing; Powder Metallurgy (6 Periods, 12 Marks)

Topics: Plastic Processing: Processing of plastics; Moulding processes: Injection moulding, Compression moulding, Transfer moulding; Extruding; Casting; Calendaring; Fabrication methods: Sheet forming, Blow moulding, Laminating plastics (sheets, rods and tubes), Reinforcing; Applications of Plastics. Powder Metallurgy: Introduction, Powder Fabrication: Mechanical and Chemical fabrication, Powder Characterization: Particle size measurement, BET surface area, Interparticle friction, Powder packing, mixing and blending, Shaping and Compaction, Slurry techniques and Sintering.

In simple words: How plastics are moulded, extruded and fabricated, and how metal parts are made from powder: press it, then sinter it.

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Unit 3 — Modern Machining Processes; Hybrid Machining Processes (10 Periods, 12 Marks)

Topics: Modern Machining Processes: Introduction, comparison with traditional machining; Ultrasonic Machining: principle, Description of equipment, applications; Electric Discharge Machining: Principle, Description of equipment, Dielectric fluid, tools (electrodes), Process parameters, Output characteristics, applications; Wire cut EDM: Principle, Description of equipment, Controlling parameters; applications; Abrasive Jet Machining: principle, description of equipment, application; Laser Beam Machining: principle, description of equipment, application; Electro Chemical Machining: description of equipment, application. Hybrid Machining Processes: Concept; Classification of Hybrid Machining Processes; Major Elements of Hybrid Machining Technology; Benefits of Hybrid Machining Technology.

In simple words: Machining without a cutting tool: sparks (EDM), electrolysis (ECM), ultrasound (USM), abrasive jets (AJM) and lasers (LBM), and hybrids that combine two processes.

Unit 4 — CNC Machining and Operations (10 Periods, 12 Marks)

Topics: Vertical and horizontal machining center: Constructional features, Axis identification, Electronic control system, Automatic tool changer and tool magazine. CNC programming: Preparatory functions (G code), miscellaneous functions (M code), Part programming including subroutines and canned cycles. Principles of computer aided part programming.

In simple words: How CNC machining centres work, how their axes and tool changers are organised, and how part programs are written in G and M codes, with subroutines and canned cycles.

Unit 5 — Automation and Robotics (10 Periods, 12 Marks)

Topics: Introduction and Need; (A) Single spindle automates, transfer lines. (B) Elements of control system, Limit switches, Proximity switches, Block diagram for feedback and servo control system, Introduction to PLC, Block diagram of PLC. Robotics: Definition, Classification of Robots: Geometric classification and Control classification, Laws of Robotics, Robot Components, Coordinate Systems, Robot applications in manufacturing: Material transfer and machine loading/unloading, Processing operations like Welding and painting, Assembly operations, Inspection automation, Limitation of usage of robots in processing operation.

In simple words: Why factories automate, how PLCs and servo controls run machines, and what robots can and cannot do in manufacturing.

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List of Practicals (as listed in the syllabus)

1. Study the constructional details of EDM Machine.
2. Study the constructional details of CNC lathe.
3. Study the constructional details of CNC milling machine.
4. Develop a part programme for lathe operations and make a job on CNC lathe and CNC turning centre.
5. Develop a part programme for milling operations and make a job on CNC milling.
6. Prepare a specimen of composite material with two or more materials.
7. Observe the microstructure of composite material specimen.
8. Find the mechanical strength of composite material specimen.

Course Outcomes

- CO1: Explain the geometry, materials, performance, and maintenance of cutting tools, and analyze the effects of machining parameters.
- CO2: Describe and compare plastic processing techniques and powder metallurgy processes.
- CO3: Analyze the principles, process parameters, capabilities, and applications of modern, non-traditional, and hybrid machining processes.
- CO4: Interpret CNC machine configurations and develop basic CNC part programs using G-codes and M-codes.
- CO5: Explain the concepts of automation, PLCs, and industrial robotics, and evaluate their applications.

Reference Books (as listed in the syllabus)

- Production Technology – HMT, Bangalore, Tata Mc-Graw Hill.
- CNC machines – Pabla B. S. and M. Adithan, New Age International Limited.
- Non conventional Machining – P. K. Mistra, Narvasa Publishining House.
- Manufacturing Processes – Begman and Amsted, John Willey and Sons.
- Advanced manufacturing technology – David L. Goetsch.
- Exploring Advanced Manufacturing Technologies – Stephen F. Krar and Arthur Gil, Industrial Press.
- Website for reference: http://swayam.gov.in

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Source: IRDT Kanpur NEP-2020 curriculum for the 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. 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.