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Computer Aided Design & Manufacturing — Complete Syllabus

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

Subject 5.6.1 (Open Elective-III, Qualifying) • 50 Marks Internal Only • 2 Credits • L 2 – P 0

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Qualifying subject — read this first: you must PASS this subject, but its marks are **not** added to your awarded division or total marks. It is assessed internally for 50 marks only, with no external examination. It is one 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).

Examination Scheme

Code	Paper	Type	L – P	Credits	Internal	External	Total
5.6.1	Computer Aided Design & Manufacturing	Qualifying	2 – 0	2	50	—	50†

What This Subject Aims To Do

Manufacturing today belongs to computerized equipment and machine tools that make a variety of components with high quality, high precision and low cost at a faster rate. Computer Aided Design, Computer Aided Manufacturing and Flexible Manufacturing Systems are all part of Computer Integrated Manufacturing, which helps a manufacturer achieve the desired goals within the stipulated time. After studying this subject, students know about these integrated techniques and how they help a manufacturer reach the goal.

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Detailed Contents — 3 Units

Unit I — Introduction

Introduction to CAD, CAM & CIM; advantages of CAD & CAM; product cycle; reasons for implementation of CAD & CAM; steps involved in CAM operation; introduction to CNC; CNC programming (G-codes, M-codes, APT programming).

Rapid Prototyping: 3D printing; fused deposition modeling; laminated object manufacturing; selective laser sintering; stereo lithography; ballistic particle manufacturing.

Unit II — Surface / Solid Modelling Using CAD/CAM

Introduction to parametric and non-parametric surfaces; creation of simple surfaces using revolved surface, ruled surface and 3D surfaces commands; designing software used in creation of solid models; concept of solid models; solid primitives — box, cylinder, cone, sphere, wedge and torus; construction of solid using Region, Extrude and Revolved feature; creation of composite solid using Boolean function e.g. union, subtraction and intersection; sectioning of solids and modification of solid edges and faces using solid editing commands, Shell, Separate commands; performing 3D operations like 3D array, mirror and rotate; creation of fillets and chamfers; dimensioning of solids; 2D and 3D transformation: translation, scaling, rotation, mirror, zooming, panning and clipping.

Unit III — Flexible Manufacturing System

Introduction to FMS; principles of flexibility; changes in manufacturing system — external changes and internal changes; job flexibility, machine flexibility; features of FMS — production equipment, support system, material handling system, computer control system; advantages & limitations of FMS.

Printing errors in the official syllabus, corrected here: the rationale prints “Commuter Aided Designing” for Computer Aided Designing; Unit I prints “Intoduction of CNC” for Introduction; the rapid prototyping list prints “Ball 3 to 2 particle manufacturing” for Ballistic Particle Manufacturing (BPM). The corrections above follow the standard terms; the printed forms are recorded in the notes.

Course Outcomes

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

- **CO1:** Explain the fundamentals of CAD, CAM, CNC, product cycle, CNC programming (G-codes, M-codes, APT) and rapid prototyping technologies.

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- **CO2:** Create and modify 2D and 3D surface and solid models using parametric CAD tools, solid primitives, Boolean operations, transformations, and dimensioning techniques.
- **CO3:** Analyze the concepts, components, flexibility types, advantages, and limitations of Flexible Manufacturing Systems (FMS) for modern manufacturing environments.

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, CAD/CAM/CIM; **Study Unit 2** = Syllabus Unit I, CNC and rapid prototyping; **Study Unit 3** = Syllabus Unit II, surfaces and solids; **Study Unit 4** = Syllabus Unit II, editing and transformations; **Study Unit 5** = Syllabus Unit III, FMS.

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 II is the longest and the most practical: practise the solid modelling ideas (primitives, Boolean operations, editing commands, transformations) until you can describe them without notes. Unit I rewards clear definitions (CAD, CAM, CIM, CNC, the rapid prototyping methods), and Unit III rewards a short, structured answer on FMS features, advantages and limitations. Revise from the notes unit by unit, then write the likely question at the end of each unit.

Reference Books / Online Resources (As listed in the syllabus)

- CAD/CAM by Mikell Groover and Zimmers; Prentice Hall of India Pvt. Ltd., Delhi.
- Computer Aided Manufacturing by Rao, Kundra and Tiwari; Tata McGraw Hill, New Delhi.
- Introduction to Robotics by John J. Craig; Pearson Education Asia, Singapore.
- Industrial Robot by Groover; Prentice Hall of India Pvt. Ltd., Delhi.
- Robotics by Yoram Koren; McGraw Hill International Book Co., New Delhi.
- CAD/CAM – Theory and Practice by Zeid; Tata McGraw Hill Publishers, New Delhi.
- CAD/CAM/CIM by S. Radha Krishnan.
- CNC Machines by Dr. B.S. Pabla – New Age Publications.
- e-books/e-tools/relevant software to be used as recommended by AICTE/BTE/NITTTR, Chandigarh.
- http://swayam.gov.in

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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.

