

Department of Manufacturing Engineering and Industrial Management



COEP Technological University
Pune



Courses Offered, At a Glance

6 courses across two semesters build your foundation

— From Product Concepts to Real-World Design and Manufacturing Skills

SEMESTER I (S.No. 1 to 4 Choice based)

13 CREDITS TOTAL

- | | |
|---|------------------|
| 1. Basics of Manufacturing Technology (BMT)
Engineering Science Course · ES-II | 3 credits |
| 2. Product Prototyping Practices (PPP)
Engineering Science Elective · ES-III | 3 credits |
| 3. Manufacturing Practices & Fab Lab (MPFL)
Vocational & Skill Course · VSEC | 2 credits |
| 4. Robot & Drone Operations Safety (RDOS)
Vocational & Skill Course · VSEC | 2 credits |
| 5. Fundamentals of Production Drawing (FPD)
Engineering Science Course · ES-I -Mandatory for FY B.Tech. (MSE) | 3 credits |

Courses Offered, At a Glance

6 courses across two semesters build your foundation

— From Product Concepts to Real-World Design and Manufacturing Skills

SEMESTER II (S.No. 1 to 3 Choice based)

10 CREDITS TOTAL

1. Basics of Manufacturing Technology (BMT)

Engineering Science Course • ES-IV

3 credits

2. Manufacturing Practices & Fab Lab (MPFL)

Vocational & Skill Course • VSEC

2 credits

3. Robot & Drone Operations Safety (RDOS)

Vocational & Skill Course • VSEC

2 credits

4. Essentials of Production Systems & Smart Factories (EPSF)

Program Core Course (PCC)- Mandatory for FY B.Tech. (MSE)

3 credits

Basics of Manufacturing Technology (BMT)- Choice based for Semester-I & II

Why manufacturing matters to every engineer

CATEGORY & CREDITS

Engineering Science Course (ES-II/ES-IV)
3 Credits

TEACHING SCHEME

THEORY : 3 Hr/Week

EVALUATION SCHEME

TA:20 • MSE:30 • ESE:50



Concept into reality

Turn CAD, electronics & software into physical products.



Engineering Foundation

CS, Civil, EE and all engineering fields depend on manufacturing.



Automation

Explore CNC machining & industrial robotics for high-tech production.



Quality + cost

How materials, tolerances & process choice affect cost & reliability.

WHAT YOU WILL LEARN



CASTING & FORMING

• Sand casting • Hot & Cold working



CONVENTIONAL MACHINING

• Lathe • Milling • Drilling
• Gear cutting • Shaping • Finishing



WELDING & JOINING

• Welding • Soldering
• Brazing



SHEET METAL & SURFACE

• Blanking • Punching • Deep drawing
• Etching • Anodizing • Electroplating



NC/CNC & ROBOTS

• Principles • Classification
• Applications



METROLOGY & MEASUREMENT

• Limits • Fits • Tolerances
• Measuring instruments

Basics of Manufacturing Technology (BMT)- Choice based for Semester-I & II

Core skills, learning value and cross-branch relevance

CORE SKILLS & OUTCOMES

1 Process selection

Choose casting, machining, forming or sheet-metal routes.

2 Machining & joining

Turning, milling, drilling, welding, brazing & soldering.

3 CNC & automation

NC/CNC fundamentals, robot classes, controls & automation.

4 Metrology & inspection

Fits, tolerances, roughness & measuring instruments.

LEARNING VALUE

Core Manufacturing Processes

Design → Manufacturing Link

Quality & Precision

Multidisciplinary Competence



Casting



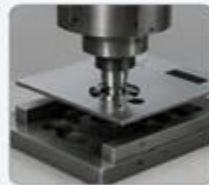
Forming



Machining



Welding



Sheet Metal Working



Surface Treatment



CNC / NC Machines



Robotics



Metrology & Measurement



Joining Processes

RELEVANCE ACROSS BRANCHES

Civil

CAD, Prototyping & Innovative Construction Components

CSE

Design Thinking, CAD & Physical Tech Prototypes

Electrical

Design, Prototype & Test Electrical Components

E&TC

Electronic Devices, Enclosures & Communication Hardware

Instrumentation

Sensors, Instruments & Control-system Components

Mechanical

Product Design, CAD, Prototyping, Manufacturing & Testing

Metallurgy

Materials, Additive Manufacturing, Fabrication & Evaluation

Product Prototyping Practices (PPP)- Choice based for Semester-I

From idea → CAD → prototype → validated product

CATEGORY & CREDITS

Engineering Science Course (ES-III)
3 Credits

TEACHING SCHEME

THEORY : 2 Hr/Week
LAB : 2 Hr/Week

EVALUATION SCHEME

TA:20 • MSE:30 • ESE:50
LAB CIE: 100



Become an innovator

Design thinking +
brainstorming



Master modern tools

CAD + advanced
manufacturing



Validate ideas

Function, durability
& safety tests



Launch / consult

Prepare for prototyping
business

COURSE CONTENT • COMPLETE PRODUCT-DEVELOPMENT LIFECYCLE

1

Conceptualization

Idea generation • design thinking • specifications

2

Prototyping techniques

CAD • digital prototyping • conventional & additive
manufacturing • laser cutting • welding • 3D printing

3

Testing & validation

Functional • durability testing

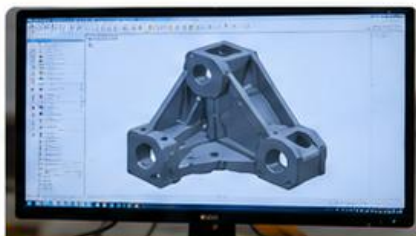
4

Safety

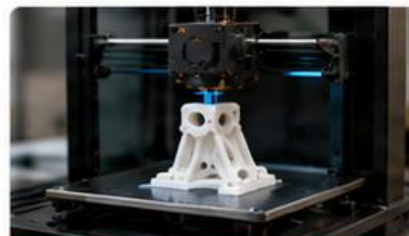
Safety • regulatory considerations



IDEA



DESIGN



PROTOTYPE



TEST



LAUNCH

VALUE: innovative ideas • functional prototypes • durability/safety/cost testing • advanced technology • business readiness

Product Prototyping Practices (PPP)- Choice based for Semester-I

Core skills, learning outcomes and cross-branch relevance

CORE SKILLS & OUTCOMES



Conceptualize & Design

Idea To Concept,
Specifications



Create Prototypes & 3D Models

CAD, Digital + Physical
Prototyping



Learn about Validation Tests

Function, Durability,
Safety & Cost



Use Advanced Technology

Additive Manufacturing,
CNC, Laser Cutting Etc.



Manage & Launch The Product

Business Readiness
& Consultancy

LEARNING OUTCOMES



Design & conceptualize innovative product ideas

Apply design thinking, identify user needs and develop specifications



Create functional prototypes using modern tools

Use CAD, digital prototyping, conventional & additive manufacturing



Test and validate prototypes

Conduct functional, durability, safety and cost-effectiveness testing



Use advanced technologies efficiently

Apply CNC, robotics, additive manufacturing and modern processes



Prepare to launch / manage prototyping businesses

Understand product development, regulatory aspects, cost analysis and consultancy

RELEVANCE ACROSS BRANCHES

Civil

CAD, Prototyping & Innovative Construction Components

CSE

Design Thinking, CAD & Physical Tech Prototypes

Electrical

Design, Prototype & Test Electrical Components

E&TC

Electronic Devices, Enclosures & Communication Hardware

Instrumentation

Sensors, Instruments & Control-system Components

Mechanical

Product Design, CAD, Prototyping, Manufacturing & Testing

Metallurgy

Materials, Additive Manufacturing, Fabrication & Evaluation

Manufacturing Practices & Fab Lab (MPFL)- Choice based for Semester-I & II

Hands-on workshop foundation for all M-group branches

CATEGORY & CREDITS

Vocational & Skill Enhancement Course (VSEC)
2 Credits

TEACHING SCHEME

THEORY : 1 Hr/Week
LAB : 2 Hr/Week

EVALUATION SCHEME

TA:20 • ESE:30
LAB CIE: 50

1

Build foundation skills

Carpentry • welding • fitting •
machining • digital fabrication

2

Master hard skills

Practical basic manufacturing
processes

3

Validate through hands-on

Safe practice builds confidence
& employability

4

Prepare for industry

Workshop / shop-floor capability

WHAT THE COURSE ADDS



SKILL DEVELOPMENT

Core manufacturing skills demanded in industry



INNOVATION & PROTOTYPING

3D printing • laser cutting • CNC machining •
PCB making



MULTIDISCIPLINARY INTEGRATION

Mechanical, electrical & digital fabrication
practices



MATERIAL



CUTTING / FORMING



JOINING / PROCESSING



PRODUCT

FROM RAW MATERIALS TO REAL PRODUCTS

Manufacturing Practices & Fab Lab (MPFL)- Choice based for Semester-I & II

Core skills + learning value

“Strong Foundations & Modern Fabrication skill helps you to build and deliver with precision.”

CORE SKILLS & OUTCOMES



Shop-floor safety

Safe workshop practice



Hard skills

Core fabrication skills



Validate skills

Precision & quality



Innovate products

Modern fabrication



Manage

Projects & consultancy

LEARNING OUTCOMES



Welding, Carpentry, Machining & Digital Fabrication



Functional Components With Precision & Safety



Traditional Workshop + Modern Fabrication



Measurement, Finishing & Quality Practices



Confidence For Workshop Projects, Fabrication Jobs Or Consultancies

WHY IT MATTERS

1

Bridges concepts with real workshop applications

2

Improves employability in manufacturing, construction & fabrication

3

Hands-on experience with essential tools & machines

4

Supports entrepreneurship in fabrication, repair & prototyping

Robot & Drone Operations Safety (RDOS)- Choice based for Semester-I & II

CATEGORY & CREDITS

Vocational & Skill Enhancement Course
(VSEC) 2 Credits

TEACHING SCHEME

THEORY : 1 Hr/Week
LAB : 2 Hr/Week

EVALUATION SCHEME

TA:20 • ESE:30
LAB CIE: 50



Robot awareness

Basics, types & applications



Drone awareness

Basics, types & applications



Build models

Hands-on robot & drone
prototypes



Safety & regulations

Responsible operation & rules

WHAT YOU WILL LEARN

UNIT 1 • BASICS OF ROBOTICS



- Classification
- Specifications
- Selection
- Components
- Controllers
- Sensors & drives
- Programming languages
- Applications



Industrial Robots



Mobile Robots



UNIT 2 • DRONE OPERATIONS & SAFETY

- History & evolution
- Components & types
- Lift / thrust / drag / weight
- Zones & airspace
- Obstacle & altitude sensors
- Remote control & GPS navigation
- Photography & agriculture
- Search & rescue
- Safety & regulations



Drones & UAS



Mapping & Inspection

Robot & Drone Operations Safety (RDOS)- Choice based for Semester-I & II

Core skills, outcomes and multidisciplinary relevance

CORE SKILLS & OUTCOMES



Fundamentals
Robot & Drone Basics



Model Building
Build & Prototype



Hands-on applications
Operate & Apply



Advanced Technology
Automation & Navigation



Safety Regulations
Rules & Responsible Use

LEARNING OUTCOMES



Robot elements, structure & classification



Select robot sensors, drives & grippers



Understand robot programming



Drone basics, classification & operations



Identify drone elements



Understand drone safety guidelines & regulations

RELEVANCE ACROSS BRANCHES

Civil

Surveying, mapping, site inspection, 3D concrete printing

CSE

AI, flight software, navigation, computer vision

Electrical

Power, motors, battery electronics

E&TC

Wireless, telemetry, RF, sensor data

Instrumentation

Feedback, calibration, flight stability

Mechanical

Frames, kinematics, aerodynamics, durability

Metallurgy

Lightweight composites, high-strength / heat-resistant materials

Manufacturing

Smart factories: assembly robots, logistics drones, safety workflows

MANDATORY COURSES FOR

B.Tech. First Year

Manufacturing Science & Engineering (MSE)

Department of Manufacturing Engineering & Industrial Management

Build the language, systems and factory mindset behind engineering products.

Fundamentals of Production Drawing (FPD) -Semester I

The language connecting DESIGN → MANUFACTURING → QUALITY

CATEGORY & CREDITS

Engineering Science Course (ES-I)
3 Credits

TEACHING SCHEME

THEORY : 2 Hr/Week
LAB : 2 Hr/Week

EVALUATION SCHEME

TA:20 • MSE:30 • ESE:50
LAB CIE: 100

1

IDEA

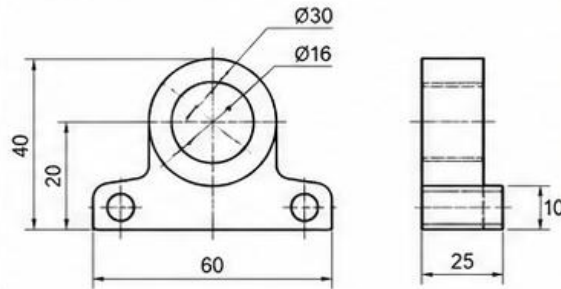
What do we want to make?



2

DRAWING

How should it look?



3

PRODUCT

How accurately should it be made?



QUALITY

Does it meet the requirements?



SEE IT → DRAW IT → SPECIFY IT → MAKE IT → CHECK IT

WHAT YOU WILL LEARN



Drawing standards
& dimensioning



Orthographic &
isometric views



CAD drafting



Limits, fits &
tolerances (GD&T)



Surface
roughness



Welding symbols



Foundation for production engineering, machine design, manufacturing, CAD/CAM, metrology & product development.

Fundamentals of Production Drawing (FPD) - Semester I

What students gain from the course

“By the end, you will understand not just a drawing — but why it matters in production.”

CORE SKILLS & OUTCOMES

1

Visualize better
Convert 2D Drawings Into Clear 3D Understanding.

2

Think like a manufacturer
Dimensions, Fits & Tolerances
Decide Assembly.

3

Speak with precision
Drawing, GD&T, Surface & Welding Symbols.

4

Build practical skills
Drafting + Introductory CAD.

LEARNING VALUE

✓

Visualize components and communicate design intent clearly

✓

Understand how dimensions, fits & tolerances affect assembly

✓

Apply accuracy, tolerance & surface requirements in production

✓

Develop drafting and introductory CAD capability

✓

Build a foundation for manufacturing and quality decisions

FOUNDATION FOR ENGINEERING

PRODUCTION ENGINEERING

Manufacturing drawings & process communication

MACHINE DESIGN

Fits, tolerances, GD&T & functional requirements

MANUFACTURING

Translate design information into production

CAD / CAM

Digital drafting & downstream manufacturing data

METROLOGY

Inspection, dimensions & tolerances

PRODUCT DEVELOPMENT

Specifications from concept to production

A good drawing prevents confusion and a great production drawing helps create the right product.

Essentials of Production Systems & Smart Factories (EPSF) -Semester II

Build the factory mindset for modern manufacturing

CATEGORY & CREDITS

Program Core Course (PCC)
3 Credits

TEACHING SCHEME

THEORY : 2 Hr/Week
LAB : 2 Hr/Week

EVALUATION SCHEME

TA:20 • MSE:30 • ESE:50
LAB CIE: 100

1

MANUFACTURING SYSTEMS

Operations, costs & KPIs



2

AUTOMATION STRATEGIES

Levels & industrial control



3

SENSORS & ACTUATORS

Analog / digital interfacing



4

MATERIAL TRANSPORT & STORAGE

Conveyors, AGVs & automated storage



WHAT YOU WILL LEARN



Manufacturing systems, operations, costs & KPIs



Automation strategies, levels & industrial control



Sensors, actuators & analog/digital interfacing



Material transport, storage & automated storage



Manufacturing cells, assembly lines, FMS & robotics



MES, ERP, Industry 4.0 & future factories

THE FACTORY ECOSYSTEM



Sensors



Actuators



Control



Conveyors



Storage



AGVs



IoT



Smart factories

CAREER VALUE

1

Production Engineer

2

Automation / Manufacturing Engineer

3

Smart Manufacturing / Industry 4.0

Essentials of Production Systems & Smart Factories (EPSF) -Semester II

Connect machines, people, automation and data

WHY SHOULD YOU LEARN THIS?

Build the factory mindset needed for modern manufacturing & automation.

CORE LEARNING VALUE

1 FACTORY PERFORMANCE

Production Flow & Performance

2 CONNECTED SYSTEMS

Machines • Sensors • Automation • Data

3 SMART FACTORY TOOLS

Robotics • FMS • MES • ERP

4 MODERN MANUFACTURING

Emerging Factory Technologies

USE OF THE COURSE

1 Understand Factory Performance & Production Flow

2 Connect Machines, Sensors, Automation & Data

3 Learn where Robotics, FMS, MES & ERP Fit

EXPOSURE TOWARDS

1 **CONTROL** Sensors • Actuators • Control

2 **MATERIAL FLOW** Conveyors • AGVS • AS/RS

3 **SMART FACTORY** Robotics • IoT • Smart Sensors

RELEVANCE TO MANUFACTURING SCIENCE & ENGINEERING

• Supports the Program's Manufacturing Foundation • Bridges Production Systems With Automation & Smart Manufacturing • Prepares For Modern Factory Technologies

Manufacturing Engineering & Industrial Management

THE TAKEAWAY

Don't just learn how to make a product.
Learn how the **FACTORY** makes it smarter.

Think. Design. Build. Manufacture..



Thank You