





Advanced Manufacturing Processes

Unit 1: Introduction to Non-Traditional Machining (NTM)

🌟 1.1 Basic Concept of Non-Traditional Machining (NTM)

◆ Definition:

Non-Traditional Machining (NTM) refers to those machining processes that **remove material** from the workpiece **without using traditional cutting tools** like in lathes, milling, etc.

◆ These use  energy,  water,  light, or  chemical reactions instead of sharp cutting tools.

🧠 Main Idea:






→ NTM = Material removed by *non-mechanical* methods.

Example:


- Laser beam cutting, EDM (Electric Discharge Machining), Water Jet Cutting, etc.

⚠️ 1.2 Necessity of Non-Traditional Machining

✂️ Traditional methods can't do everything. So NTM is **needed when**:

1.  Material is **very hard or brittle** (e.g., ceramics, hardened steel).
2.  Complex shapes needed (tiny holes, deep cavities).
3.  **Heat-sensitive** materials (no tool contact = no heat damage).
4.  Very **tight tolerances** and **good surface finish** required.
5.  Machining of materials that are **non-conductive** or **non-metallic** (e.g., glass, plastic).

🧠 Real-life example:

 Making micro-holes in spectacle frames using lasers (traditional drill won't work).

🧩 1.3 Classification of Non-Traditional Machining Processes

📊 Based on Energy Used:

Type	Process	Example
🔥 Mechanical	Uses mechanical energy	Water Jet Machining (WJM)
⚡ Electrical	Uses spark discharge	Electric Discharge Machining (EDM)
🔧 Thermal	Uses heat energy	Laser Beam Machining (LBM), Plasma Arc
🧪 Chemical	Uses chemical reaction	Chemical Machining (CHM)
🔌 Electrochemical	Combo of electricity + chemical	Electrochemical Machining (ECM)

✅ 1.4 Advantages, Limitations & Field of Applications





💎 Advantages:

- Can cut **any material**, even the hardest ones 💪
- No tool wear (since no contact in most methods)
- Can create **micro features** and complex shapes
- Excellent surface finish ✨

⚠️ Limitations:

- **High cost** of machines 💰
- Slow material removal rate 🐢
- Skilled operator required 🧠
- Some methods not suitable for mass production





Field of Applications:

- **Aerospace**  (e.g., turbine blade machining)
- **Medical**  (e.g., surgical tools)
- **Electronics**  (e.g., micro-holes in circuit boards)
- **Automobile**  (e.g., fuel injector nozzle)

1.5 Comparison: Traditional vs Non-Traditional Machining

Feature	Traditional	Non-Traditional
Tool Contact	Yes (tool touches work)	No/Minimum contact
Tool Wear	High	Low/None
Accuracy	Moderate	Very High
Material Type	Only soft & ductile	Any material
Surface Finish	Normal	Excellent
Cost	Cheaper	Expensive

Quick Revision:

- NTM = No cutting tool. Uses  ,  ,  or  instead.
- Useful for hard, brittle, or heat-sensitive materials.
- High precision, low tool wear, but expensive and slow.
- Types = Mechanical, Electrical, Thermal, Chemical, Electrochemical.