9. Introduction to Digital Manufacturing

- **Definition:** Digital Manufacturing refers to the integration of digital technologies into the manufacturing process, enabling more efficient production, customization, and real-time monitoring.
- **Example:** A factory uses digital manufacturing techniques such as IoT-enabled machinery, 3D printing, and real-time data analytics to optimize production, reduce waste, and respond quickly to changes in demand.

Summary Table: Digital Life Cycle

Digital Life Cycle Component	Description	Example
Collaborative Product Development	Teams working together across locations to design and develop products	Global automotive company developing a new car model
Mapping Requirements to Specifications	Translating customer needs into detailed product specifications	Software development team mapping customer requirements
Part Numbering	Systematic assignment of unique identifiers to components	Electronics manufacturing assigning part numbers to components
Engineering Vaulting	Secure storage and reuse of design data	Aerospace company reusing CAD models for new aircraft designs
Engineering Change Management	Managing and implementing design changes	Medical device manufacturer tracking surgical instrument changes

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Digital Life Cycle Component	Description	Example
Bill of Material (BOM)	List of components and materials required to build a product	Automotive industry BOM for car model
Process Consistency	Standardization of manufacturing processes	Consumer electronics company ensuring uniform quality
Digital Mock-up	Virtual representation of a product for analysis and refinement	Automotive industry simulating car assembly process
Prototype Development	Creating a physical model for testing	3D-printed prototype of a new consumer gadget
Virtual Testing	Computer simulations to evaluate product performance	Aerospace virtual wind tunnel tests
Collateral	Digital assets supporting development and marketing	Marketing team using 3D renderings for promotional materials
Digital Manufacturing	Integration of digital technologies into manufacturing	IoT-enabled machinery optimizing factory production