

Course Structure

Lecture 1: Introduction to Industry 4.0 and Design Evolution

Overview:

- History and evolution of industry revolutions.
- What is Industry 4.0? Core technologies and principles.
- The role of design in the industrial revolution and the transition from mass production to mass customization.

Summary:

Understand the foundational concepts of Industry 4.0 and its implications on design strategies.

Notes:

- Four industrial revolutions: From steam to digitization.
- Key principles of Industry 4.0: Interconnectivity, information transparency, technical assistance, decentralized decisions.
- The transformation of design paradigms: From a fixed model to adaptive models.

Lecture 2: Manufacturing Strategies in Industry 4.0

Overview:

- Additive manufacturing and its benefits.
- New and advanced materials in Industry 4.0.
- Exploiting maturing technologies through design.

Summary:

Dive into the latest manufacturing techniques and understand their implications on design.

Notes:

- Advantages of additive manufacturing: customization, reduced waste, complex designs.
- Role of new materials: self-healing materials, smart materials.
- Designing with advanced manufacturing techniques in mind.

Lecture 3: Design Processes & Methodologies in the Age of Automation

Overview:

- Design for Automated Assembly/Dis-assembly.
- Importance of fool-proofing.
- The role of component families in the modern manufacturing landscape.

Summary:

Understand how automation influences the design process and the importance of creating systems that can adapt to change.

Notes:

- Benefits of automated assembly and its impact on design.
- Fool-proofing techniques: Poka-yoke and mistake-proofing.
- Designing components that are versatile and can be used across multiple products.

Lecture 4: Quality of Design Techniques

Overview:

- Failure Mode and Effects Analysis (FMEA): design and process.
- Quality Function Deployment (QFD).
- Value analysis and engineering.

Summary:

Ensure design quality and robustness by using advanced analytical techniques.

Notes:

- The importance of FMEA in identifying potential design failures.
- QFD as a tool for understanding customer requirements.
- Cost-effective design through value analysis.

Lecture 5: The Economics of Process Selection and Integration

Overview:

- Factors influencing process selection.
- Integration of Design and Manufacture.
- Economics of choosing the right manufacturing process.

Summary:

Understand the financial implications of design decisions and the importance of integrating design and manufacturing.

Notes:

- Cost-benefit analysis in process selection.
- Benefits of concurrent engineering.
- How to design for manufacturability.

Lecture 6: Sustainability and Design

Overview:

- Design for recycling.
- Design for reliability and maintainability.
- Designing products, systems, and components for sustainability.

Summary:

Learn how to design products that are eco-friendly, durable, and require minimal maintenance.

Notes:

- Importance of sustainable design in the modern world.
- Lifecycle analysis and design.
- Strategies for designing products that last.

Lecture 7: Societal Impacts of "Design for Industry 4.0"

Overview:

- Changes in product consumption patterns.
- Impacts on employment and job roles.
- Ethical considerations in design.

Summary:

Delve into the societal implications of Industry 4.0 on product design and manufacturing.

Notes:

- How Industry 4.0 is influencing consumer behaviour.
- The changing landscape of jobs in the design and manufacturing sector.
- Ethical considerations: inclusivity, accessibility, and sustainability.

Lecture 8: Reflections and Future Outlook

Overview:

- Reflecting on current "Design for X" approaches.
- Pinpointing potential opportunities.
- The economic impact of Design for Industry 4.0.

Summary:

Project into the future of design in the age of Industry 4.0, considering potential challenges and opportunities.

Notes:

- Current successes and challenges in "Design for X".
- Forecasting future trends in design and manufacturing.
- Economic implications: How Design for Industry 4.0 can be a game-changer.