DEPARTMENT OF TECHNOLGY EDUCATION,IER
UNIVERSITY OF THE PUNJAB, LAHORE-PAKISTAN
Course Outline

Programme	BS Technology Education	**Course Code**	**312**	**Credit Hours**	3
Course Title	Material and Manufacturing Processes				

Course Introduction

This course provides an introduction to the fundamentals of materials science and manufacturing processes. Students will learn about different types of materials, their properties, and various manufacturing techniques used to transform raw materials into finished products. Emphasis is placed on understanding the relationships between material properties and manufacturing processes.

Learning Outcomes

On the completion of the course, the students will:

1. Understand the basic properties of different types of materials.
2. Identify and describe various manufacturing processes.
3. Understand the relationship between material properties and manufacturing techniques.
4. Apply basic manufacturing techniques to produce simple components.
5. Analyze the advantages and limitations of different manufacturing processes.
6. Solve basic problems related to material selection and manufacturing methods.

Course Content		**Assignments/Readings**
Week 1	**Introduction to Materials Science** • **Unit 1.1**: Overview of Materials Science • **Unit 1.2**: Classification of Materials	Reflective essay on the importance of materials science in engineering
Week 2	**Properties of Materials** • **Unit 2.1**: Mechanical Properties • **Unit 2.2**: Thermal and Electrical Properties	Develop a chart of mechanical properties for different materials
Week 3	**Material Selection** • **Unit 3.1**: Criteria for Material Selection • **Unit 3.2**: Case Studies in Material Selection	Develop a material selection criteria for a specific application

Week 4	**Introduction to Manufacturing Processes** • **Unit 4.1**: Overview of Manufacturing Processes • **Unit 4.2**: Historical Development of Manufacturing	Write a report on different types of manufacturing processes
Week 5	**Casting Processes** • **Unit 5.1**: Basics of Casting • **Unit 5.2**: Types of Casting	Develop a simple casting process for a small component
Week 6	**Forming Processes** • **Unit 6.1**: Introduction to Forming Processes • **Unit 6.2**: Types of Forming Processes	Write a report on the principles of forming processes
Week 7	**Machining Processes** • **Unit 7.1**: Basics of Machining **Unit 7.2**: Types of Machining Processes	Write a report on the principles of machining processes
Week 8	**Joining Processes** • **Unit 8.1**: Introduction to Joining Processes **Unit 8.2**: Types of Joining Processes	Research and present on the principles of joining processes
Week 9	**Additive Manufacturing** • **Unit 9.1**: Basics of Additive Manufacturing • **Unit 9.2**: Types of Additive Manufacturing	Develop a simple 3D printing process for a small component
Week 10	**Surface Treatment Processes** • **Unit 10.1**: Introduction to Surface Treatment • **Unit 10.2**: Types of Surface Treatment	Write a report on the principles of surface treatment processes
Week 11	**Heat Treatment Processes** • **Unit 11.1**: Basics of Heat Treatment	Write a report on the principles of heat treatment processes

	• **Unit 11.2**: Types of Heat Treatment	
Week 12	**Material Testing and Inspection** • **Unit 12.1**: Introduction to Material Testing • **Unit 12.2**: Types of Material Testing	Develop a simple material testing procedure for a specific material
Week 13	**Process Planning and Optimization** • **Unit 13.1**: Basics of Process Planning • **Unit 13.2**: Process Optimization Techniques	Write a report on the principles of process plannin
Week 14	**Sustainable Manufacturing** • **Unit 14.1**: Introduction to Sustainable Manufacturing • **Unit 14.2**: Case Studies in Sustainable Manufacturing	Write a report on the principles of sustainable manufacturing
Week 15	**Emerging Trends in Manufacturing** • **Unit 15.1**: Current Trends in Manufacturing • **Unit 15.2**: Future Directions in Manufacturing	Research and present on current trends in manufacturing
Week 16	**Course Review and Final Assessment** • **Unit 16.1**: Review of Key Concepts and Themes • **Unit 16.2**: Comprehensive Final Exam	Group presentation summarizing key learnings from the course

Textbooks and Reading Material

1. Textbooks.

- Materials Science and Engineering: An Introduction by William D. Callister Jr. and David G. Rethwisch

2. Suggested Readings

- Manufacturing Processes for Engineering Materials by Serope Kalpakjian and Steven R. Schmid

Teaching Learning Strategies

1. **Lectures:** To introduce and explain key concepts and theories.
2. **Hands-on Labs:** To provide practical experience with robotics components and programming.
3. **Assignments and Projects:** To reinforce learning and encourage application of concepts in real-world scenarios.
4. **Group Discussions:** To facilitate peer learning and collaborative problem-solving.

Assessment

Sr. No.	Elements	Weight age	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.