

# Materials and Processes (40-assignment)



This is an integrated instructional module designed specifically to operate within the LJ ScanTEK Modular Technology Program environment. It includes a 10-assignment exploratory curriculum and a further 30-assignment in-depth curriculum. The exploratory curriculum and the in-depth curriculum are each split into two parts. Each part includes a pre-test and post test. The module includes hardware, software, and curriculum materials sufficient to provide a complete learning experience.

The curriculum incorporates continuous assessment through questions. When used in conjunction with a ClassAct networked management system, this provides instant feedback of student performance. The assessments begin with a comprehensive pre-test. This quiz includes questions for each subsequent assignment, together with questions that will specifically test math and reading ability.

Every assignment starts with a series of questions designed to track inventory. These ensure that any missing items are located before they are needed.

Each assignment is divided into a series of tasks. Hands-on tasks form the core of the student work. Where appropriate, these are accompanied by research tasks based upon illustrated textbooks and on-screen applications. Assessment questions are incorporated into each task.

**Typical 10-assignment topic areas include:**

- Classification of plastics, metals, woods and composite materials
- Exploring thermoplastics
- Thermoplastic molding process
- Testing of materials for hardness
- Manufacturing process of wood, metals and plastics
- Single-part molding
- Testing of materials for density, melting point and heat conductivity
- Designing components for injection molding
- Multi-part molding
- Combinational molding to include metallic inserts
- Problem solving task – Design a Promotional Gift

**Typical 10-assignment activities include:**

- Identify, and classify, plastics and metals.
- Use a thermoplastic molder to transform granules of plastic into solid plastic.
- Using virtual testing software, test a range of sample materials.
- Use a thermoplastic molder with a multi-part mold.
- Using books, research the processes for shaping wood, metal and plastic.
- Identify, and classify, woods and composite materials from a range of sample materials.
- Using CAI, identify different forms of materials by investigating the making of a spoon from wood, metal, and plastic.
- Use a thermoplastic molder with an extrusion die to make lengths of solid plastic.
- Using virtual testing software, test a range of sample materials for their density.
- Use a thermoplastic molder with a single-part mold.
- Using books, research the costs of making products from materials.

**Typical 30-assignment topic areas include:**

- Introduction to the thermoject
- Plastic bottle manufacture
- Plastic molding techniques
- Materials and material identification
- Testing of materials for impact strength
- Operating temperatures
- Physical and mechanical properties of materials
- Weight and density
- Conductors and insulators
- Prototyping and testing
- Recycling plastic
- Floppy disk fabrication
- Thermoplastics and thermosetting plastics
- Iron casting
- Molding metal fittings into plastic
- Molecular structure of solids, liquids and gasses
- Manufacturing finances
- The design process
- Careers in materials processing

**Typical 30-assignment activities include:**

- Use a thermoplastic injection molder to change plastic granules into a solid length of plastic.
- Investigate the safety issues involved with using materials processing equipment.
- Evaluate how the sequencing of processes can increase productivity.
- Mold a plastic token using a thermoplastic injection molder.
- Identify the use of plastic molding techniques in industry.
- Use a multi-part mold to create a plastic product.
- Look at the different stages involved in the problem solving design loop.
- Evaluate the design of a plastic molded product.
- Identify plastics and metals from a group of sample materials.
- Identify the impact strength of various plastics and metals.
- Attach a plastic doorknob to a door using a temporary fixing.
- Take a close look at the redesign section of the problem solving design loop.
- Alter a doorknob design to include a bolt.
- Identify various physical and mechanical properties of copper and PVC.
- Identify the strengths and hardness of various plastics and metals.
- Mold a plastic doorknob that accepts a screw fixing.
- Test a doorknob design against design criteria.
- Identify the density of various materials.
- Calculate strength to weight ratios of various materials.
- Look at how metal fixings are used in the construction of a computer floppy disk.

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**Typical 30-assignment activities include (continued):**

- Mold a plastic doorknob to include a metal fixing.
- Evaluate the redesign section of the problem solving design loop.
- Identify the various processing techniques used in creating a computer floppy disk.
- Produce a plastic model car using a multi-part mold.
- Evaluate how recycled material is used in industry.
- Look at materials and processes used in an energy efficient house.
- Classify different types of plastics by following descriptions.
- Create a safety cap using a smart mold design.
- Identify different types of plastic.
- Investigate the use of wood in industrial situations.
- Compare the hardness of plastics and woods.
- Create a plastic extrusion using an extrusion die.
- Cut a sample of plastic and wood to compare strengths.
- Identify the molecular structure of solids, liquids and gasses.
- Identify the use of ceramic and composite materials in industrial applications.
- Test composite and ceramic materials for heat conductivity.
- Identify the difference between thermoset materials and thermoplastic materials.
- Identify the fixed and variable costs involved in the manufacturing industry.
- Compare the savings made by changing the design of a product.
- Complete a problem solving exercise to reduce the amount of wasted energy in a virtual energy house.
- Create specific length extrusions to reduce wasted energy and material.
- Identify three areas of control in a manufacturing environment.
- Mold a product with a fault in it.
- Rectify the problem causing manufacture of faulty products.
- Identify how sequencing automation can increase productivity.
- Evaluate past practical activities.
- Carry out the problem solving design loop.
- Identify the finances involved in manufacturing.
- Complete a budget plan for a company.
- Follow traditional paper-based product plans.
- Identify the basic techniques used in computer aided designing.
- Identify the differences between CAD, CADD and CAM.
- Adapt a mold design to create a screwdriver.
- Mold a screwdriver using thermoplastics.
- Identify where different types of metals are used.

**Typical 30-assignment activities include (continued):**

- Problem solve a corn-cob holder design.
- Compare the 'design process' model to the problem solving design loop.
- Identify jobs involved in the primary, secondary and tertiary sectors of manufacturing.
- Identify careers involving materials and processes.

Each assignment is designed around a list of performance objectives. These lists include academic, technical and occupational objectives. The assignments are written in such a way as to enable a student to attain the performance objectives, with the assessment questions linked to these in order to provide a measure of true competency.

The performance objectives are used by the ClassAct management system to generate a comprehensive portfolio of student competency reports. Default reports supplied with this module include:

- Entry report
- Technical/Occupational Exit report
- Basic Skills report based upon the federal SCAN's report.

**The items supplied with this instructional module include:**

- 10-assignment On-Screen Student Assignment Guide CD
- 10-assignment Student Assignment Guide
- 10-assignment Student Workbook
- 10-assignment Instructor's Guide
- 30-assignment Student Assignment Guide
- 30-assignment Student Workbook
- 30-assignment Instructor's Guide
- Computer Aided Instruction Software
- Book 'Manufacturing Technology'
- Book 'Resistant Materials'
- Thermoject and handle
- Thermoplastic granules container
- Tube of grease and brush in beaker
- Miter jig
- Pair of gloves
- Mold preparation sheet
- Measuring cylinder
- Model door

**Additional items required:**

- Computer

**Module Facts**

For Technology Program, order as:  
ST350/40 Materials and Processes

	No.	Average time
Assignments	40	45 minutes
Extension Activities	4	45 minutes
<b>Total</b>		<b>33 hours</b>



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