Mechanisms (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:

- Direction of rotation and speed change using spur gears
- Simple gear trains
- Pulley and belt systems
- Power transmission systems
- Energy inputs and outputs
- Mechanical advantage of pulley systems
- Cranks and slider mechanisms
- Cams
- Pneumatic, hydraulic and electrical power systems
- First order levers
- Inclined planes
- Gear boxes

Typical 10-assignment activities include:

- Learn about safety when using the mechanisms training system.
- Find out what spur gears are.
- Use spur gears to see how they can reduce or increase speed.
- Learn about gear ratios, which can be used to calculate how much gears will change speed.
- Evaluate pulley belt systems and discover a method of solving problems they can cause.
- Examine the use of cams, and discover how they can be used to change rotary motion to straight-line motion.
- Examine the effect of fixed pulleys on the size and direction of forces.
- Set up a moveable pulley system.
- Use a spring balance to measure the effect moveable pulleys have on forces.
- Calculate mechanical advantage.
- Perform experiments with second and third order levers.
- Examine the uses of inclined planes.

Typical 10-assignment activities include (continued):

- Compare friction forces involved when dragging and rolling weights up a slope.
- Design a winch power transmission system. Use the mechanisms training system to build and test a simulation of the winch design.

Typical 30-assignment topic areas include:

- Safety procedures
- Introduction to the mechanisms trainer
- Gear timings
- Gear ratios
- Construction of simple and compound gear trains
- Velocity ratio of belt drives
- Timing belt
- Velocity calculation
- Fixed pulleys
- Bevel gears
- Moveable pulleys
- Calculation of energy efficiency of mechanical systems
- Types of gears
- Crank and slider mechanism
- Alternative power systems
- Second and third order lever systems
- Powered elevator design
- Mechanical advantage of inclined planes
- Gearbox design
- Powered boat winch design

Typical 30-assignment activities include:

- Learn how to measure the rotary speed of motorized gears.
- Build simple gear trains and measure the speed changes that occurred when powered.
- Learn how to predict the changes in speed gear trains produce.
- Build a type of gear train called a compound gear train.
- Convert the rotary speed of a spinning gear wheel into the linear speed of a moving vehicle.
- Examine the use of pulley and belt systems used to transmit rotary motion over large distances.
- Build timing belt systems and compare them with the gear systems and pulley belt systems.
- Build power transmission systems that use combine different mechanisms to transfer rotary motion.
- Investigate the use of pulleys to lift objects.
- Build pulley systems that reduce the effort needed to lift loads.
- Calculate the energy inputs and outputs of different pulley systems to find out how pulleys affect the energy needed to lift objects.

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Typical 30-assignment activities include (continued):

- Calculate the theoretical mechanical advantage of pulley systems and compare this with the measured mechanical advantage to observe the efficiency.
- Build a motorized winch system and measure the electrical power input and the mechanical power output.
- Build a winch system that uses a more complex pulley system to provide a large mechanical advantage and discover what effect this has on efficiency.
- Design a motorized winch system that will raise a load at a specific speed.
- Use bevel gears to connect the motor to an axle that is in a different direction from the axle of the motor.
- Build a mechanical system that uses crank and slider mechanisms to convert rotary motion into straight-line motion.
- Use cams to convert rotary motion into linear motion and examine how the shape of the cam affects the motion produced.
- Compare mechanical systems with pneumatic, hydraulic and electrical power systems.
- Examine the use of levers that change the direction of a force.
- Build and test levers used to magnify force.
- Build and test levers used to magnify distance.
- Investigate special mechanisms used to provide and transmit power and operate as safety devices.
- Discover how inclined planes can be used to provide mechanical advantage.
- Explore the effect of inclined planes on energy.
- Describe the application of inclined planes in screw threads.
- Design gearboxes to provide specific changes in force and speed.
- Design an energy efficient winding mechanism for a powered elevator.
- Design a mechanical system for raising a boat from the water and into a boathouse.
- Develop the boat winch design to allow for cost.
- Build a model of a boat winch design and test it using the Mechanisms Trainer.

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
- Book: 'Mechanisms'
- Mechanisms Trainer
- Stopwatch
- Ruler
- Protractor
- Double pulley block

Additional items required:

- Computer

Module Facts

For Technology Program, order as:
ST260/40 Mechanisms

	No.	Average time
Assignments	40	45 minutes
Extension Activities	4	45 minutes
	Total	33 hours

LJ Technical Systems
Web site: www.ljgroup.com

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