

## Independent School District of Boise City

Technology – Power/Energy/Transportation

Course No. 1604

Open to: 8 One Semester Course

Prerequisite: None

Lab Fees: \$8.00

Content: Students will examine the four main areas of transportation-air, space, terrestrial, and marine. It will be studied how these transportation areas relate to energy conservation and power generation. Lab activities may include electronics, problem solving, computer drafting, and vehicle construction. Vehicle construction activities may include pneumatic or water rockets, and terrestrial, air, or marine vehicles powered by solar, wind, air rubber band, or CO<sub>2</sub>. Wind tunnel testing may be provided. Career and consumer information will be presented.

### Table of Contents

DESCRIPTION	TIME	APPENDIX
*Note: All activities, as listed, take approximately 17 weeks (leaving one week for finals).		
UNIT 1 – Introductions and Definitions		
What is Power?	1 Day	
What is Energy?		A
What is Transportation?		B
UNIT 2 – Basic Electronics		
Suggested Activity: Small groups with electronics kits	10 Days	C
UNIT 3 – Ground Transportation		
Suggested Activity: CO <sub>2</sub> Dragsters	5 Days	D
Suggested Activity: Maglev Vehicles	3 Days	E
Suggested Activity: Mousetrap Cars	10 Days	F
Suggested Activity: Train Simulation	10 Days	G, H, I
Suggested Activity: Locomotion (transportation sim.)	10 Days	J
UNIT 4 – Water Transportation		
Suggested Activity: America’s Cup (Sailboat Race)	5 Days	K, L, M
UNIT 5 – Air Transportation		
Suggested Activity: Balsa and Tissue Kites	10 Days	N, O, P, Q
Suggested Activity: Hot Air Balloons	10 Days	R, S
Suggested Activity: Rubber band-Powered Flight	10 Days	T, U, V
Suggested Activity: Air & Water Rockets	5 Days	W, X, Y
Suggested Activity: CO <sub>2</sub> gliders	5 Days	Z
UNIT 6 – Future Cities		
Suggested Activity: Simcity 3000	10 Days	AA, BB
Suggested Activity: Wind Power		
Suggested Activity: Solar Power		
TOTAL # OF DAYS		100
End of Course Exam		CC

<b>8th Grade Power, Energy, and Transportation</b>		<b>District Reference</b> 1604
<b>Unit No. 1</b>	<b>Introductions and Definitions</b>	<b>1 day</b>

<b>Instructional Objective</b>		<b>Standard Reference</b>	
1604.01 Students will discuss and understand the history and relevance of power, energy, and transportation.		09.08, 09.09, 09.10	
No.	Performance Objective	Resource Reference	Assessment Correlation
01	Students will be able to define power, energy, and transportation.		EOC
02	Students will be able to explain the difference between potential and kinetic energy.		EOC
03	Students will be able to list, in chronological order, the invention and uses of energy sources.	See Appendix A	EOC
04	Students will be able to discuss the costs and benefits of modern transportation systems.	See Appendix B	EOC

<b>8th Grade Power, Energy, and Transportation</b>		<b>District Reference</b> 1604
<b>Unit No. 2</b>	<b>Basic Electronics</b>	<b>5 days</b>

<b>Instructional Objective</b>		<b>Standard Reference</b>	
1604.02 Students will demonstrate technical knowledge and skills about electric power technology.		10.10	
No.	Performance Objective	Resource Reference	Assessment Correlation
01	Students will be able to define and demonstrate the use of a potentiometer, resistor, capacitor, diode, LED, transistor, switch, transformer, series circuit, parallel circuit, relay, voltmeter, and photo resistor.	See Appendix C; Radio Shack Basic Electronics Workbook I	EOC
02	Students will be able to build a simple two-transistor radio transmitter.	See Appendix C; Radio Shack Basic Electronics Workbook I	
03	Students will be able to build a fully functional siren.	See Appendix C; Radio Shack Basic Electronics Workbook I	
04	Students will be able to build a sound synthesizer.	See Appendix C; Radio Shack Basic Electronics Workbook I	
05	Students will be able to build a percussion	See Appendix C;	

	instrument synthesizer.	Radio Shack Basic Electronics Workbook I	
06	Students will be able to read and write electronic circuits.	See Appendix C; Radio Shack Basic Electronics Workbook I	

<b>8th Grade Power, Energy, and Transportation</b>		<b>District Reference</b> 1604
<b>Unit No. 3</b>	<b>Ground Transportation</b>	<b>39 days</b>

<b>Instructional Objective</b>		<b>Standard Reference</b>	
1604.03 Students will use their knowledge of aerodynamics and friction to create a dragster propelled by carbon dioxide.		09.01, 09.04, 09.05, 09.08, 09.09, 09.10, 09.11	
<b>No.</b>	<b>Performance Objective</b>	<b>Resource Reference</b>	<b>Assessment Correlation</b>
01	Students will be able to name Newton's first law of motion.		EOC
02	Students will be able to name Newton's second law of motion.		
03	Students will be able to apply their knowledge of Newton's laws of motion to their CO2 dragster.		
04	Students will be able to define rotational inertia.		EOC
05	Students will be able to use a C.A.D. program to test a dragster design for aerodynamics.	See Appendix D	
06	Students will be able to draw five concept sketches for a CO2 dragster.	See Appendix D	
07	Students will be able to create a 3-view design sketch for one selected dragster design.	See Appendix D	EOC
08	Students will be able to produce a working drawing for a CO2 dragster.	See Appendix D	
09	Students will be able to construct a working model of their CO2 dragster that meets specific criteria.	See Appendix D	
10	Students will be able to launch their CO2 dragster and determine its speed in miles per hour.	See Appendix D	EOC
<b>Instructional Objective</b>		<b>Standard Reference</b>	
1604.04 Students will demonstrate a working understanding of magnetic levitation by constructing a floating vehicle.		09.01, 09.04, 09.05, 09.08, 09.09, 09.10, 09.11	
<b>No.</b>	<b>Performance Objective</b>	<b>Resource Reference</b>	<b>Assessment Correlation</b>
01	Students will be able to use magnets to create a vehicle that has as little friction as possible on a magnetic track.	See Appendix E	
02	Students will be able to construct a mag-lev	See Appendix E	

	vehicle for the greatest downhill speed, taking weight, aerodynamics, magnetic polarity, and friction into account.		
<b>Instructional Objective</b> 1604.05 Students will use a mousetrap as the energy source for a race vehicle.		<b>Standard Reference</b> 09.01, 09.04, 09.05, 09.08, 09.09, 09.10, 09.11	
<b>No.</b>	<b>Performance Objective</b>	<b>Resource Reference</b>	<b>Assessment Correlation</b>
01	Students will be able to explain how axle and wheels size affect speed and distance.		EOC
02	Students will be able to safely set a mousetrap.		
03	Students will be able to construct a vehicle that uses the snap of a mousetrap to propel it forward.		
04	Students will be able to make decisions that will result in better product performance.		
05	Students will be able to construct a mousetrap vehicle for maximum acceleration.	See Appendix F	
<b>Instructional Objective</b> 1604.06 Students will use Microsoft Train Simulator to learn how trains are run to transport people and goods.		<b>Standard Reference</b> 09.10, 09.11	
<b>No.</b>	<b>Performance Objective</b>	<b>Resource Reference</b>	<b>Assessment Correlation</b>
01	Students will be able to complete tutorials on diesel and electric trains.		
02	Students will be able to complete passenger train routes and keep to a set timetable.	See Appendix G	
03	Students will be able to couple and uncouple virtual train cars.	See Appendix G	
04	Students will be able to deliver goods to specific trackside industries and keep to a set timetable.	See Appendix G	
05	Students will be able to explain the progression of train technologies and history.	See Appendix H	EOC
06	Students will be able to name the two competing train companies that participated in the transcontinental railroad.		EOC
07	Students will be able to trace the two routes taken by the Union Pacific and Central Pacific railroads while constructing the transcontinental railroad.	See Appendix I	EOC
<b>Instructional Objective</b> 1604.07 Students will demonstrate skills in designing and managing transportation systems.		<b>Standard Reference</b> 09.10, 09.11	
<b>No.</b>	<b>Performance Objective</b>	<b>Resource Reference</b>	<b>Assessment Correlation</b>
01	Students will be able to use a computer simulation program called "Locomotion" to	See Appendix J	

	design and manage transportation routes over water, land, and air.		
02	Students will be able to define “intermodal” transportation.		EOC
03	Students will be able to successfully deliver raw materials, goods, and passengers using trains, busses, subways, trucks, airplanes, and boats.	See Appendix J	
04	Students will be able to meet the transportation needs of a growing city.	See Appendix J	
05	Students will be able to manage a budget.		

<b>8th Grade Power, Energy, and Transportation</b>		<b>District Reference</b> 1604
<b>Unit No. 4</b>	<b>Water Transportation</b>	<b>10 days</b>

<b>Instructional Objective</b> 1604.08 Students will construct a boat powered by two different power sources.		<b>Standard Reference</b> 09.01, 09.05, 09.10, 09.11	
<b>No.</b>	<b>Performance Objective</b>	<b>Resource Reference</b>	<b>Assessment Correlation</b>
01	Students will be able to design and build a sailboat that will fit into the available rain gutter or pipe.	See Appendix K	
02	Students will be able to race a boat that uses a rubber band paddlewheel for power.	See Appendix K	
03	Students will be able to race the same boat, replacing the paddlewheels with a sail and using a fan for power.	See Appendix K	
04	Students will be able to identify a sailboat’s mast, mainsail, jib, bow, hull, stern, rudder, and boom.	See Appendix L	EOC
05	Students will be able to name five famous ships or boats in U.S. history.	See Appendix M	EOC

<b>8th Grade Power, Energy, and Transportation</b>		<b>District Reference</b> 1604
<b>Unit No. 5</b>	<b>Air Transportation</b>	<b>25 days</b>

<b>Instructional Objective</b> 1604.09 Students will learn about the physics and history of kites.		<b>Standard Reference</b> 09.01, 09.04, 09.05, 09.08, 09.09, 09.10, 09.11	
<b>No.</b>	<b>Performance Objective</b>	<b>Resource Reference</b>	<b>Assessment Correlation</b>
01	Students will be able to follow written instruction and demonstrations for the construction of a simple box kite.	See Appendix N	

02	Students will be able to build a kite that is square, neat, and light weight.	See Appendix O	
03	Students will be able to build a kite with an angle of attack appropriate for flight.	See Appendix O	
04	Students will be able to build a kite that flies non-stop in light wind conditions.	See Appendix O	
05	Students will be able to explain how the forces of lift and drag affect the flight of a kite.	See Appendix P	EOC
06	Students will be able to explain the history of kites.	See Appendix Q	EOC
<b>Instructional Objective</b> 1604.10 Students will learn about the physics and history of lighter than air flight.		<b>Standard Reference</b> 09.01, 09.04, 09.05, 09.08, 09.09, 09.10, 09.11	
<b>No.</b>	<b>Performance Objective</b>	<b>Resource Reference</b>	<b>Assessment Correlation</b>
07	Students will be able to follow written instructions and demonstrations for the construction of a 10-gore hot air balloon.	See Appendix R	
08	Students will be able to build a balloon that is neat and light weight.	See Appendix S	
09	Students will be able to build a balloon with no gaps for air to escape.	See Appendix S	
10	Students will be able to launch their balloon for maximum time aloft using propane gas.	See Appendix S	
<b>Instructional Objective</b> 1604.11 Students will learn about the physics and history of fixed-wing aircraft.		<b>Standard Reference</b> 09.01, 09.04, 09.05, 09.08, 09.09, 09.10, 09.11, 10.18	
<b>No.</b>	<b>Performance Objective</b>	<b>Resource Reference</b>	<b>Assessment Correlation</b>
01	Students will be able to follow written instruction and demonstrations for the construction of a rubber band-powered model airplane.	See Appendix T	
02	Students will be able to name important events in the history of fixed-wing aircraft.	See Appendix U	EOC
03	Students will be able to label the parts of a fixed-wing airplane.	See Appendix V	EOC
04	Students will be able to explain how an airfoil creates lift.	See Appendix V	EOC
<b>Instructional Objective</b> 1604.12 Students will learn about the physics and history of rockets.		<b>Standard Reference</b> 09.01, 09.04, 09.05, 09.08, 09.09, 09.10, 09.11	
<b>No.</b>	<b>Performance Objective</b>	<b>Resource Reference</b>	<b>Assessment Correlation</b>

01	Students will be able to explain the history of rocket construction and flight.	See Appendix W	EOC
02	Students will be able to build a rocket using a straw and clay.		
03	Students will be able to build a rocket using paper and tape, launched with an air compressor.	See Appendix X	
04	Students will be able to follow written instructions and demonstrations for building a bottle rocket using a 16oz or 2 liter pop bottle.	See Appendix Y	
05	Students will be able to design a recovery system for slowing the decent of their water bottle rocket.		
<b>Instructional Objective</b> 1604.13 Students will use their knowledge of flight to create and launch a CO2 glider.		<b>Standard Reference</b> 09.01, 09.04, 09.05, 09.08, 09.09, 09.10, 09.11	
<b>No.</b>	<b>Performance Objective</b>	<b>Resource Reference</b>	<b>Assessment Correlation</b>
01	Students will be able to create an airfoil made of foam.	See Appendix Z	
02	Students will be able to build a foam glider powered by a CO2 canister.		

<b>8th Grade Power, Energy, and Transportation</b>		<b>District Reference</b> 1604
<b>Unit No. 6</b>	<b>City Planning and Management</b>	<b>10 days</b>

<b>Instructional Objective</b> 1604.14 Students will design and manage a city and its power, energy, and transportation needs.		<b>Standard Reference</b> 09.08, 09.09, 09.10, 09.11	
<b>No.</b>	<b>Performance Objective</b>	<b>Resource Reference</b>	<b>Assessment Correlation</b>
01	Students will be able to design the layout of a successful city, complete with power, energy, and transportation zones.		
02	Students will be able to manage a city's budget.		
03	Students will be able to meet the needs of a "simcity" in such a way that it grows and prospers.	See Appendices AA and BB	
04	Students will be able to explain the concept of supply and demand.		
05	Students will be able to name five ways to increase the EQ (education quotient) of their sim citizens.		
06	Students will be able to apply what they see and do in the simulation to their own community.		

## **09.0 POWER/ENERGY AND TRANSPORTATION SYSTEMS I**

### **Prerequisite:** Fundamentals of Technology

Students enrolled in this course will explore sources, storage, transportation, consumption, control, environmental impacts, and conservation of power, energy and transportation. Land, ground effects, water, air, space, and intermodal transportation systems will be explored with practical activities emphasizing relevant scientific and engineering concepts. Activities include defining problems, designing prototypes, using computer-assisted applications, constructing models, and testing prototypes using appropriate tools such as wind tunnels and performance tests.

PROGRAM TASK LISTING EFFECTIVE DATE: June 30, 1995

PROGRAM AREA: Technology Education

PROGRAM TITLE: Power/Energy and Transportation Systems I

IDAHO CODE NUMBER: TE 1940

- 09.01 Demonstrate the ability to work safely with a variety of technologies.
- 09.02 Demonstrate interpersonal skills as they relate to the workplace.
- 09.03 Identify and apply methods of information acquisition and utilization.
- 09.04 Apply basic skills in communications, mathematics, and science appropriate to technological content and learning activities.
- 09.05 Demonstrate and apply design/problem-solving processes.
- 09.06 Discuss individual interests and aptitudes as they relate to a career.
- 09.07 Make an informed and meaningful career choice.
- 09.08 Demonstrate technical knowledge and skills about energy technology.
- 09.09 Demonstrate technical knowledge and skills about power technology.
- 09.10 Demonstrate technical knowledge and skills about transportation technology.
- 09.11 Perform independent-study and technical skills related to energy, power, or transportation technology.

PROGRAM TASK LISTING EFFECTIVE DATE: June 30, 1995

PROGRAM AREA: Technology Education

PROGRAM TITLE: Power/Energy and Transportation Systems I

IDAHO CODE NUMBER: TE 1940

09.01 DEMONSTRATE THE ABILITY TO WORK SAFELY WITH A VARIETY OF TECHNOLOGIES--

The student will be able to:

1. Select appropriate tools, procedures, and/or equipment needed to produce a product.
2. Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment needed to produce a product.
3. Demonstrate knowledge required to maintain and troubleshoot equipment used in a variety of technological systems.
4. Follow laboratory safety rules and procedures.
5. Demonstrate good housekeeping at work station within total laboratory.
6. Identify color-coding safety standards.
7. Explain fire prevention and safety precautions and practices for extinguishing fires.
8. Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment.

09.02 DEMONSTRATE INTERPERSONAL SKILLS AS THEY RELATE TO THE WORKPLACE--

The student will be able to:

1. Perform roles in a student personnel system or in the Idaho Technology Student Association (Idaho TSA).
2. Participate as a member of a team.
3. Teach others new skills.
4. Identify skills needed to serve clients/customers.
5. Demonstrate leadership skills.
6. Describe strategies necessary for negotiating agreements.
7. Demonstrate the application of skills necessary to work with people of diverse backgrounds.
8. Form an understanding and appreciation for work after listening to or observing technology workers.
9. Form an understanding and appreciation for work after participating in a simulated technology group project in the laboratory.
10. Form an understanding and appreciation for the roles and work of co-workers.

09.03 IDENTIFY AND APPLY METHODS OF INFORMATION ACQUISITION AND UTILIZATION--

The student will be able to:

1. Define terms related to computers.
2. Identify and describe methods of information acquisition and evaluation.
3. Discuss advantages and disadvantages in the application of technologies.
4. Produce a plan to organize and maintain information relevant to emerging technologies.
5. Comprehend and communicate information relevant to emerging technologies.
6. Demonstrate the use of computers to process information.
7. Demonstrate the ability to gather information using media centers, electronic communications (i.e. computer networking) and emerging media (CD-ROM, laser disk, etc.)

09.04 APPLY BASIC SKILLS IN COMMUNICATIONS, MATHEMATICS, AND SCIENCE APPROPRIATE TO TECHNOLOGICAL CONTENT AND LEARNING ACTIVITIES--

The student will be able to:

1. Identify and explain the main and subordinate ideas in a written work.
2. Distinguish different purposes and methods of writing, identify a writer's point of view and tone, and interpret a writer's meaning.
3. Define unfamiliar words by use of structural analysis, decoding, contextual clues, or by using a dictionary.
4. Distinguish fact from opinion.
5. Read critically by asking pertinent questions, by recognizing assumptions and implications, and by evaluating ideas.
6. Select, relate, and organize, ideas using outlining and/or graphic organizers and develop the ideas in coherent paragraphs.
7. Improve one's own writing by restructuring, correcting errors, and rewriting.
8. Gather and organize information from primary and secondary sources; write a report using this research; quote, paraphrase, and summarize accurately; and cite sources properly.
9. Vary one's writing style, including vocabulary and sentence structure, for different readers and purposes.
10. Write logical and understandable statements, or phrases, to accurately fill out commonly used forms.
11. Compose unified and coherent correspondence, directions, descriptions, explanations and reports.
12. Participate critically and constructively in the exchange of ideas, particularly during class discussions and conferences with instructors.
13. Conceive and develop ideas about a topic for the purpose of speaking to a group; choose and organize related ideas; present them clearly in Standard English; and evaluate similar presentations by others.

14. Use the mathematics of:
  - integers, fractions, and decimals;
  - ratios, proportions, and percentages;
  - roots and powers;
  - algebra;
  - geometry.
15. Make estimates and approximations, and judge the reasonableness of a result.
16. Use elementary concepts of probability and statistics.
17. Draw, read, and analyze graphs, charts, and tables.
18. Ask appropriate scientific questions and recognize what is involved in experimental approaches to the solutions of such questions through familiarity with laboratory and field work.
19. Organize and communicate the results obtained by observation and experimentation.
20. Apply the basic principles of biology, physics, and chemistry. (Properties of matter; structure of compounds; concepts of motion; temperature, pressure and volume; work, power, force and energy; machines; human cell structure).
21. Identify problems rooted in basic biology, physics, or chemistry (effects of hazardous materials on health and safety, effects of drugs on health, trouble shooting problems on a machine).

09.05 DEMONSTRATE AND APPLY DESIGN/PROBLEM-SOLVING PROCESSES--

The student will be able to:

1. Describe and explain steps in the design/problem-solving process.
2. Propose solutions to given problems.
3. Design and implement the optimal solution to a given problem.
4. Document each step of the design/problem-solving process.
5. Demonstrate "Brainstorming" as a process to solve problems.
6. Define "critical thinking" and its value in the problem-solving process.

09.06 DISCUSS INDIVIDUAL INTERESTS AND APTITUDES AS THEY RELATE TO A CAREER--

The student will be able to:

1. Describe individual strengths and weaknesses.
2. Discuss individual interests related to a career.
3. Identify careers within specific areas of technology.
4. Explore careers within specific areas of interest.

09.07 MAKE AN INFORMED AND MEANINGFUL CAREER CHOICE--

The student will be able to:

1. Make a tentative occupational choice based on the information learned and interest developed in this course.
2. Review tentative occupational choices based on the information learned and interest developed in this course.

09.08 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS ABOUT ENERGY TECHNOLOGY--

The student will be able to:

1. Demonstrate knowledge and understanding of sources of thermal energy.
2. Demonstrate knowledge and understanding of sources of radiant energy.
3. Demonstrate knowledge and understanding of sources of nuclear energy.
4. Demonstrate knowledge and understanding of sources of chemical energy.
5. Demonstrate knowledge and understanding of sources of electrical energy.
6. Demonstrate knowledge and understanding of sources of mechanical energy.
7. Demonstrate knowledge and understanding of sources of fluid energy.
8. Define Energy.
9. Use units of energy measurement to calculate input and output.
10. Apply knowledge of energy technology in making a working system.

09.09 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS ABOUT POWER TECHNOLOGY--

The student will be able to:

1. Define Power
2. Demonstrate method of measuring power
3. Demonstrate knowledge, understanding and application of simple machines.
4. Calculate problems using power ratio.
5. Demonstrate an understanding of hydraulic/pneumatic power control.
6. Set up and Calculate power problems.
7. Demonstrate knowledge and applications in controlling power.  
Electricity/Electronics - AC/DC, Components, Digital electronics/logic circuits, Hydraulic/pneumatic, Mechanical
8. Identify methods of power transmission.
9. Demonstrate knowledge and understanding of heat engines, their parts and operation.
10. Students will be able to solve problems using more than one method of power control.

09.10 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS ABOUT TRANSPORTATION TECHNOLOGY--

The student will be able to:

1. Understand historical development of each transportation system.
2. Understand and apply the theories of each transportation system in developing efficient working models.
3. Design and construct vehicles in each transportation system.
4. Demonstrate knowledge of land transportation.
5. Demonstrate knowledge of ground effect transportation.
6. Demonstrate knowledge of air transportation.
7. Demonstrate knowledge of space transportation.
8. Demonstrate knowledge of marine transportation.
9. Illustrate or design an intermodal transportation system.

09.11 PERFORM INDEPENDENT-STUDY AND TECHNICAL SKILLS RELATED TO ENERGY, POWER, OR TRANSPORTATION TECHNOLOGY--

The student will be able to:

1. Select an individual or group project in cooperation with the teacher.
2. Work with a mentor from the school or community to help complete the project.
3. Develop a written plan of work to carry out the project.
4. Show evidence of technical study in support of the project.
5. Perform skills related to the project.
6. Complete the project as planned.
7. Collect or produce data on energy and power through the operation of computer.

## 10.0 POWER/ENERGY AND TRANSPORTATION SYSTEMS II

**Prerequisites:** Fundamentals of Technology

Power/Energy and Transportation Systems I

Power/Energy and Transportation Systems II students will continue to build on their knowledge of transportation systems by experimenting with increasingly complex systems and concepts. Guidance, intermodal and urban transportation systems are explored. Students continue to seek solutions to problems through research and design, prototype development and experimentation. Students perform technological assessments on transportation topics of interest.

PROGRAM TASK LISTING EFFECTIVE DATE: June 30, 1995

PROGRAM AREA: Technology Education

PROGRAM TITLE: Power/Energy and Transportation Systems II

IDAHO CODE NUMBER: TE 1941

- 10.01 Express an understanding of technological systems and their complex interrelationships.
- 10.02 Measure and report the power and efficiency of power producing systems.
- 10.03 Demonstrate the ability to properly identify, organize, plan, and allocate resources.
- 10.04 Apply basic skills in communications, mathematics, and science appropriate to technological content and learning activities.
- 10.05 Demonstrate an understanding of entrepreneurship.
- 10.06 Demonstrate technical knowledge and skills about steam power technology.
- 10.07 Demonstrate technical knowledge and skills about diesel engine power technology.
- 10.08 Demonstrate technical knowledge and skills about internal combustion power technology.
- 10.09 Demonstrate technical knowledge and skills about hydraulic and pneumatic power technology.
- 10.10 Demonstrate technical knowledge and skills about electric power technology.
- 10.11 Demonstrate technical knowledge and skills about jet engine power technology.
- 10.12 Demonstrate technical knowledge and skills about rocket engine technology.

- 10.13 Demonstrate technical knowledge and skills about solar cells and fuel cells.
- 10.14 Demonstrate technical knowledge and skills about nuclear power technology.
- 10.15 Perform independent advanced-study and technical skills related to energy, power, or transportation technology.
- 10.16 Demonstrate technical knowledge and skills about powered transportation systems.
- 10.17 Conduct a research and experimentation project on an energy and power system.
- 10.18 Demonstrate knowledge of history of flight.
- 10.19 Demonstrate knowledge of principles of flight.
- 10.20 Demonstrate knowledge of aerospace vehicles, difference of aircraft and vehicles.
- 10.21 Demonstrate knowledge of aerospace environments.
- 10.22 Demonstrate knowledge of aerospace and international issues.
- 10.23 Demonstrate knowledge of the future of aerospace.

PROGRAM TASK LISTING EFFECTIVE DATE: June 30, 1995

PROGRAM AREA: Technology Education

PROGRAM TITLE: Power/Energy and Transportation Systems II

IDAHO CODE NUMBER: TE 1941

10.01 EXPRESS AN UNDERSTANDING OF TECHNOLOGICAL SYSTEMS AND THEIR COMPLEX INTERRELATIONSHIPS--

The student will be able to:

1. Demonstrate knowledge of how social, organizational, and technological systems work.
2. Explore methods used to monitor and correct performance of technological systems.
3. Design and implement an optimal solution to a given problem.
4. Outline major historical technological developments or events.
5. Identify recent advances in technology.
6. Explain problem-solving roles of technology.
7. Forecast a technological development or event.

8. Define technology.

10.02 MEASURE AND REPORT THE POWER AND EFFICIENCY OF POWER PRODUCING SYSTEMS--

The student will be able to:

1. Measure the power and efficiency of a mechanical system.
2. Measure the power and efficiency of a fluid system.
3. Measure the power and efficiency of an electrical system.
4. Measure the power and efficiency of a thermal system.

10.03 DEMONSTRATE THE ABILITY TO PROPERLY IDENTIFY, ORGANIZE, PLAN, AND ALLOCATE RESOURCES--

The student will be able to:

1. Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.
2. Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.
3. Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently.
4. Display knowledge of the efficient use of human resources.

10.04 APPLY BASIC SKILLS IN COMMUNICATIONS, MATHEMATICS, AND SCIENCE APPROPRIATE TO TECHNOLOGICAL CONTENT AND LEARNING ACTIVITIES--

The student will be able to:

1. Use the features of books and reference materials, such as table of contents, preface, introduction, titles and subtitles, index, glossary, appendix, and bibliography.
2. Read and follow complex written directions.
3. Find, understand, and apply information from a variety of sources (books, manuals, newspapers, periodicals, directories, reference works, computer printouts, and other printed matter or electronic sources such as video display terminals).
4. Use and expand general and specialized vocabulary (including abbreviations, acronyms, and concepts) as appropriate to subject areas studied at the grade level.
5. Write Standard English sentences with correct:
  - sentence structure;
  - verb forms;
  - punctuation, capitalization, possessives, plural forms, and other matters of mechanics;
  - word choice and spelling.
6. Answer and ask questions coherently and concisely, and follow spoken instructions.
7. Identify and comprehend the main and subordinate ideas in lectures and

discussions, ask questions to clarify information heard, and report accurately what others have said.

8. Perform with accuracy the computations of addition, subtraction, multiplication, and division using natural numbers, fractions, decimals, and integers.
9. Make and use measurements in both traditional and metric units.
10. Formulate and solve problems in mathematical terms, selecting appropriate approaches and tools (mental computation, trial and error, paper-and-pencil techniques, calculator, and computer).
11. Solve work-related problems involving the basic arithmetic operations using whole numbers, fractions, decimals, and percents.
12. Describe the role of observation and experimentation in the development of scientific theories.
13. Gather scientific information through skills in laboratory, field, and library work.
14. Draw conclusions or make inferences from data.
15. Apply basic scientific/technical solutions to the appropriate problems.

#### 10.05 DEMONSTRATE AN UNDERSTANDING OF ENTREPRENEURSHIP--

The student will be able to:

1. Define entrepreneurship.
2. Describe the importance of entrepreneurship to the American economy.
3. List the advantages and disadvantages of business ownership.
4. Identify the risks involved in ownership of a business.
5. Identify the necessary personal characteristics of a successful entrepreneur.
6. Identify the business skills needed to operate a small business efficiently and effectively.

#### 10.06 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS ABOUT STEAM POWER TECHNOLOGY--

The student will be able to:

1. Identify and define the key terms, categories, and parts of steam power technology.
2. Describe the operating theory and principles of steam engines and steam turbines.
3. Explain the uses and applications of steam power engines and systems.
4. Identify industries that produce and use steam power systems.
5. Describe energy and fuel sources for steam power operations.
6. Perform technical skills in building, assembling, maintaining, or operating a steam power system.

10.07 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS ABOUT DIESEL ENGINE POWER TECHNOLOGY--

The student will be able to:

1. Identify and define key terms, categories, and parts of diesel engine power technology.
2. Describe the operating theory and principles of diesel engine power technology.
3. Explain the uses and applications of diesel engines.
4. Identify industries that produce and use diesel engines.
5. Describe energy and fuel sources for diesel engines.
6. Perform technical skills in building, assembling, maintaining, or operating diesel engines.

10.08 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS ABOUT INTERNAL COMBUSTION POWER TECHNOLOGY--

The student will be able to:

1. Identify and define the key terms, categories, and parts of gasoline engine internal combustion technology.
2. Describe the operating theory and principles of internal combustion gasoline engines.
3. Explain the uses and applications of internal combustion gasoline engines.
4. Identify industries that produce and use internal combustion gasoline engines.
5. Describe energy and fuel sources for internal combustion gasoline engines.
6. Perform technical skills in building, assembling, maintaining, or operating internal combustion gasoline engines.

10.09 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS ABOUT HYDRAULIC AND PNEUMATIC POWER TECHNOLOGY--

The student will be able to:

1. Identify and define key terms, categories, and parts of hydraulic and pneumatic power technology.
2. Describe the operating theory and principles of hydraulic and pneumatic power technology.
3. Explain the uses and applications of hydraulic and pneumatic power systems.
4. Identify industries that produce and use hydraulic and pneumatic power systems.
5. Describe the energy sources for hydraulic and pneumatic power systems.
6. Perform technical skills in building, assembling, maintaining, or operating hydraulic and pneumatic power systems.

10.10 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS ABOUT ELECTRIC POWER TECHNOLOGY--

The student will be able to:

1. Identify and define the key terms, categories, and parts of electric power technology.
2. Describe the operating theory and principles of electric power systems.
3. Explain the uses and applications of electric power systems.
4. Identify industries that produce and use electric power systems.
5. Describe energy and fuel sources for electric power systems.
6. Perform technical skills in building, assembling, maintaining, or operating an electric power system.

10.11 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS ABOUT JET ENGINE POWER TECHNOLOGY--

The student will be able to:

1. Identify and define key terms, categories, and parts of jet engine power technology.
2. Describe the operating theory and principles of jet engine power technology.
3. Explain the uses and applications of jet engines.
4. Identify industries that produce and use jet engines.
5. Describe energy and fuel sources for jet engines.
6. Perform technical skills in building, assembling, maintaining, or operating jet engines.

10.12 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS ABOUT ROCKET ENGINE POWER TECHNOLOGY--

The student will be able to:

1. Identify and define key terms, categories, and parts of rocket engine power technology.
2. Describe the operating theory and principles of rocket engine power technology.
3. Explain the uses and applications of rocket engines.
4. Identify industries that produce and use rocket engines.
5. Describe energy and fuel sources for rocket engines.
6. Perform technical skills in building, assembling, maintaining, or operating rocket engines.

10.13 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS ABOUT SOLAR CELLS AND FUEL CELLS--

The student will be able to:

1. Identify and define key terms, categories, and parts of solar cell and fuel cell power technology.
2. Describe the operating theory and principles of solar cell and fuel cell power technology.
3. Explain the uses and applications of solar cell and fuel cell power technology.
4. Identify the industries that produce and use solar cell and fuel cell power systems.
5. Describe the energy and fuel sources for solar cell and fuel cell power systems.
6. Perform technical skills in building, assembling, maintaining, or operating solar cell or fuel cell systems.

10.14 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS ABOUT NUCLEAR POWER TECHNOLOGY--

The student will be able to:

1. Identify and define the key terms, categories, and parts of nuclear power technology.
2. Describe the operating theory and principles of nuclear power systems.
3. Explain the uses and applications of nuclear power systems.
4. Identify industries that produce and use nuclear power systems.
5. Describe energy and fuel sources for nuclear power systems.
6. Perform technical skills in building, assembling, maintaining, or operating a simulated or real nuclear power system.

10.15 PERFORM INDEPENDENT ADVANCED-STUDY AND TECHNICAL SKILLS RELATED TO ENERGY, POWER, OR TRANSPORTATION TECHNOLOGY--

The student will be able to:

1. Select an individual or group project in cooperation with the teacher.
2. Work with a mentor from the school or community to help complete the project.
3. Develop a written plan of work to carry out the project.
4. Show evidence of technical study in support of the project.
5. Perform skills related to the project.
6. Complete the project as planned.
7. Collect or produce data on energy and power through the operation of a computer.

10.16 DEMONSTRATE TECHNICAL KNOWLEDGE AND SKILLS ABOUT POWERED TRANSPORTATION SYSTEMS--

The student will be able to:

1. Identify and define key terms, categories, and parts of land, water, air, and space transportation systems.
2. Describe the theories and operating principles of land, water, air, and space transportation.
3. Explain the uses and applications of land, water, air and space transportation vehicles.
4. Identify industries that produce and use land, water, air, and space transportation vehicles.
5. Describe the energy and power systems used in land, water, air, and space vehicles.
6. Perform technical skills in building, assembling, servicing, or operating a complete transportation vehicle.
7. Demonstrate knowledge of the future of land, ground effect, air, water, and space modes of transportation.

10.17 CONDUCT A RESEARCH AND EXPERIMENTATION PROJECT ON AN ENERGY AND POWER SYSTEM--

The student will be able to:

1. Identify a problem.
2. State a need to research the problem.
3. Form a hypothesis about the problem.
4. Plan the procedures for researching the problem.
5. Conduct the research following the planned procedures.
6. Present the research findings in a seminar.
7. State conclusions based on the research findings.

10.18 DEMONSTRATE KNOWLEDGE OF HISTORY OF FLIGHT--

The student will be able to:

1. Investigate the evolution of flight technology.
2. Identify early flight attempts.
3. Study the effects of world issues on the development of flight.

10.19 DEMONSTRATE KNOWLEDGE OF PRINCIPLES OF FLIGHT--

The student will be able to:

1. Gain an understanding of basic aerodynamic principles.
2. Apply an understanding of aircraft motion and control.
3. Demonstrate the operations of Aircraft propulsion.
4. Demonstrate the principles of navigation in flight.

10.20 DEMONSTRATE KNOWLEDGE OF AEROSPACE VEHICLES, DIFFERENCE OF AIRCRAFT AND VEHICLES--

The student will be able to:

1. Identify each aerospace vehicle type and explain the properties of flight associated with each type.
2. Apply the principles of flight to each type of aerospace vehicle.

10.21 DEMONSTRATE KNOWLEDGE OF AEROSPACE ENVIRONMENTS--

The student will be able to:

1. Survey the Galactic Community.
2. Survey the Solar System.
3. Survey the Earth's atmosphere.
4. Analyze the effects space flight has on the human body.
5. Study the effects that Humans have on Space.

10.22 DEMONSTRATE KNOWLEDGE OF AEROSPACE AND INTERNATIONAL ISSUES-

The student will be able to:

1. Identify the effects of international issues on aerospace.
2. Evaluate the effects that aerospace has had on international issues; environment, world trade, government policies, etc.

10.23 DEMONSTRATE KNOWLEDGE OF THE FUTURE OF AEROSPACE--

The student will be able to:

1. Forecast possible advancements in prolonged space travel.
2. Forecast possible advancements in artificial environments.
3. Forecast possible advancements in space-related production technology.
4. Forecast possible advancements in biotechnology.
5. Forecast possible advancements in clothing.
6. Forecast possible advancements in entertainment and recreation.
7. Forecast possible advancements in transportation technology.
8. Describe present and future aerospace careers.