

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.

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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.

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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.