

POWER, ENERGY, AND TRANSPORTATION TECHNOLOGY III HONORS
DEPARTMENT OF TECHNOLOGICAL STUDIES
HIGH POINT REGIONAL HIGH SCHOOL

Prerequisites: *Power, Energy, and Transportation Technology I*
 Power, Energy, and Transportation Technology II

Course Description:

This advanced level course will continue to explore the areas of technology that relate to Power, Energy, and Transportation. It will require students to participate in challenging, hands-on design, and problem solving activities that will reinforce the principles of land, marine, air, and space transportation. Furthermore, applications of alternative energy will be addressed through real-world issues and potential solutions. The design loop will be used to develop clear and professional documentation. Furthermore, students will continue to expand on their communication, teamwork, presentation, craftsmanship, and professional skills as they approach the conclusion of their high school career. High Point Regional High School's curriculum and instruction are aligned to the State's Core Curriculum Content Standards and address the elimination of discrimination by narrowing the achievement gap, by providing equity in educational programs and by providing opportunities for students to interact positively with others regardless of race, creed, color, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, religion, disability or socioeconomic status.

Purpose:

This course concentrates on student involvement in several state and national competitions. The emphasis will continue to be on hands on, problem solving activities in which students work together in lab activities designed to reinforce the content presented and compete against other schools. The demands of these competitions will properly serve as challenging culmination activities for these students while concurrently presenting them with the opportunity to showcase their design and communication skills amongst peers from around the state.

New Jersey State Standards Addressed:

Technological Literacy STANDARD 8.2 (Technology Education) All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world as they relate to the individual, society, and the environment.

A. Nature and Impact of Technology

1. Use appropriate data to discuss the full costs, benefits and trade-offs, and risks related to the use of technologies.
2. Explain how technological development is affected by competition through a variety of management activities associated with planning, organizing, and controlling the enterprise.
3. Provide various examples of how technological developments have shaped human history.

B. Design Process and Impact Assessment

1. Analyze a given technological product, system, or environment to understand how the engineering design process and design specification limitations influenced the final solution.
2. Evaluate the function, value, and appearance of technological products, systems, and environments from the perspective of the user and the producer.
3. Develop methods for creating possible solutions, modeling and testing solutions, and modifying proposed design in the solution of a technological problem using hands-on activities.
4. Use a computer assisted design (CAD) system in the development of an appropriate design solution.
5. Diagnose a malfunctioning product and system using appropriate critical thinking methods.

6. Create a technological product, system, or environment using given design specifications and constraints by applying design and engineering principles.

C. Systems in the Designed World

1. Explain the life cycle of a product from initial design to reuse, recycling, remanufacture, or final disposal, and its relationship to people, society, and the environment, including conservation and sustainability principles.
2. Analyze the factors that influence design of products, systems, and environments.
3. Compare and contrast the effectiveness of various products, systems, and environments associated with technological activities in energy, transportation, manufacturing, and information and communication.

Method of Instruction:

This course will be taught through a variety of instructional methods. Formal instruction will occur in order to present to the students the knowledge necessary to successfully complete the assigned supplemental activities. This knowledge will be applied through comprehensive design and problem solving projects that will require the following:

- Extensive research and development
- The generation of multiple solutions to the real life situation presented
- Detailed drawings and prototype development
- Portfolio development
- Cooperative and effective teamwork
- Active class participation through a variety of presentation techniques

Students will be strongly encouraged to actively participate in class discussions with the instructor and each other. Students will be expected to conduct themselves in a manner that will only enhance the cooperative work environment that will be present in this class.

There will be little homework assigned and ample time will be provided during class for all related assignments. Students will be encouraged and required to stay after school at certain times throughout the year to enhance or in some cases complete the assigned projects.

Evaluation:

The following are the items included in the evaluation of student achievement with approximate percentage constituted by each in the computation of the grade received by the student.

Classwork/Homework	10%
Quizzes	10%
Tests	15%
Projects/Labs	35%
Class Participation	30%

As noted, class participation plays a critical role in a student's success in this course. Each student will receive a weekly class participation grade in class largely based upon classroom conduct, citizenship, following safety guidelines, arriving prepared for class, teamwork, and effort. Grading criteria in terms of class participation on any given week will be based on the nature of the class, as it will change multiple times throughout the year.

Course Proficiencies and Approximate Sequence:

At the conclusion of the course, the student should demonstrate minimum competency in the skills and knowledge described in the unit goals listed below.

Unit 1: Course Introduction and Safety Guidelines**Time: 3 days**

The student will:

1. Outline the course expectations and timeline for instruction.
2. Discuss the specific discipline policy that relates to behavior in this class.
3. Outline the specific safety guidelines of the classroom.

Unit 2: Tool and Machine Safety**Time: 1 Week**

The student will:

1. Safely operate a band saw, scroll saw, drill press, disk and belt sander, brake, metal roller, shear, soldering gun, hand drill, etc.
2. Safely use hand tools- claw hammer, screw driver, hand saw, coping saw, hack saw
3. Read a metric and English ruler.

Unit 3: Review –Power, Energy & Transportation**Time: 2 Weeks**

The student will, based on the knowledge acquired in Power, Energy, and Transportation I & II, the students will:

1. Discuss technology as it relates to power, energy, and transportation.
2. Discuss the importance of the study of power, energy, and transportation.
3. Understand the different uses of energy in transportation.
4. Identify with the three basic power systems.
5. Discuss the future of transportation and potential careers in transportation.
6. Review the design loop and its impact on technological problem solving.
7. Review the presentation techniques of formal documentation used in previous years.

Unit 4: Introduction to Aeronautical Transportation**Time: 2 Weeks**

The student will:

1. Describe the modes of Aeronautical transportation
2. Define spacecraft.
3. Describe the space environment and its acceptance of transportation.
4. Identify how the six vehicular systems relate to space travel.
5. Identify the different routes of space travel.
6. Identify the two types of space transportation modes.
7. Identify the different space vehicles.
8. Describe what makes a spacecraft fly.
9. Introduce the concept of orbiting and its importance to aeronautical transportation.
10. Introduce the potential uses of alternative energy in space travel.

Unit 5: Aeronautical Transportation Activity**Time: 8 Weeks**

The student will:

1. List, describe, and implement the steps of the design process in order to develop a comprehensive documentation portfolio.

2. Utilize a variety of different forms of presentation techniques.
3. Apply the importance of guidance, control, propulsion, and structural systems to the effectiveness of the aerospace transportation vehicle.
4. Apply various concepts within energy and power to the structural design and development of this prototype.

Unit 6: Engineering Code of Conduct**Time: 3 Days**

The student will:

1. Develop as a class, an engineering code of conduct.
2. Research current engineering codes of conducts.
3. Understand why an engineering code of conduct is needed.

Unit 7: Higher Education and Careers**Time: 1 Week**

The student will:

1. Identify institutes of higher education with engineering degree programs.
2. Identify the many career opportunities an engineering degree supports. Vision of their daily life.
3. Identify throughout the course the roll of mathematics and scientific knowledge/skills.
4. Identify what produce a larger income.
5. Identify careers where engineering thinking would play a vital role.

Unit 8: Review – Technical Documentation**Time: 3 days**

The student will:

1. State the four design principles.
2. Review orthographic projection and isometric drawing.
3. Propose strengths and weaknesses of previous student work.
4. Propose changes and suggestions as suggested through specific project specifications.

Unit 9: Comprehensive Competitive Events**Time: 25 Weeks**

The student will:

1. Apply the knowledge of physical technology to the design and development of working prototypes.
2. Implement the design process in order to develop a working solution to a real world problem.
3. Develop an accurate and practical time management log.
4. Utilize different forms of educational technology to design and present solutions to the presented problems.

NOTE: All times listed are approximate.

Materials for Instruction:

1. Johnson, Stephen R. Exploring Transportation. (Goodheart-Wilcox Company, Tinley Park, Illinois). 2000. ISBN 1-56637-675-0.
2. Smith, Howard. Understanding Technology. (Goodheart-Wilcox Company, Tinley Park, Illinois). 1998. ISBN 1-56637-374-3.

3. Wright, Thomas. Technology Systems. (Goodheart-Wilcox Company, Tinley Park, Illinois). 1966. ISBN1-56637-263-1.
4. SmartBoard technology
5. Overheads
6. Models and demonstration tools.
7. NASA CD-Rom Technology, word processing, computer design software
8. Centennial of Flight materials and resources
9. Handouts and worksheets
10. Variety of different materials for usage and processing
11. Videos describing technology, transportation, small engines, and alternate energy
12. Several Internet website

