

Communication Technology 1

AUGUST 2007

COURSE NUMBER 777

TEACHER: MR. MARK WALLACE

SUPERVISOR: MR. MARK WALLACE

PRINCIPAL: MR. GREG YOUNGMAN

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(First offered September 2005)

Name of Course: Communication Technology 1
Level of Course: Academic
Prerequisites: None
Grades Levels Offered to: 9 through 12
Course Number: 777
Number of Credits: 5
Length: Thirty Six Week curriculum / 180 days
Recommended class size: Maximum 18- (*Computer restrictions*)
Teacher Recommendation: One-Certified Technology Education Teacher
Revised Date and Teachers Names: Mr. Mark Wallace (August 2007)

Purpose:

Communications is an essential element of any community's infrastructure-- but in the business community it can be the factor that promotes growth or accentuates decline. In the 1980's, expanded use of the facsimile machine -- or "fax" -- and computer networks increased communication capabilities around the globe. These technology advances revolutionized the way the United States conducts business at home and abroad. The business climate of the 21st century will require even greater communications capabilities to meet the needs of business in the "information era."

Engineering is problem solving using tools called math and science. The study thereof provides the key that opens the door to solving some of the most exciting problems at hand in our society (Seymour). It should be noted that "tools" include mathematical knowledge, and software applications such as PowerPoint and spreadsheet, etc.. Using these tools helps to stimulate creativity and build self-confidence.

The program will demonstrate what engineers do and how important they are, and how they ultimately impact society. It is the problem-solving techniques engineers learn that makes them advantageous to "non-traditional" engineering employers. People with engineering degrees are not necessarily locked into an engineering career. They have many skills that enable them to adapt very readily to various circumstances.

Communication technologies provide the means for collecting and processing sending, receiving and storing information into forms that can be used by people.

As the nation moves into the 21st century, new space communications systems will be required to meet the expanding needs of global telecommunications customers. In addition, the U.S. share of the communications satellite and equipment market has been shrinking since 1982 in the face of increased competition from European and Japanese companies. The Advanced Communications Technology Satellite (ACTS) Program is NASA's response to these competitive challenges of the future.

An introduction and understanding of communication technology is essential for all individuals. Knowing how to use a communication device is important, but understanding the input, process and outputs of communication technology will help in developing a technologically literate society.

Communication Technology 1,2,3, and 4 will be an interdisciplinary academic program fostering critical inquiry into the social, cultural, economic and political impacts of information and communication technologies. The program emphasis is on having the student acquire those business, manufacturing, media, computer and communication skills necessary for employment in today's communication technology industries and business organizations. Activities and content areas in Communication Technology 1 include: electronic communication systems: Geographical Information Systems, Optics, Lasers and Telecommunications fiber optic and video simulation/game design.

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, affection or sexual orientation, gender, religion, disability or socioeconomic status.

Method of Instruction:

Communications technology is an experienced-based course that studies systems that are used in a global society. Activities include the study of communication technology systems and the dynamics of the communication processes that occur between human-to-human, human-to-machine, and machine-to-machine. Students will use a variety of technology tools to engineer/create solutions to real-world problems in communications. This Communication Technology 1 course will provide students with knowledge of various areas of communication engineering/technology through participation in problem solving and design activities. There will be a clear connection made between the material taught in science classes and engineering principles. In the "real world," there are many overlaps between science and engineering, and the boundaries are often indistinct." (Herz) Studying areas of engineering and then applying the engineering process in order to solve real life problems will provide students with a better understanding of how real world situations are addressed. Furthermore, a common reason that young people are attracted to a career field is that the career appeals to their intellect and emotions: they are intellectually aware of the benefits of the work and emotionally committed to the work because of its personal relevance in their lives (Brown 2001).

Engineering projects motivate students to pursue math and science. When faced with engineering/design problems, students have to apply their math and science right away rather than in indefinite future. Engineering projects give students a sense of accomplishment and require them to use skills from multiple disciplines. Engineering problem solving allows students to master important life skills.

General Objectives:

At the conclusion of this course, the students will be able to:

1. Define engineering and technology.
2. Describe communication technology systems.
3. List, describe, and implement the steps in the engineering/design process.
4. Identify how different communication systems operate.
5. Utilize a variety of different forms of presentation techniques.
6. Work in teams for learning, problem solving, design and presentation.
7. Prepare for life-long learning by using self-management and self-assessment strategies in terms of knowledge and skills.
8. Develop careful and precise writing.
9. Explore career-specific areas.
10. Develop skills in critical thinking, analytical reasoning and logic, and the ability to establish and recognize the validity of information.
11. Understand the complex relationship of scientific, technological, social, business, legal, historical, and artistic issues in design.
12. Carry out engineering/design/problem solving projects by using established scientific principles in the creation of functional and appealing products.
13. Become an independent leader, recognize when to follow, and know how to be a good team member.
14. Develop and apply cross-disciplinary cognitive knowledge to new problems.

Lecture/Discussion

Objectives 1, 2, 4

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Class Projects/ Lab Sessions	Objectives 3, 6, 7, 12, 13, 14
Problem-Based learning	Objectives 4, 8, 10, 11,
Computer-Base instruction	Objectives 5
Homework	Objectives 4
Mentor/Visitations	Objectives 9

Measurement of success in meeting these general objectives will be carried out through the following methods of assessment:

Classwork/Homework	Objective 4,15
Quizzes/Tests Mid Term Exam and Final Exam	Objectives 1, 2
Projects/Labs	Objectives 3, 5, 6, 8, 9, 12, 14,
Class Participation	Objectives 7, 10, 11, 13, Quantified by credit points on projects and labs

Standards Targeted Throughout the Curriculum

Science STANDARD 5.4 (Nature and Process of Technology) All students will understand the interrelationships between science and technology and develop a conceptual understanding of the nature and process of technology.

A. Science and Technology

1. Know that scientific inquiry is driven by the desire to understand the natural world and seeks to answer questions that may or may not directly influence humans, while technology is driven by the need to meet human needs and solve human problems.

B. Nature of Technology

2. Assess the impacts of introducing a new technology in terms of alternative solutions, costs, tradeoffs, risks, benefits and environmental impact.

C. Technological Design

3. Plan, develop, and implement a proposal to solve an authentic, technological problem.

Technological Literacy STANDARD 8.1 (Computer and information literacy) All students will use computer applications to gather and organize information and to solve problems.

A. Basic Computer Skills and Tools

4. Create a multi-page document with citations using word processing software in conjunction with other tools that demonstrates the ability to format, edit, and print.
5. Construct a spreadsheet, enter data, use mathematical or logical functions to manipulate and process data, generate charts and graphs, and interpret the results.
6. Produce a multimedia project using text, graphics, moving images, and sound.
7. Produce and edit page layouts in different formats using desktop publishing and graphics software.
8. Discuss and/or demonstrate the capability of emerging technologies and software in the creation of documents or file

B. Application of Productivity Tools

Social Aspects

1. Describe the potential and implications of contemporary and emerging computer applications for personal, social, lifelong learning, and workplace needs.
2. Exhibit legal and ethical behaviors when using information and technology, and discuss consequences of misuse.
3. Make informed choices among technology systems, resources, and services in a variety of contexts.
4. Use appropriate language when communicating with diverse audiences using computer and information literacy.

Information Access and Research

1. Select and use specialized databases for advanced research to solve real world problems.
2. Identify new technologies and other organizational tools to use in personal, home, and/or work environments for information retrieval, entry, and presentation.
3. Evaluate information sources for accuracy, relevance, and appropriateness.
4. Compose, send, and organize e-mail messages with and without attachments.

Problem Solving and Decision Making

1. Create and manipulate information, independently and/or collaboratively, to solve problems and design and develop products.
2. Identify, diagnose, and suggest solutions for non-functioning technology systems.
3. Identify a problem in a content area and formulate a strategy to solve the problem using brainstorming, flowcharting, and appropriate resources.
4. Integrate new information into an existing knowledge base and communicate the results in a project or presentation.

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.

Career Education and Consumer, Family and Life Skills STANDARD 9.1 (Career and Technical Education) All students will develop career awareness and planning, employability skills, and foundational knowledge necessary for success in the workplace.

A. Career Awareness/Preparation

1. Evaluate academic and career skills needed in various career clusters.
2. Analyze factors that can impact an individual's career.
3. Research current advances in technology that apply to a selected occupational career cluster.

B. Employability Skills

1. Communicate and comprehend written and verbal thoughts, ideas, directions, and information relative to educational and occupational settings.
2. Select and utilize appropriate technology in the design and implementation of teacher-approved projects relevant to occupations and/or higher educational settings.
3. Evaluate the following academic and career skills as they relate to home, school, community, and employment:
 - Communication
 - Punctuality
 - Time management
 - Organization
 - Decision making
 - Goal setting
 - Resources allocation
 - Fair and equitable competition
 - Safety
 - Employment application skills
 - Teamwork
4. Demonstrate teamwork and leadership skills that include student participation in real world applications of career and technical education skills.
5. Demonstrate occupational health and safety skills related to industry-specific activities.

Career Education and Consumer, Family and Life Skills STANDARD 9.2 (Consumer, Family, and Life Skills) All students will demonstrate critical life skills in order to be functional members of society.

A. Critical Thinking

1. Apply communications and data analysis to the problem-solving and decision making processes in a variety of life situations.
2. Describe and apply constructive responses to criticism.
3. Apply the use of symbols, pictures, graphs, objects, and other visual information to a selected project in academic and/or occupational settings.
4. Recognize bias, vested interest, stereotyping, and the manipulation and misuse of information while formulating solutions to problems that interfere with attaining goals.
5. Apply knowledge and skills needed to use various means of transportation within a community.

B. Self-Management

1. Apply project planning and management skills in academic and/or occupational settings.
2. Compare and contrast methods for maximizing personal productivity.

C. Interpersonal Communication

1. Model interpersonal and effective conflict resolution skills.
2. Communicate effectively in a variety of settings with a diverse group of people.

D. Character Development and Ethics

1. Analyze how character influences work performance.
2. Identify and research privileges and duties of citizens in a democratic society.
3. Discuss consequences and sanctions when on-the-job rules and laws are not followed.
4. Compare and contrast a professional code of ethics or code of conduct from various work fields and discuss similarities and differences.
5. Apply a professional code of ethics to a workplace problem or issue.

F. Safety

1. Engage in an informed discussion about rules and laws designed to promote safety and health.
2. Describe and demonstrate basic first aid and safety procedures.
3. Analyze the occurrence of workplace hazards.
4. Practice the safe use of tools and equipment.
5. Implement safety procedures in the classroom and workplace, where appropriate.
6. Discuss motor vehicle safety, including but not limited to, New Jersey motor vehicle laws and regulations, methods of defensive driving, and the importance of personal responsibility on public roads/streets.

Source: *New Jersey Department of Education Standards* <http://www.nj.gov/njded/stass/>

New Jersey Technology Education Standards (TEANJ)

- Apply values and make rational decisions about technological issues. (NJTES 1.19)
- Design and make devices and hybrid systems that solve complex real world problems. (NJTES 2.22)
- Develop alternative plans for redesigning devices and systems. (NSTES 2.23)
- Utilize and modify existing devices and systems for use in the solution of new problems. (NJTES 3.16)
- Combine different materials in the production of products. (NJTES 3.19)
- Create computer simulations to test and explain design concepts. (NJTES 4.14)
- Create multimedia presentations to inform others about design concepts, products, and events. (NJTES 4.16)
- Access and search the Internet for relevant information while conducting research. (NJTES 6.16)
- Use advanced publication methods. (NJTES 7.38)
- Generate original ideas based on previous knowledge and research. (NJTES 7.41)
- Acquire knowledge and skills that increase aesthetic awareness as it applies to technological design and ergonomics. (NJTES 7.139)

Source: *1996 Technology Educators Association of New Jersey. (www.TEANJ.org)*

Standards of Technological Literacy from the (TFAA) Technology for All Americans Project and the International Technology Education Association (ITEA)

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- In order to comprehend the scope of technology, students should learn that technology is closely linked to creativity, which has resulted in innovation. (TFAA #1, H)
- In order to recognize the core concepts of technology, students should learn that systems thinking involves considering how every part relates to others. (TFAA #2, N)
- In order to comprehend the attributes of design, students should learn that there are trade offs that are made in the design process. (TFAA #8, F)
- In order to comprehend the attributes of design, students should learn that the requirements for a design are made up of criteria and constraints. (TFAA#8, G)
- As part of learning how to apply design processes, students should be able to make two-dimensional and three-dimensional representations of the designed solution. (TFAA #11, J)
- In order to select, use, and understand information and communication technologies, students should learn that the use of symbols, measurements, and drawings promotes clear communication by providing a common language to express ideas. (TFAA #17, K)

Source: International Technology Education Association (2000). Standards for Technological Literacy. Reston, VA: ITEA. ISBN 1-887101-02-0

Benchmarks of Project 2061

- Almost all control systems have inputs, outputs, and feedback. The essence of control is comparing information about what is happening to what people want to happen and then making appropriate adjustments. This procedure requires sensing information, processing it, and making changes. In almost all modern machines, microprocessors serve as centers of performance control
- Technological problems often create a demand for new scientific knowledge, and new technologies make it possible for scientists to extend their research in new ways or to undertake entirely new lines of research. The very availability of new technology itself often sparks scientific advances.
- Mathematics, creativity, logic and originality are all needed to improve technology.
- Technology usually affects society more directly than science because it solves practical problems and serves human needs (and may create new problems and needs). In contrast, science affects society mainly by stimulating and satisfying people's curiosity and occasionally by enlarging or challenging their views of what the world is like.
- Social and economic forces strongly influence which technologies will be developed and used. Which will prevail is affected by many factors, such as personal values, consumer acceptance, patent laws, the availability of risk capital, the federal budget, local and national regulations, media attention, economic competition, and tax incentives.
- Technological knowledge is not always as freely shared as scientific knowledge unrelated to technology. Some scientists and engineers are comfortable working in situations in which some secrecy is required, but others prefer not to do so. It is generally regarded as a matter of individual choice and ethics, not one of professional ethics.
- In deciding on proposals to introduce new technologies or to curtail existing ones, some key questions arise concerning alternatives, risks, costs, and benefits. What alternative ways are there to achieve the same ends, and how do the alternatives compare to the plan being put forward? Who benefits and who suffers? What are the financial and social costs, do they change over time, and who bears them? What are the risks associated with using (or not using) the new technology, how serious are they, and who is in jeopardy? What human, material, and energy resources will be needed to build, install, operate, maintain, and replace the new technology, and where will they come from? How will the new technology and its waste products be disposed of and at what costs?
- Human inventiveness has brought new risks as well as improvements to human existence.

Engineering activities will also stress many New Jersey and National math and science standards. Math and science applications are imperative to help solve problem solving and engineering/design activities.

Specific Behavioral Objectives and Timelines:

Current school structure: One day = One 42 minute period. Many units of study are woven together to simulate the real world.

Unit 1: Course Introduction and Safety Guidelines

Time: 3 days/Ongoing

Goal:

- To introduce the students to the course expectations, discipline policy, and safety guidelines.

Objectives:

Students will be able to:

- Understand the course expectations and timeline for instruction.
- Understand the discipline policy that relates to behavior in this class.
- Outline the specific safety guidelines of the classroom and shop rules.

Assignments:

- Movie related worksheet

Lab Activities:

- None

Audio-Visual Needs:

- Overhead projector
- Movie "UVEX PPE Eyewear Training Video/Technology Department Eye Safety"

Computer Needs/Use: None

-

Assessment Method:

- Safety Quiz

Standards targeted via this unit:

- NJCCCS 5.4, 8.1, 8.2, 9.1, 9.2
- NJTES 1.19
- NJTES 7.41

Unit #2: Introduction to Engineering/Design/Technology

Time: 3 Weeks/Ongoing

Goal:

- Introduce the students to the systems of engineering, technology education and technological literacy.

Objectives:

Students will be able to:

- Define technology.
- Define engineering.
- List the various areas of engineering.
- Describe the difference between science, technology, and engineering.

- Describe technology as a system, and list and explain the components of these systems.
- Use various brainstorming techniques to generate ideas and solutions.
- Discuss the positive and negative impacts of different technological systems.
- Introduce the design loop and its impact on technological problem solving.
- Introduce the presentation technique of formal documentation.

Assignments:

- Homework: *The Design Loop*
- Classwork: *Creating a Design Brief/Technological Outputs/Decision making*
- Classwork: *Coloring and Shading*
- Homework: *Isometric and Orthographic Projection*
- *Great Achievements* www.engineeringgirl.org/nae/cw.../cgmh4T2HYL

Lab Activities:

- Guest speakers
- Field of Engineering Power Point Presentation
- Isometric Drawing and Orthographic drawing
- Sketching rendering demonstration and practice

Audio-Visual Needs:

- PowerPoint / Smart board technology
- Previous examples of student work
- Movie “What’s Up In Technology”-
 - Produced by Thirteen-WNET - Ed. Resource Center-450 W. 33rd. Street NY, NY 1001
- Movie “Exploring The Design Process”-#V710-1994 Hearlihy & Co.
- Text: Hutchinson, J. and Karsnitz, J. (1994). *Design and Problem Solving in Technology*. Albany: Delmar Publishers, Inc. (*A good intro to technology text. Also good for middle school.*)

Computer Needs/Use:

- Internet research

Assessment Method:

- Authentic: *Teacher Observation*
- Traditional: *Introduction to Technology Test/future problem solving projects*

Standards targeted via this unit:

- NJCCCS 5.4, 8.1, 8.2, 9.1, 9.2
- NJTES 7.139
- NJTES 5
- NJTES 1.9
- NJTES 1.1
- NJTES 1.2
- NJTES 1.3
- NJTES 1.4, 1.5 1.6 1.7, 1.101.11
- TFAA #1, H
- TFAA #2, N
- STL #8, F

Unit #3: Presentations Techniques

Time: 3 weeks/Ongoing/Interwoven

Goal:

- To allow students to develop their ability to effectively communicate technological information and ideas through a variety of media.

Objectives:

Students will be able to:

- Create diagrams and sketches by hand and electronically to express design ideas and solutions.
- Create multi-media presentations to inform others about design concepts, products, and events.
- Create electronic databases and spreadsheets to gather, sort, analyze, and present data.
- Communicate orally and in writing the results of their design work.
- Create two and three-dimensional technical drawings by hand and electronically to develop and express design proposals.

Assignments:

- Web Page Design
- Publication Design
- Documentation of engineering design projects
- Sketching and Rendering
- Isometric and Orthographic drawing
- CAD/Parametric introduction

Lab Activities:

- Guest speakers
- Field of Engineering Power Point Presentation
- Design a Web Page- www.engneergirl.org
- Design a publication on famous women engineers
- Documentation
- Drawings, Models, and Prototypes

Audio-Visual Needs:

- None

Computer Needs/Use:

- Computers, Smart board technology, projectors, software

Assessment Method:

- Authentic: Documentation, drawings, presentations
- Traditional: Teacher Observation

Standards targeted via this unit:

- NJTES 4 .13, 4.14, 4.15, 4.16
- NJCCCS 5.4, 8.1, 8.2, 9.1, 9.2

Unit #4: Team-Work/Performance

Time: 1 day/On Going

Goal:

- To have students understand and demonstrate the importance of good teamwork skills.

Objectives:

Students will be able to:

- Demonstrate effective skills for interaction with others
- Demonstrate the ability to work with people who are different from oneself
- Demonstrate a positive attitude about self
- Demonstrate skills in responding to criticism and providing constructive criticism to others
- Demonstrate an understanding of the importance of personal skills and attitudes towards job success
- Demonstrate positive work attitudes and behaviors

Assignments:

- Group engineering and design projects

Lab Activities:

- Team success model
- Guest Speakers
- Visitations to work sites

Audio-Visual Needs:

- None

Computer Needs/Use:

- None

Assessment:

- Authentic: Teacher observation
- Traditional: none/ class participation

Standards targeted via this unit:

- NJ CCCS 2.0, #3
- NJ CCCS 3.0, #8
- NJSTES 1.19
- NJSTES 6.16

Unit #5: History of Communication Engineering

Time: 1 Week/Ongoing

Goals:

- To acquaint the student with influences of communication systems engineering & communication technology in history.

Objectives:

- Students will develop an understanding of the cultural, social, economic, and political effects of engineering.

Assignments:

- Read biographies of famous communication system designers/engineers.
(<http://inventors.about.com/cs/womeninventors/>)
- Power point presentation development portion of mid term on famous inventors, engineers and scientists.

Lab Activities:

- Guest speakers
- Field of Engineering Power Point Presentation (Individual or Group)
- Research case studies of amazing feats performed in the area of communication technology

Audio-Visual Needs:

- Videotapes. VCR. Monitor

Computer Needs/Use:

- Computers

Assessment Method:

- Authentic: Power Point presentations
- Traditional: Test on Communication History

Standards targeted via this unit:

- NJCCCS 5.4, 8.1, 8.2, 9.1, 9.2
- NJTES 1.13
- NJTES 6.16, 1.8 1.121.13,1.14, 1.15, 1.161.21
- TFAA #4 E, F

Unit #6: Introduction to Communication Systems

Goals:

- To know and understand the various systems which are invented in the information and communication technology field.
- To design and model a communication system.

Objectives: Students will:

- State the definition of communication
- Describe several ways in which people communicate.
- Define communication technology.
- Identify and give examples of fur types of communication systems.
- Diagram and explain the communication process.(Encoding, Transmitting, Receivng, Decoding)
- Cite and describe the four steps in the process for producing a message.
- Explain the difference between computer hardware and software.
- Understand the difference between Information and communication.
-

Assignments:

- Develop presentation on various systems of communication.

Lab Activities:

- Lecture/presentation
- Research
- PowerPoint presentation

Audio-Visual Needs:

- Videotapes. VCR. Monitor

Computer Needs/Use:

- Computers

Assessment Method:

- Authentic: Power Point presentations
- Traditional: Test on Communication systems models

Standards targeted via this unit:

Unit #7: Models of Communication

Goals:

- To Be Developed
-

Objectives:

- Students will
- Linier Transmission System

Assignments:

Lab Activities:

Audio-Visual Needs:

- Videotapes. VCR. Monitor

Computer Needs/Use:

- Computers

Assessment Method:

- Authentic:
- Traditional:

Standards targeted via this unit:

- NJCCCS 5.4, 8.1, 8.2, 9.1, 9.2

Unit #8: Tool and Machine Safety

Time: 1 Week/Ongoing

Goal:

- To introduce students to the safe and proper operation of hand tools and power machines so that they may fabricate solutions to engineering problems. In the process of using these tools, the student will view automation and operator safety as significant engineering problems to brainstorm as well as the effect of gender or hand dominance on operations.

Objectives:

Students will be able to:

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

Assignments:

- Tool and Machine Safety

Lab Activities:

- Safety Demonstrations/ Safety Rules

Audio-Visual Needs:

- None

Computer Needs/Use:

- None

Assessment:

- Traditional: Safety Tests

Standards targeted via this unit:

- NJTES 3.16, 3.17, 3.18, 3.19
- NJCCCS 5.4, 8.1, 8.2, 9.1, 9.2

Unit #9: Electronic Systems:

Time: 10 Weeks

Goal:

- Introduce the components, concepts, and principles associated with the electronic circuit design through lectures, software, and lab activities.

Objectives:

- Define Electronics.
- List several characteristics of alternating current.
- List several characteristics of direct current.
- Distinguish between the functions and practical applications of series and parallel circuits.
- Describe the difference between conductors and insulators.
- Define Ohm's Law.
- Define voltage; characteristics, units, and usage.
- Define current; characteristics, units, and usage.

- Define resistance; characteristics, units, and usage.

Audio-Visual Needs:

- Overhead projector
- Classroom Demonstrations
- Student Handouts
- SmartBoard technology

Computer Needs/Use:

- Instructor: PowerPoint Presentation
- Instructor: Schematic Design Software
- Students: Internet research
- Students: Schematic Design Software

Assignments:

- Class work: *Software Tutorials*
- Class work: *Component Function and Identification*
- Homework: *Real-World Applications*

Lab Activities:

- Design and develop individual depictions of electrical components, including function, appearance, usage, and safety concerns for compilation into a class booklet.
- Design, analyze, and diagnose electronic circuits using the Schematic Design Software.
- Design and develop working electronic circuits using electronic component/circuit activities.

Assessment Method:

- Authentic: Teacher observations,
- Traditional: Class work, presentation, quizzes, tests

Standards targeted via this unit:

- NJCCCS 5.4, 8.1, 8.2, 9.1, 9.2
- Project 2061, #3

Unit 10: Design and Development Activity: Electronic Communication **Time: 6 Weeks**

Goal:

- The students will apply their acquired knowledge in order to complete a comprehensive design and problem solving activity.

Objectives:

- Implement the steps in the design process.
- Utilize a variety of forms of presentation techniques.
- Apply acquired knowledge into the development of a working prototype.
- Implement the teamwork performance model to maximize group efficiency.
- Introduce a variety of different materials for usage and processing.

Audio-Visual Needs:

- Demonstrations
- Schematic Software
- SmartBoard technology

Computer Needs/Use:

- Schematic Software
- Internet Research

Assignments:

- Design rationale statement
- Working drawing approval
- Incremental due dates

Lab Activities:

- Design a working Point of Purchase display for a local display that will effectively and aesthetically promote a school organization.

Assessment Method:

- Authentic: Teacher observations
- Traditional: Design of final product, class participation and diligence

Standards targeted via this unit:

- NJCCCS 5.4, 8.1, 8.2, 9.1, 9.2
- NJSTES 3.19
- NJSTES 2.23
- STL #1, H
- STL #8, F
- STL #8, G
- STL #11, J
- Project 2061, #3

Unit #11: Optics, Photonics and Laser Technology

Time: 4 Weeks

Goals:

- To understand what lasers are and how they work in a communication system.
- Be able to use a laser to communicate.

Objectives: *Students will*

- Understand the difference between light and laser light.
- Be able to diagram the parts and explain how a laser works.
- Know the various types of lasers.
- BE able to use optics to manipulate laser light
- Explain reflection, refraction, absorption and transparency.
- Understand how laser disks work
- Be able to make a hologram

Assignments:

- Make a hologram
- Diagram the parts of a laser.
- Make a communication system that utilizes a laser

Lab Activities: *Under Development*

Audio-Visual Needs:

- Videotapes. VCR. Monitor, Book Lasers What the Can Do and How they Work

Computer Needs/Use:

- Computers

Assessment Method:

- Authentic: Power Point presentations
- Traditional: Test on laser parts and usage.

Standards targeted via this unit:

Unit #12:GIS:

Time: 3 Weeks

Goal:

- Gain an everyday sense of some of the components of a GIS

- Recognize GIS as a key geographic tool in seeing the world in spatial terms.
- Understand some kind of spatial data used in GIS.
- Recognize a GIS as providing a systematic way to understand aspects of the spatial organization of the earth's surface.
- Examine some aspects of using GIS in analysis and decision making.
- Explore the spatial context of an area known to them and use their personal geographic framework in the exploration.
- Recognize some of the interactions and connections between the earth's physical and human systems using the United States as a focus.
- Understand the concepts of GIS data layers, its connections to the earth's physical and human systems, and the appropriateness of the use of GIS in this kind of investigation.
- Learn a technique of organizing geographic information into maps for further analysis.
- Use their mapped output as a way of investigating geographical patterns and generating geographic questions, hypotheses, and generalizations.
- Explore human geographical characteristics they might want as part of a GIS.
- Engage in personal decision making around possible future states of residence.
- Analyze the mental geographic databases they used in the process.
- Explore methods of creating and presenting geographic information.
- Give evidence of how personal characteristics and preferences may influence people's perceptions of place, regions, and the internal maps they carry.
- Consider how GIS would be useful in organizing, displaying and analyzing the geographic data.

Objectives:

- *Students will be able to:*
- Examine the concepts of GIS and the basic components of this increasingly important computerized geographic tool.
- Explore an application using the technology focused on U.S. Population distribution and some of the factors associated with these geographic patterns.
- Identify the basic components of a GIS (geography, data, a computer, and a thinking operator).
- Identify two virtues of using a GIS in decision-making (speed and flexibility).
- Construct a map using a written description.
- Demonstrate how geographic information affects decision-making.
- Identify some of the types of spatial data generally found in a GIS.
- Recognize some of the associations between various GIS data layers.
- Appreciate the inherent data input, updating, and expansion capabilities of GIS.
- Sketch a map of the neighborhood around the school from memory.
- Identify the relative location of geographic features in the neighborhood.
- Analyze differences/similarities between depictions of each other's mental map.
- Recognize patterns on interdependency among various geographic features.
- List some elements important to locating the site for a new service.
- Relate various aspects of their mental maps to basic GIS components
- Understand, at least in elemental fashion, how GIS enhances geographic analysis.
- Create quantile maps of state level data.
- Describe and suggest reasons for patterns of historic and contemporary human settlement/migration in the United States.
- Compare and contrast aspects of population distribution by areas of the country.
- Describe some physical processes that shape and forms in this country.
- List several ways in which technology and human intervention in the physical world have altered settlement patterns in this country.
- Explain some of the relationships between population distribution and the natural world.
- Create quantile maps of state level data.

- Speculate about relationships between data they have mapped and data they have not seen.
- Generate a list of specific data items they would want to use in the further research and potentially seek out these data sets.
- Create Graphic data
- Quantify, map, and analyze information contained in personal mental maps.
- Speculate on other data useful in further research.
- Develop and test geographic generalizations.
-

Assignments:

- Class work
- Oral presentations

Lab Activities: (Chosen activities will be based on student teacher selection.)

Assessment Method:

- Copy of poster “Explore Your World with a Geographical Information System”
- Copies of handout A GIS fable: The road less traveled
- Student drawing material
- Student writing material
- Copy of local street map of school area
- Local government planning documents of the neighborhood
- Copy of North American atlas
- Copies of US population estimates.
- Copy of census bureau’s statistical abstract of the United States
- Copies of blank outlines of USA
- Colored Pencils/markers
- Geodesy Customized Data- SpaceStars Program- One per student

Wall size map of US

Copies of residential preference survey form

Audio-Visual Needs:

- SmartBoard technology
- Examples of student work
- Internet

Computer Needs/Use:

- Student Internet research
- Documentation development
- GIS Software
- Student presentation using SmartBoard
- Computer lab
- Data base, spreadsheet, internet, & presentation software

Assessment Method:

- Authentic: Comprehensive documentation, teacher observation, teamwork performance, student self and group assessment, daily logs
- Traditional: Class participation

Standards targeted via this unit:

- NJCCCS 5.4, 8.1, 8.2, 9.1, 9.2
- NJTES 3.19, 1.17, 1.18, 1.19, 1.20, 2.22, 2.23, 2.24

- NJTES 6
- NJTES 4.7, 4.8, 4.9 4.10, 4.13, 4.14, 4.15, 4.16
- TFAA #1, H
- TFAA #8, F
- TFAA 10
- TFAA #8, G
- TFAA #11, J
- Project 2061, #3

Assessment:

a. The assessment of student progress in the objectives cited on the previous pages will be primarily by, but not limited to, the following criteria.

Design Portfolios & Presentations	40%
Homework	10%
Tests	20%
Class Participation/Code of Conduct	20%
Knowledge Logs/Notebooks	10%

i. Observation

Systematic, wherein the observer gathers data on one or more precisely defined behaviors;

Nonsystematic, in which the observer watches the child at school in the setting of concern and notes the behaviors, characteristics, and personal interactions that seem significant;

ii. Authentic Assessment Measures Progress in Applied Skills

Authentic assessment rates students' performance on real world tasks. To perform successfully on these tests, students must know the subject area and be able to use that knowledge to perform problem solving tasks. Activities used in authentic assessments may include:

Conducting research; Designing a solution to a problem;

Writing a news article, poem, or short story;

revising and discussing papers;

Performing an oral presentation based on a project or analysis; and collaborating with others

b How will you measure the effectiveness of this course?

i. Increased enrollment in upper level course.

ii. Increases in final exam grades

iii. Increase in final grades.

iv. Student end of course evaluation.

c. When was the last mid term exam written/ or revised? 2008

d. When was the last final exam written/ or revised? 2008

Homework, Extra Credit Policy:

Due to the periodic nature of homework in this course, homework will not be accepted late unless a legitimate excuse exists. Extra credit will be available during the design and problem solving activities in the form of additional research/development and competitive events.

Special Course Policies:

Success in this course will be based on a variety of factors, however the instructor will most directly assess the student's performance in comprehensive design and problem solving activities, teamwork performance, and class participation as the means of determining a grade. A typical week in class will consist of formal instruction on a variety of material, students working in groups to complete work pertaining to the lecture, research and development, teamwork to generate possible solutions to and solve problems, and in some cases the development of different products and prototypes. Quizzes and tests will be given to re-emphasize and assess the student's understanding of the presented information.

Periodic evaluation of objectives and this curriculum guide:

With the evaluation curriculum every five years, administration requests a curriculum re-write in the year **2012**.

Labs: Supporting materials will be developed for all labs to help the new teacher.

- Engineering Design Activities
- Invention and Innovation Product Design
- Area of Engineering
- Power Point Presentation- Area of Engineering
- Famous Engineers -Power Point
- Spreadsheet Analysis of design)graphing Calculator/CPU
- Word-processing
- Smart board Technology

Lab/Classroom set up and special needs:

The recommended maximum class size is eighteen students. This course will be taught implementing a variety of different and state of the art instructional technologies such as:

- Multiple computers- One computer for every student.
- Scanner
- Electronic Trainers and Electronic Software
- Digital camera
- Multiple workbenches
- SmartBoard technology
- Projection screen and device
- Electrical outlets
- Testing area- Structure Tester
- Teamwork areas
- Table top: scroll saw, drill press, band saw, sander
- Hand tools
- Software: word processing, presentation, electronic workbench, internet digital camera, scanner, publishing, spreadsheet, Pro-DESK TOP or Inventor Parametric 3-D design software,
- Movie "What's Up In Technology"-
 - Produced by Thirteen-WNET - Ed. Resource Center-450 W. 33rd. Street NY, NY 1001
- Movie "Exploring The Design Process"-#V710-1994 Hearlihy & Co.

Note: A current technology education lab would be suitable. School budget is used to currently fund this program. Federal Perkins funding could be used if there is an Engineering CIP coded program. This class would be considered a 1st level course. Students could select to enter our Communication Technology 2 course.

Materials/Resources:

Program Audio-Visual/ Computer Needs:

- Smart board technology
- Presentation techniques
- Series of videos
- Multiple models
- Previous student work
- County Work
- Jessie Clark work on a Lake

People Resources:

- IEEE
- County GIS Office
- February- National Engineers Week
- Technology Educators Association of NJ
- International Technology education Association
- Technology Student Association

Visitations:

County GIS Office, Fiber Optic/IP service provider, Electronics School of Higher Ed.

Supplementary Readings and Instructors Bibliography:

- Hutchinson, John Design and Problem Solving in Technology. (Delmar, Albany, New York). 1994. ISBN 0-8273-5244-1.
- Norman, Eddie, Advanced Design and Technology Second Addition. (Pearson Education Limited, Essex, England), 1995. ISDN 0 582 24496 4
- Smith, Howard. Understanding Technology. (Goodheart-Wilcox Company, Tinley Park, Illinois). 1998. ISBN 1-56637-374-3.
- Todd, Ronald. Introduction to Design and Technology. (Thompson Learning Tools, Cincinnati, Ohio). 1996. ISBN 0-538-64465-6
- Wright, Thomas. Technology Systems. (Goodheart-Wilcox Company, Tinley Park, Illinois). 1966. ISBN1-56637-263-1.
- Henry Petroski's recent books on engineering.
- The Comforts of Home: The American House and the Evolution of Modern Convenience by Merritt Ierley
- Wondrous Contrivances; Technology at a Threshold by Merrit Ierley
- The Existential Pleasures of Engineering by Samuel Florman
- INVENTING AMERICA: A History of the United States was published in 2002 by *W. W. Norton & Co.*
- Mark Devaney of Grafica. "Careers in Engineering"
- American Heritage puts out a superb magazine called Technology and Invention

Web pages that support learning:

- <http://www.ieee.org> Institute of Electrical and Electronics Engineers, Inc.
- <http://www.energy.gov> Energy web pages
- <http://www.nasa.gov> NASA Web Page
- www.dot.gov US Department of Transportation
- <http://attila.stevens-tech.edu/lore-el/pre-college/> Stevens Institute of Technology
- <http://www.teanj.org> NJ professional teachers association for technology education
- <http://www.iteawww.org> National professional teachers association for technology education
- <http://www.fsea.org> After school club
- <http://www.asee.org> American Society of Engineering Education
- <http://enr.oregonstate.edu/pubs/docs/CoE-AR-2002.pdf>
- <http://www.greatachievements.org/> Greatest Engineering Achievements of the 20th Century
- <http://www.nae.edu/> National Academy of Engineering
- <http://www.siemens-foundation.org/> Siemens Foundation
- <http://www.jets.org/> Junior Engineering Technical Society
- <http://www.discoverengineering.org/home.asp> Discover Engineering On Line
- http://www.inventionatplay.org/playhouse_main.html Lemeison Center for the Study of Invention & Innovation
- <http://www.engineeringk12.org/> ASEE Engineering k-12 education web page
- <http://www.gis.com/whatisgis/>
- <http://gislounge.com/library/introgis.shtml>
- <http://www.esri.com/software/arcgis/concepts/overview.html>
- <http://www.geog.ubc.ca/courses/klink/gis.notes/ncgia/u01.html>
- <http://www.wakegov.com/county/propertyandmapping/gis.htm>

College Search Sites:

- <http://encarta.msn.com/college/collegeFind.asp>
- <http://www.petersons.com/ugchannel/?ppcse=looksmart>
- <http://www.gocollege.com/>
- <http://www.usnews.com/usnews/edu/college/cohome.htm>
- <http://www.aesmentor.org/>
- <http://www.search4careercolleges.com/?affiliateid=603>

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