Warren County School District

Technology Education Planning Committee Report

Developing a Standards-Based Technology Program

Fall 2004

Executive Summary

The Technology Education Planning Committee began its charge to develop a state-of-the-art technology program by establishing a working definition of technology and a technologically literate citizen. These parameters were established by examining the literature of prominent state and national organizations. This provided a philosophy to guide them through a program re-evaluation.

The program review followed a process under development by the International Technology Education Association (ITEA); Warren county being one of the first districts in the country to use the process. The process included the evaluation of all standards-based program components: content, curricula, instruction, learning environment, student assessment, and professional development. The change process is well defined, proceeding through a series of steps from where we are to how to we know we have arrived.

The committee established a department vision and mission, compatible with the broader mission of the district. Goals and strategies were then developed to move the district towards the established goals. The strategies outline specific actions and responsibilities. Each action requires not only a responsible person or team, but also includes an estimated budget to reach the goal. Program evaluation, or, How do we know we have arrived?, is followed by suggestions for program evaluation. Finally, a three-year timeline was established to determine priorities.

In addition, a district-wide curriculum scope and sequence was developed that integrated technology studies from elementary to adult. This model combined curriculum approved by the state Technology Education Association of Pennsylvania (TEAP) curriculum committee, with additional electives at the high school, which are submitted as planned instruction at the end of this report.

The results on this semester long process are submitted in this document. It is clearly the intent of this committee to evolve the technology program of Warren county school district into the 21st century, and provide the best opportunities for its students and community.

Technology Education Planning Committee:
David Krack, Arthur Anderson, Elizabeth Anderson, Bob McKelvy, John Victor, Dan Passmore, Andrew Perlstein, Rosemary Greene, Glenn Hider

Contents

Rationale for the Study of Technology

Technology is a human function. It helps to define us as a species. We have developed along with technology throughout our history, including prerecorded history. Technological knowledge, processes and artifacts surround us in our daily lives, whether it is educational, work-related, or for leisure time. The pace of technological advancements has been accelerating over time, and directly affects the economy.

In order to be able to effectively use, mange and understand technology, people must become technologically literate. Literacy can be used in the context of a variety of subject areas, such as reading, writing, mathematics, science, history, etc. Technological literacy refers to what technology is, how it is developed, how it is affected by society, and how it can affect society. Citizens of a democratic society need to be literate in order to make informed decisions, both on the personal evaluation and selection of technology as a consumer, and for the broader goal of influencing public policy on local, regional or national issues relating to technology.

The National Academy of Engineering/ National Research Council, in its publication Technically Speaking, emphasizes that technological literacy is comprised of three related dimensions: knowledge, ways of thinking and acting, and capabilities (2002, pg. 3-4). They are identified in Figure 1 below.

Figure 1 Characteristics of a Technologically Literate Citizen

Knowledge

- Recognizes the pervasiveness of technology in everyday life.
- Understands basic engineering concepts and terms, such as systems, constraints and trade-offs.
- Is familiar with the nature and limitations of the engineering design process.
- Knows some of the ways technology shapes human history and people shape technology.
- Knows that all technologies entail risk, some that can be anticipated and some that cannot.
- Appreciates that the development and use of technology involve trade-offs and a balance of costs and benefits.
- Understands that technology reflects the values and culture of society.

Ways of Thinking and Acting

- Asks pertinent questions, of self and others, regarding the benefits and risks of technologies.
- Seeks information about new technologies.
- Participates, when appropriate, in decisions about the development and use of technology.

Capabilities

- Has a range of hands-on skills, such as using a computer for word processing and surfing the Internet and operating a variety of home and office appliances.
- Can identify and fix simple mechanical or technological problems at home or work.
- Can apply basic mathematical concepts related to probability, scale, and estimation to make informed judgments about technological risks and benefits.

Technology Defined

Technology has a variety of meanings, depending on your viewpoint, background, and experience. It can be simply viewed as objects, such as computers. However, a more detailed look at the discipline of technology reveals that it also includes a variety of processes, and a body of knowledge (much the same as the discipline of science). Technology is an activity unique to the human species, and in fact, defines us. Humans and technology have evolved together over many centuries. The following definitions, although similar in nature, represent the views of several prominent professionally organizations. For more in-depth reading, the reader is encouraged to refer to the full publications (see Appendix A for full reference).

"In its broadest sense, technology is the process by which humans modify nature to meet their needs and want. However, most people think of technology only in terms of its artifacts: computers and software, aircraft, pesticides, water-treatment plants, birth control pills, and microwaves ovens, to name a few. But technology is more than its tangible products. An equally important aspect of technology is the knowledge and processes necessary to create and operate those products, such as engineering know-how and design, manufacturing expertise, various technical skills, and so on. Technology also includes all of the infrastructure necessary for the design, manufacture, operation, and repair of technological artifacts, from corporate headquarters and engineering schools to manufacturing plants and maintenance facilities."
(from Technically Speaking: Why All Americans Need to Know More About Technology, National Academy of Engineering/National Research Council, 2002, pgs. 2-3)

"The word technology encompasses many meanings and connotations. It can refer to the products and artifacts of human invention- a videocassette recorder is a technology, as are pesticides. It can denote the body of knowledge necessary to create such products. It can mean the process by which such knowledge is produced and such products are developed. Technology is sometimes used very broadly to connote an entire system of products, knowledge, people, organizations, regulations, and social structures, as in the technology of electric power or the technology of the Internet."
(from Standards for Technological Literacy: Content for the Study of Technology, International Technology Education Association. 2000, pg. 23)

"In the broadest sense, technology extends our abilities to change the world: to cut, shape, or put together materials; to move things from one place to another; to reach further with our hands, voices, and senses. We use technology to try and change the world to suit us better. The changes may relate to survival needs such as food, shelter, or defense, or they may relate to human aspirations such as knowledge, art, or control."
(from Benchmarks for Science Literacy, American Association for the Advancement of Science: Project 2061, 1993, pg. 41)

Organizations That Support Technology Education:
Resources for Further Information

Secretary's Commission on Achieving Necessary Skills (SCANS): is the "Essential preparation for all students, both those going directly to work and those planning further education." SCANS deals with 3 Foundations which include basic skills, thinking skills, and personal qualities while also dealing with 5 Competencies which are resources, interpersonal skills, information, systems, and technology.
www.tier.net/schools/tcenters/scans.htm
www.ttrx.doleta.gov/SCANS/

Workforce Development: has 4 learning goals that are associated: deliver education; improve access to financial resources; promote learning for the workers' needs and interests; and to increase awareness and motivation to participate in education.
www.team.org

The National Science Foundation: states "The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering."
http://www.nsf.gov

Pennsylvania Proposed Academic Standards for Science and Technology: uses the interdisciplinary approach to incorporate Science and Technology as one. The standards include: Unifying themes, Inquiry and Design, Biological Sciences-physics and chemistry, Earth Sciences, Technology Education, Technological devices, and Science, technology, and human Endeavors. The PA Standards are higher that the National Standards, therefore the PA Standards exceed the National Standards.
www.pde.psu.pa.edu

Project 2061: is the long-term initiative of the American Association for the Advancement of Science working to reform K-12 science, mathematics, and technology education nationwide.

In 1985, the American Association for the Advancement of Science launched a long-term effort to reform science, mathematics, and technology education for the 21st century. That same year, Halley's Comet was approaching the sun, prompting the Project's originators to consider all of the scientific and technological changes that a child entering school in 1985 would witness before the return of the comet in 2061-hence the name, Project 2061. Project 2061 continues to seek similar guidance from outside educators, scientists, and business people through its advisory body, the National Council on Science and Technology Education.
http://www.project2061.org/

Technology for All Americans Project: is an effort to increase the technological literacy of all Americans, the National Science Foundation (NSF) and the National Aeronautics and Space

Administration (NASA) funded this project to develop a nationally viable rationale and structure for technology education. This effort has been spearheaded by the International Technology Education Association (ITEA) and is called "Technology for All Americans." The project's goal is to offer those who are interested in technology education a clear vision of what it means to be technologically literate, how this can be achieved at a national level, and why it is important for the nation.
http://www.iteawww.org

The National Aeronautics and Space Administration (NASA): states that "Future leaders of American, even if not astronauts, scientists, or engineers, must have a fundamental understanding of science, mathematics, and technology to reap the rewards of NASA's discoveries.
ftp://ftp.hg.nasa.gov/pub/pao/Golden/1999/April28.html

Program Defined

(the following is from Realizing Excellence: Structuring Technology Programs, ITEA, 2005)

Program is a broad term in education. Program includes content, professional development, curricula, instruction, student assessment, and the learning environment.

Content
Content lays out the knowledge and abilities students should learn to become technologically literate. Content is the subject-matter ingredients that go into curriculum.

Professional Development
Professional development refers to the training teachers need to be able to teach the content. It is a continuous process of lifelong learning and growth that begins early in life, continues through the undergraduate, pre-service experience, and extends through the in-service years.

Curricula
Curricula are the way the content is delivered each day in the laboratory-classroom. Curricula include the structure, organization, balance, and presentation of the content to the student and provide the plan followed by the teacher for instruction.

Instruction
Instruction is the teaching process used by the teacher to deliver the content to all students. It involves various teaching methods, strategies, and techniques. Effective instruction requires an understanding of how students learn.

Student Assessment
Student Assessment is a process of collecting data on student knowledge, understanding, and abilities that teachers can use to help students achieve. It is systematic, and the evidence collected should be used to refine instruction and provide feedback to the learner.

Learning Environment
The learning environment is the place where instruction occurs. It may occur in a classroom or a laboratory or outside of the school, as on a field trip. It consists of such things as space, equipment, resources (including supplies and materials), and safety and health requirements.

The primary purpose of any program is to facilitate and enhance student learning. (p. 2)

The Change Process

In order for the district to work through the big picture, a series of questions need to be considered (the following is from Realizing Excellence: Structuring Technology Programs, ITEA, 2005):

Where are we now?

This will help establish the determine what or program currently looks like. Aspects include:

- Whom do our programs serve?
- Do we have technology at all grade levels?
- Are our current facilities designed to promote the study of technology?
- Who is required to study technology?
- What is the status of our program components (content, professional development, curricula, instruction, student assessment, and learning environments)?
- Are program elements aligned with standards?

Where do we want to go?

What do our graduates need to know and be able to do related to technology? How are the standards stressed, and how do they support other academic standards?

How are we going to get there?

Program management should ensure that adequate resources are available to accomplish missions, goals, and curricular objectives. This includes effective program goals and other funding, support and resources. Each stakeholder should understand their role, and the actions they can contribute to the process (actions are spelled out below).

What knowledge and abilities must educators possess to get there?

Teachers are responsible for their own growth, which administrators must support. Both groups can plan careful selection of in-service opportunities together, during the planning process.

How will we know when we have arrived?

Program evaluation should be implemented both systematically and continuously. Successes and setbacks may occur, but revisions to the process may help correct any setbacks. The process is not a linear, one-shot deal. The goal should remain in focus: develop technological literacy in all of the districts' students.

Actions for Establishing Technology Programs

(the following is modified from Table 2, page 28, from Realizing Excellence: Structuring Technology Programs, ITEA, 2005)

Solicit Program Support

- Identify stakeholders
- Articulate an initial vision
- Form committee(s)

Lay the Groundwork

- Inventory the current program status
- Develop a technology program mission statement
- Establish long-term goals
- Solicit administrative approval

Structure the Technology Program

- Develop a program scope and sequence
- Identify and document courses (standards-based)
- Establish an action plan
- Identify program needs
- Develop a budget

Secure Resources

- Obtain funding
- Access laboratory-classrooms (multipurpose)
- Seek additional grants/funding

Implement, Monitor, and Adjust

- Establish and utilize a management system
- Hire or re-educate teachers
- Allocate funds and other resources
- Schedule courses and place (recruit) students
- Market and promote the study of technology

Evaluate and Revise

Vision Statement

The technology education program is committed to students at all levels of education in order to ensure an understanding of technological development for the benefit of the community and society at large.

Mission Statement

The mission of the technology education program in the WCSD is to help prepare K-12 students to become productive, responsible citizens. Highly qualified educators working in state of the art facilities will provide the students with knowledge, understanding, application and evaluation of technology. By combining knowledge of content, process, and skills, students will develop competency in problem-solving, higher order thinking, design and planning, and cooperative learning. Integration across the curriculum will provide the students with the abilities necessary to serve the community.

Program Goals

1) Develop a curriculum based on PA State standards applicable to grades K-12.

Strategies:

- Research and modify current standards based curriculum
- Assist elementary teachers to integrate tech content/activities as needed
- Develop scope and sequence
- Develop course descriptions
- Develop planned courses
- Identifying resources (textbooks and materials)
- Integration across the curriculum will provide the students with the abilities necessary to serve the community.

Assessment:

2) Develop student assessments to measure knowledge, understanding, application, and evaluation of technology.

Strategies:

- Research and identify current assessment tools to assess program
- Develop appropriate assessments for various instructional strategies
- Design program assessment (monitor and adjust)

Assessment:

3) Plan, and implement appropriate professional development opportunities to maintain highly qualified educators.

Strategies:

- Research opportunities for professional development
- Define “high quality”
    - Organizations, conferences, other schools, education
- Develop a plan to coordinate with curricula
- Dissemination plan (train the trainers)

Assessment:

-

4) Identify and develop equal and appropriate learning environments to facilitate the program throughout the district

Strategies:

- Research and identify equal appropriate learning environments for similar curricula
- Develop a plan of equity throughout the district
- Plan and implement appropriate learning environments
- Develop a plan to stay current
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Assessment:

-Advances technological literacy
-Has appropriate equipment and tools for the study of technology
-Is appropriate to deliver technology curricula
-Has appropriate safety and health requirements
-Can accommodate all students

Strategies for Achieving Goals

Goal #1 Develop a curriculum based on PA State standards applicable to grades K-12

The strategies are as follows:

Research and modify current standards based curriculum

- Creating technology at 10th grade level
- Reexamining the standards
- Course description that is age appropriate

Assist elementary teachers to integrate tech content/activities as needed

- Use in service/staff development days to explain the entire Technology Education program to Elementary teachers will help to promote the courses. Helping teachers and teacher coaches to understand what the Technology Education program is, will enable those teachers to understand and guide students to those courses. The presentations would be the responsibility of the Tech Ed teachers and teacher coaches. Identifying the current resources and those needed is necessary.
- Creating an advisory group consisting of parents and industry members is suggested. Meetings could be biannually or at the request of the advisors. This group would help guide and support the program. Parents would be a great asset by encouraging students to participate in the program and industry would keep the teachers informed of the job openings and the training needed.
- A list of invitees will be created by the teachers and will hopefully be ready for the fall. D. Krack volunteered to head this project.

Develop Scope and sequence

- Capstone requirement of 42 minutes per class period, a mandatory 6th grade course as a cycle class, and how to manage the middle school concept within our district (we have different structures throughout the district).
- It was suggested that the course be written with an option for the building Principal on how and where to present.

Develop Course descriptions

- It was suggested that as a department assessment anchors be adopted in reading and math.

Identify resources (textbooks and materials)

- The teachers will be examining textbooks to be suggested for use in the courses. They will be communicating with each other to determine which books should be listed in the "Required/Approved Textbooks and Materials" section of the Planned Instruction. It was stated that the books would be used mainly as a resource and not necessarily followed chapter by chapter. The book or books should

facilitate covering the standards for the course and the state standards should be used for consistency.

Integration across the curriculum will provide the students with the abilities necessary to serve the community

- They will incorporate relationship to other planned instructions such as math, science and reading per course. Not all of these subjects will apply to each course. It was suggested that the Graduation Project could be used for reading. While writing the courses, the teachers were encouraged to be specific in math, science, and reading as they move up in the grades.
- Choose anchors from PDE Assessment anchors and Eligible Content
  - Reading
  - Math

Assessment:

When writing the formative and summative assessment, teachers should make sure these assessments enable the teacher to know if the student has above average proficiency to pass the course. Designed activities would be a plus. If a student presents a project for grading, the teacher should be able to use a rubric to determine a grade. Documentation is needed. Creating an evaluation was also discussed along with possibly having an evaluation done by peers. Teacher documentation is still a major portion of the grade.

Goal #2 Develop student assessments to measure knowledge, understanding, application, and evaluation of technology.

Strategies:

Research and identify current assessment tools to assess program

- Assessment rubrics
- Designed activities

Develop appropriate assessments for various instructional strategies

- Projects
- Documentation

Design program assessments (monitor and adjust)

- Student observation
- Advisory
- Written reflections
- Course evaluation by students

Goal #3 Plan and implement appropriate professional development opportunities to maintain highly qualified educators.

Strategies:

- Research opportunities for professional development
  - IU #5
  - Governor's Institute
  - TEAP/NWPA Chapter

    - National ITEA
- Define "high quality"
    - Organizations, conferences, other schools, education
        - Investigate and/or visit locations with respected curriculum in the field of Technology Education
            - Forest Hills High School
            - Corry High School
- Develop a plan to coordinate with curricula
    - Learn from the best and imitate
- Dissemination plan (train the trainers)

Present a program by the Technology Education department to the teachers within the school district to describe and promote the program the first year. The second year should be a follow up in which the district teachers report what they did and how the program was received. Incorporating Technology Education in their classrooms was the suggested route.

Goal #4 Identify and develop equal and appropriate learning environments to facilitate the program throughout the district

Strategies:

- Research and identify equal appropriate learning environments for similar curricula

Current Facilities:

	YJS HS	YE MS	TAS	SJS HS	SES	AVS	EJS HS	SG E	RE	WA HS	BW MS
Grades	**8-12**	**K-7**	**K-8**	**6-12**	**K-5**	**K-5**	**7-12**	**K-6**	**K-6**	**9-12**	**5-8**
Class-room	**X**	**X**	**X**				**X**				
Wood-shop	**X**		**X**	**X**			**X**			**X**	
Computer Lab		**X**									
Modular Lab				**X**							**X**
Drafting										**X**	

- Develop a plan of equity throughout the district
    - Elementary level needs:
        - Supply Carts/room
        - Small Hand tools
            - Moveable to various classrooms
                - Need to have controls/maintenance forms
                - How to move equipment or supplies from room to room school to school
                    - How to teach the same courses in the different schools
                    - Ex: Tidioute K-8 Beaty 5-8
                    - Ex: Sheffield has 6–12 Eisenhower has 7-12
    - Middle School level needs:
        - Classroom
            - Tables, Stations
        - General Lab
            - Process Areas
        - Storage Area to allow all areas to be covered

- Develop a plan of equity throughout the district

MIDDLE SCHOOL NEEDS

Class of 24	Dollars	YEMS	SJSHS	Beaty	EMSHS
Computers	14,400.	O%	0%	100%	100%
Hand Tools	6,000.	100%	66%	100%	50%
Multimedia Tools	5,000.	100%	100%	100%	100%
Software	20,000.	100%	25%	100%	100%
Workstations	30,000.	100%	0%	50%	25%
Chairs, Tables, Benches	40,000.	100%	0%	0%	0%
Bench top Tools	3,000.	0%	100%	50%	15%
Fixtures	2,000.	100%	100%	100%	10%
Design Tools	1,500.	100%	0%	100%	0%
Consumable Hardware	**To be**	**budgeted**	**annually**		

HIGH SCHOOL NEEDS

Class of 24	Dollars	YHS	SHS	WAHS	EHS
Computers	14,400.	10O%	0%	100%	100%
Software	20,000.	100%	50%	100%	100%
Multimedia Tools	5,000.	100%	100%	100%	100%
Furniture (tables/chairs)	5,000.	100%	100%	100%	100%
Design Tools	1,000.	100%	100%	100%	100%

- Plan and implement appropriate learning environments

PROTO LAB

Class of 24	Dollars	YHS	SHS	WAHS	EHS
Furniture (cabinets/benches)	25,000.	5O%	10%	10%	50%
Safety (ventilation)	50,000.	100%	20%	50%	100%
Power Tools (cords etc)	2,000.	100%	100%	100%	100%
Hand Tools	2,000.	100%	100%	100%	100%
Machines	15,000.	100%	100%	100%	100%
Fixtures	1,000.	100%	100%	100%	100%
Bio-Tech	6,000.	100%	100%	100%	100%

- Develop a plan to stay current

Budget Totals for Ensuring Equitable Labs

Middle School Total: $166,910

High School Total: $157,200

Proto Lab Total: $261,000

District-Wide Total*: $585,110

*estimates based on approximate costs of equipment, furniture, computers and software, tools, and safety equipment. Costs do not reflect the development of facilities such as wiring, renovating, lighting, etc.

TIME LINE

2005 - 2006	2006 – 2007	2007 - 2008	
6th, 7th and 9th grades	8th grade		Curriculum
	Engineering Design	Designs in Bio-Tech	
Wood Technology	Multimedia		
Manufacturing			Facilities
Start Prototypes	Continue Prototypes	Finish Prototypes	
Start Classrooms	Finish Classrooms		
Establish Department Head	Continue Department Head	Continue Department Head	Professional Development
Establish Budget	Continue Budget	Continue Budget	
Professional Development	Professional Development	Professional Development	
TSA, TEANWP	Design Challenges	Design Challenges	Student Org.
Administrative Discretion (50% ideal)	25%	25%	Funding
Start Advisory Board	Work on Program Promotion Use Multimedia	Get Program of the Year Award (goal)	Other
Work with Elementary Teachers			

Program Evaluation

- Advances technological literacy
- Has appropriate equipment and tools for the study of technology
- Is appropriate to deliver technology curricula
- Has appropriate safety and health requirements
- Can accommodate all students

District-Wide Scope & Sequence

Elementary
Integrated Experiences

Middle School:
6th- Exploring Technology
7th- Applying technology
8th – Creating Technology

High School:

Required 9th Grade
Technology Design & Systems

Electives
Design & Manufacturing Enterprise
Wood Technology
Engineering Design & Applications
Multimedia Technology
Designs in Bio-Related Technology

Capstone course
Innovation & Invention

*students may also opt for more specific Career courses at WCCC

Post-Secondary Options
Military
Trade School
Apprenticeship Programs
Associate Degree Programs
Baccalaureate Programs of Study

WARREN COUNTY SCHOOL DISTRICT

Planned Instruction

Exploring Technology

Course Title:

Course Number:

Suggested Educational Level(s): **6th Grade**

Suggested Periods Per Week: **5** **Length of Period: 42 minutes**

Suggested Length Of Course: **9 weeks**

Units Of Credit (If Appropriate):

Date Written: **10/29/04** **Date Approved**:

Date Reviewed: **Implementation Year**: **2005 - 2006**

Teacher Certification Required: **Technology Education or Elementary**

Standards Addressed (code): **3.1.7 A&D, 3.2.7 C&D, 3.3.7 D, 3.6.7 A,B&C,**

3.8.7 A,B,&C,

Assessment Anchors: R6.A.2, M6.A.1, M6.A.2, M6.A.3, M6.B.1, M6.B.2, M6.E.2, M6.E.3

Relationship to Other Planned Instruction:
Mathematics & Science
Prerequisites:
None
Special Requirements:
Up-To-Date Facilities & Equipment, Storage Units
Writing Team Members:
Technology Education Planning Committee

Standards addressed (code and description):

PA 3.1.7 A- Explain the parts of a simple system and their relationship to each other.
PA 3.1.7 D -Explain scale as a way of relating concepts and ideas to one another by some measure.
PA 3.2.7 C -Identify and use the elements of scientific inquiry to solve problems.
PA 3.2.7 D -Know and use the technological design process to solve problems.
PA 3.3.7 D -Explain basic concepts of natural selection.
PA 3.6.7 A -Explain biotechnologies that relate to related technologies of propagating, growing, maintaining, adapting, treating and converting.
PA 3.6.7 B -Explain information technologies of encoding, transmitting, receiving, storing, retrieving and decoding.
PA 3.8.7 A -Explain how sciences and technologies are limited in their effects and influences on society.
PA 3.8.7 B -Explain how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.
PA 3.8.7 C- Identify the pros and cons of applying technological and scientific solution~ to address problems and the effect upon society.
R6.A.2 - Demonstrate the ability to understand and interpret nonfiction text, including informational, eg. Textbooks and print media (magazines, brochures, etc.); autobiographies; and biographies to grade level.
M6.A.1 - Demonstrate an understanding of numbers, ways of representing numbers, and representing numbers, relationships among numbers and number systems.
M6.A.2 - Understand the meanings of operations, use operations and understand how they relate to each other.
M6.A.3 - Compute accurately and fluently and make reasonable estimates.
M6.B.1 - Demonstrate an understanding of measurable attributes of objects and figures, and the units, systems and processes of measurement.
M6.B.2 - Apply appropriate techniques, tools and formulas to determine measurements.
M6.E.2 - Select and/or use appropriate statistical methods to analyze data.
M6.E.3 - Understand and/or apply basic concepts of probability or outcomes.

COURSE DESCRIPTION: (Brief – suitable for course descriptions issued to students.)
Exploring Technology is an activity-based course that introduces students to technology by examining the basic systems of communication, manufacturing, construction, transportation and bio-related. Students will study the evolution of technology, invention and innovation, impacts of technology, the systems approach and various problem-solving methods. This course provides a foundation for future studies in technology.

Outline of Content Sequence and Recommended Time (weeks or days):

Introduction to Technology	**2 days**
Classroom/Lab Safety	**2 days**
Systems of Technology	**1-2 days**
Systems Approach	**3 days**
Impacts and Trade Offs	**2-3 days**
Evolution of Technology	**2-3days**
Invention and Innovation	**3-4days**
Problem Solving Methods	**4-5days**
Technology/Mathematics/ Science	**1-2days**
Communication Technology	**4-5 days**
Production technology	**4-5 days**
Transportation Technology	**4-5days**
Bio-Related Technology	**4-5days**

Specific Educational Objectives to be Taught:

1. Develop knowledge in technology and its basic systems of bio-related, communication, construction, manufacturing, and transportation.

2. Identify the systems approach and how it is applied to the study of technology.

3. Identify the relationship between technology, mathematics, and science.

4. Apply problem-solving skills as an individual and in-group situations.

5. Apply knowledge of safety and proper and efficient use of various tools, machines, and equipment.

6. Identify with the evolutions of technology; analyze its impacts on people, society and the environment; and research possible future developments.

7. Explore communication, construction, manufacturing, transportation, and bio-related technologies by performing basic processes

Formative Assessments (optional): Assessment Rubrics, Teacher Observation, Peer Evaluation

Summative Assessments: Portfolio, Completed Projects, Combination of True/False, Multiple Choice, Short Answer, Matching Exams.

Required/Approved Textbooks and Materials: Texts list below are currently under review for adoption.

Book Title: Exploring Technology	**Book Title: Introduction to Technology**
Publisher: ITEA	**Publisher: Glencoe**
ISBN #:	**ISBN #:**
Copyright: 2001	**Copyright: 2005**
Date of Adoption: Under Review	**Date of Adoption: Under Review**

Two or More Sample Units (optional): See Technology Education Planning Committee Report Appendixes

WARREN COUNTY SCHOOL DISTRICT

Planned Instruction

Course Title: Applying Technology

Course Number:

Suggested Educational Level(s): 7

Suggested Periods Per Week: 5 **Length of Period**: 42 minutes

Suggested Length Of Course: semester

Units Of Credit (If Appropriate):

Date Written: 10-5 to 11-10-04 **Date Approved**:

Date Reviewed: **Implementation Year**:

Teacher Certification Required: Industrial Arts/ Technology ed.

Standards Addressed (code): 3.1.7 A,B,C,D,E 3.2.7 A,B,D 3.4.7A,B,C 3.5.7B 3.6.7A,B,C 3.7.7A,B,C,D,E 3.8.7A,B

Math Anchors Addressed (code):7.A.2.2 7.A.3.1 7.B.1.1 7.B.2 7.B.2.1 7.C.1

Reading Anchors Addressed (code):R7.A.2.1 R7.A.2.3 R7.A.2.5 R7.A.2.7

Relationship to Other Planned Instruction: This course is an ongoing effort to provide students with a knowledge of the systems of technology extant in today's world. It is a required course that lays the groundwork and prepares students for the planned courses at the high school level. Hands-on activities support mathematics and science standards and mathematics anchors. Problem solving activities support reading and writing standards and anchors

Prerequisites: none

Special Requirements**: Typical Facilities**

Ideally, the course should be taught in a multipurpose facility consisting of a classroom area and a laboratory area. Existing technology education laboratories are well suited for this course because of their flexibility and the typical space, tools, materials and equipment they bring with them. It is also recommended that individual work areas (e.g., prototyping, testing, etc.) be established and identified in the laboratory.

The facility should be equipped with multimedia computers connected to the Internet. Computers should be loaded with software programs that can be used to complement course activities. Examples of appropriate software for the course include those programs related to word processing, presentation, digital editing and image manipulation, vector drawing, CADD, CNC tutorial, robotics simulation, and electronic circuit design. Other recommended support materials for the course would include, a videocassette and DVD player, Television / monitor, overhead projector, video projector, color ink jet printer, computer scanner, digital camera, and digital camcorder.

The classroom area should contain desks and chairs and appropriate multimedia equipment. In addition, the classroom should be flexible so that the seating can be easily arranged to accommodate different instructional strategies (e.g., group problem-solving activities).

Technology Education labs in the School district should be equipped with bench top type tools but, it may be more cost effective to use the power tools that are currently in the labs. This would avoid the expense of purchasing all new tools. Needs for tools would include a scroll saw, a band saw, a bench grinder, a table saw, if a planer is currently in a lab pre surfaced lumber would not be needed and less expensive rough cut lumber could be purchased; a drill press, a rotating drum sander

Hammers	Assortment of Screwdrivers	Utility & X-acto Knives
Wire Cutters	Assortment of Pliers	Saws (coping, back)
Power Drill & Bits	Rulers & Tape Measures	Wrench Assortment
Adhesives	Storage Containers	Files & Abrasive Papers
Nut Drivers	Soldering Set	Tap & Die Set
VOMs	Soldering Iron	Socket Set
Power Supplies	Safety Glasses	Scissors
Clamping Devices	Vise	Power Miter Box
Hot Glue Gun	Computer Repair Kit	

Writing Team Members: Technology Education Planning Committee

Standards addressed (code and description):

3.1.7A Explain the parts of a simple system and their relationship to each other.

3.1.7B Describe the use of models as an application of scientific or technological concepts.

3.1.7C Identify patterns as repeated processes or recurring elements in science and technology.

3.1.7D Explain scale as a way of relating concepts and ideas to one another by some measure.

3.1.7E Identify change as a variable in describing natural and physical systems.

3.2.7A Explain and apply scientific and technological knowledge.

3.2.7B Apply process knowledge to make and interpret observations.

3.2.7D Know and use the Technological design process to solve problems.

3.4.7A Describe concepts about the structure and properties of matter.

3.4.7B Relate energy sources and transfers to heat and temperature.

3.4.7C Identify and explain the principles of force and motion.

3.5.7B Recognize earth resources and how they affect everyday life.

3.6.7A Explain biotechnologies that relate to related technologies of propagating, growing, maintaining, adapting, treating and converting.

3.6.7B Explain information technologies of encoding, transmitting, receiving, storing, retrieving and decoding.

3.6.7C Explain physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design.

3.7.7A Describe the safe and appropriate use of tools, materials and techniques to answer questions and solve problems

3.7.7B Use appropriate instruments and apparatus to study materials.

3.7.7C Explain and demonstrate basic computer operations and concepts.

3.7.7D Apply computer software to solve specific problems.

3.7.7E Explain basic computer communications systems.

3.8.7A Explain how science and technology are limited in their effects and influences on society.

3.8.7B Explain how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.

3.8.7C Identify the pros and cons of applying technological and scientific solutions to address problems and the effect upon society.

COURSE DESCRIPTION: (Brief – suitable for course descriptions issued to students.)

Applying Technology is an activity-based course that focuses on the application of the tools, materials and processes of communication, manufacturing, construction and transportation, and biotechnologies. Students will study the ways materials, energy and information are processed to transmit information, build structures, make products, move passengers and freight, and explore the areas of bio-related technologies.

Specific Educational Objectives to be Taught:
Upon completion of this course, students should be able to:

1. Know how each system of technology processes information, energy and materials and manages people.
2. Apply mathematics and scientific principles to the solution of technological problems.
3. Apply a wide variety of materials.
4. Understand the importance of energy to each system of technology.
5. Communicate information using a variety of graphic and electronic communication processes.
6. Manufacture products using a variety of forming, separating and combining processes.
7. Construct structures using rigid and non-rigid structural elements to withstand specified loads and forces.
8. Transport freight and/or passengers on land, water and in the air and analyze the six technical subsystems of transportation.
9. Address issues concerning the effects of technology socially, economically, and environmentally.
10. Become literate in biotechnology including areas of agriculture, bioengineering, and medical technology.

Formative Assessments (optional):

During the process of learning students will be assessed using:
1. Rubrics
2. Student and teacher produced evaluations based on observation of the processes.
3. Teacher evaluation of student learning behaviors in cooperative groups.
4. Student portfolio entries of the processes and products.

Summative Assessments:

Upon completion of unit work assessment will be based on:
1. Teacher assessment of student's product.
2. Teacher will assess student documentation of projects.
3. Use of teacher produced tests which may include:

a. multiple choice
b. true/false
c. matching
d. fill in the blank
e. or any other traditional type of test questions

Required/Approved Textbooks and Materials:

Book Title: Introduction To Technology
Publisher: Glencoe
ISBN #:
Copyright: 2005
Date of Adoption: Under review. Not yet adopted.

Book Title: Teaching Technology
Publisher: ITEA
ISBN #:
Copyright: 2000
Date of Adoption: Under review. Not yet adopted.

Book Title: Exploring Technology
Publisher: ITEA
ISBN #:
Copyright: 2001
Date of Adoption: Under review. Not yet adopted.

Book Title: Invention and Innovation
Publisher: ITEA
ISBN #:
Copyright: 2004
Date of Adoption: Under review. Not yet adopted.

Book Title: Technological Systems
Publisher: ITEA
ISBN #:
Copyright: 2005
Date of Adoption: Under review. Not yet adopted.

Two or More Sample Units (optional):

Unit 1 Introduction to Technology (2 periods)
Students begin course defining what technology is.
Teacher presents information on technology definitions

Viewing Technological systems approach. (2 periods)

A. Inputs defined
B. Processes defined
C. Resources defined
D. Outputs defined

E. Feedback defined

Standards addressed: 3.1.7A,B,C 3.2.7C 3.7.7A 3.8.7B,C
Standards supported: 3.2.7A,D 3.1.7E 3.4.7B 3.6.7B,C 3.7.7D 3.8.7A,B

Materials required: paper, pencils, video presentation (optional)
Required media/Equipment: VCR or DVD player or presentation software
Delivery: Teacher presentation, Video on Technology defined, Text

Unit 2 Systems of Measurement (6 periods not necessarily consecutive)
Student behaviors: Note taking skills, Application of mathematics skills
Teacher: presents information on systems of measurement

Measurement Devices

A. metric scale
B. fractional (English) scale
C. micrometers
D. dial indicators
E. calipers
F. points
G. picas

Standards Addressed: 3.1.7C,D 3.7.7B

Standards Supported: 3.1.7A,E 3.2.7A 3.7.7A

Materials Required: Metric and English scales, caliper, micrometers, dial indicators, point and pica scales.

Required media/Equipment: Instructional Whiteboard, dry erase markers, measurement tutorial software, measurement manipulatives.

Delivery: Traditional interactive teacher/student introductory lessons, review, paper competency tests, further review (tutorials)

Unit 3 Laboratory Safety:
Students will take safety tests on an ongoing basis to be certified to use Laboratory equipment.

Teacher will present safety information on equipment in the traditional manner.

A. General Lab. Rules (part of Unit 1)
B. Specific rules are parts of individual units.

Standards Addressed: 3.7.7A

Standards Supported: 3.4.7B,C 3.7.7B 3.8.7C

Materials Required: Safety signage, Teacher produced safety Tests, Text

Unit 4 Engineering Design (materials) 15-20 periods

Students will use the technological problem solving method to create a product that solves a problem.

Teacher presents the problem solving method, provides potential problems, guides students with discussions, demonstrations, historical perspectives of how inventors and scientists solved certain social, economic and other types of human existence problems. Teacher also guides students in the solving of a student chosen problem.

1. Teams of students come up with alternate solutions.
2. Class chooses the "best" solution
3. Prototype is produced.
4. Materials are chosen.
5. Product is produced.

Standards addressed: 3.1.7A,B 3.2.7A,B,C,D 3.4.7A 3.6.7C 3.7.7A,B 3.8.7A,B

Standards supported: 3.1.7C,D,E 3.4.7B,C 3.5.7B 3.7.7D 3.8.7C

Mathematics anchors addressed: 7.A.2.2 7.A.3.1 7.B.1.1 7.B.2 7.B.2.1 7.C.1

Reading anchors addressed: R7.A.2 (.3, .4, .5, .6)

Materials required: Wood (hard and softwoods), Metals (ferrous and non-ferrous), Plastics (thermoplastics and thermosets), Ceramics (clays, glasses and abrasives), Examples of composite materials (Layered, fibrous and particle)

Required media/Equipment: Drawing and prototyping software, General lab complement of drawing and manufacturing equipment and power equipment.

Delivery: Setup of Engineering/ design/ production model, Guided worksheets for problem solving, testing, design, retesting, revising and finishing a product.

WARREN COUNTY SCHOOL DISTRICT

Planned Instruction

Course Title: Creating Technology

Course Number: TBD

Suggested Educational Level(s): Grade 8

Suggested Periods Per Week: 5 **Length of Period**: 42 Minutes

Suggested Length Of Course: 1 Semester

Units Of Credit (If Appropriate): 0.5

Date Written: 10-04 **Date Approved**:

Date Reviewed: **Implementation Year**: 05-06

Teacher Certification Required: Industrial Arts or Technology Education

Standards Addressed (code): Math Anchors: M8.A.1, M8.A.2, M8.A.3, M8.B.1, M8.B.2, M8.C.1, M8.C.2, M8.C.3, M8.D.1, M8.D.2, M8.E.1, M8.E.2, M8.E.3, M8.E.4

Reading Anchor: R8.A.2

See Attached for PA Standards aligned with Course Outline

Relationship to Other Planned Instruction:

All Technology Education Courses, Math, Reading

Prerequisites:

Technological Design & Systems

Special Requirements:

Classroom:
A technology education classroom should be designed to encourage group work and class collaboration. The room should contain desks and chairs along with several computers with internet capabilities. The technology classroom should be flexible to allow for a wide array of seating patterns to accommodate a variety of teaching styles.

Laboratory:
The manufacturing lab must contain many essential specialized tools. Existing industrial arts and technology education facilities are well suited to teach these courses due to the amount of space and the amount of specialized tools found in the classroom. It is required that all manufacturing classrooms have access to computers with CADD and word processing capabilities. It is also necessary for the manufacturing lab to have a wide variety of material manipulating tools. The lab must have hand tools.

Writing Team Members:
Technology Planning Committee

Standards addressed (code and description):

RA. Comprehension and Reading Skills
- RA.2 Demonstrate the ability to understand and interpret nonfiction text, including Informational, e.g., textbooks, print media (magazines, brochures, etc.), autobiographies, biographies, editorials and speeches appropriate to grade level.

MA. Numbers and Operations
- MA.1 Demonstrate an understanding of numbers, ways of representing numbers, relationships among numbers and number systems.
- MA.2 Understand the meanings of operations, use operations and understand how they relate to each other.
- MA.3 Compute accurately and fluently and make reasonable estimates.

MB. Measurement
- MB.1 Demonstrate an understanding of measurable attributes of objects and figures, and the units, systems and processes of measurement (not assessed at Grade 11).
- MB.2 Apply appropriate techniques, tools and formulas to determine measurements.

MC. Geometry
- MC.1 Analyze characteristics and properties of two- and three- dimensional geometric shapes and demonstrate understanding of geometric relationships.
- MC.2 Identify and/or apply concepts of transformations or symmetry (not assessed at Grades 6, 7 or 11).
- MC.3 Locate points or describe relationships using the coordinate plane (not assessed at Grade 3).

MD. Algebraic Concepts
- MD.1 Demonstrate an understanding of patterns, relations and functions.
- MD.2 Represent and/or analyze mathematical situations using numbers, symbols, words, tables and/or graphs.
- MD.3 Analyze change in various contexts (not assessed at Grades 3, 4 or 8).
- MD.4 Describe or use models to represent quantitative relationships (not assessed at Grade 3, 4, 5, 6 or 7).

ME. Data Analysis and Probability
- ME.1 Formulate or answer questions that can be addressed with data and/or organize, display, interpret or analyze data.
- ME.2 Select and/or use appropriate statistical methods to analyze data (not assessed at Grade 3).
- ME.3 Understand and/or apply basic concepts of probability or outcomes.
- ME.4 Develop and/or evaluate inferences and predictions or draw conclusions based on data or data displays (not assessed at Grades 3, 4, 5 or 6).

See Attached for PA Standards aligned with Course Outline

COURSE DESCRIPTION: (Brief – suitable for course descriptions issued to students.)

Creating Technology is an activity-based course in which students form an enterprise (company). Students participate in the organization and management of the enterprise; select and engineer a product; raise money; hire employees; engineer a production line; produce, advertise and sell the product; and finally distribute profits. Students play varying roles to solve real-world design, engineering, production, financial, and marketing problems.

Outline of Content Sequence and Recommended Time (weeks or days):

See Attached

Specific Educational Objectives to be Taught:

Upon completion of this course, students will be able to:

1. Acquire the knowledge of the role and impacts of the free enterprise system in our society.
2. Experience the management and labor organizational structure of an enterprise.
3. Understand the importance of people with a variety of skills and knowledge to an enterprise.
4. Integrate communication, production and transportation technologies in a classroom enterprise experience.
5. Create technology by applying mathematics and scientific principles.
6. Participate in the engineering, producing, marketing, financing and managing processes of an enterprise.
7. Assess the impact of computers and computer-controlled devices in an enterprise.
8. Evaluate the impacts of scrap, waste pollution and recycling.

Formative Assessments (optional):

Rubrics for Design Process and Individual / Group participation

The curriculum matrix that follows allows the Content, Activities and Resources to match state (PA) and national (N) standards, in column two. The matching of content with activities and resources is consistent with past curriculum guides.

Summative Assessments:

"Creating Technology" portfolio including process and product

Required/Approved Textbooks and Materials: Not yet adopted

Under Review

Book Title: Exploring Technology **Intro to Technology**
Publisher: ITEA **Pierce & Karwatka**
ISBN #:

Copyright: 2001 2005
Date of Adoption:
Two or More Sample Units (optional):

Machinery's Handbook (reference)
Architectural Graphic Standards (reference)

Methodology of Teaching/Timeframes

Teachers will employ a variety of teaching methods. The majority of the learning taking place in the classroom will be inquiry based learning. The teacher will also use contextual teaching. Students will be given real life situation and be asked to solve problems. Since the problem is real the students are more likely to retain more information. It is important that the teacher makes the problem engaging to the student in order to teach the students in the most efficient way possible. Teachers instructing an 18 week course are given a better opportunity to instruct the students in this manor. As the term becomes shorter the less lab time will be available to the students so the lecture portion of the course becomes more important.

Content Outline:	PA State and National Standards	Technology Learning Activities	Resources:
Introduction to Creating Technology I. Creating Technology 1. Inventors 2. Innovators 3. Entrepreneurs 4. Enterprise 5. Types of Manufacturing 6. Types of Enterprises	PA3.8.7-C Explain how human ingenuity and technological resources satisfy specific human needs and improve the quality of life. N1: Students will develop an understanding of the characteristics and scope of technology. N4 - Students will develop an understanding of cultural.	INVENTORS, INNOVATORS AND ENTREPRENEURS: Inventors and innovators often create fantastic new product ideas, but it is the entrepreneurs who turn the idea into a successful enterprise, which provides jobs for workers, products for consumers, and profits for investors. Steven Jobs and Bill Gates are two recent entrepreneurs (and inventors as well). Have students research famous inventors, innovators, and entrepreneurs.	Ref:L3-001 Ref:L3-002
II. Enterprise Inputs 1.People a. Management b. Labor 2. Tools and Machines a. Forming b. Combining c. Separating 3. Materials a. Woods b. Metals c. Plastics d. Ceramics e. Composites 4. Information a. Classroom/Lab Safety (1) Safety Rules and Guidelines (2) Tool and Machine Safety (3) Eye Protection b. Technological Literacy 5. Money a. Paying People b. Buying Other Resources	PA. 3.7.7. A. Describe the safe and appropriate use of tools, materials and techniques to answer questions and solve problems. N6: Students will develop an understanding of the role of society in the development and use of technology. N13: Students will develop abilities to assess the impact of products and systems.	SAFETY TEST: Students should be required to pass safety test, such as those provided in the PA Safety Guide, before being permitted to use tools or machines in the classroom or lab. Implement a comprehensive safety program premised upon the PA Safety Guide.	Res:L3-003 Res:L3-004
III. Organizing an Enterprise 1. Forms of Ownership a. Individual Proprietorship b. Partnership c. Corporation	PA 3.8.7 B Explain how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.	BOARD OF DIRECTORS: Some teachers recruit school administrators, other teacher and even parents to sit on a board of directors for the classroom enterprise. This type of evaluative board makes the students realize this class is	Res:L3-005 Ref:L3-006 Ref:L3-007 Ref:L3-008 Ref:L3-009

2. Corporate Organization a. Stockholders b. Board of Directors c. Managers d. Employees	N3: Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study. N4: Students will develop an understanding of the cultural, social, economic, and political effects of technology.	important. ELECTING MANAGEMENT OFFICERS: Selecting the right managers for the job is important to the success of the enterprise. Students should be given the opportunity to vote for the student-managers they want. The teacher may want to retain the position of Chief Executive Officer in the order to maintain ultimate control and safety purposes. JOB APPLICATIONS AND INTERVIEWS: Students should fill out job applications and interview for jobs. Some teachers record the interviews on vide to see how a potential employer would view them.	
IV. Financing an Enterprise 1. Obtaining Loans a. Banks Loans b. Private Investors 2. Selling Bonds a. Bond Investors b. Interest Payments 3. Selling Stock a. Stock Certificates b. Share Price c. Possible Dividends	PA 3.7.7.D Apply computer software to solve specific problems. PA 3.8.7 B Explain how human ingenuity and technological resources satisfy specific human needs and improve the quality of life. N6: Students will develop an under standing of the role of society in the development and use of technology. N3: Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.	SELLING STOCK: Some teachers limit the stock sales to only the students in the class while others open sales to any interested investors. It is important for students to realize that the classroom enterprise will go on for years after they leave this course and the consumers and the stockholders should be rewarded with quality products and dividends so they will continue to be consumers and stockholders in the future.	Res:L3-010 Res:L3-011 Ref:L3-012
V. Design Engineering 1. Purposes a. Researching Product Ideas b. Developing Product Plans 2. Conducting Market Research a. Survey Consumer Needs and Wants	PA 3.2.7 B Apply process knowledge to make and interpret observations. PA 3.8.7 B Explain how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.	PRODUCT SELECTION: Selecting the proper product is critical to the ultimate success of the classroom enterprise. Teachers should judge the abilities of their students in selecting an appropriate product. Many teachers have a number of proven product	Ref:L3-016 Res:L3-017 Res:L3-018 Ref:L3-019

b. Available Products and Competition 3. Product Design Criteria a. Form and Function b. Consumer Appeal c. Ease of Manufacture d. Costs and Durability 4. Sketching Ideas a. Thumbnail and Rough Sketches b. Renderings 5. Making and Testing Mock-ups a. Scale Model b. Not Functional 6. Making and Testing Prototypes a. Full Scale b. Fully Functional Product 7. Working Drawings a. Detail and Assembly Drawings b. Bill of Materials c. CAD Applications 8. Subcontracting services	N1: Students will develop and understanding of product demand. N4: Students will gain an understanding of cultural and social impacts of a product. N8: Students will have insight into the attributes of the design process.	plans available and let students select their product from this collection. This limits the possibilities of students selecting products that are just too difficult. Ease of manufacture is only one criterion in product selection. Remember, the ultimate goal of an enterprise is to make profits—the product should appeal to consumer needs and wants. CONDUCTING MARKET RESEARCH: Market research can take many forms. The most popular approach is to select a product and ask potential consumers if they like, need or want the product; how likely they are to buy the product; and how much they would be willing to spend. MOCK-UPS AND PROTOTYPES: Mock-ups are usually made form clay, cardboard, balsa, or some other easily worked material. Mock-ups are made for appearance analysis. The prototype is the first fully functional product. It is used to test product function and provide information for methods, manufacturing, and quality control engineering. Necessary tooling, inspection gauges, and plant layout should be identified. WORKING DRAWINGS: A complete set of working drawings, including detail and assemble drawings of the product and a bill of materials should be created. If available, use a CAD system for the highest quality drawings. With teacher-selected products, minor changes in design or manufacture can be changed quickly with a CAD system from one year to the next.	
VI. Production Engineering 1. Purposes a. Determine Product Cycle Time b. Increase Productivity 2. Methods Engineering a. Operation Process Charts (1) Operations and Inspections	PA 3.1.7 A Explain the parts of a simple system and their relationship to each other. PA 3.1.7 C Identify patterns as repeated processes or recurring elements in science and technology.	METHODS ENGINEERING CHARTS: Students should be given the experience of creating operation process and flow process charts. In reality, these charts are made and revised several times to engineer the most efficient production system possible. In the classroom with simple products these sheets	Ref:L3-020 Ref:L3-021 Ref:L3-022 Ref:L3-023 Ref:L3-024 Res:L3-025

(2) One Per Product b. Flow Process Charts (1) All Processes (2) One Per Part c. Operation Sheets 3. Manufacturing Engineering a. Plant Layout (1) Fixed-Position Layout (2) Process Layout (3) Product Layout b. Materials Handling Procedures (1) Fixed Path Conveyors (2) Variable Path Vehicles c. Tooling (1) Jigs and Fixtures (2) Tooling Design and Safety 4. Quality Control Engineering a. Inspection Station b. Inspection Gages (1) Indicating Gages (2) Fixed Gages 5. Tooling-up a. Conducting Pilot Run b. Debugging Bottlenecks	N20: Students will gain an understanding of all aspects of manufacturing processes.	only need to be created once. MATERIAL HANDLING SYSTEMS: Students could design and implement both fixed position (conveyor belts, chutes, rollers) and variable path (carts, AGV's, dollies) materials handling systems. These systems give a sense of automation to a production line. Simple conveyors can be made using a belting material, electric motor and pulleys or a gear reduction box. Some teachers integrate technologies by subcontracting this work to a transportation class. QUALITY CONTROL ENGINEERING: Students should understand the importance of quality control to the productivity and efficiency of an enterprise. The most popular type of quality control devices are the fixed go no-go gages. Tolerances are built into the gages, which are used to quickly measure sizes on parts. TOOLING-UP: Tooling –up is a dry run of the production line. This may take several days to complete because of the need to debug the system and eliminate bottlenecks by adding work stations where needed.	
VII. Producing Products 1. Design 2. Marketing 3. Financing 4. Assembling 5. Packaging 6. Safety	PA 3.7.7 A, B, C, D Students will be able to describe safe and appropriate use of tools, materials and techniques along with selecting the appropriate materials and instruments and software for the task at hand. N20: Students will gain an understanding of all aspects of manufacturing technologies.	MASS PRODUCTION: For a classroom enterprise, mass production by intermittent (batch) or continuous manufacturing methods makes the most sense. Custom manufacturing can lead to customer satisfaction problems in the mass market. If possible, try to integrate some aspects of flexible, just-in-time or computer-aided manufacturing.	Res:L3-026 Res:L3-027 Ref:L3-028
VIII. Marketing Process 1. Advertising Products a. Advertising Media	PA 3.1.7 D Explain Scale as a way of relating concepts and ideas to one another by some measure.	MARKETING CAMPAIGN: Advertise, sell and service products. Print media, such as posters or flyers handed out in	Res:L3-029 Res:L3-030 Res:L3-031

b. Advertising Campaign 2. Selling Products a. Salespeople b. Identifying consumers	N18: Students will have a understanding of information and communication.	school are the simplest means of marketing. Video commercials playing in the cafeteria at lunch or radio commercials during the morning intercom announcements can have a dramatic impact on the learning experience. Some teachers pay commissions for the most products sold. Others subcontract part of marketing, such as advertising.	Ref:L3-032 Ref:L3-033
IX. Financial Process 1. Break-Even Analysis a. Selling Price b. Expenses and Income c. Methods (1) Graphic Method (2) Algebraic Method (3) Computer Method 2. Calculating Payroll a. Gross Pay b. Taxes and Deductions c. Net Pay 3. Balance Sheet Report a. Assets b. Liabilities 4. Income Statement Report a. Gross Profits b. Operating Expenses c. Profit/Loss 5. Calculating Dividends a. Net Profits b. Stock Share Sold c. Dividends Per Share	PA 3.7.7.D Apply computer software to solve specific problems. PA 3.8.7.A Explain how sciences and technologies are limited in their effects and influences on society N5: The effects of technology on the environment N16: Energy and power technologies N17: Students will develop and understanding of an be able to select and use information and communication technologies	BREAK-EVEN ANALYSIS: Conduction a break-even analysis is critical to a realistic enterprise course. Students should realize that producers have many expenses and often make very little profit on each product. Using computer spreadsheet is the simples way to perform this process. PAYROLL: Some teachers pay students with grade points and make deductions for coming late to class, not cleaning up or not putting away tools. Every student is required to earn a minimum number of payroll grade points. Any points above this minimum may be use to buy extra credits on quizzes and tests. Other teachers pay students play money, which can be redeemed in the school cafeteria or bookstore or in local fast food or retail stores. Of course, previous arrangements must be made to secure donations from these establishments. Use computers to automate the payroll, too. BALANCE SHEET AND INCOME STATEMENTS: The balance sheet and income statement are used to report the financial outcome of an enterprise. There are forms that are available which may be used for this reporting. Also, if available, use computer spreadsheet to automate this process. PAYING DIVIDENDS: The ultimate result of any enterprise course should be when the students return the original	Res:L3-034 Res:L3-035 Ref:L3-036 Res:L3-037 Ref:L3-038

		investments to the stockholder along with a dividend.	
X. Enterprise Outputs and Impacts A. Jobs and Careers B. Products and Services C. Scrap 1. Material Left Over After Processes a) Material Chips From Lathe b) Unused Material After Cuts c) Others 2. Can Be Reused 4. Waste a. Material Thrown Away After Use. (1) Product Packages (2) Broken/Worn Out Product (3) Others b. Never Reused 5. Air Pollution a. Acid Rain b. Smog/Smoke 6. Water Pollution a. Chemical Waste b. Solid Waste 7. Recycling a. Advantages 1. Conserves Natural 2. Resources 3. Saves Money 4. Conserves Energy 5. Reduces Landfill Waste b. Materials Recycled Most Often 1. Iron and Steel 2. Paper 3. Aluminum c. Recycling Scrap and Waste 1. New Product Ideas 2. New Uses for Scrap and		CAREER RESEARCH: Have students research a career they are interested in by using the Dictionary of Occupational Titles, which is available in most libraries. The Occupational Outlook Handbook is also a good source of information. CORPORATE RESEARCH: Have students research a company and its products using a computer database, such as Compact Disclosure. RECYCLING: Run a problem-solving activity that requires students to design new products or brainstorm new uses for scrap and waste created in the technology labs or in the school or community. A central project, such as an aluminum can crusher or newspaper bundler system, could be developed and mass-produced. Also, there are plans available for recycling sawdust and other scrap.	Ref:L3-039 Res:L3-040 Ref:L3-041
XI. Future Developments A. Total Automation B. Space Exploration C. Technological Illiteracy and Technocracy	PA 3.2.7. D Know and use the technological design process to solve problems. N11: Apply design process	RESEARCH FUTURE DEVELOPMENTS: Students could conduct research and write a paper, give a presentation, conduct a debate or make a model of some future development in technology that may interest them.	

D. Global Competition E. New Technology			

RESOURCES:

REF: L3-001
Inventors and Innovators
(WV Exploring Technology in the Middle School. pp. 55)

REF: L3-002
Biographies of Important People
(Komacek. pp. 85-86)

REF: L3-003
PA Safety Guide

REF: L3-004
Developing Safety Programs
(CITE. Vol. 1, #2. MF-E-003)

REF: L3-005
Identify an Organizational Structure that is Appropriate for Use in a Classroom Manufacturing Activity. (Mid-America. ETE-37-D)

REF: L3-006
Starting a Business Enterprise
(Komacek. pp. 255-256)

REF: L3-007
Corporate Charter and Bylaws
(Komacek. pp. 256-257)

REF: L3-008
Job Application
(WV Exploring Technology in the Middle School. pp. 216)

REF: L3-009
Identifying and Hiring Employees
(Komacek. pp. 86-89)

REF: L3-010
Complete a Blank Stock Certificate
(Mid-America. ETE-71-D)

REF: L3-011
Finances in Manufacturing
(Target Activity)

REF: L3-012
Acquiring Finance by Selling Stock
(Komacek. pp. 185-187)

RES: L3-013
Identify a Product that can be Manufactured by Your Class. (Mid-America. ETE-75-D)

REF: L3-014
Surveying the Market
(Komacek. pp. 169-170)

REF: L3-015
Conducting a Market Survey
(WV Exploring Technology in the Middle School. pp. 223-224)

REF: L3-016
Selecting a Product
(WV Exploring Technology in the Middle School. pp. 211-212)

REF: L3-017
Modeling Product Design Solutions
(CITE. Vol. 1, #4. CM-T-007)

REF: L3-018
Evaluating Product Design Solutions
(CITE. Vol. 1, #4. CM-T-008)

REF: L3-019
Verifying Product Designs with Mock-ups and Prototypes
(Komacek. pp.217-219)

REF: L3:020
Sketching Product Ideas
(Komacek. pp. 214-215)

REF: L3-021
Working Drawings
(WV Exploring Technology in the Middle School. pp. 214)

REF: L3-022
Process Charts
(WV Exploring Technology in the Middle School. pp. 220-222)

REF: L3-023
Methods Engineering: Planning Manufacturing Processes
(Komacek. pp. 236-237)

REF: L3-024
Manufacturing Engineering: Plant Layout and Materials Handling Systems
(Komacek. pp. 236-237)

REF: L3-025
Designing Inspection Gauges
(CITE. Vol. 3, #2. MF-E-006)

REF: L3-026
Introduction to Robots
(Target Activity)

REF: L3-027
Introduction to Robots
(CITE. Vol. 4, #4. MF-G-014)

REF: L3-028
Hydraulically Controlled Robotic Arm
(Komacek. pp. 138-141)

REF: L3-029
Video Production
(Target Activity)

REF: L3-030
Package Analysis
(CITE. Vol. 1, #1. MF-E-001)

REF: L3-031
Improve an Advertisment
(Mid-America. ETE-65-B)

REF: L3-032
Designing a Logo
(Tooley. Pp. 79-81)

REF: L3-033
Advertising Your Product
(WV Exploring Technology in the Middle School. pp. 226)

REF: L3-034
Finance in Manufacturing
(Target Activity)

RES: L3-035
Developing Budgets
(CITE. Vol. 4, #3. MF-G-009)

REF: L3-036
Calculating a Break Even-Analysis
(Komacek. pp. 307-309)

REF: L3-037
Maintaining Time Reports
(CITE. Vol. 4, #4. MF-E-012)

REF: L3-038
Calculating a Payroll
(Komacek. pp. 63-64)

REF: L3-039
Considering a Career in Manufacturing
(Komacek. pp. 63-64)

REF: L3-040
Recycling Aluminum
(CITE. Vol. 4, #4. GT-C-004)

REF: L3-041
Recycling Sawdust
(WV Exploring Technology in the Middle School. pp. 176)

CITE Activities
Center for Implementing Tech. Education
Department of Industry and Technology
Ball State University
Muncie, IN 47306

Komacek, S., Lawson, A. & Horton, A. (1990). Manufacturing Technology. Albany, NY: Delmar Publishers.

Mid-America Activities
Mid-America Vocational Curriculum
Consortium, Inc.
1500 West Seventh
Stillwater, OK 74074

Pennsylvania Safety Guide
Pennsylvania Department of Education
333 Market Street
Harrisburg, PA 17126-0333

Target Activities
Vocational Curriculum Laboratory
Cedar Lakes Conference Center
Ripley, WV 25271

Tooley, R. & Bailey, R. (1991).
Communication Technology Today and
Tomorrow: Student Workbook. Peoria, IL:
Glencoe/McGraw-Hill.

WV Exploring Tech. In the Middle School
Vocational Curriculum Laboratory
Cedar Lakes Conference Center
Ripley, WV 25271

GLOSSARY

1. Assembly line-Workers standing side-by-side in long lines, each doing a task.
2. Bill of materials- A list of specifications and costs related to every part within a product.
3. Break-even point- the number of products a company must sell to break even; no financial profit or loss is made.
4. CADD-Computer Aided Drafting & Design. Used by engineers to draw, design, and test product on the computer.
5. Consumer-Anyone who buys and uses manufactured goods.
6. Continuous manufacturing-The product is moved continuously along the production line, usually with a conveyor.
7. Corporation- A form of private ownership that gives workers part ownership of the company, as well as a voice in its operation and an equal share in profits.
8. Custom manufacturing-One or just a few products are manufactured by a single person or several people who work on it from beginning to end.
9. Dividends-The money paid back to the stockholder out of the profits from the company.
10. Division of Labor-A system of organizing people to work together that included dividing work into simple tasks.
11. Entrepreneur- One who organizes a business undertaking, assuming a financial ristk for the sake of future profits.
12. Fixed Costs- Manufacturing expenses that remain the same, or fixed, for a company no matter how many products it makes or sells.
13. Individual proprietorship- A business owned by one person.
14. Intermittent Manufacturing-This type of manufacturing processes products in small numbers.
15. Just In Time Manufacturing-A system that delivers products just in time to be sold.
16. Labor Union-Organizations for workers that obtain and protect workers' rights.
17. Mass production-Another term for continuous manufacturing; the product is moved along the production line continuously.
18. Occupational Safety and Health Administration (OSHA)- The federal agency that makes and enforces safety standards in the workplace.
19. Partnership-Two or more people who share, or co-own, a business.
20. Profit- the money left over after a product is sold and all expenses are paid for.
21. Stock-Certificate that represents ownership in a corporation.
22. Stockholder-Individuals who invest in a company by buying stocks.
23. Unit costs-The costs to manufacture each product or unit.
24. Variable costs-Manufacturing expenses that increase or decrease with the quantity of products manufactured.
25. Vendor-Company that sells needed inputs to the manufacturing company.

WARREN COUNTY SCHOOL DISTRICT

Planned Instruction

Course Title: Technological Design and Systems

Course Number:

Suggested Educational Level(s): 9th

Suggested Periods Per Week: 5 **Length of Period**: 42 minutes

Suggested Length Of Course: 18 weeks

Units Of Credit (If Appropriate): ½ credit

Date Written: **Date Approved**:

Date Reviewed: **Implementation Year**:

Teacher Certification Required: IA / Technology Education

Standards Addressed (code): 3.1.10. (A,B,E), 3.2.10. (C,D), 3.4.10. (C), 3.6.10. (A,B,C), 3.7.10. (A), 3.8.10. (A,B,C),

Reading Assessment Anchor: R11.A.2 Demonstrate the ability to understand and interpret nonfiction text.

Mathematics Assessment Anchors:

- MA.1 Demonstrate an understanding of numbers, ways of representing numbers, relationships among numbers and number systems.
- MA.2 Understand the meanings of operations, use operations and understand how they relate to each other.
- MA.3 Compute accurately and fluently and make reasonable estimates.
- MB.1 Demonstrate an understanding of measurable attributes of objects and figures, and the units, systems and processes of measurement (not assessed at Grade 11).
- MB.2 Apply appropriate techniques, tools and formulas to determine measurements.
- MD.1 Demonstrate an understanding of patterns, relations and functions.
- MD.2 Represent and/or analyze mathematical situations using numbers, symbols, words, tables and/or graphs.

Relationship to Other Planned Instruction: Follows Elementary and Middle Level Technology Curriculum and is a prerequisite for High School Technology electives or coursework at Warren County Career Center

Prerequisites: Middle Level Technology Education

Special Requirements: Up-to-date facilities, equipment, and storage

Writing Team Members: Technology Education Planning Committee

Standards addressed (code and description):

3.1.10.A - Discriminate among the concepts of systems, subsystems, feedback, and control in solving technological problems.

3.1.10.B - Describe concepts of models as a way to predict and understand science and technology.

3.1.10.E - Describe patterns of change in nature, physical and human made systems.

3.2.10.C - Apply the elements of scientific inquiry to solve problems.

3.2.10.D - Identify and apply the technological design process to solve problems.

3.4.10.C - Distinguish among the principles of force and motion.

3.6.10.A - Apply biotechnologies that relate to propagating, growing, maintaining, adapting, treating, and converting.

3.6.10.B - Apply knowledge of information technologies to encoding, transmitting, receiving, storing, retrieving, and decoding.

3.6.10.C - Apply physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural, production, marketing, research, and design to real world problems.

3.7.10.A - Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions.

3.8.10.A - Analyze the relationship between societal demands and scientific and technological enterprises.

3.8.10.B - Analyze how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.

3.8.10.C - Evaluate possibilities consequences and impacts of scientific and technological solutions.

COURSE DESCRIPTION: (Brief – suitable for course descriptions issued to students.)

Technological Design and Systems is a foundation course in technology for all students in the ninth grade. This exciting, hands-on course provides an overview of the systems areas of bio-related, information, and physical technology. Students, working alone or in groups, will build a foundation for technological literacy by developing, producing, testing and assessing solutions to technological problems. Also, the impacts of technology will be analyzed.

Outline of Content Sequence and Recommended Time (weeks or days):

Units	Weight	18 week (Semester)
Unit 1 – Safety	2%	2 Days
Unit 2 – Impacts	3%	3 Days
Unit 3 – Systems Model	5%	1 Week
Unit 4 – Engineering Principles	7%	7 Days
Unit 5 – Problem Solving	8%	8 Days
Unit 6 – Communication Systems	15%	2 Weeks 3 Days
Unit 7 – Construction Systems	15%	2 Weeks 3 Days
Unit 8 – Manufacturing Systems	15%	2 Weeks 3 Days
Unit 9 – Transportation Systems	15%	2 Weeks 3 Days
Unit 10 – Bio-related Technology	15%	2 Weeks 3 Days

Specific Educational Objectives to be Taught:

Upon completion of this course, students should be able to:

1. Understand the resources and processes of technology.
2. Develop individual talents and creative abilities through problem-solving activities and design applications.
3. Analyze impacts of technology
4. Increase technological literacy and ability to make informed decisions regarding technological issues that affect society.
5. List, select and apply the inputs, processes, and outputs of the technological systems model.
6. Identify, produce, test and analyze systems of transportation.
7. Identify, produce, test and analyze systems of communication.
8. Identify, produce, test and analyze systems of construction.
9. Identify, produce, test and analyze systems of manufacturing.
10. Identify, produce, test and analyze systems of biotechnology.

11. Develop, produce, use and assess technological products and services to meet human needs and wants or to solve technological problems.

Formative Assessments (optional):

Objective tests
Written assignments
Lab reports
Web based
Use rubrics to assess process, not just product
Peer evaluation by rubric

Summative Assessments:

Project
Portfolio

Required/Approved Textbooks and Materials: *Not yet adopted*
Glencoe: Technology Today and Tomorrow – under review

Book Title:
Publisher:
ISBN #:
Copyright:
Date of Adoption:

Two or More Sample Units (optional):

WARREN COUNTY SCHOOL DISTRICT

Planned Instruction

Course Title: Design and Manufacturing Enterprise

Course Number:

Suggested Educational Level(s): 9th (2nd semester) – 11th

Suggested Periods Per Week: 5 **Length of Period**: 42 minutes

Suggested Length Of Course: 18 weeks

Units Of Credit (If Appropriate): ½ credit

Date Written: **Date Approved**:

Date Reviewed: **Implementation Year**:

Teacher Certification Required: Technology Education

Standards Addressed (code): 3.1.10. (A,B,C,D,E); 3.1.12. (A,B,C,D,E); 3.2.10. (A,B,D); 3.2.12. (A,B,D); 3.6.10. (B,C); 3.6.12. (B,C); 3.7.10. (A,C,D); 3.7.12. (A,C,D); 3.8.10. (A,B,C); 3.8.12. (A,B,C)

Reading Assessment Anchor: R11.A.2 Demonstrate the ability to understand and interpret nonfiction text.

Mathematics Assessment Anchors:

- MA.3 Compute accurately and fluently and make reasonable estimates.
- MB.2 Apply appropriate techniques, tools and formulas to determine measurements.
- MD.1 Demonstrate an understanding of patterns, relations and functions.
- MD.2 Represent and/or analyze mathematical situations using numbers, symbols, words, tables and/or graphs.

Relationship to Other Planned Instruction: High School elective course option that follows successful completion of Technological Design and Systems.

Prerequisites: Technological Design and Systems

Special Requirements: Up-to-date facilities, equipment, and storage

Writing Team Members: Technology Education Planning Committee

Standards addressed (code and description):

3.1.10.A	Discriminate among the concepts of systems, subsystems, feedback and control in solving technological problems
3.1.10.B	Describe concepts of models as a way to predict and understand science and technology.
3.1.10.C	Apply patterns as repeated processes or recurring elements in science and technology.
3.1.10.D	Apply scale as a way of relating concepts and ideas to one another by some measure.
3.1.10.E	Describe patterns of change in nature, physical and man made systems.
3.1.12.A	Apply concepts of systems, subsystems, feedback and control to solve complex technological problems.
3.1.12.B	Apply concepts of models as a method to predict and understand science and technology.
3.1.12.C	Assess and apply patterns in science and technology.
3.1.12.D	Analyze scale as a way of relating concepts and ideas to one another by some measure.
3.1.12.E	Evaluate change in nature, physical systems and man made systems.
3.2.10.A	Apply knowledge and understanding about the nature of scientific and technological knowledge.
3.2.10.B	Apply process knowledge and organize scientific and technological phenomena in varied ways.
3.2.10.D	Identify and apply the technological design process to solve problems.
3.2.12.A	Evaluate the nature of scientific and technological knowledge.
3.2.12.B	Evaluate experimental information for appropriateness and adherence to relevant science processes.
3.2.12.D	Analyze and use the technological design process to solve problems.
3.6.10.B	Apply knowledge of information technologies of encoding, transmitting, receiving, storing, retrieving and decoding.
3.6.10.C	Apply physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design to real world problems.
3.6.12.B	Analyze knowledge of information technologies of processes encoding, transmitting, receiving, storing, retrieving and decoding.
3.6.12.C	Analyze physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design to real world problems.
3.7.10.A	Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions.
3.7.10.C	Apply basic computer operations and concepts.
3.7.10.D	Utilize computer software to solve specific problems.

3.7.12.A	Apply advanced tools, materials and techniques to answer complex questions.
3.7.12.C	Evaluate computer operations and concepts as to their effectiveness to solve specific problems.
3.7.12.D	Evaluate the effectiveness of computer software to solve specific problems.
3.8.10.A	Analyze the relationship between societal demands and scientific and technological enterprises.
3.8.10.B	Analyze how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.
3.8.10.C	Evaluate possibilities consequences and impacts of scientific and technological solutions.
3.8.12.A	Synthesize and evaluate the interactions and constraints of science and technology on society.
3.8.12.B	Apply the use of ingenuity and technological resources to solve specific societal needs and improve the quality of life.
3.8.12.C	Evaluate the consequences and impacts of scientific and technological solutions.

COURSE DESCRIPTION: (Brief – suitable for course descriptions issued to students.)

This 10th through 12th grade course is intended to allow students to participate in starting, running, and succeeding in a business endeavor. Students will choose the type of product that they will produce, decide how to produce it, and market it. This class can be integrated with a business course, and/or be used as a senior project.

Outline of Content Sequence and Recommended Time (weeks or days):

1.	Introduction to the class and details on course requirements	2 days
2.	Safety	2 weeks
3.	Departments of Manufacturing	6 weeks
4.	Mass production.	8 weeks
5.	Liquidation	1 week

Specific Educational Objectives to be Taught:

1. Utilize the proper steps in designing a product.
2. Cooperate with others to facilitate a good working environment.
3. Qualify the importance of marketing, stock shares, and finances.
4. Make up and implement quality control devices.
5. Generate and apply management principles.
6. Employ inventory control techniques.
7. Develop the necessary paperwork needed to assist the manufacturing of a product.

8. Classify the various impacts of manufacturing including: environmental, societal, and technological impacts.

Formative Assessments (optional):

Peer Assessment
Teacher Observation

Summative Assessments:

Documentation / Portfolio
Project

Required/Approved Textbooks and Materials: *Not yet adopted*

Book Title:
Publisher:
ISBN #:
Copyright:
Date of Adoption:

Two or More Sample Units (optional):

WARREN COUNTY SCHOOL DISTRICT

Planned Instruction

Course Title: Engineering Design and Applications

Course Number:

Suggested Educational Level(s): 9th (second semester)–12th

Suggested Periods Per Week: 5 **Length of Period**: 42 min.

Suggested Length Of Course: 1 Semester

Units Of Credit (If Appropriate): ½1/2 credit

Date Written: **Date Approved**:

Date Reviewed: **Implementation Year**:

Teacher Certification Required: IA / Technology Education

A. Standards Addressed (code):

3.1.10. (ABCDE); 3.1.12. (ABCDE); 3.2.10. (ABD); 3.2.12. (ABD); 3.6.10. (ABC); 3.6.12. (ABC); 3.7.10. (ABCD); 3.7.12. (ABCD); 3.8.10. (BC); 3.8.12. (BC)

Supports 3.8.10.A and 3.8.12.B

Reading Assessment Anchor: R11.A.2 Demonstrate the ability to understand and interpret nonfiction text.

Mathematics Assessment Anchors:

- MA.1 Demonstrate an understanding of numbers, ways of representing numbers, relationships among numbers and number systems.
- MA.2 Understand the meanings of operations, use operations and understand how they relate to each other.
- MA.3 Compute accurately and fluently and make reasonable estimates.
- MB.2 Apply appropriate techniques, tools and formulas to determine measurements.
- MD.1 Demonstrate an understanding of patterns, relations and functions.
- MD.2 Represent and/or analyze mathematical situations using numbers, symbols, words, tables and/or graphs.

Relationship to Other Planned Instruction: Follows the Technological Designs and Systems course as an elective course.

Prerequisites: Technological Design Systems (9^{th} grade)

Special Requirements: Up-to-date facilities, equipment, and storage

Writing Team Members: Technology Education Planning Committee

Standards addressed (code and description):

Standards Met:

3.1.10.A Discriminate among the concepts of systems, subsystems, feedback and control in solving technological problems
3.1.10.B Describe concepts of models as a way to predict and understand science and technology.
3.1.10.C Apply patterns as repeated processes or recurring elements in science and technology.
3.1.10.D Apply scale as a way of relating concepts and ideas to one another by some measure.
3.1.10.E Describe patterns of change in nature, physical and man made systems.
3.1.12.A Apply concepts of systems, subsystems, feedback and control to solve complex technological problems.
3.1.12.B Apply concepts of models as a method to predict and understand science and technology.
3.1.12.C Assess and apply patterns in science and technology.
3.1.12.D Analyze scale as a way of relating concepts and ideas to one another by some measure.
3.1.12.E Evaluate change in nature, physical systems and man made systems.
3.2.10.A Apply knowledge and understanding about the nature of scientific and technological knowledge.
3.2.10.B Apply process knowledge and organize scientific and technological phenomena in varied ways.
3.2.10.D Identify and apply the technological design process to solve problems.
3.2.12.A Evaluate the nature of scientific and technological knowledge.
3.2.12.B Evaluate experimental information for appropriateness and adherence to relevant science processes.
3.2.12.D Analyze and use the technological design process to solve problems.
3.6.10.A Apply biotechnologies that relate to propagating, growing, maintaining, adapting, treating and converting.
3.6.10.B Apply knowledge of information technologies of encoding, transmitting, receiving, storing, retrieving and decoding.

3.6.10.C Apply physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design to real world problems.
3.6.12.A Analyze biotechnologies that relate to propagating, growing, maintaining, adapting, treating and converting.
3.6.12.B Analyze knowledge of information technologies of processes encoding, transmitting, receiving, storing, retrieving and decoding.
3.6.12.C Analyze physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design to real world problems.
3.7.10.A Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions.
3.7.10.B Apply appropriate instruments and apparatus to examine a variety of objects and processes.
3.7.10.C Apply basic computer operations and concepts.
3.7.10.D Utilize computer software to solve specific problems.
3.7.12.A Apply advanced tools, materials and techniques to answer complex questions.
3.7.12.B Evaluate appropriate instruments and apparatus to accurately measure materials and processes.
3.7.12.C Evaluate computer operations and concepts as to their effectiveness to solve specific problems.
3.7.12.D Evaluate the effectiveness of computer software to solve specific problems.
3.8.10.B Analyze how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.
3.8.10.C Evaluate possibilities consequences and impacts of scientific and technological solutions.
3.8.12.B Apply the use of ingenuity and technological resources to solve specific societal needs and improve the quality of life.3.8.12.C Evaluate the consequences and impacts of scientific and technological solutions.

Standards Supported:

3.8.10.A Analyze the relationship between societal demands and scientific and technological enterprises.
3.8.12.A Synthesize and evaluate the interactions and constraints of science and technology on society.

COURSE DESCRIPTION: (Brief – suitable for course descriptions issued to students.)

In Engineering Design students develop critical thinking and problem-solving skills.

Engineering Design integrates the technological problem-solving method with

knowledge of science, mathematics, communications and other disciplines. It

provides students with opportunities to research, design, develop, build, test and evaluate solutions to real life problems related to meeting human needs and wants. Content is drawn from Bio-Related, Construction, Communication, Transportation and Manufacturing technologies

Outline of Content Sequence and Recommended Time (weeks or days):

#	**Unit**	**Days**
1.	Safety	8
2.	Systems Model	2
3.	Engineering Principles	15
4.	Mechanical Systems	15
5.	Electrical and electronic systems	15
6.	Design	15
7.	Optimization	7
8.	Technological/societal interaction	5
9.	Ethical and legal responsibilities	3
10.	Careers in design and engineering	2
11.	Historical antecedents and future trends	3
	Total Days:	90

Specific Educational Objectives to be Taught:

1. Demonstrate proficiency in identifying and using appropriate modeling techniques.
2. Identify and describe the component parts and operation of technological systems.
3. Differentiate between open loop and closed loop systems through developing, producing, using and assessing technological control systems.
4. Identify the laws, principles and phenomena that describe engineering systems and synthesizing working models of engineered systems.
5. Explain and utilize decision making strategies commonly used by engineers including: optimization, break-even analysis and risk assessment.
6. Describe how technology and society interact. Specifically, assess technological impacts in real life contexts and make decisions based upon the assessments.
7. Demonstrate an understanding of the design process that includes: framing design briefs, selecting problem solving strategies, design execution, materials testing, research, prototyping and testing.

8. Use the engineering design process to generate products, processes and systems based on individual and societal needs.
9. Follow ethical and legal guidelines when designing and engineering products, processes and systems.
10. Investigate various careers involved in the design engineering field.
11. Demonstrate positive safety attitudes and behaviors throughout the design engineering process.

Formative Assessments (optional):

Objective tests
Written assignments
Lab reports
Web based
Use rubrics to assess process, not just product
Peer evaluation by rubric

Summative Assessments:

Project
Portfolio

Required/Approved Textbooks and Materials:

Book Title: Not yet adopted
Publisher:
ISBN #:
Copyright:
Date of Adoption:

Two or More Sample Units (optional):

WARREN COUNTY SCHOOL DISTRICT

Planned Instruction

Course Title: Multimedia Technology I

Course Number:

Suggested Educational Level(s): Grades 9, 10, 11, & 12

Suggested Periods Per Week: 5 **Length of Period**: 42 min.

Suggested Length Of Course: 1 year

Units Of Credit (If Appropriate): 1 credit

Date Written: October 29, 2004 **Date Approved**:

Date Reviewed: **Implementation Year**: 2005 - 2006

Teacher Certification Required: Industrial Arts / Technology Education

Standards Addressed (code): 3.1.10.A 3.1.12.A 3.6.10.B 3.6.12.B 3.7.10.A 3.7.10.C 3.7.10D 3.7.12C Supports: 3.2.10&12ABD 3.4.10&12C

Assessment Anchors Addressed (code): R 11.A.2

Mathematics Assessment Anchors:

- MA.1 Demonstrate an understanding of numbers, ways of representing numbers, relationships among numbers and number systems.
- MA.3 Compute accurately and fluently and make reasonable estimates.
- MB.2 Apply appropriate techniques, tools and formulas to determine measurements.
- MD.1 Demonstrate an understanding of patterns, relations and functions.

Relationship to Other Planned Instruction: Builds on required technology education courses. Enhances Math, Science, and English courses.

Prerequisites: None

Special Requirements: Digital Camera, Digital Camcorder, Computer with Desktop Publishing, Photo-shop, and related software installed, Color Inkjet Printer, Photo Paper, Photo Transfer Paper, Video Tape Equipment and Media

Writing Team Members: Technology Education Planning Committee

Standards addressed (code and description):

3.1 Unifying Themes
3.1.10.A Discriminate among the concepts of systems, subsystems, feedback and control in solving technological problems.
3.1.12.A Apply concepts of systems, subsystems, feedback and control to solve complex technological problems.

3.6 Technology Education
3.6.10.B Apply knowledge of information technologies of encoding, transmitting, receiving, storing, retrieving, and decoding.
3.6.12.B Analyze knowledge of information technologies of processes encoding, transmitting, receiving, storing, retrieving, and decoding.
3.7 Technological Devices
3.7.10.A Identify and safely use a variety of tools, basic machines, materials, and techniques to solve problems and answer questions.
3.7.10.C Apply basic computer operations and concepts.
3.7.12.C Evaluate computer operations and concepts as to their effectiveness to solve specific problems.
3.7.10.D Utilize computer software to solve specific problems.

Assessment Anchors Addressed (code and description):
R 11.A.2 Demonstrate the ability to understand and interpret nonfiction text, including informational, e.g., textbooks, print media (magazines, brochures, etc.), editorials, public documents; autobiography; biography; and essay appropriate to grade level.

COURSE DESCRIPTION:

An introductory course using the universal systems model approach, including but not limited to the information technologies of encoding, transmitting, recording, storing, retrieving, and decoding. Students will apply problem-solving and creative thinking ability through activities and experiences, which stimulate thinking and encourage ideation.

First Semester: Applying different informational technologies; communication, and graphic communication skills will be explored extensively. Students will attain the knowledge and skills necessary to apply various aspects of communication technology within their projects. Projects may include: design CD covers, design calendars, desktop publishing, screen-printing, black and white photography, and a power point presentation.

Second Semester: Using the knowledge and skills attained in the previous semester, students will apply various aspects of advanced desktop publishing and video and television production. Activities may include designing brochures or flyers using desktop publishing, digital photography, web-design, construction of a web page, and power point portfolio.

Outline of Content Sequence and Recommended Time (weeks or days):

II. Introduction to Information Technology a. Definition of Information Systems. b. Safety in the Learning Environment a. Attitudes b. Regulated Safety Concerns	Demonstrate safe and efficient use of communication tools, materials and equipment.	Students will discuss the various aspects of Information Systems and are required to pass a safety exam before using materials, tools and equipment in the learning environment.	RES 1 RES 2
III. Universal Systems Model a. Inputs b. Processes c. Outputs d. Feedback	Analyze a communication system using the universal systems model to identify its inputs, processes, outputs and feedback mechanisms.	Students will discuss the systems model and be introduced to technical drawings, sketching, layout, and design.	RES 2 RES 4
IV. Layout and Design a. Sketching a. Lines b. Geometric Shapes b. Design Principles a. Space b. Proportion c. Balance d. Contrast e. Harmony f. Rythym	Analyze the use of design principles in visual images or common products. Develop, produce, use and asses visual messages that demonstrate appropriate application of design principles.	CD Cover/Calendar Students will have on option to either design a CD Cover or a Calendar. This project will be open-ended which means there are no restrictions. Students will be assessed on thumbnail sketches, the creativity of the idea, the use of design principles in the project, and the presentation of the final project.	RES 3 RES 4

Content Outline:	Students should be able to:	Technology Learning Activities	Resources:
V. Graphic Reproduction a. Types of Graphic Reproduction a. Screen b. Gravure c. Offset d. Ink Jet e. Relief b. Quark Express a. Basic Layout b. Incorporating outside inputs	Design graphic messages for a specific audience. List, describe, and analyze the different methods of graphic reproduction.	Students will design a shirt dealing with technology. Student will be required to complete all of the following. 1. Thumbnail Sketches 2. Camera ready copy using Quark Express 3. Positives and negatives 4. Shirt with completed design using the screen printing method.	RES 1 RES 4
VI. Electronic Media a. Digital Photography a. Using a digital camera b. Transferring images to a computer b. Adobe Photo Shop a. Edit photos b. Importing and Exporting	Operate digital photographic equipment. Use Adobe Photo Shop to modify pictures using the digital camera.	Students will take a minimum of five and a maximum of eight photographs using the digital camera. Students will import their photos from the digital camera into Adobe Photo Shop. They will be required to modify at least three of their photos and print out the others using an ink jet printer. Photos must be of good quality.	RES 1 RES 3
VII. Microsoft Office a. Power Point a. Using Power Point b. Presentation of	Operate Power Point using the skills learned throughout the year. Give a presentation in front of the class Integrate digital photography with power point.	As a final project, the student will design a power point portfolio of their years work. Students will include their shirt, CD cover or calendar and digital photos. The students will also be	RES 1 RES 4

	completed assignment c. Integration of digital photography		required to present their completed project to the class.	

Specific Educational Objectives to be Taught:

Students should be able to communicate ideas with multiple forms of media.
Students will learn to select and integrate appropriate mediums.
Students will be knowledgeable in correlating the message with the audience.
Students will gain experience in implementing media tools.

Formative Assessments (optional):

Teacher generated assessments (quizzes and tests).

Summative Assessments:

Portfolio or final class presentation.

Required/Approved Textbooks and Materials:

Book Title: Under Review
Publisher:
ISBN #:
Copyright:
Date of Adoption:

Two or More Sample Units (optional):

Refer to Warren County Technology Education Planning Committee Report.

TLA RESOURCES:

RES 1 Sanders, Mark. Communication Technology: Today and Tomorrow

RES 2 www.psu.pde.edu, web site of the PA Department of Education

RES 3 PA Science and Technology Standards
RES 4 TEAP Curriculum Guide

RESOURCES:

WEBSITES:

1. http://www.pde.psu.edu/
Pennsylvania Department of Education
2. www.iteawww.org
International Technology Education Association
3.http://onlineethics.com
Online ethics center for science and engineering

TEXT:

1. Pennsylvania Department of Education. PA Safety Guide. 333 Market Street Harrisburg, PA 17126-0333: Pennsylvania Department of Education
2. Technology Education Association of Pennsylvania Curriculum Guide
3. Sanders, Mark. Communication Technology: Today and Tomorrow

GLOSSARY:

1) Information Systems – processing of information using a method to demonstrate the effectiveness of image generating technique to communicate an idea and analyze and evaluate the effectiveness of a graphic object designed and produced to communicate.
2) Universal Systems Model – is a way for complex systems to be broken down into their component parts to facilitate understanding. The main components for the Universal Systems Model are: inputs, processes, outputs, and feedbacks.
3) Inputs – people, knowledge, materials, energy, tools, and money
4) Processes – encoding, transmitting, receiving, storing, retrieving, and decoding
5) Outputs – new or more efficient processes, new knowledge, impacts, services, and communicated information.
6) Feedback – monitors and adjusts according to outcomes.
7) Encoding – information transformed into electronic code that can be read by a computer.
8) Transmitting – moving of encoded information within or between systems.
9) Receiving - accepting encoded information from a transmitting device.
10) Decoding – generating a graphic message from encoded information.

WARREN COUNTY SCHOOL DISTRICT

Planned Instruction

Course Title: Designs in Bio-Related Technology

Course Number:

Suggested Educational Level(s): 9 - 12

Suggested Periods Per Week: 5 **Length of Period**: 42

Suggested Length Of Course: 18 weeks

Units Of Credit (If Appropriate): .5

Date Written: 10-24-2004 **Date Approved**:

Date Reviewed: **Implementation Year**: 2005-06

Teacher Certification Required: Industrial Arts/Technology Education

Standards Addressed (code): 3.1.10-A, B,C , E; 3.1.12-A, B, C, E; 3.2.10-A, B, C, D; 3.2.12-A, B, C, D; 3.3.10-A, C; 3.3.12-C; 3.5.10-D; 3.6.10-A, B, C;
3.6-12-A, B, C; 3.7.10-A, B; 3.7.12-A, B; 3.8.10-A, B, C; 3.8.12-A, B, C
Also supports 3.1.10-D; 3.1.12-D; 3.4.10-A, C; 3.4.12-A, C; 3.5.10-B; 3.5.12-B, D; 3.7.10-C, D, E; 3.7.12-C, D, E

Reading Assessment Anchors: R11.A.2 Demonstrate the ability to understand and interpret nonfiction text.

Mathematics Assessment Anchors:

MA.3 Compute accurately and fluently and make reasonable estimates.
MD.2 Represent and/or analyze mathematical situations using numbers, symbols, words, tables and/or graphs.
ME.1 Formulate or answer questions that can be addressed with data and/or organize, display, interpret or analyze data.

Relationship to Other Planned Instruction: Builds on required 9th grade technology education course, enhances math, science, research, writing, presenting and computer skills.

Prerequisites: Technological Design & Systems

Special Requirements: Updated tools, equipment, facilities

Writing Team Members: Technology Education planning committee

Standards addressed (code and description):

3.1.10 A. Discriminate among the concepts of systems, subsystems, feedback and control in solving technological problems

3.1.10.B Describe concepts of models as a way to predict and understand science and technology.

3.1.10.C Apply patterns as repeated processes or recurring elements in science and technology.

3.1.10.E Describe patterns of change in nature, physical and man made systems.

3.1.12.A Apply concepts of systems, subsystems, feedback and control to solve complex technological problems.

3.1.12.B Apply concepts of models as a method to predict and understand science and technology.

3.1.12.C Assess and apply patterns in science and technology.

3.1.12.E Evaluate change in nature, physical systems and man made systems.

3.2.10.A Apply knowledge and understanding about the nature of scientific and technological knowledge.

3.2.10.B Apply process knowledge and organize scientific and technological phenomena in varied ways.

3.2.10.C Apply the elements of scientific inquiry to solve problems.

3.2.10.D Identify and apply the technological design process to solve problems.

3.2.12.A Evaluate the nature of scientific and technological knowledge.

3.2.12.B Evaluate experimental information for appropriateness and adherence to relevant science processes.

3.2.12.C Apply the elements of scientific inquiry to solve multi-step problems.

3.2.12.D Analyze and use the technological design process to solve problems.

3.3.10.A Explain the structural and functional similarities and differences found among living things.

3.3.10.C Describe how genetic information is inherited and expressed.

3.3.12.C Explain gene inheritance and expression at the molecular level.

3.5.10.D assess the value of water as a resource.

3.6.10.A Apply biotechnologies that relate to propagating, growing, maintaining, adapting, treating and converting.

3.6.10.B Apply knowledge of information technologies of encoding, transmitting, receiving, storing, retrieving and decoding.

3.6.10.C Apply physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design to real world problems.

3.6.12.A Analyze biotechnologies that relate to propagating, growing, maintaining, adapting, treating and converting.

3.6.12.B Analyze knowledge of information technologies of processes encoding, transmitting, receiving, storing, retrieving and decoding.

3.6.12.C Analyze physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design to real world problems.
3.7.10.A Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions.
3.7.10.B Apply appropriate instruments and apparatus to examine a variety of objects and processes.
3.7.12.A Apply advanced tools, materials and techniques to answer complex questions.
3.7.12.B Evaluate appropriate instruments and apparatus to accurately measure materials and processes.
3.8.10.A Analyze the relationship between societal demands and scientific and technological enterprises.
3.8.10.B Analyze how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.
3.8.10.C Evaluate possibilities consequences and impacts of scientific and technological solutions.
3.8.12.A Synthesize and evaluate the interactions and constraints of science and technology on society.
3.8.12.B Apply the use of ingenuity and technological resources to solve specific societal needs and improve the quality of life.
3.8.12.C Evaluate the consequences and impacts of scientific and technological solutions.

COURSE DESCRIPTION: (Brief – suitable for course descriptions issued to students.)

This course provides a broad overview of bio-related technologies as it relates to technology education. Students will study these systems from historical, current and potential future applications of bio-related technologies in a broad spectrum of industries/agencies. Students will participate in various laboratory and research activities as they identify and analyze bio-related products, services and processes. They will work individually and in groups to design, test, analyze and evaluate bio-related processes and products.

Outline of Content Sequence and Recommended Time (weeks or days):

1. Definitions(1 week)
    a. Biotechnology
    b. Bio-related technology
    c. Comparisons for the study of technology education
2. History of Bio-Related Technology (1 week)
    a. Stages of development
    b. Discoveries
    c. Famous bio-technologists
3. Content Organizers for the Study of Bio-Related Technology (1 week)
    a. Agriculture
    b. Bio-materials

c. Genetic engineering
d. Medical technology
e. Regulations and safety
f. Resource recovery

4. Applying Design in Bio-Related Technology (1 week to introduce)
    a. Design process
    b. Formulating the Problem
    c. Ideation and Research
    d. Data Collection and Testing
    e. Analyzing
    f. Presentation (1 week to present)
    g. Documentation
5. Developing and Analyzing Bio-Related Technology Activities (remainder of course)
    a. Integrating math, science and technology
    b. Types of activities
        i. Design briefs
        ii. Problem solving
        iii. Investigative research
        iv. Simulations
        v. Others
    c. Impacts of bio-related technology
    d. Future applications in bio-related technology
    e. Careers in bio-related technology

Specific Educational Objectives to be Taught:

Upon completion of this course, the student should be able to:

1. Define and contrast biotechnology and bio-related technology and their implications to technology education.
2. Construct and examine a historical outline in the development and discoveries of bio-related technologies in selected topics or themes.
3. Identify, apply and assess appropriate science, technology and mathematic concepts in design and problem-solving activities in bio-related technology.
4. Define, apply and appraise the bio-related technology content areas of agriculture, bio-materials, genetic engineering, medical technology, regulation and safety, and resource recovery to selected topics of study.
5. Determine and evaluate influences to decisions about bio-related technologies including but not limited to social/cultural values, politics, legalities, the environment, economics, education and technology.
6. Determine and evaluate impacts of bio-related technology systems.
7. Investigate and assess career opportunities in bio-related technologies and identify educational requirements and technical skills needed for employment.

Formative Assessments (optional):

Rubrics will be used to assess the design process, and participation in group and individual work.

Summative Assessments:

Assessment strategies may include the following:

1. Objective tests
2. Laboratory reports
3. Written assignments
4. Web-based assignments
5. Portfolio development

Required/Approved Textbooks and Materials:

Book Title: *Bio-Related Technology*
Publisher: Delmar Publishers
ISBN #:
Copyright: 1993
Date of Adoption:

Also: Pennsylvania Department of Education (2001). *Biotechnology Curriculum Framework, K-12.* Harrisburg, PA: Author (available on-line at PDE website).

Two or More Sample Units (optional):

WARREN COUNTY SCHOOL DISTRICT

Planned Instruction

Course Title: Innovation and Invention

Course Number:

Suggested Educational Level(s):
11th and 12th

Suggested Periods Per Week: 5 **Length of Period**: 42 minutes

Suggested Length Of Course: 18 or 36 weeks

Units Of Credit (If Appropriate): ½ or 1 credit

Date Written: **Date Approved**:

Date Reviewed: **Implementation Year**:

Teacher Certification Required: IA / Technology Education

Standards Addressed (code): 3.1.12. (A), 3.2.12. (D), 3.6.12. (A,B,C), 3.7.12. (A,D), 3.8.12. (A,B,C),

Reading Assessment Anchor: R11.A.2 Demonstrate the ability to understand and interpret nonfiction text.

Mathematics Assessment Anchors:

- MA.1 Demonstrate an understanding of numbers, ways of representing numbers, relationships among numbers and number systems.
- MA.3 Compute accurately and fluently and make reasonable estimates.
- MB.2 Apply appropriate techniques, tools and formulas to determine measurements.
- MD.2 Represent and/or analyze mathematical situations using numbers, symbols, words, tables and/or graphs.

Relationship to Other Planned Instruction: Proposed as a course to be taken if no Technology Education elective is taken after the required Technological Design and Systems course in 9th grade.

Prerequisites: Technological Design and Systems

Special Requirements: Up-to-date facilities, equipment, and storage

Writing Team Members: Technology Education Planning Committee

Standards addressed (code and description):
3.1.12.A - Apply concepts of systems, subsystems, feedback and control to solve complex technological problems.
3.2.12.D - Analyze and use the technological design process to solve problems.
3.6.12.A - Analyze biotechnologies that relate to propagating, growing, maintaining, adapting, treating and converting.
3.6.12.B - Analyze knowledge of information technologies of processes encoding, transmitting, receiving, storing, retrieving and decoding.
3.6.12.C - Analyze physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design to real world problems.
3.7.12.A - Apply advanced tools, materials and techniques to answer complex questions.
3.7.12.D - Evaluate the effectiveness of computer software to solve specific problems.
3.8.12.A - Synthesize and evaluate the interactions and constraints of science and technology on society.
3.8.12.B - Apply the use of ingenuity and technological resources to solve specific societal needs and improve the quality of life.
3.8.12.C - Evaluate the consequences and impacts of scientific and technological solutions.

COURSE DESCRIPTION: (Brief – suitable for course descriptions issued to students.)

Innovation & Inventions helps students develop critical thinking and problem solving skills. Innovation & Invention integrates the technological problem solving method with knowledge of science, mathematics, communications and other disciplines. It provides students with opportunities to research, design, develop, build, test and evaluate solutions to real life problems related to meeting human needs and wants. Content is drawn from Bio-related, Physical and Information Technology, however each student or group will focus on those areas that match their goal. Emphasis is placed on documenting and presenting the research during various stages of the process. This capstone course may be used to satisfy a student's senior project or community project.

Outline of Content Sequence and Recommended Time (weeks or days):

Units	Weight	18 week (Semester)	36 week (Full Year)
Unit 1 – Safety	5%	1 week	1 week
Unit 2 – Presenting (during and final)	5%	1 week	2 weeks
Unit 3 – Systems Model	5%	1 week	2 weeks
Unit 4 – Design	45%	8 weeks	17 weeks
Unit 5 – Engineering Principles (as needed)	20%	4 weeks	8 weeks
Unit 6 – Optimization	5%	1 week	2 week
Unit 7 - Technological/societal interaction	3%	2-3 days	1 week
Unit 8 - Ethical and legal responsibilities	3%	2-3 days	1 week
Unit 9 - Careers in design and engineering	3%	2-3 days	1 week
Unit 10 - Historical antecedents and future trends	3%	2-3 days	1 week

Specific Educational Objectives to be Taught:

Upon completion of this course, students should be able to:

1. Demonstrate positive safety attitudes and behaviors throughout the design engineering process.
2. Provide periodic update presentations about the project and the technological method employed throughout the various processes.
3. Review and differentiate between open loop and closed loop systems through developing, producing, using, and assessing technological control systems.
4. Demonstrate an understanding of the design process that includes: framing design briefs, selecting problem solving strategies, design execution, materials testing, research, prototyping, and testing.
5. Appropriately document all phases of the design process as assigned, and present the process at various stages including a final exhibition and presentation.
6. Review and utilize the laws, principles and phenomena that describe engineering systems and synthesize working models of engineered systems.
7. Explain and utilize decision-making strategies commonly used by engineers including: optimization, trade-offs, break-even analysis and risk assessment.
8. Describe how technology and society interact. Specifically, assess technological impacts of the design problem and make decisions based upon the assessments.
9. Follow ethical and legal guidelines when designing and engineering products, processes and systems.
10. Investigate various careers involved in the design-engineering field.
11. Identify historical antecedents to the design problem an potential future trends.
12. Present information in a clear, informative and concise manner.

Formative Assessments (optional):

Peer assessment
Teacher observation

Summative Assessments:

Documentation/Portfolio
Project

Required/Approved Textbooks and Materials:

Book Title: *Not yet adopted*
Publisher:
ISBN #:
Copyright:
Date of Adoption:

Two or More Sample Units (optional):