

**RENTON SCHOOL DISTRICT NO. 403**

**CAREER AND LIFE SKILLS EDUCATION**

**PRINCIPLES OF TECHNOLOGY 3 & 4/ROBOTICS**

**CURRICULUM GUIDE**

**Adopted by the Board of Directors: June 9, 1999**

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# ACKNOWLEDGMENTS

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## **A PHILOSOPHY OF EDUCATION FOR THE RENTON PUBLIC SCHOOLS**

A basic function and duty of a free society is the education of its children, youth and adults.

It is the responsibility of the schools to provide each student with the opportunities necessary to develop the scholarship, skills and attitudes which will enable the student to achieve mental, physical, emotional and social maturity.

Further, each student should, as a result of the school experience, be able to make decisions and to accept responsibility for those decisions.

POLICY: 6001

ADOPTED: February 3, 1977

Renton School District No. 403

Renton, Washington

Renton School District #403 recognizes the need for every graduate to have acquired job entry skills or at least to possess a level of knowledge and skills permitting continued training after high school.

**RENTON SCHOOL DISTRICT NO. 403**  
**GENERAL INSTRUCTIONAL GOALS**  
**Policy 6010**

The Renton School District fosters an educational process which helps all students achieve at their highest potential.

The Renton School District:

**LEARNING**

- Offers a curriculum which prepares our students for the future.
- Emphasizes that diversity contributes positively to the individual and to the community.
- Provides learning experiences matched to the needs, interests, and abilities of our diverse student population.
- Extends learning opportunities beyond the school.

**INSTRUCTION**

- Offers a variety of high quality instructional resources and services to students, staff, and community.
- Supports multiple instructional strategies.
- Provides resources and opportunities for continuing professional development of our staff.
- Conducts ongoing evaluations of our instructional programs.
- Maintains safe and inviting facilities that are conducive to learning.

**COMMUNITY**

- Creates partnerships which involve students, parents, staff and other community members and organizations.
- Promotes effective communication.
- Values and encourages development of a spirit of community service.
- Respects the rights and responsibilities of all.

As a result of the educational process in Renton, students will understand and apply:

Language skills including reading, writing and communication, with opportunities to learn world languages.

Mathematics skills including concepts, procedures, problem solving, reasoning, and mathematical language.

Science Skills including concepts, principles, and the scientific process.

Social studies skills, concepts, and processes - emphasizing history, geography, economics, international perspectives, multiculturalism, and participatory democracy.

Arts and humanities skills, concepts, and processes to create, perform, and solve problems and respond effectively.

Health and physical education skills, concepts, and processes to promote lifelong physical, mental and social well being.

In order to strengthen the above curricular areas, Renton students will understand and apply:

Thinking skills including the ability to - gather and analyze information, think logically, critically and creatively, integrate experience and knowledge in making reasoned judgments, and solve problems.

Career and life skills necessary for successful and responsible participation in family, work and community.

Technological skills to support learning, problem solving, and communication.

Skills necessary to be a lifelong learner and a contributor to the general welfare and the quality of life for all.

**EVALUATION:** The Renton School District regularly reviews, evaluates and modifies these General Instructional Goals to meet the changing needs of students, staff and community.

**RENTON SCHOOL DISTRICT NO. 403**  
**SCIENCE PROGRAM GOALS**

The Renton School District Science Program will:

1. Provide Students with the opportunities to master, maintain and apply the basic facts, concepts, skills, and processes associated with science
2. Develop positive attitudes in students toward themselves through their relationships with science
3. Foster curiosity, initiative, creativity, and objectivity
4. Encourage student understanding and respect for the environment
5. Develop rational thinking processes which underlie the scientific approach to problem-solving, i.e:
  - Define the problem
  - Make observations and collect data
  - Analyze and classify data
  - Build hypotheses
  - Design and carry out experiments
  - Evaluate results and build theories
  - Build model systems to explain theories
6. Develop fundamental skills in
  - Manipulating laboratory materials and equipment
  - Gathering, organizing, and communicating scientific information
7. Develop a knowledge of and a respect for the past contributions, the future possibilities, and the existing limitations for science in solving problems that are faced in society
8. Provide for the reinforcement of study and academic skills taught in other areas of the curriculum such as mathematics and language arts
9. Provide an opportunity for the students to acquire an understanding of the relationship of science to everyday living and various occupations
10. Increase student awareness of historical developments in science
11. Provide curriculum opportunities for both college and vocationally oriented students
12. Establish and maintain a safe learning environment and develop safety awareness in students

Approved by the Board of Directors June 16, 1977

## RENTON SCHOOL DISTRICT #403

# CAREER AND LIFE SKILLS EDUCATION GOALS

### GOAL 1: PROVIDE HIGH QUALITY VOCATIONAL-TECHNICAL EDUCATION PROGRAMS AND SERVICE

#### Objectives:

- A. Assure that students completing Vocational-Technical Education programs have technical and behavioral competencies and basic skills sufficient to succeed in the workplace or higher education.
- B. Establish course and/or program transferability and articulation processes among K-12, community and technical colleges, private schools, colleges and universities, industry, apprentice-related training, and military training.
- C. Establish and regularly review standards for all Vocational-Technical Education programs.
- D. Evaluate Vocational-Technical programs based on standards, objectives, placements, job performance, costs, and community/industry acceptance.
- E. Utilize global, national, state, regional, and local data and advisory committee recommendations to identify appropriate curriculum and course offerings, program standards which meet the need of families, communities, business and industry.
- F. Provide facilities, equipment and instructional programs which meet the needs of a changing workplace.
- G. Revise or discontinue these programs that no longer meet the needs of students, business, labor, industry, and/or the community.
- H. Provide qualified instructors and administrators for Vocational-Technical Education based on relevant certification standards.
- I. Develop and utilize competency-based curricula for Vocational-Technical Education programs.

**GOAL 2: CONTRIBUTE TO THE ECONOMIC DEVELOPMENT OF THE STATE**

**Objectives:**

- A. Facilitate cooperation between public and private sector entities.
- B. Establish new Vocational-Technical programs based on existing and projected employment needs/demands and entrepreneurial opportunities.
- C. Work cooperatively with the public and private sectors, economic development organizations, labor, and educational institutions to provide creative, targeted programs that meet the needs of youth in economically depressed areas.
- D. Provide family life education programs which serve to strengthen families and contribute to the effectiveness of workers in managing their consumer and family roles and in their careers.
- E. Strengthen management skills for those seeking employment in worker owned and managed businesses.
- F. Create a stronger working partnership with Team Washington and other economic agencies and the associate development organizations.

**GOAL 3: ASSURE ALL INDIVIDUALS EQUAL ACCESS TO VOCATIONAL-TECHNICAL EDUCATION PROGRAMS, SERVICES, AND ACTIVITIES**

**Objectives:**

- A. Provide Vocational-Technical programs, services, and activities that are free from racial, socio-economic, age, ethnic or sex bias, discrimination or stereotyping.
- B. Provide access to barrier-free Vocational-Technical Education programs.
- C. Actively recruit under-represented groups to all aspects of Vocational-Technical Education.
- D. Provide supportive services which promote entrance and success in Vocational-Technical programs.

**GOAL 4: PROVIDE/UTILIZE AN INTEGRATED STATE PLANNING PROCESS**

**Objectives:**

- A. Involve business, industry, agriculture, labor and other governmental and educational agencies in the planning processes at the state and local levels to ensure that establishment of delivery objectives and budget priorities.
- B. Identify instructional area/programs based on demand, placements, training needs, program costs, and follow-up.
- C. Utilize local, regional, state, national and global employment data, trends and advisory committees/organizations in identifying program offerings.

**GOAL 5: PROVIDE AND MARKET VOCATIONAL-TECHNICAL EDUCATION**

**Objectives:**

- A. Increase public awareness, understanding, and acceptance of Vocational-Technical Education.
- B. Actively involve students, parents, community leaders, legislators, labor representatives, business organizations, industry, representatives, and other decision-makers from state and local arenas in Vocational-Technical Education program events and issues.

**GOAL 6: PROVIDE INDIVIDUALS WITH CAREER DEVELOPMENT PROGRAMS AND EXPERIENCES**

**Objectives:**

- A. Provide career orientation, exploration, occupational information, self-appraisal, and educational planning.
- B. Provide instruction in job search, job retention and job change skills and further education pursuits.
- C. Assure that Vocational-Technical Education programs encompass demands of today's workplace and include attitudinal, employability, leadership, basic interpersonal, and job specific skills.

**GOAL 7: ASSURE A QUALITY STAFF DEVELOPMENT PROGRAM**

**Objectives:**

- A. Provide appropriate channels for advisory committee recommendations in the program and policy-making process.
- B. Provide in-service training opportunities for local advisory committee members.
- C. Provide in-service training for administrators and Vocational-Technical instructors regarding the effective use of advisory committees.

## **RENTON SCHOOL DISTRICT NO. 403**

### **CAREER AND LIFE SKILLS EDUCATION**

#### **MISSION STATEMENT**

The mission of career and life skills education in the Renton School District #403 is to prepare all learners for successful roles in families, careers and communities.

#### **THREE BELIEFS**

##### **A. Beliefs about individual needs**

1. All learners have unique gifts and talents and can be successful.
2. All learners must develop self-esteem and personal confidence for productive roles in society.
3. All learners need to have and attain personal and career goals, arising from a lifespan approach to personal growth and career development.

##### **B. Beliefs about society's expectations**

1. All learners must be prepared to become ethical, responsible and contributing world citizens.
2. All learners must adapt to change and participate in lifelong learning.
3. All learners must prepare for family roles and to balance work and family responsibilities.
4. All learners must develop essential creative/critical thinking, problem solving and communication skills.
5. All learners must value and have an appreciation for diversity in their schools, communities and workplaces.
6. All learners must recognize the impact of productive work on our economy.

##### **C. Beliefs about systems that care for and support learners**

1. All learners must have equitable access to a quality education.
2. All learners deserve to participate in learning systems where programs are mutually reinforcing and interdependent and where learning is related to life applications.
3. All learners must discover that school is part of a broader set of community resources they must access for learning and for achieving success in life.
4. All school programs must be developed in cooperative with family, business, labor and community representatives.
5. All staff must be accountable to ensure that all learners have the opportunity to establish and reach their goals.

**RENTON SCHOOL DISTRICT NO.403**  
**Renton, Washington**

**CAREER AND LIFE SKILLS EDUCATION**

Renton School District #403 operates a comprehensive Career and Life Skills Education Program through its four comprehensive high schools and two alternative programs. The district also participates in two countywide Tech Prep consortia with local community and technical colleges. This partnership allows students to earn college credit while still enrolled in high school programs. Secondary and post-secondary curricula are coordinated and students master and achieve skills, concepts, and technical competencies in high school that articulate with college programs. Students earn credit towards high school graduation and college technical programs at their home high schools.

The focus has changed in recent years from an emphasis on only job preparation to one of career exploration and exposure. While skill development and employment readiness is still a primary goal, emphasis has been placed on career exploration, career pathway preparation, and post-secondary articulation.

The **Family and Consumer Science Education Program** is offered at Hazen, Lindbergh, Renton, and Black River High Schools. The program is comprised of the following: Careers in Education; Careers with Children; Children & Parenting; Design; Eating Well/Creative Foods; Exploring Early Childhood and Exploring Early Childhood/Work Experience; Family Health; Health Club; Independent Living; Personal Choices; Teen Parenting/GRADS; and American Sign Language. School district and community sites provide applied workbased learning opportunities for program students.

The **Business Education Program** is offered in the District's three comprehensive high schools and at the Sartori Learning Center. The program consists of technical business related classes sequentially arranged into a course of instruction leading to a Certificate of Proficiency or Mastery to facilitate job placement or post secondary articulation. These courses are as follows: Business Communications; Business Connections 1-2; Business Connections Work Experience 1-2; Business law; Business Management; Computer Applications; Electronic Math Applications; Information Processing; Machine Transcription; Principles of Business; Recordkeeping; Word Processing 1-2; and Advance Word Processing. The Business Connections Workbased Learning component provides actual related job experience through workstations in the community. Business programs are often arranged and blocked with language arts programs to support program integration and technology use in the writing process.

A comprehensive **Workbased Learning Program** is offered in all of the facilities in the Renton School District. This program couples on-the-job experience and related classroom training to prepare students for employment during and beyond high school. The **Marketing Education** and **Diversified Occupations Programs** provide students the opportunity to combine related classroom instruction and paid work experience to earn high

school credit. These programs assist and support students as they make the transition from school to work. **Volunteer experiences, Internships, Job Shadows, and Service Learning** are also strong components of this community based applied experiences.

The community also plays a vital role in other programs offered through the Renton School District. The **Health Careers/ Sciences Program** is reliant on clinical training stations and coordinated work experiences for students through local convalescent centers, nursing facilities, and community hospitals. This program is offered to all students in the Renton School District but operates only at Hazen High School.

**Technology Education Programs** are offered at all three comprehensive high school facilities, and the Sartori Education Center. These programs are often integrated with the Science and Math departments to support applied learning and the development of technical skills and competencies for all students. Courses in this department are: Automotive Service Technician 1-2; CAD & Computer Graphics 1-2; Computer Graphics and Communications Related Careers 1-2; Electronics and Related Careers 1-2; Engineering Drafting and Related 1-2; Fundamentals of Networking Technology 1-2; Light Duty Mechanics and related Careers 1-2; Materials Science and Technology 1-2; Metalworking, Construction, Maintenance and Related Careers 1-2; Power and Energy 1-2; Principles of Technology 1-2; Video Production 1-2; Woodworking, and Construction, Maintenance and Related Careers.

Integrated instruction has been the focus of the Career and Life Skills instructional team for the past several years and the results can be seen throughout the program in each of the secondary schools. Several programs have been launched and are operating very successfully in all of the secondary sites. While these programs qualify for vocational funding, the district has made the commitment to operate them in collaboratively with a related academic instructor. These **Applied Vocationally Approved Programs** are titled: Applied Communications; Applied Mathematics; Material Science Technology; and Principles of Technology.

Renton School District has made a commitment to provide vocational training and job preparation opportunities for Special Needs students in addition to mainstreaming them, when appropriate. In order to have enough students to allow several offerings, the district has entered into interdistrict cooperative agreements with surrounding districts to accept students on a space available basis. There are four such **special programs**: **Building Maintenance** operates at the Sartori Learning Center and the **Career Ladders/Community Classroom** is offered at Valley Medical Center. The **Horticulture/Landscape Design 1-2 Program** is operated at Black River High School and **Health Careers** section is located at Hazen High School.

The district is also a partner in the Vocational/Special Education consortium of King County School Districts. The primary purpose of this participation is to make Vocational-Technical Education more accessible to persons with disabilities, provide additional inservice opportunities to all instructors and support to vocational instructors as they provide applied learning opportunities to special needs students.

**PRINCIPLES OF TECHNOLOGY 3 & 4/ROBOTICS**  
**Program Goals**

Provide an opportunity for students to acquire an understanding of the relationship between science and technology to everyday living and various occupations.

To familiarize students with standard manufacturing tools and a variety of materials.

Provide an opportunity for students to develop skills in time management, teamwork, self-direction, and self-evaluation.

Build students' self-confidence and positive attitude through success in a series of increasingly challenging experiences.

Provide an opportunity to develop logical and creative thinking in science and technology.

## **PRINCIPLES OF TECHNOLOGY 3 & 4/ROBOTICS Program Standards**

In order for the Robotics program to be more effective, teachers will give specific consideration to:

1. Placing an emphasis on lab/shop safety.
2. Treating the stated objectives as minimal expectations for each project.
3. Encourage neatness, legibility, creativity and craftsmanship.
4. Require student to correct their errors.
5. Require students to plan, prototype, manufacture and evaluate each project.
6. Keep current records of student progress.

## **PRINCIPLES OF TECHNOLOGY 3 & 4/ROBOTICS**

### **History**

In 1995 a course called Principles of Technology was instituted in the Renton School District. This class was developed to integrate the teaching of science and technology into a unified subject and to emphasize their applications. The class was team-taught by a technology teacher and a science teacher. As teachers became more experienced with the material of the class it became apparent that many supplementary projects were required to keep student interest level high. It was evident that most students were enrolling in the class because of its project nature. Many students had already completed a year of physics and knew most of the theory. The class became an opportunity for them to learn about and to explore the possibilities of an area unknown to most of them – the technology laboratory. As the students learned how to use the tools and materials available, they were challenged by more complex projects, which required a greater combination of both theory and technology to solve. The class culminated with a robotics contest, which has grown in size each year. The contest requires an entire quarter of dedicated work by the students. Students were taking Principles of Technology just for the opportunity to participate in the robot contest. The teaching team and associated departments decided to develop a class, which concentrated on robots – their design and construction.

A team was formed to develop the proposed curriculum and the material have been reviewed and endorsed by the related articulation committee, program advisory committee, and the Renton School District Workforce Training and Transition Advisory Council. The development and implementation of this program is also noted the District-wide Plan for Vocational-Technical Education and is consistent with like programs offered through the Career and Life Skills Department. This program will also articulate with ongoing collaborative efforts between the RSD and local community and technical colleges.

**PRINCIPLES OF TECHNOLOGY 3 & 4/ROBOTICS**  
**Washington State Essential Academic Learning Requirements**

<b>PRINCIPLES OF TECHNOLOGY 3 &amp; 4/ROBOTICS</b>						
This Career and Life Skills course supports the Washington State Essential Academic Learning Requirements.						
<b>COURSE OBJECTIVES:</b>	<b>ART</b>	<b>COMMUNICATION</b>	<b>MATHEMATICS</b>	<b>SCIENCE</b>	<b>WRITING</b>	<b>READING</b>
<b>Unit 1:</b> Introduction to Robotics	*	*	*	*	*	*
<b>Unit 2:</b> Industrial Safety	*	*	*	*	*	*
<b>Unit 3:</b> Introduction to Metal Shop Tools and Equipment	*	*	*	*	*	*
<b>Unit 4:</b> Introduction to Wood Shop Tools and Equipment	*	*	*	*	*	*
<b>Unit 5:</b> Introduction to Electricity	*	*	*	*	*	*
<b>Unit 6:</b> Introduction to Sumo Wrestling Robots	*	*	*	*	*	*
<b>Unit 7:</b> Programming Robotic Arm	*	*	*	*	*	*
<b>Unit 8:</b> Lego Robot	*	*	*	*	*	*
<b>Unit 9:</b> Six Legged Walking Robot	*	*	*	*	*	*
<b>Unit 10:</b> Basic Electronics	*	*	*	*	*	*
<b>Unit 11:</b> Digital Electronics	*	*	*	*	*	*
<b>Unit 12:</b> Electronic Robotics	*	*	*	*	*	*
<b>Unit 13:</b> Mechanical Devices	*	*	*	*	*	*
<b>Unit 14:</b> Gears and Moving Objects	*	*	*	*	*	*
<b>Unit 15:</b> CAD Drafting	*	*	*	*	*	*
<b>Unit 16:</b> Regional Robotics Competition	*	*	*	*	*	*

## **PRINCIPLES OF TECHNOLOGY 3 & 4/ROBOTICS**

### **Objectives**

Each objective is preceded by the statement, “The intent of instruction is that the student will:

#### **Group Dynamics and Communications**

1. Identify the principles and skills of good teamwork.
2. Recognize the difference between a team environment workplace and a conventional workplace.
3. Identify interpersonal characteristics of a team player.
4. Demonstrate the characteristics of a team player.
5. Contrast the role of a team with the role of an individual.
6. Identify good personal ethical characteristics and behaviors.
7. Define discrimination, harassment, and equality.
8. Demonstrate nondiscriminatory behavior.
9. Explain the value of applying a problem-solving system.
10. Apply a system of problem-solving.
11. Identify opportunities for applying problem-solving techniques.
12. Distinguish between the roles of a team member and team leader.
13. Perform techniques used as a team member.
14. Perform techniques used as a team leader.
15. Apply group dynamic principles to manufacturing situations.
16. Communicate beyond the work group.
17. Identify possible electronic communication uses.
18. Explain the effect of electronic communications versus other communication methods.
19. Select appropriate communications methods.
20. List the characteristics of a good group leader.
21. Identify various group processes.
22. Identify components of group dynamics.
23. Demonstrate group leadership and facilitation skills.
24. List the steps of specific manufacturing processes.
25. Write in complete sentences.
26. Use correct punctuation.
27. Use corrects spelling.
28. Write with accuracy, brevity, and clarity.
29. Organize material with a logical flow.
30. Organize an oral presentation.
31. Demonstrate good speaking characteristics.
32. Demonstrate appropriate presentation demeanor.
33. Interpret and clarify specifications prepared by others.
34. Communicate with customer to clearly define requirements.

## **Measurement**

1. Match measurement activities to manufacturing process.
2. Select & use appropriate measurement techniques and instruments.
3. Describe measurement's role in manufacturing.
4. Distinguish between direct and calculated measurements.
5. Compute calculated measurements.
6. Demonstrate general measurement techniques.
7. Demonstrate semi-precision measurement techniques.
8. Justify the use of precision measurements in manufacturing.
9. Match appropriate measurement tools with various types of measurement requirements.
10. Demonstrate proper measurement tool usage.
11. State selection criteria for measurement tools.
12. Convert between USCS and metric measurement systems.
13. Convert fractional measurements to decimal measurements.
14. Compute within measurement systems.
15. Explain the function of measurement tools.
16. Justify the use of particular measurement tools based on characteristics.
17. Perform measurements.
18. Document results of measurements and calculations.
19. Interpret results of measurements and calculations.
20. List steps of proper measurement procedures.
21. Explain rationale for each step.
23. Identify error possibilities in measurement tool selection.
24. Identify common conversion error possibilities.
25. Define measurement.
26. Distinguish between general and precision measurements.
27. Distinguish between USCS and metric measurement systems.
28. Compare and contrast different measuring systems and techniques.
29. Select measuring system and procedures based on system characteristics.

## **Safety and Health**

1. Assume responsibility for the personal safety of self and others.
2. Maintain a clean and safe work environment.
3. Develop a personal attitude towards safety.
4. Comply with established safety practices.
5. Complete forms/paperwork as required.
6. Wear protective safety clothing and equipment as required.
7. Maintain and use protective guards and equipment on machinery.
8. Locate and properly use protective equipment.
9. Handle/store flammable materials appropriately.
10. Correctly use multiple energy sources (air, fluids gravity, etc.) and lock-out, tag-out procedures.
11. Recognize/identify elect hazards (i.e., defective outlets, "burning" odors, etc.)

12. Prevent spontaneous ignition by practicing proper waste disposal habits.
13. Keep marked aisles clear of equipment and materials.
14. Interpret/display MSDS sheet as required.
15. Identify fire exits and fire-fighting equipment.
16. Report unsafe practices to appropriate personnel.
17. Operate equipment in a safe, prescribed manner.
18. Locate power shutoff controls for all machinery/equipment.
19. Maintain strict quality control standards throughout the forming, separating, and combining processes.
20. Inspect material, equipment, and fixtures for defects and report malfunctions to appropriate person.
21. Determine weight/operating limits of equipment.
22. Perform periodic checks during operation to assure proper function.
23. Notify appropriate personnel of injury.
24. Check and evaluate life-endangering conditions.
25. Define the types of hazards (chemical, biological and physical).
26. Evaluate and determine hazards.
27. Meet health, safety, and legal requirements with regard to process, product and people.

### **Quality Assurance**

1. Understand goals for quality application.
2. Integrate improvement processes.
3. Analyze and interpret test data for compliance with specifications.
4. Correct production process (if indicated by analysis of the data).
5. Monitor process improvement.
6. Identify customer problems.
7. Determine causes of the problem.
8. Apply problem-solving skills and tools.
9. Recommend possible solutions.

### **Print Interpretation**

1. Explain basic blueprint terminology.
2. Identify the types of dimensions.
3. List the essential components found in the general drawing notes.
4. Identify the types of lines within a drawing.
5. Locate bill of materials in a drawing.
6. Identify orthographic views.
7. Identify isometric views.
8. List the steps in making an isometric sketch.
9. Identify position of views (top, front, side and auxiliary).
10. Visualize one or more views from a given view.
11. Determine the scale of the view or a section.
12. Verify scale against engineer's scale rule to determine accuracy.

### **Shop Skills**

1. Perform the basic arithmetic functions.
2. Translate into dollar cost/value.
3. Utilize hand calculators.
4. Calculate with percents, rate, ration, and proportion.
5. Make reasonable estimates of arithmetic results, determine averages, etc.
6. Possess basic mechanical skills.
7. Possess standard machine tool operating skills.
8. Inspect machinery and equipment.
9. Interpret safety manual directives.
10. Follow established safety procedures when around machinery equipment.
11. Describe the importance of correct fixtures.
12. Design and create fixtures.
13. Follow established safety procedures when using machine tools.
14. Identify a variety of common machine equipment and machine tools.
15. Describe the function of specific machine tools.
16. Inspect tools for defects.
17. Maintain company-provided tools.
18. Locate and retrieve production materials specific to process flow and delivery schedule.
19. Receive and communicate process flow instructions and delivery schedules.
20. Prepare resources for production.
21. Operate hand tools in a safe, prescribed manner.
22. Inspect tools for defects.
23. Maintain company provided tools.
24. Lay out a part for cutting and drilling.
25. Interpret prints to determine appropriate tool usage.
26. Interpret drawings/schematics.
27. Follow electrical troubleshooting procedures.
28. Use appropriate equipment to monitor power supply.
29. Differentiate between types of tools.
30. Identify the function of each tool.
31. List the common properties of metal.
32. Identify types of work-saving devices utilized in manufacturing.
33. Describe scenarios in which work saving devices can be utilized.

### **Business Management and Manufacturing Com**

1. List possible computer applications in manufacturing processes.
2. Analyze the effect of introducing computers into manufacturing processes.
3. Determine the impact on manufacturing personnel when computers are introduced.
4. List computer software programs used in manufacturing processes.
5. Demonstrate proficiency in listed software.
6. Utilize an industry-accepted work processing software package.
7. Utilize an industry-accepted graphic software package.
8. Explain the importance of a master schedule for a manufacturing process.
9. Develop a master schedule for a manufacturing process.

### **Product and Process Control**

1. List the steps involved to bring a production from the design stage to production.
2. Create a project plan.
3. Develop a process plan.
4. Obtain and store materials needed to ensure continuity of workflow.
5. Identify some of the factors that should be considered when designing products and processes.

## **PRINCIPLES OF TECHNOLOGY 3 & 4/ROBOTICS**

### **Scope and Sequence**

#### **A. Industrial Safety**

1. Hand Tool Usage
2. Machine Tool and Power Equipment Use and Operation
3. Compressed Air
4. General Laboratory Safety
5. Equipment Maintenance
6. Material Handling
7. Hazardous Material Handling, Storage, and Disposal

#### **B. Measurement**

1. Rulers
2. Gauges
3. Micrometers
4. Vernier Calipers

#### **C. Design**

1. Sketching
2. Mechanical Drawing
3. Computer Aided Drafting

#### **D. Metalworking, Machining, and Related Processes**

1. Sheet Metal, Cold Metal and Forming Processes
2. Fasteners and Joining Materials
3. Hot Metals and Related Processes
4. Milling and turning Materials

#### **E. Woodworking, Composites, and Related Processes**

1. Material Procurement, Layout, and Design
2. Power Equipment and Processes
3. Fasteners and Joining Materials

#### **F. Power and Energy Transmission**

1. Mechanical
2. Fluid
3. Electrical
4. Thermal

#### **G. Electrical Systems**

1. Safety
2. Electricity Generation
3. Direct and Alternating Current

## H. Introduction to Robotics

1. Industrial Robots
2. Computerized Numerical Control
3. Programmable Arms
4. Walking and Transporting Equipment
5. Design, Maintenance, and Troubleshooting

## **PRINCIPLES OF TECHNOLOGY 3 & 4/ROBOTICS**

### **Course Overview**

Robotics is a two semester interdisciplinary elective course for juniors and seniors who have successfully completed at least one year of Physics I, II or Principles of Technology. Students may receive credit in either science or vocational/occupational areas.

Robotics is a part of an integrated curriculum, which incorporates elements of science and technology, design, building, teamwork, and competition. Students will learn how to take an initial idea through the design, development, construction, and evaluation cycle. Specific skills will be gained in brainstorming, teamwork and team building, computer design, prototyping, construction, and self-evaluation. Students will learn to safely integrate processes and operate various manufacturing tools and equipment during project construction.

The target audience will be students interested in technology, science, and engineering who wish to extend their knowledge and apply basic concepts in science and technology. The course is appropriate for students who have completed physics or principles of technology. The curriculum emphasizes applied learning, and infuses multi-disciplinary ideas, which more accurately reflect the learning and working environments students will encounter in the world of business and industry.

The activities that students will experience are interdisciplinary and are facilitated by a team of teachers. It is expected that students will spend the majority of their time working on projects and processes of increasing complexity. Each teacher will use a wide range of teaching styles that will include, but not be limited to, lecture, laboratory experiences including work in the technology laboratory, discussion, teamwork, research through various media and written work. Projects may include robotic arms; computer interfaced mechanical/electronic systems, computer/robotic programming, compressed air generators, “sumo-wrestling” robots, and walking robots. The final project/contest affords students the opportunity to test their creativity, knowledge, and skill at a regional/national level. No single text will be used.

## **PRINCIPLES OF TECHNOLOGY 3 & 4/ROBOTICS**

### **Student Projects**

Robotics is designed to provide students with a background in applied physics and technology by having them complete a series of increasingly complex projects related to robots.

The Projects may include

- Sumo wrestling robots (synthesis of the previous projects)
- Robot arms (computer programming)
- Computer controlled robots (electronics and computer programming)
- Walking robots (combining previous knowledge)
- Regional robotic contest (culminating project)

All projects demand that the students learn to be creative in developing their ideas, managing their time and troubleshooting their problems.

**PRINCIPLES OF TECHNOLOGY 3 & 4/ROBOTICS**  
**Instructional Materials**

Robotics, Douglas R. Malcolm, Jr. Delmar Publishing, Inc.

Industrial Electronics, Humphries, James T. and Sheets, Leslie P., Delmar Publishing, Inc.

Principles of Technology, Cord Communications, copyright 1993

**PRINCIPLES OF TECHNOLOGY 3 & 4/ROBOTICS**  
**Evaluation**

The following criteria are applicable in the total evaluation of student progress:

1. Student performance in the shop and laboratory.
2. Creative solutions to the assigned projects.
3. Project reporting techniques.
4. Class participation
5. Performance in the project competitions.