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ABSTRACT

A project was conducted to review industrial arts curriculum needs and to formulate recommendations relative to curriculum revision in Louisiana. The state was divided into three regions for administrative purposes. A needs assessment instrument was developed and mailed to each industrial arts teacher in the state (as of 1979), with a 50 percent return rate. The questionnaire gathered data relative to three areas of the program: profile of industrial arts teachers in Louisiana; examination of program status and need by grade level and subject area; and provision of selected information relative to the role of industrial arts in the public schools of Louisiana. As a result of examination of data gathered through the questionnaire, a rationale for industrial arts in Louisiana, goals for industrial arts on each grade level, course titles, a program model and a flowchart for industrial arts course sequencing were developed. In addition, basic outlines of selected courses were developed by regional centers; work on this phase of the project is continuing. (The bulk of this document contains course outlines, including course descriptions, target grade level, prerequisites, and course content for industrial arts courses.) (KC)

STATE OF LOUISIANA

DEPARTMENT OF EDUCATION

BULLETIN NO. 1687

# FINAL REPORT

# LOUISIANA INDUSTRIAL ARTS CURRICULUM PROJECT

# PHASE I

Issued by

Office of Vocational Education

N. J. Stafford, Jr., Ed.D.
Assistant Superintendent

J. KELLY NIX
State Superintendent

## Foreword

This publication is a guide for the improvement of instruction in Industrial Arts Education for the State of Louisiana. It should be of benefit to industrial arts teachers, supervisors, counselors, and administrators. These operational guidelines will help local administrators, teacher educators, and industrial arts teachers to determine the extent to which their programs are meeting the needs of our youth. Industrial Arts Education Programs must be organized to meet the needs of all students.

A constant concern for educators is the construction and revision of curriculum. Industry and technology are the core of industrial arts instruction. Both are constantly changing; therefore, curriculum and instruction must change in order to provide students a realistic and accurate understanding of industry and its function in our complex technological society.

J. Kelly Nix
State Superintendent of Education

ACKNOWLEDGEMENTS

This publication represents the cooperative efforts of personnel in the Louisiana Industrial Arts Association and the Industrial Arts Section in the Office of Vocational Education, Louisiana State Department of Education. Special recognition goes to Dr. Thomas Eppler, Northwestern State University, Regional Co-Director; Dr. Vincent F. Kuetemeyer, Louisiana State University, Regional Co-Director; Mr. Thomas Landry, University of Southwestern Louisiana, Regional Co-Director; and Dr. James W. Trott, Louisiana State University, Project Coordinator-Director who served as Project Director in the development of the guide. Special commendation goes also to members of the writing team who worked diligently to make this publication a reality.

The following teachers spent many hours writing, field testing, and finalizing these guidelines. They teach in all sizes of schools and in all areas of the state. They are: Tom Dixon, Jeff Laughlin, Charles Johnson, Lazarus Grogan, Jr., Meryland Robinson, Donald T. Saunier, Sidney J. Sanders, Dan Berard, Eric W. Moss, William G. Hickman, Joseph Ledet, Charles G. Chauvin, Raphael N. Songy, Michael Beauvais, Mike Noble, H. Carl Schaff, and Octave Bernard.

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FINAL REPORT PHASE I

LOUISIANA INDUSTRIAL ARTS CURRICULUM PROJECT

In response to a request from the Louisiana State Department of Education, Louisiana State University, Northwestern State University, and the University of Southwestern Louisiana developed a joint proposal for conducting a comprehensive review of curriculum needs and to formulate recommendations relative to curriculum revision. A curriculum review of this size had not been attempted since the early 1970's.

The project, as proposed, would divide the state into three geographical regions, each to be served by a regional center housed at the cooperating institutions.

| Portion of the State | University |
|---|---|
| North | Northwestern State |
| West Central | Southwestern |
| East Central | LSU - Baton Rouge |

Louisiana State University, Baton Rouge, would act as the primary grantee and fiscal agent for the project.

In an effort to ensure a comprehensive examination of curriculum needs, every effort was made to involve all parties having an interest and role in industrial arts education in Louisiana. A series of meetings was set up to gather input at various locations around the state. The results of these meetings are summarized elsewhere in this report. The discussion that follows is presented in the order that the topics and enablers were presented in the proposal.

Step 1 - The Development of a Needs Assessment Instrument

1a. Review of related literature

A review of available data bases was conducted in an effort to determine what work, if any, had been done previously in this area. The search focused on grades 6-12 in the area of industrial arts. The only significant work in progress was the Standards for Industrial Arts Project which is being conducted by Virginia Polytechnic Institute and State University under contract to the U.S. Office of Education. The Standards Project is designed to be an update and extension of the Schmitt-Pelley study of the early 1960's.

Needs assessment instruments that could be directly used in the Louisiana Project did not exist. A needs assessment instrument was, therefore, developed by the project staff. The instrument gathered data related to three specific areas of the program:

1. Profile of industrial arts teachers in Louisiana.
2. Examination of program status and need by grade level and subject area.
3. Provision of selected information relative to the role of industrial arts in the public schools of Louisiana.

The finished instrument was reviewed by professionals for comments and suggestion prior to statewide administration. The Department of Experimental Statistics at LSU assisted in developing a data management system for the study. A copy of the instrument was mailed to each industrial arts teacher of record as of the 1979 reporting year. The reporting year was based on data from the State Department of Education reports from the LEAs. A final return rate of slightly less than 50% was realized. This figure includes instruments that were received after the cut-off date or those returns that were not usable due to missing or incomplete data.

Question 1 identified the geographical region of the state in which the respondent was teaching. Percentage by reporting region is outlined

below:

| | |
|---|---|
| North | 20% |
| South | 27% |
| East | 47% |
| invalid | 6% |
| | 100% |

The apparently high percentage of respondents in the eastern portion of the state can, to some degree, be attributed to the large population centers present in that area.

Question 2 profiled the grade levels at which the respondent was currently teaching. Thirteen percent indicated that they taught exclusively grades 6-7-8 while 20% indicated that they taught at grades 9-10 with an additional 20% reporting grades 11-12. Combinations of the three groupings listed accounted for 39% of the respondents. No effort was made to determine what types of combinations existed..

Question #2 "What grade levels do you currently teach?"

Table 2

Distribution by Grade Levels Taught

| Grade Level | N | Percent |
|---|---|---|
| 6-7-8 | 22 | 22 |
| 9-10 | 33 | 20 |
| 11-12 | 34 | 20 |
| Combinations of above | 66 | 38 |
| Invalid | 13 | 8 |

For question 2, it is not possible to determine exactly how the combinations are made.

Question #3 "Number of years of industrial arts teaching experience."

Table 3

Years of Industrial Arts Teaching Experience

| Years of Experience | N | Percent |
|---|---|---|
| 1 | 5 | 3 |
| 2-4 | 26 | 15 |
| 5-8 | 24 | 14 |
| 9-10 | 18 | 11 |
| Over 10 | 91 | 54 |
| Invalid | 4 | 3 |

No specific data were generated relative to how many teachers are near retirement age. However, many LEAs are indicating a high percentage of industrial arts personnel near retirement (within 5 years).

Question four related to the highest degree currently held by the respondent. Data for this question are presented in Table 4.

Table 4

Highest Degree Held

| Degree | N | Percent |
|---|---|---|
| Bachelors | 71 | 42 |
| Masters | 37 | 22 |
| Masters Plus | 45 | 27 |
| Doctorate | 6 | 3.5 |
| Invalid | 9 | 5.5 |

A compilation of Certification data is maintained by State Departments of Education. This information was compiled on a National basis by the Standards for Industrial Arts project. The project reported that for the period 1977-78, 97.8% of the employed Industrial Arts teachers were fully certified by the standards of their state. Only 1.1% held temporary certification while 1.1% held no valid Industrial Arts credentials. A similar random sample of 1,872 industrial arts programs nationally indicates that 3.3% of the employed industrial arts teachers held no degree. The study reported that 52% of the industrial arts teachers held a master's degree. Approximately 2% had work past the master's degree but short of a doctorate, while .2% reportedly held a terminal degree.

Louisiana's data indicate that 91.5% of the respondents hold full certification, compared to a national sample of 93.7%. The national sample study indicated that 6.4% were not fully certified, compared to a figure of 6.5% for the respondents in the Louisiana study.

The second section of the study examined industrial arts program status and needs. Grade levels were broken down into three groups: 6-7-8, 9-10, and 11-12. Within each group, possible content was listed by 13 common designations, which have become widely accepted at both the state and national levels.

Tables five, six, and seven show median response values as well as Spearman r's for pairs of questions for each subject area. In all cases a value of 1 indicates the need for less emphasis with an increasing emphasis up to a maximum value of 4.

Grades 6-7-8

| Subject | As Is | Should be | Sr |
|---|---|---|---|
| Woodworking | 2.0 | 3.0 | +.29 |
| Metalworking | 1.0 | 2.0 | +.38 |
| Electricity | 1.0 | 2.0 | +.41 |
| Electronics | 1.0 | 2.0 | +.40 |
| Power Mechanics | 1.0 | 2.0 | +.54 |
| Graphic Arts | 1.0 | 2.0 | +.39 |
| Drafting | 2.0 | 3.0 | +.50 |
| Crafts | 2.0 | 3.0 | +.38 |
| Manufacturing | 2.0 | 3.0 | +.32 |
| Construction | 2.0 | 3.0 | +.29 |
| Graphic Communications | 1.0 | 2.0 | +.29 |
| Power and Transportation | 1.0 | 2.0 | +.36 |

Grades 9-10

| Subject | As Is | Should be | Sr |
|---|---|---|---|
| Woodworking | 3.0 | 3.0 | +.23 |
| Metalworking | 2.0 | 3.0 | +.40 |
| Electricity | 2.0 | 3.0 | +.21 |
| Electronics | 2.0 | 3.0 | +.33 |
| Power Mechanics | 2.0 | 3.0 | +.21 |
| Graphic Arts | 2.0 | 2.0 | +.40 |
| Drafting | 3.0 | 3.0 | +.38 |
| Crafts | 2.0 | 2.0 | +.42 |
| Manufacturing | 2.0 | 2.0 | +.47 |
| Construction | 2.0 | 2.0 | +.30 |
| Power and Transportation | 2.0 | 2.0 | +.42 |

Grades 11-12

| Subject | As Is | Should be | Sr |
|---|---|---|---|
| Woodworking | 3.0 | 3.0 | +.13 |
| Metalworking | 2.0 | 3.0 | +.26 |
| Electricity | 2.0 | 3.0 | +.25 |
| Electronics | 2.0 | 3.0 | +.30 |
| Power Mechanics | 2.0 | 3.0 | +.37 |
| Graphic Arts | 2.0 | 3.0 | +.29 |
| Drafting | 3.0 | 4.0 | +.27 |
| Crafts | 1.0 | 2.0 | +.37 |
| Manufacturing | 1.0 | 2.0 | +.57 |
| Construction | 2.0 | 3.0 | +.49 |
| Graphic Communications | 1.0 | 2.0 | +.51 |
| Power and Transportation | 2.0 | 3.0 | +.56 |

One question dealt with course structure at the middle grades, specifically if middle grades programs could be successfully organized around the four clusters of manufacturing, construction, power/transportation, and communications. Seventy-four percent of the respondents indicated that such an organizational pattern was acceptable for the middle grades.

The next group of questions dealt with the relationship of the industrial arts program to the overall school program. One question dealt with the adequacy of the industrial arts physical facility. The responses to this question were rather evenly distributed among the four response areas with a very slight emphasis in the "mildly agree" range indicating a "generally adequate facility." The second question dealt with the adequacy of tools and equipment provided. Thirty-eight percent of the respondents indicated that the levels of equipping was less than needed with only 22% indicating that their levels of equipping were generally adequate. In a related question, 66% of the respondents indicated that many of the hand and power tools in their program were in need of replacement.

Three questions were asked relating to budgetary conditions. Sixty percent of the respondents indicated that they had no set supply budget for the school year. Of this number it is suspected that some of the programs have a base figure from which to work with the possibility of additional moneys as the funds are available or as the need arises. On the other hand, 58% indicated that the amount of money allocated for the industrial arts program was inadequate in terms of supporting the type of program conducted. About 50% of the respondents indicated agreement with the statement "I do not teach what I need to be teaching because of an inadequate supply of money."

Five questions focused on the industrial arts programs as a part of the total school program. Sixty-two percent of the teachers responding indicated a feeling that their administration had an adequate understanding of the role of the industrial arts program in the school. Sixty-two percent of the teachers indicated that they were consulted by their administration when decisions that affected their programs were made. A full 66% indicated strong agreement that a local plan for industrial arts should be an essential element in developing a quality program. However, only 40% indicated that any type of local plan for industrial arts currently existed in their system. No attempt was made to determine the completeness of such a plan when the presence of such a plan was indicated. Ninety-two percent of the respondents indicated that if a state or local plan for industrial arts were available that they would use it in their programs.

INSTRUMENT

School of Vocational Education
College of Agriculture

LOUISIANA STATE UNIVERSITY AND AGRICULTURAL AND MECHANICAL COLLEGE
BATON ROUGE · LOUISIANA · 70803

Dear Fellow Industrial Arts Educators:

As many of you know, the industrial arts profession in Louisiana is beginning a curriculum development project that is designed to produce a State Plan for industrial arts in Louisiana. We need the help of all industrial arts professionals in the State. The enclosed questionnaire is the first step in getting this project under way. Will you please complete it and return the answer sheet in the enclosed postage-paid envelope.

You should be hearing from one of the regional co-directors of the project concerning regional meetings for your area of the State in the near future. When you do hear, please consider it a personal invitation to become involved. Your help is needed.

Sincerely,

James W. Trott, Jr.
Project Director



Extension and International Education Department • Industrial and Technical Education Department • Vocational Agricultural Education Department
Vocational Home Economics Education Department

LOUISIANA INDUSTRIAL ARTS CURRICULUM PROJECT
INDUSTRIAL ARTS PROGRAM SURVEY

The following questionnaire will provide needed information for the Louisiana Industrial Arts Curriculum Project. Please help by completing the questionnaire and returning it soon in the enclosed postage-paid envelope. Due to the large number of forms that we will be receiving, we are using a separate answer sheet. Please mark your answers in black pencil only. Pen, etc. will not be read by the machine. Question numbers on the question sheet correspond to the numbered answer spaces on the separate answer sheet. For some questions, more than one answer may be required.

Example: "In which region of the State do you work? A, B, or C?" (see attached map)

| | | | | | |
|---|---|---|---|---|---|
| 1. | A | B | C | D | E |
| | 0 | 0 | 0 | 0 | 0 |

Darken in the proper circle.

1. In which region of the State do you work? (see attached map)

   A B C

2. At what grade level(s) do you currently teach?

   A. 6-7-8 B. 9-10 C. 11-12

3. How many years of industrial arts teaching experience do you have?

   A. 1 year B. 2-4 years C. 5-8 years D. 8-10 years
   E. over 10 years

4. Please indicate the highest degree held.

   A. B.S. B. M.S. C. Master's Plus D. Ed.D. or Ph.D.

5. Please indicate the types of teaching certificates held.

   A. "A" B. "B" C. "C" D. "T"

Questions 6-83 seek your opinion about industrial arts programs in Louisiana's schools. For each question you will be provided with a choice of letters (A, B, C, D). The letters stand for the following:

A. very great emphasis
B. great emphasis
C. moderate emphasis
D. little emphasis

The programs are divided into three groups: Grades 6-7-8, grades 9-10, and grades 11-12. For each grade group, 12 content areas are listed plus an "other" blank so you can add an area that has either been left out or is not covered as a part of one of the 12. For each content area you are asked to make two responses. The first response (even-numbered questions) should indicate your opinion as to how much emphasis the area is currently getting as a part of industrial arts programs in Louisiana. The second response (odd-numbered questions) should reflect how much emphasis you feel each area should receive as a part of industrial arts programs in Louisiana.

EXAMPLE:

| | Now | Should |
|---|---|---|
| Grades 6-7-8 Woodworking | (6) A B C D | (7) A B C D |

If you believe that woodworking on the 6-7-8th grade level is now receiving only moderate emphasis, then you should darken in the (C) for question 6 on your answer sheet. If you also believe that woodworking should be receiving great emphasis, then you should darken in the (B) on the answer sheet for question number 7. If you wish to respond to the "other" item for a particular grade level, please do this on a separate sheet of paper and include it with your answer sheet.

| | Situation as you see it now exists | Situation as you feel it should be |
|---|---|---|
| GRADES 6-7-8 | | |
| Woodworking | (6) A B C D | (7) A B C D |
| Metalworking | (8) A B C D | (9) A B C D |
| Electricity | (10 A B C D | (11) A B C D |
| Electronics | (12) A B C D | (13) A B C D |
| Power Mechanics | (14) A B C D | (15) A B C D |
| Graphic Arts | (16) A B C D | (17) A B C D |
| Drafting | (18) A B C D | (19) A B C D |
| Crafts | (20) A B C D | (21) A B C D |
| Manufacturing | (22) A B C D | (23) A B C D |
| Construction | (24) A B C D | (25) A B C D |
| Graphic Communications | (26) A B C D | (27) A B C D |
| Power and Transportation | (28) A B C D | (29) A B C D |
| Other | (30) A B C D | (31) A B C D |

| | Situation as you see it now exists | | | | Situation as you feel it should be | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **GRADES 9-10** | | | | | | | | | |
| Woodworking | (32) | A | B | C | D | (33) | A | B | C | D |
| Metalworking | (34) | A | B | C | D | (35) | A | B | C | D |
| Electricity | (36) | A | B | C | D | (37) | A | B | C | D |
| Electronics | (38) | A | B | C | D | (39) | A | B | C | D |
| Power Mechanics | (40) | A | B | C | D | (41) | A | B | C | D |
| Graphic Arts | (42) | A | B | C | D | (43) | A | B | C | D |
| Drafting | (44) | A | B | C | D | (45) | A | B | C | D |
| Crafts | (46) | A | B | C | D | (47) | A | B | C | D |
| Manufacturing | (48) | A | B | C | D | (49) | A | B | C | D |
| Construction | (50) | A | B | C | D | (51) | A | B | C | D |
| Graphic Communications | (52) | A | B | C | D | (53) | A | B | C | D |
| Power and Transportation | (54) | A | B | C | D | (55) | A | B | C | D |
| Other | (56) | A | B | C | D | (57) | A | B | C | D |
| **GRADES 11-12** | | | | | | | | | |
| Woodworking | (58) | A | B | C | D | (59) | A | B | C | D |
| Metalworking | (60) | A | B | C | D | (61) | A | B | C | D |
| Electricity | (62) | A | B | C | D | (63) | A | B | C | D |
| Electronics | (64) | A | B | C | D | (65) | A | B | C | D |
| Power Mechanics | (66) | A | B | C | D | (67) | A | B | C | D |
| Graphic Arts | (68) | A | B | C | D | (69) | A | B | C | D |
| Drafting | (70) | A | B | C | D | (71) | A | B | C | D |
| Crafts | (72) | A | B | C | D | (73) | A | B | C | D |
| Manufacturing | (74) | A | B | C | D | (75) | A | B | C | D |
| Construction | (76) | A | B | C | D | (77) | A | B | C | D |
| Graphic Communications | (78) | A | B | C | D | (79) | A | B | C | D |
| Power and Transportation | (80) | A | B | C | D | (81) | A | B | C | D |
| Other | (82) | A | B | C | D | (83) | A | B | C | D |

Questions 84-97 ask your opinion on certain issues relating to industrial arts. Mark on the answer sheet the letter choice that best describes the degree to which you agree or disagree with the statement. The letters stand for the following choices:

A. strongly disagree
B. mildly disagree
C. mildly agree
D. strongly agree

The questions are written from a teacher's standpoint. If you are a supervisor, please read the statements to reflect the average situation in the industrial arts programs for which you have responsibility.

84. The building (facility) housing my industrial arts program is adequate in terms of space.

A B C D

85. The amount of equipment and tools in my lab (shop) is generally adequate for my program.

A B C D

86. Many of the hand and power tools in my program are in need of replacement.

A B C D

87. I have no set supply budget for my program.

A B C D

88. My annual supply budget is adequate to support the type of industrial arts program which I presently conduct.

A B C D

89. I do not teach what I need to be teaching because of inadequate supply money.

A B C D

90. My school administration has an adequate understanding of the role of the industrial arts program in my school.

A B C D

91. Our industrial arts department is consulted by the administration concerning decisions that must be made that affect the industrial arts program area.

A B C D

92. Our school/local school system has a school/system wide plan for industrial arts.

A B C D

93. A school/system wide plan for industrial arts is important in developing a quality industrial arts program.

A B C D

94. If a high quality (state/local) industrial arts curriculum plan, that was based on Louisiana's industrial arts needs, was available, I would use it in my program.

A B C D

95. Industrial arts at the junior high/middle grades should emphasize developing student skills in the use of tools.

A B C D

96. Industrial arts at the high school level should emphasize training persons for entering specific jobs.

A B C D

97. Industrial arts at the junior high/middle grades could be successfully organized around broad areas such as construction, manufacturing, etc.

A B C D

## RATIONALE FOR INDUSTRIAL ARTS IN LOUISIANA

Industrial Arts is that segment of the total educational program that provides sequential learner-centered experiences, designed to foster: (a) an understanding of self; (b) an understanding of the economic system and consumer awareness; (c) an awareness of educational and occupational options; (d) an awareness of the managerial, social, historical, and cultural aspects of industry; (e) the development of avocational interests; and (f) the development of basic skills in the proper use of common industrial tools, materials, and processes.

Industrial arts has the obligation to provide programs that: (1) assist in the discovery and development of personal aptitudes, interests, creative technical problem-solving abilities, self-reliance, sound judgment, and resourcefulness; and (2) assist in the development of industrial skills necessary for living in a technical society.

As a component in the total educational program, industrial arts has the responsibility for providing programs that: (1) assist individuals in making informed and meaningful occupational choices in industry and technology; (2) provide occupational information and exploratory experiences pertaining to a broad range of occupations including training requisites, working conditions, salaries or wages, and other relevant information; and (3) prepare students for enrollment in advanced vocational and technical education programs. To this end, industrial arts programs should develop and maintain a close working relationship with such programs.

Students in Louisiana's schools can benefit from industrial arts programs at both the elementary and secondary levels. Regardless of their sex, ability levels, or handicaps, all students can benefit from industrial arts activities, which may motivate them in other studies and which will assist them in preparing for adult roles in a complex technological society.

## GOALS FOR INDUSTRIAL ARTS

In providing a sound program of industrial arts for Louisiana's schools, clear goals are essential to serve as program guides. While the overriding goal of industrial arts is to assist students in developing toward successful adulthood through the development of their socio-economic awareness, their interests, their abilities, and their understanding of industry and technology and their potential as citizens, other supporting goals are listed below:

1. To develop in each student an insight and understanding of industry and the free enterprise system and its relationship to society through a coordinated program of study focusing on the principles and practices of industry.
2. To assist students in developing their talents, aptitudes, interests, and potentials. This as a part of the school's responsibility to assist each student in developing to their fullest potential.
3. To develop in each student an understanding of industrial processes and the practical application of scientific principles.
4. To develop problem-solving abilities related to the materials, processes, and products of industry. The problem-solving approach as applied in industrial arts involves creative thinking and gives the student an opportunity to apply principles and processes of the scientific method, along with supporting activities, to the solution of problems.
5. To develop in each student skills in the proper and safe use of the tools, materials, and machines common to industrial processes. These skills are acquired through planning, construction, and production activities centered around industrial-technical processes and products.

6. To develop in each student attitudes toward career opportunities that will enhance their chances of success as they progress through the career preparation process. To the end that they are able to make informed career decisions resulting in satisfactory and rewarding job selection.

Depending on their content and focus, these six goals are applicable to all grade levels (K-12) and to adult programs and to all segments of the student population, including but not limited to the gifted, the slow learner, and the handicapped. These goals are consistent with and supportive of the roles identified for industrial arts in Title II of PL94-482, The Vocational Education Act of 1976.

GOALS BY GRADE LEVEL-

Industrial arts education programs should be an articulated set of offerings in both vertical and horizontal directions. This will ensure reasonable content progression and program focus.

ELEMENTARY GRADES (K-5 or 6)

Industrial arts education at the elementary grades should consist of basic industrial and technological problem solving activities, which are appropriate to learning experiences of all elementary school children. Each child can benefit from gaining a clearer understanding of our industrial-technological society. Activities involving the use of tools, materials, and processes should be integrated within the basic curriculum of the elementary school.

Specific goals for elementary level industrial arts program should be: (a) to develop in the students an occupational awareness and a positive self-image of themselves as workers, and (b) to develop problem solving abilities, technical awareness, creative abilities and basic skills associated with tools, materials, and processes. Such activities can contribute to the development of logical reasoning powers, psychomotor

skills and cooperative work traits.

MIDDLE SCHOOL/JUNIOR HIGH GRADES-

Industrial Arts at the junior/middle grades should provide a variety of laboratory and classroom experiences with an emphasis on orientation and exploration. The curriculum develops aptitudes, abilities, and interests of students while at the same time developing their appreciation for technical knowledge. Through "hands-on" experiences, students learn about industry and are thereby provided with the skills useful in making informed and meaningful occupational choices. Three primary goals for industrial arts in the middle/junior high grades are:

1. To develop in each student technical competencies, concepts and basic skills common to industrial-technical materials and processes.
2. To develop in each student an awareness of industry and technology and its effect on a changing, evolving society.
3. To provide each student with an opportunity to explore the construction, manufacturing, communication, transportation and other related clusters of industrial activity.

Industrial Arts programs at the middle/junior grades provide students with the opportunity to explore in a "hands-on" way many of the occupational areas associated with industry. This type of activity can be invaluable as students seek to determine those areas that are consistent with their interests and abilities.

SENIOR HIGH SCHOOL-

Industrial arts at the senior high school level provides concentrated and somewhat specialized technical courses designed to meet the industrially related consumer needs of secondary students as well as preparing students

for enrollment in advanced vocational-technical programs. High school programs may use combinations of general and unit organization as a part of their delivery system. At this level elective options are important because they help students to expand their career awareness, technological literacy, consumer skills, and skills and knowledges related to the world of work. Such options play a significant role in assisting students in making job related decisions as they progress through the formal education system. Students in the upper grades evidence a wide range of interests, abilities, and life goals. With this in mind, designers of industrial arts programs must provide courses that attempt to address the widest possible range of student's needs and interests. In the industrial arts program, not all students will study the same depth or type of content. For example, courses and content may be tailored to a student who will find it necessary to exit school prior to the normal completion time or who may be involved in advanced vocational-technical training as a portion of the regular high school program. Industrial arts at the high school level will address the following types of student needs:

1. To provide basic instruction to meet the needs of three basic groups of students: (a) for the elective student who seeks to explore more deeply the avocational, cultural, and consumer aspects of American industry, (b) for those students who will pursue advanced education in areas of vocational, technical, industrial education, and the applied sciences, and (c) for the reluctant learner, the prospective dropout, the culturally unique, and those students who may be entering the labor force either prior to normal graduation or immediately thereafter.

2. To provide the students with practical and realistic learning situations that simulate the industrial world of work.

3. To develop in all students those attitudes and attributes that will assist them in becoming productive members of society.

The course title listing that follows utilizes course title terminology that is descriptive of the content of the courses and has achieved general acceptance on both regional and national levels. The minimum and maximum time specifications provided for in the clusters recognize that in grades 6-8 industrial arts experiences should be of a broad exploratory nature. It further recognizes that time use configurations at those grade levels often makes 36-week elective courses impractical. Where a full 36-week block of time is available, two or more clusters of up to 18 weeks each should be scheduled. The six-week time minimum recognizes that it is very difficult to develop a meaningful program that utilizes a smaller time frame. Where possible, all of the cluster areas listed should be available so that students will have an opportunity to explore the widest possible range of material.

The "General Industrial Arts" course listed for grades 9-12 is specified as a prerequisite to all unit programs except the drafting sequence. It is felt that if students reach this point and have either a limited number of elective hours available or are beginning the first of many industrial arts courses, a good foundation course is essential. By providing basic skills and knowledge in a course that cuts across other unit courses, repetition can be minimized and more time devoted to technical content.

## COURSE TITLES

6th through 8th

Construction
Manufacturing
Communication
Transportation
Industry (sixth grade only)

Minimum time for any cluster will be six weeks. Maximum time allowed in a cluster will be 18 weeks. All areas in each cluster should be taught.

9th through 12th

General Industrial Arts*
Basic Woodworking
Advanced Woodworking
Construction
Basic Electricity/Electronics
Advanced Electricity
Advanced Electronics
Basic Metals
Advanced Metals
Basic Welding
Power and Energy
Power Mechanics
Basic Graphic Arts
Advanced Graphic Arts
Basic Plastics
Basic Recreational Crafts
Advanced Recreational Crafts
Basic Technical Drafting
Advanced Technical Drafting
Architectural Drafting

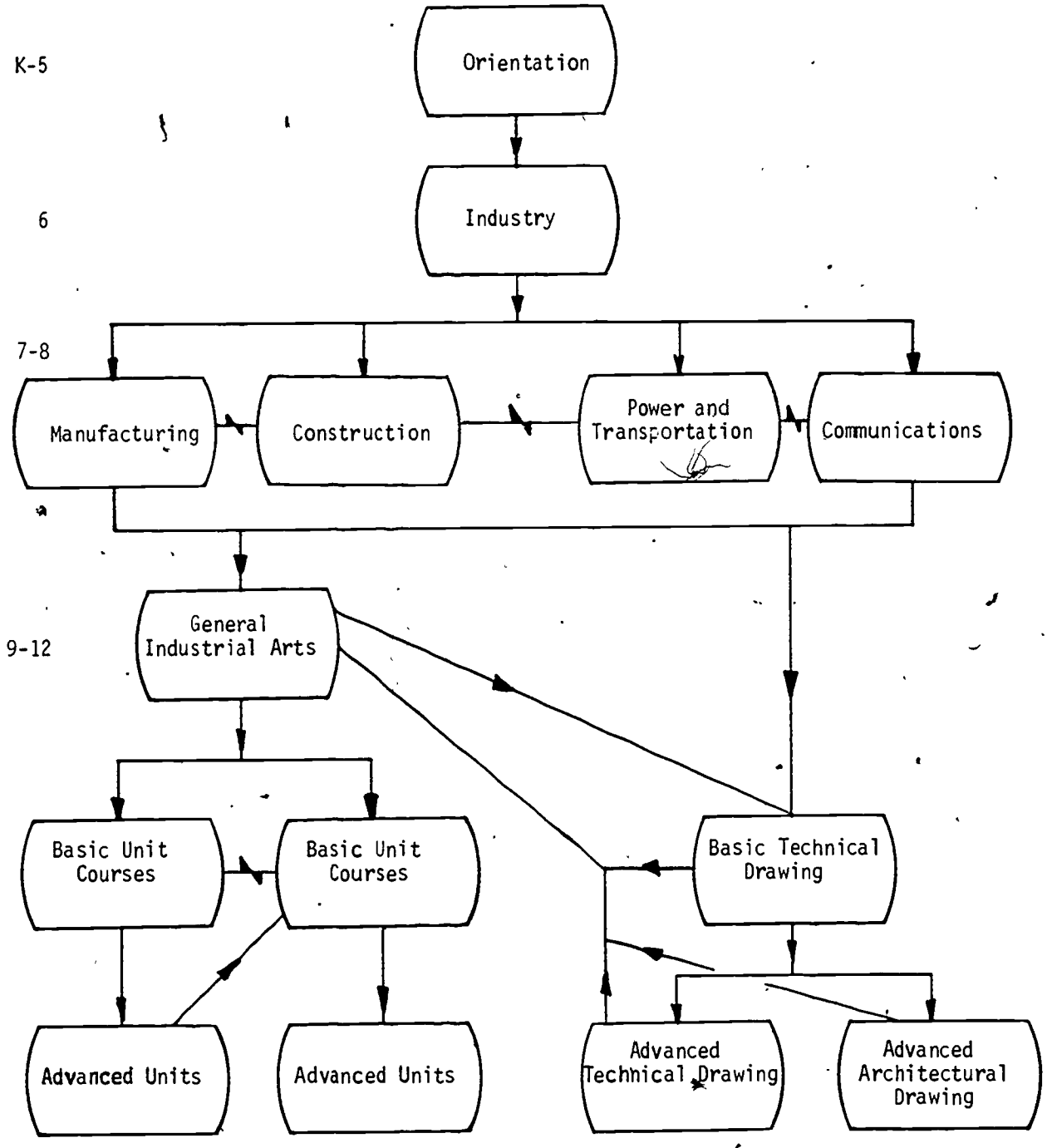
*Prerequisite to all several unit shops except drafting.

## PROGRAM MODEL

The following program model shows the proposed method of articulation for industrial arts programs in Louisiana. This should serve as a document for planning industrial arts offerings at the local level. Assistance in formulating and implementing a specific plan is available from the Industrial Arts Section of the Louisiana State Department of Education.

FLOW CHART FOR INDUSTRIAL ARTS COURSE SEQUENCING

Proposed Model (for discussion only)



Input Meetings conducted as part of LIACP

In order to determine the needs and concerns of these practitioners in the field, several meetings were held around the State. At least one meeting was held in each of the following locations:

Baton Rouge

Natchitoches

Grambling University

New Orleans

Thibodaux

Morgan City

Lake Charles

In addition to these meetings, sessions were held as part of LIAA and LVA meetings to promote and explain the project.

Through such a wide geographical arrangement, ample opportunity was provided for input and questions. While there were numerous concerns addressed by the participants, there were some that seemed to be common to most of the gatherings. These are listed below:

1. The need to have greater program offerings than those traditionally offered such as woods.
2. The need for additional Federal/State funds, particularly at the middle grades.
3. Funds and support for serving handicapped students.
4. The need for State/Local plans for Industrial Arts.
5. Concern that any plan must have a commitment from all agencies (Teacher Education, SDE, LEA, etc.) if the effort is to be successful.
6. Program standardization so that students moving from one locale

to another will have had similar experiences and thus experience a smooth flow between programs.

7. The need for program articulation within and between schools.
8. The need for in-service sessions when new curriculum patterns are initiated.

All of these concerns have been noted by the project staff. It is understood that each of these issues will be addressed in phase II of the project through recommendations.

## SUMMARY AND CONCLUSIONS

It is the opinion of the project staff that the curriculum revision project has accomplished those goals outlined in the proposal, thereby laying the foundation for further curriculum revision in the future. The project has provided the opportunity for a closer working relationship between State Department staff, classroom teachers, and university personnel in the pursuit of a common goal. The continuing dialog that has resulted from project activities is rare in undertakings of this size and has seemed to foster an attitude of greater understanding and cooperation between the various segments of the profession involved.

In some content areas the merits of various organizational approaches were often debated at length. The final result, however, represents a decision based on the rationale and goals stated and insofar as possible, an accommodation of a full range of views.

Work is well under way on the second phase of the project and should be concluded in June, 1982. Some portions of the materials under development are being used on a trial basis during the 1981-82 school year. It is the feeling of the project staff that significant progress has been realized and that a sound base for continued growth has been established.

BASIC OUTLINES OF SELECTED COURSES

by

REGIONAL CENTER

LOUISIANA STATE UNIVERSITY

REGIONAL CENTER

DEPARTMENT OF INDUSTRIAL AND TECHNICAL EDUCATION

# BASIC ELECTRICITY/ELECTRONICS

Course Description:

This is a basic level course in electricity/electronics and assumes no previous knowledge in either. The content is designed to make the student aware of the very intricate relationship between our highly technological society and the fields of electricity/electronics. The students will gain working knowledge of relevant theories and their applications. They will also design and fabricate electrical and electronic items to further increase their understanding.

Target Grade Level:

This course is designed for students in grades 10, 11, and 12.

Prerequisites:

General Industrial Arts (Algebra I desirable)

I. Nature of electricity
- work and energy
- units of energy
- energy conversion
- efficiency
- structure of matter
- electric charges
- valence electrons
- free electrons
- ions
- measuring electricity
- controlling electricity
- voltage, amperage, resistance
- units and conversions
- electrical safety

II. Components and energy sources
- batteries and cells
- conductors
- switches
- sources

III. Multiple and single load circuits
- power
- power transfer
- series circuits
- parallel circuits
- series-parallel circuits

IV. Electromagnetism and alternating current
- Fields, flux, poles
- Induction
- Motors
- Inductive reactance
- Types of AC waveforms
- Quantifying AC
- Phases of AC

V. Transformers

VI. Capacitance
- nature of capacitance
- capacitive reactance
- capacitive action in a circuit

VII. Wiring codes and regulations agencies
- UL
- NEC
- CSA

VIII. Planning an installation

IX. Household circuits

X. Semiconductor types
- N-type
- P-type
- Junction diodes

XI. Junction transistors

XII. Small signal amplifiers

XIII. Large signal amplifiers

XIV. Amplifier troubleshooting

# ADVANCED ELECTRONICS

Course Description:

This is an advanced course in electronics that introduces more complex topics in electronic technology. Emphasis is placed on the technology and its applications rather than on specific skills. The topics of communications and digital techniques are treated in some detail.

Target Grade Levels:

This course is targeted for grades 11 and 12.

Prerequisites:

General Industrial Arts, Basic Electricity/Electronics (Algebra I & II are desirable)

I. Introduction to bi-polar devices (review)
II. Power supplies
III. Advanced small signal amplifiers
IV. Advanced large signal amplifiers
V. Oscillators
VI. RF circuits
VII. Radio receivers and transmitters
    AM
    FM
    Other types
VIII. Video circuits
IX. Digital circuits
X. Electronic control devices and circuits

# ADVANCED ELECTRICITY

Course Description:

This is an advanced course in electricity that introduces more complex topics in the area of electricity. Emphasis is placed on the technology rather than skill development. The content presented provides a sound basis for moving into a highly technical electrical program.

Target Grade Level:

This course is targeted for grades 11 and 12.

Prerequisites:

General Industrial Arts, Basic Electricity/Electronics, (Algebra I & II are desirable).

# BASIC PLASTICS

Course Description:

This is a basic course dealing with plastics and other non-traditional materials. Students will have an opportunity to gain insights into the production and forming processes for these materials and will have an opportunity to work with the more common of these materials and processes.

Target Grade Level:

This course is targeted for students in grades 10, 11, and 12.

Prerequisites:

General Industrial Arts

# POWER AND ENERGY

Course Description:

This is a course designed to deal with the broad issues of power and energy in a contemporary world. Our key focus will be energy depletion, energy demand, alternate energy forms and sources, and evolving energy systems. Topics will include, but not be limited to, traditional power and energy systems.

Target Grade Level:

This course is targeted at students in grades 10, 11, and 12.

Prerequisites:

General Industrial Arts

# POWER MECHANICS

Course Description:

This course focuses on power generation, conversion, and utilization systems. The student is provided with experiences in designing, constructing and using various power systems. Emphasis will also be given to the topics of serviceability and practicality.

Target Grade Level:

This course is targeted for students in grades 10, 11, and 12.

Prerequisites:

General Industrial Arts

Course Outline

MANUFACTURING

I. Introduction to manufacturing

A. The manufacturing industry

1. Production system

2. Personnel system

3. Management system

B. Evolution of manufacturing

1. Primitive man

2. The first technology

a. Agriculture

b. Crafts

C. Institutions of society

1. Family

2. Religion

3. Education

4. Ownership

5. Government

D. Industry today

1. How goods are acquired

a. Extraction

b. Reproduction

2. How goods are processed

a. Manufacturing

b. Construction

E. Tools, materials, and processes

1. Basic hand tools
2. Portable power tools
3. Machine tools
   a. Basic
   b. Special
4. Industrial materials
   a. Natural
      (1) Wood
      (2) Metal
   b. Synthetics
      (1) Plastics
      (2) Nylon
   c. Processes
      (1) Forming
      (2) Separating
      (3) Combining

F. Types of production
   a. Custom production
   b. Mass production
   c. Job lot

II. Manufacturing management technology

A. Functions of management technology
   1. Planning
      a. Formulating
      b. Researching
      c. Designing
      d. Engineering

2. Organizing

a. Structuring

b. Supplying

3. Controlling

a. Directing

b. Monitoring

c. Reporting

d. Correcting

B. Inputs

1. Natural resources

a. Cotton

b. Petroleum

c. Ores

2. Energy

a. Waterpower

b. Coal

c. Petroleum

3. Finance and capital

a. Fixed capital

b. Working capital

4. Labor force

III. Organization

A. Sole proprietorship

B. Partnership

C. Corporations

1. Owned by stockholders

2. Privately owned

2. Types of corporations

a. Holding company

b. Merger

IV. Identifying consumer demand

A. Consumer

1. Individuals

2. Organizations

a. Manufacturers

b. Constructors

c. Wholesalers and retailers

d. Institutions

e. Government

B. Consumer demands

1. Market potentials

2. Population group

3. Trends

4. Preference

5. Competition

6. Volume

V. Research and development

A. Research

1. Retrieving

2. Describing

3. Experimenting

B. Development

1. Designing

a. New products

b. Existing products

2. Engineering

C. Importance of research and development

D. People and organizations in research and development

1. Private funds

2. Public funds

3. Universities

4. Government agencies

5. Foundations

VI. Designing and engineering

A. Consumer demand

1. Ideas

2. New knowledge

B. Design problem

1. Alternate solution

a. Making sketches

b. Rendering

c. Making three-dimensional mock-ups

2. Evaluations of solutions

3. Design solutions

C. Refining the design solution

1. Making three-dimensional models

2. Studying alternate solutions

3. Selecting materials and techniques

D. Prototypes

E. Product planning meetings for final approval

1. First meeting - design meeting

2. Second meeting - feasibility

3. Third meeting - presentation

4. Fourth meeting - rehearsal

5. Fifth meeting - final approval

VII. Production planning

A. Planning processes

1. List processes and operations

2. Select work stations

3. Analyze work floor

4. Analyze work methods

B. Automation

1. Feedback

2. Mechanical handling

3. Program control

4. Data processing

C. Measuring work

1. Machine time

2. Man time

a. Loading

b. Unloading

c. Assembling

d. Adjusting

e. Moving

D. Estimating cost

1. Materials

2. Direct labor

3. Overhead

4. Profit

E. Tooling up for production

1. What machines, equipment, and tools will be needed
2. Choosing and ordering all standard machines, tools, and equipment
3. Designing and ordering special tools and machines
   a. Dies
   b. Patterns
   c. Jigs and fixtures
   d. Gauges
   e. Supervising the installation of machines, start up, and trial runs

F. Installing production control system

1. Order
   a. Custom production
   b. Intermittent
2. Flow
3. Continuous production
4. Batch
5. Block
6. Load
7. Special project

G. Material handling system

1. Receiving
2. Unpacking
3. Handling
4. Storing

5. Protecting

VIII. Quality control

A. Directing

B. Monitoring

1. Receiving inspection

2. Reporting

3. Correcting

IX. Designing and engineering the plant

A. Problem identification

1. Recognize need

2. Gather data

3. Evaluate

B. Preliminary idea

1. Develop ideas

2. Make sketches

3. Write ideas

4. Record thoughts

C. Refinement

1. Select better preliminary ideas

2. Make scale drawing

3. Determine lengths, sizes, and shapes

D. Analysis

1. Site analysis

2. Functional analysis

3. Structural analysis

4. Cost analysis

E. Decision

1. Repair graphs, charts, and schematics

2. Present to the group

3. Decide

F. Implementation

1. Prepare working drawing specification

2. Construct the manufacturing plant

X. Define equipment and material

A. Equipment

1. Technical requirements

2. Economic factors

3. Management decision

a. To make

b. To buy

c. To lease or rent

d. Security

B. Materials

1. Types of materials

a. Raw materials

b. Industrial materials

c. Component parts

2. Procurement of materials

a. Purchasing agent

b. Commodity buyer

c. Expedites

3. Purchasing procedure

a. Requisition

b. Selection from register

c. Screening

d. Bid or quotation

e. Purchase

4. Methods of purchasing

a. Hedging

b. Budgeting

5. Authority for purchasing

a. Management

b. Purchasing agent

XI. The computer

A. Programming

1. Identifying problem

2. Flow charting

3. Writing program

B. Input form

1. Cards

2. Tapes

C. Central processing

1. Control

2. Memory

3. Arithmetic

4. Logic

D. Output form

1. Printed page

2. Cards

3. Tapes

E. Job opportunities

1. Systems analysis

2. Programmers

3. Technicians

F. Manufacturing and the computer

1. Repetitive clerical work

a. Accounting

b. Payrolling

2. Sales forecasting

3. Production planning and controlling

4. Machine operations

XII. Manufacturing personnel technology

A. Manufacturing employment and the labor force estimated number by age group and years

B. Categories of manufacturing employment

1. Durable goods employment

2. Non-durable goods employment

C. Production occupations

1. Unskilled

2. Semi-skilled

a. Use of machines

b. Assembling parts

c. Driving forklift trucks

3. Skilled

a. Machinists

b. Job setters

c. Tool makers

d. Plumbers

e. Electricians

D. Managerial occupations

1. President
2. General manager
3. Shop superintendent
4. Shop foreman
5. Personnel manager
6. Engineer/technicians

E. Personnel technology

1. Hiring
   a. Recruiting
   b. Selecting
   c. Inducting
2. Training
   a. On the job
   b. Vestibule school
   c. Apprenticeship
   d. Classroom
   e. Cooperative
   f. Management
3. Working
   a. Providing economic rewards
   b. Providing physical setting
   c. Providing social environment
4. Advancing
   a. Promoting
   b. Demoting

c. Discharging

5. Retiring

a. Counseling

b. Preretirement job engineering

c. Recognizing service

d. Awarding retirement benefits

F. Organized labor

1. Unions

Agreements - contracts

2. History of organized labor

a. Shoemakers and printers

b. National federations

(1) A.F.L.

(2) C.I.O.

3. Arbitration

4. Strike

5. Collective bargaining

(National labor relations act)

G. Establishing accident prevention programs

1. Establishing safety programs

(People and safety)

2. Safety in manufacturing

3. Personal safety practices

4. General safety practices

5. Careers in safety

(1) Industrial health

(2) Ecology

XIII. Production technology

A. Preprocessing

1. Receiving

2. Unpacking

3. Handling

4. Storing

5. Protecting

B. Processing

1. Forming

2. Separating

3. Combining

C. Post processing

1. Installing

2. Maintaining

3. Repairing

4. Altering

D. Securing raw materials

1. Extraction

(Ores, petroleum)

2. Reproduction

(Plants, etc.)

E. Kinds of materials

1. Wood

2. Leather

3. Metal

4. Plastics, etc.

F. Converting raw materials

1. Butchering
2. Distilling
3. Melting
4. Evaporating
5. Filtering
6. Roasting

G. Making industrial materials
1. Plates
2. Sheets
3. Tubes
4. Paperboard
5. Fiberboard
6. Cardboard

H. Making assemblies
1. Combining components
a. Mixing
b. Coating
c. Bonding
d. Mechanical fastening
2. Forming
a. Casting or molding
b. Compressing or stretching
c. Conditioning
3. Separating
a. Shearing
b. Chip removing
c. Other processes

I. Combining assemblies

1. Batch or lot assembly

2. Continuous assembly

J. Preparing for distribution

1. Protecting

a. Rough handling

b. Moisture

c. Bad weather

2. Labeling

a. Manufacturer

b. Name of product

c. Quantity

d. Directions

e. Descriptions

f. Other special information

3. Storing

a. Handling

b. Sorting and counting

c. Using space

d. Displaying

e. Using product

K. Distribution

1. Shipper

2. Wholesaler

3. Retailer

4. Consumer

L. Servicing manufactured products

1. Types of manufactured products

a. Durable

b. Non-durable

2. Types of servicing

a. Installing

b. Maintaining

c. Repairing

d. Altering

M. Harnessing energy from nature

1. Classes of energy

a. Mechanical

(Turbine)

b. Radiant

(Light)

c. Chemical

(Fuels)

d. Heat

(Steam)

e. Electrical

(Magnets)

f. Nuclear

(Core of atom),

2. Harnessing energy

a. Collection

b. Control

c. Containment

3. Future energy sources

   a. Ocean tides

   b. Sun

   c. Heat under surface of earth

   d. Laser beam

   e. Nuclear fusion

# Crafts

I. Introduction to Crafts

A. Development of crafts

1. Origin

2. Types

B. Marketing techniques

1. Determining market demands

2. Advertising

3. Sales

C. Classification of crafts

1. Industrial

2. Domestic

3. Personal adornment

4. Recreational

II. Crafts planning and designing

A. Designing

B. Sketching

C. Measurement and layout

D. Safety

III. Craft material areas

A. Metal craftwork

B. Ceramic craftwork

C. Woodcraft

D. Leather craftwork

E. Plastic craftwork

Metal Craftwork

I. Understanding metal craftwork
   A. Origin
   B. Characteristics
   C. Properties
   D. Classification
      1. Ferrous
      2. Nonferrous

II. Scrollwork
   A. Designing the scroll
   B. Forming the scroll
   C. Bending and twisting
   D. Bending and forming metal on a machine
   E. Drilling
   F. Riveting and decorating
   G. Safety
   H. Projects

III. Metal spinning
   A. The spinning lathe
   B. Spinning tools
   C. Chucks for metal spinning
   D. Metals adaptable for spinning
   E. Metal spinning lubricants
   F. Fundamentals of metal spinning
   G. Soldering spun projects
   H. Polishing spun projects

I. Modern trends in metal spinning

J. Safety

K. Projects

IV. Working with metals

A. Tools used in forming and raising metals

B. Forming metals by beating down

C. Forming metals by raising

D. Decorating metals

V. Metal tooling

A. Metals and tools

B. Procedure for tooling metal foil

C. Safety

D. Projects

VI. Chasing

A. Procedure for chasing on a wood block

B. Chasing on pitch

C. Safety

D. Projects

VII. Etching metals

A. Styles of etching

B. Materials used in etching

C. Etching procedure

D. Mordants used for etching art metals

VIII. Metal enameling

A. Materials and tools

B. Procedure

IX. Cutting, finishing, and assembling metals

A. Coloring copper and brass

B. Sawing or piercing

C. Annealing and pickling metal

D. Soldering art metal projects

E. Projects

Ceramic Craftwork

I. Development of ceramics
   A. Origin
   B. Characteristics
   C. Properties
   D. Classification
      1. Glass
      2. Clay
II. Glass blowing
   A. Tools
   B. Basic operations
   C. Flameworking
      1. Blowing
         a. Offhand
         b. Lampworking
      2. Rods
      3. Tubes
   D. Safety
   E. Projects
III. Glass staining
   A. Types
      1. Opalescent
      2. Transparent
         a. Antique
         b. Cathedral
      3. Flashed
      4. Frosted

B. Tools

C. Operations

1. Designing

2. Patterns

3. Cutting

4. Assembling

5. Cleaning

D. Safety

E. Projects

IV. Glass etching

A. Materials and tools

B. Etching procedure

C. Projects

V. Mosaics

A. Styles of mosaics

B. Materials used to make mosaics

C. Procedures

D. Finishing

VI. Ceramic clay work

A. Materials used in clay work

B. Common methods

1. Cutting and modeling

2. Shaping pieces on forms

3. Building up and pinching

4. Casting

5. Potter's wheel

C. Applying glaze

D. Firing ceramics

E. Plaster molds

Woodcraft

I. Understanding woods

A. Origin

B. Types of woods

1. Characteristics

2. Properties

C. Classification

1. Hardwood

2. Softwood

II. Woodburring

A. Tools used in woodburring

B. Selecting the wood

C. Creating the design

D. Transferring the design

E. Fundamentals of burring the design in wood

F. Safety

III. Whittling

A. Definition of whittling

B. Care and use of whittling tools

C. How to whittle

D. Selecting wood for whittling

E. Safety

IV. Carving

A. Types of wood carving

1. Scratch or chasing

2. Chip

3. Low relief

4. Bas relief

B. Designing

C. Transferring the design

D. Selecting the wood

E. Care and use of tools

1. Hand tools

2. Power tools

F. Fundamentals of carving

1. Rough cutting

2. Gouging

3. Filing

4. Sanding

G. Projects

Leather Craftwork

I. Understanding leather
   A. Origin and uses
   B. Types of leather
   C. Processing and sorting
   D. Use of leathercraft kits
   E. Other materials

II. Layout and cutting tools

III. Tooling designs on leather
   A. Tools and materials
   B. Methods

IV. Carving designs on leather
   A. Tools and materials
   B. Techniques

V. Decorating leather with stamped designs
   A. Tools and materials
   B. Planning stamping designs
   C. Techniques for stamping

VI. Inverted silhouette carving on leather
   A. Tools and materials
   B. Methods

VII. Assembling and leather project
   A. Tools and materials
   B. Skiving
   C. Edge creasing
   D. Edge trimming
   E. Making folded edges

F. Folding heavy leather

G. Cementing parts for assembly

VIII. Cleaning and applying finish to leather articles

A. Cleaning

B. Coloring

C. Applying an edge finish

D. Applying an antique finish

E. Applying outdoor finishes

F. Applying a protective finish

IX. Lacing leather materials

A. Purpose and uses

B. Types of lacing

C. Lacing tips

X. Attaching metal hardware

A. Types of hardware

B. Punching holes for metal

C. Setting eyelets

D. Setting snap fasteners

E. Setting rivets

Plastic Craftwork

I. Understanding plastics craftwork

A. Origin

B. Properties and uses

C. Types

D. Classification

1. Physical

2. Chemical

E. Processing

1. Molders

2. Extruders

3. Film and sheeting

4. Pressure laminators

5. Reinforced plastic

6. Coaters

II. Plastic materials area

A. Plastic sculpture

1. Materials

2. Procedures

B. Fiberglass laminating

1. Materials

2. Procedures

C. Casting

1. Materials

2. Procedure

D. Granule forming

1. Materials

2. Procedures

E. Decorative laminates

1. Materials

2. Procedure

3. Adhering the material

F. Sheet working

1. Cutting

2. Internal carving

3. Forming

4. Fastening

5. Safety

G. Polishing, buffing, and finishing

1. Polishing and buffing

2. Coloring

3. Glazing

# COMMUNICATION

I. Introduction to communication

A. Definition of communication

B. Communication and man

1. How does man communicate

a. Communication viewpoints

(1) Sender

(2) Receiver

b. Person to person

c. Person to machine — transmission methods

d. Machine to person — mechanical, electrical, visual,

e. Machine to machine — audio, and combination of these

2. Why does man communicate?

a. To inform

b. To influence

c. To entertain

C. History and development of communication

1. Gestures, symbols, signs, and painting

2. Oral language

3. Written language

4. Communication tools

a. Printing press

b. Telegraph

c. Radio

d. Photography

e. Motion pictures

f. Television

g. Computers

II. Communication process

A. Encoding

1. Perceiving

2. Comprehending

3. Symbolizing

4. Organizing

5. Valuing

B. Transmitting

1. Gesturing

2. Touching

3. Speaking

4. Writing

5. Drawing

C. Receiving

1. Sensing

a. Seeing

b. Reading

c. Hearing

d. Feeling

e. Smelling

f. Tasting

2. Perceiving

a. Comprehending

b. Understanding

3. Valuing

a. Appraising message in light of motion

D. Decoding

1. Perceiving

2. Interpreting

3. Synthesizing

4. Responding

E. Storing

1. Recording

2. Filing

F. Retrieving

1. Obtaining

2. Retransmitting

G. Definition of "noise"

III. The communications industry

A. Management

1. Planning

2. Organizing

3. Controlling

B. Production

1. Formulating an idea

2. Deciding on a format (media)

3. Developing the chosen format

4. Producing the idea using the format

5. Transmitting the idea

6. Distributing

C. Personnel

1. Hiring

2. Training

3. Working

4. Advancing

5. Retiring

IV. Mass Communication

A. Types of mass communication

1. Audio

a. Definition

b. Methods of transmission

c. Methods of receiving

d. Some audio communication systems

(1) One-way systems

(a) Radio broadcast

(b) Recording

(c) Emergency warning devices

(2) Two-way systems

(a) Telephone

(b) Radio (i.e. CB, short-wave)

(c) Verbal

(d) Telegraph

2. Visual

a. Definition (only a receiver)

b. Methods of transmitting

c. Methods of receiving

d. Some visual communication systems

(1) One-way (only a receiver)

(a) Drawings, signs, symbols

(b) Printed matter (books, magazines, newspapers)

(c) Photographs (still and motion)

(d) Sign and body language

3. Audiovisual

a. Definition

b. Methods of transmission

c. Methods of receiving

d. Some audiovisual communication systems

(1) One-way systems

(a) Television

(b) Motion pictures

(c) Theatre (live performances)

(2) Two-way systems

(a) Socializing

(b) Computers

B. Materials and processes of mass communication

1. Graphic arts communication

a. Planning, layout, and design

b. Relief printing, linoleum block

c. Silk-screen printing

d. Letterpress printing

e. Off-set printing

f. Lithography

g. Book binding

h. Rubber stamp making

2. Telecommunications

a. Electrical

(1) Telegraph

(2) Telephone

b. Electronics

(1) Radio

(2) Tape recording

(3) Television

(4) Computers

(5) Satelites

3. Photography

a. History of photography

b. Purpose of lenses

c. Latent images

d. Types of film

e. Handling and care of film

f. Types of cameras and components

g. Camera techniques

h. F numbers and exposure

i. Composition

j. Theory of film processing

k. Methods of printing

l. Enlarging to enhance the final product

4. Drafting

a. Freehand sketching

b. Lettering,

c. Care and use of instruments

d. Geometric constructions

e. Pattern development

f. Orthographic projection

g. Pictorial drawing

h. Reproduction methods

5. Other

Course Outline

Construction

I. Introduction to construction

A. The construction industry

1. Production system

2. Personnel system

3. Management system

B. Evolution of construction

1. Primitive man

2. The first technology

a. Agriculture

b. Crafts

C. Institutions of society

1. Family

2. Religion

3. Education

4. Ownership

5. Government

D. Industry today

1. How goods are acquired

a. Extraction

b. Reproduction

2. How goods are processed

a. Manufacturing

b. Construction

E. Tools materials and processes

1. Basic hand tools

2. Portable power tools

3. Machine tools

a. Basic

b. Special

4. Industrial materials

a. Natural

(1) wood

(2) metal

b. Synthetics

(1) plastics

(2) nylon

c. Processes

(1) Forming

(2) Separating

(3). Combining

F. Types of production

1. Custom production

2. Mass production

3. Job lot

II. Beginning the project

A. Selecting a site

B. Buying real estate

C. Surveying and mapping

D. Soil testing

E. Designing and engineering construction projects

1. Identifying the design problem
    a. Developing preliminary ideas
    b. Refining ideas
2. Selecting the design
3. Making working drawings

F. Selecting a builder
1. Contracting
2. Estimating and bidding
3. Scheduling
4. Making inspections
    a. Working as a contractor
    b. Training and educating for construction
    c. Advancing in construction

III. Construction production technology
A. Getting ready to build
1. Clearing the site
2. Locating the structure
3. Earthmoving

B. Setting foundations
1. Building forms
2. Setting reinformcement
3. Mixing concrete
4. Placing and finishing concrete

IV. Framing structures
A. Floor framing
Prefabricated floors
1. Concrete decking

2. Wood

B. Walls, windows, and door framing

1. Walls

a. Load-bearing

b. Partition

2. Masonry wall

a. Block

b. Brick

3. Framed wall

a. Steel

b. Concrete

c. Wood

4. Inspecting

C. Ceiling framing

1. Exposed

2. Suspended

D. Roofs framing

1. Hip

2. Gable

3. Flat

V. Installing utilities

A. Installing heating, cooling, and ventilating systems

B. Installing plumbing systems

C. Installing piping systems

D. Installing electrical power systems

E. Installing electrical communications systems

VI. Enclosing framed superstructures

A. Roofing

1. Sheathing

2. Shingling

B. Enclosed exterior wall

1. Wood

2. Brick

3. Glass

4. Stone

5. Insulating

C. Enclosing interior walls

D. Applying ceiling materials

E. Laying floors

F. Trimming and painting

G. Landscaping and completing the site

NORTHWESTERN STATE UNIVERSITY

REGIONAL CENTER

DEPARTMENT OF INDUSTRIAL EDUCATION AND TECHNOLOGY

Title:

Basic Metals

Course Description:

Basic Metals involves the use of tools, materials, processes, and related information in the design, planning, construction, and finishing of metal products in metalworking areas such as bench metal, sheet metal, metal casting, forging, ornamental metalwork, art metal, and welding.

Target Grade Levels:

Grades 10-12

Prerequisite:

General Industrial Arts

Course Goals:

In Basic Metals, the student will become acquainted with occupational opportunities in this field of work, and should develop an appreciation of the metals industry as it relates to our everyday environment. Experiences will be provided through the logical process of planning, problem solving, evaluation, research, and manipulative "hand-on" skills. The study of Basic Metals cannot be conducted in depth, but it must be thorough enough to develop basic understanding of and skill in the use of tools and machines common to metal working industries.

Course Objectives:

To provide exploratory experiences in several metalwork areas so as to develop an understanding of current technology in the metals industries.

To teach the necessary related information and develop the essential skills needed in the design, fabrication, heat treating (where applicable), and finishing of industrial products for pre-vocational and avocational pursuits.

To develop safe work habits.

To increase understanding of the occupational requirements and opportunities in the metal fields.

To provide problem-solving situations and give opportunities to use and apply the math and science skills developed and studied in other subjects.

BASIC METALS

A COURSE OUTLINE

I. INTRODUCTION TO METALS

A. Properties

1. Brittleness
2. Ductility
3. Elasticity
4. Tensile strength
5. Hardness
6. Malleability

B. Classifications

1. Ferrous

a. Iron

(1) Iron ore, coke, limestone
(2) Pig iron
(3) Cast iron
(4) Wrought iron
(5) Steel

b. Steel

(1) Carbon--mild, medium, high
(2) Alloy--high speed, special
(3) Ways to make steel

2. Non-ferrous

a. Aluminum
b. Brass
c. Tin

3. Alloy

a. Stainless steel
b. Nickel steel

c. Magnesium

4. Base metal

a. Gold

b. Copper

c. Lead

d. Silver

C. Identification

1. Surface appearance

2. Sound

3. Spark test

4. Melting point

5. Grain structure

6. Color coding

7. Metal shapes

8. Number system

a. S.A.E.

b. A.I.S.I.

II. GENERAL SAFETY

A. Review general safety rules

(See Appendix)

B. Classroom safety rules

(See Appendix)

III. BASIC METALWORKING TOOLS

A. Hand tools

1. Vise

2. Hammers

3. Screwdrivers

4. Pliers

5. Wrenches

6. Files

7. Chisels

8. Saws

B. Power tools

1. Power hacksaw

2. Band saw

3. Hand drill

4. Drill press

5. Portable grinder and sander

6. Grinder

C. Safety

1. Hand tools

2. Power tools

IV. LAYOUT

A. Tools and uses

1. Steel rules

2. Scriber

3. Squares

a. Combination

b. Adjustable

c. Solid

4. Calipers

a. Hermaphrodite

b. Inside

c. Outside

5. Dividers

6. Trammel

7. Protractor

8. Surface gauge

9. Layout fluid

10. Punches

a. Prick

b. Center

11. V-Blocks

B. Procedures and techniques

(see Appendix)

C. Safety

1. Sharp tool care

2. Material handling

V. BENCH METALWORK

A. Hand cutting processes

Hacksaw

1. Blade selection

2. Safety

B. Chisels

1. Types

a. Flat

b. Cape

c. Round nose

d. Diamond point

2. Uses

a. Cutting

b. Shearing

c. Chipping

3. Safety

C. Files

1. Classification

a. Single-cut

b. Double-cut

c. Rasp

d. Curved-tooth

2. Shapes

a. Flat

b. Square

c. Half round

d. Round

3. Uses

a. Cut

b. Smooth

c. Fit parts together

4. Safety

D. Abrasives

1. Classification

a. Natural

(1) Emery

(2) Garnet

(3) Diamond

b. Artificial (man-made)

(1) Silicon carbide

(2) Aluminum oxide

(3) Boron carbide

2. Safety

E. Power cutting process

1. Saws

a. Power hacksaw

b. Band saw

c. Abrasive cut-off saw

d. Safety

2. Grinders

a. Bench

b. Portable

c. Pedestal

d. Safety

3. Drills and drilling machines

a. Types of drills

(1) Straight flute

(2) Twist drill

b. Sizes

(1) Numbered

(2) Lettered

(3) Fractions

(4) Drill gauge

c. Holding device

(1) Vise

(2) V-Block

d. Drilling machines

(1) Portable

(2) Drill press

e. Safety

F. Striking tools

1. Machinist's hammer (ball-peen)

2. Soft-faced hammer

a. Plastic

b. Rubber

c. Rawhide

d. Lead

3. Safety

G. Threading

1. Types of threads

a. American National Thread System

b. National coarse (NC)

c. National fine (NF)

2. Internal threading

a. Taps

(1) Taper

(2) Plug

(3) Bottoming

b. Holding device

(1) T-handle

(2) Tap wrench

3. External threads

a. Dies

(1) Solid

(2) Adjustable round

(3) Two-piece adjustable

b. Holding devices

Die stock

4. Safety

H. Clamping

1. Vises

2. Clamps

a. C-clamps

b. Vise grips

3. Protective caps

a. Wood

b. Copper

c. Sheet metal

4. Safety

I. Tightening

1. Wrenches

a. Adjustable

(1) Pipe

(2) Crescent

(3) Slip-joint pliers

(4) Channel-locks

b. Non-adjustable

(1) Open end

(2) Box end

(3) Sockets

(4) Spanner

2. Screwdrivers

a. Standard

b. Phillips head

3. Safety

J. Fastening

1. Screws

a. Machine

(1) Round head

(2) Oval head

(3) Flat head

(4) Others

b. Cap screws

c. Set screws

d. Self-tapping screws (sheet metal)

e. Thread cutting

2. Bolts

a. Machine

b. Stud

3. Nuts

a. Hex nut

b. Square nut

c. Wing nut

d. Cap nut

4. Rivets

a. Button head

b. Counter sunk

c. Flat head

d. Pan head

e. Blind rivet (pop rivet)

5. Setting a rivet

VI. SHEET METAL

A. Pattern making

1. Parallel line development

a. Prisms

b. Cylinders

2. Radial line development

a. Cones

b. Pyramids

B. Hand tools

1. Hand snips

a. Circular

b. Straight

c. Aviation

2. Punches

a. Hollow

b. Solid

3. Sheet metal gauge

4. Hammers

a. Riveting

b. Setting

c. Mallet

5. Hand seamer

6. Hand groover

7. Soldering copper

8. Safety

C. Floor machines and equipment

1. Machines

a. Squaring shear

b. Bar folder

c. Box and pan brake

d. Slip roll forming machine

e. Combination rotary machine

f. Notcher

g. Portable power shears

2. Equipment

a. Universal stake holder

b. Stakes

c. Bench snear

3. Safety

D. Bending and shaping operations

1. Hems

a. Single

b. Double

2. Edges

a. Wired

b. Burr

c. Crimped

3. Seams

a. Lap

b. Flat lock groove

c. Double seam

d. Corner seam

4. Safety

E. Sheet metal fastening

1. Riveting

2. Screwing

3. Soldering

a. Flux

b. Solder

4. Spot welder

5. Safety

VII. ART METAL

A. Tools

1. Jeweler's saw

2. Jeweler's file

3. Wood block

4. Mushroom stake

5. Sand bag

6. Hammers

a. Planishing

b. Forming

c. Raising

B. Sawing and piercing

C. Raising

D. Chasing

E. Beating down

F. Planishing

VIII. ORNAMENTAL METALWORK (WROUGHT METAL)

A. Hand bending

1. Tools

a. Vise

b. Hammer

c. Monkey wrench

d. Bending jig

2. Types of bends

a. Angle

b. Twist

c. Scroll

d. Circle

3. Safety

B. Machine bending

1. Di-acro bender

2. Universal bender

3. Metal former

4. Hossfeld scroll bender

5. Safety

IX. FORGING

A. Hand forging tools

1. Anvil

2. Tongs

a. Straight-lip

b. Curved-lip

c. Pick-up

3. Hammers

a. Sledge

b. Cross-peen

c. Ball-peen

4. Safety

B. Machine forging

C. Hand forging techniques

1. Upsetting

2. Bending

3. Drawing out

4. Safety

D. Furnace

1. Lighting

2. Operation

3. Shut down

4. Safety

E. Heat treating

1. Types

a. Annealing

b. Case hardening

c. Tempering

d. Hardening

2. Temperature control by color

3. Safety

X. METAL CASTING

A. Sand casting

1. Patterns

a. Simple (one piece)

b. Split

1. Positive draft

2. Negative draft

2. Tools

a. Flask

b. Sprue and riser cutters

c. Ram

d. Bottom board

e. Riddle

f. Strike-off bar

g. Lifter slick and oval

3. Molding sand

a. Tempering sand

b. Green sand

4. Furnace equipment

a. Crucible furnace

b. Tongs

c. Crucible

5. Safety

B. Other Types of casting

1. Shell mold

2. Investment

3. Permanent

4. Die casting

XI. WELDING

A. Gas welding

1. Tools and equipment

a. Oxygen and acetylene cylinder

b. Regulators

c. Hoses

d. Torch

e. Tips: cutting, welding, heating

f. Striker

g. Goggles and gloves

h. Flux and filler rod

2. Setting up equipment

3. Lighting torch

4. Adjusting equipment

5. Gas operations

a. Welding

b. Cutting

c. Brazing

6. Safety

B. Arc welding

1. Tools and equipment

a. Arc welding machine

b. Helmet and gloves

c. Chipping hammer

d. Wire brush

e. Electrodes

f. Protective clothing

2. Setting up equipment

3. Striking arc

4. Welding in flat position

5. Safety

XII. METAL FINISHING

1. Hand and machine finishing

a. Brushing

b. Sanding

c. Polishing

d. Buffing

e. Painting

f. Spraying

g. Dipping

XIII. PLANNING

A. Review of working drawings

1. Assembly drawing

2. Detail drawing

a. Dimensions

b. Views

B. Basic principles of design and construction

1. Lines

2. Proportion

3. Balance

4. Emphasis

5. Texture

6. Color

C. Review of measurement and shop mathematics

1. Reading a rule (review)

a. 12" rule to 1/16"

b. Metric: 1 meter to 1 millimeter

2. Shop math review

D. Individual project drawing

1. Selection of project

2. Rough sketch.

3. Teacher's evaluation of sketch

4. Final drawing (working)

E. Bill of material

1. Part number

2. Number of pieces (quantity)

3. Part name

4. Material

5. Size: thickness, width, length

6. Unit cost

7. Total cost

F. Plan of procedure

1. Operations (list)

2. Tools (list)

3. Equipment (list)

XIV. CAREERS IN METALWORKING

A. Levels of skill

1. Semi-skilled

2. Skilled

3. Technicians

4. Professions

B. Classifications of occupations

1. Steelworker (iron worker)

2. Welder

3. Tool and die maker

4. Sheet metal technician

5. Machinist

6. Others

C. Methods of training

1. High school

2. Vo-tech school

3. College

4. Apprenticeship

XV. SAFETY

A. Review safety on all units

B. Safety test

(80% or better to be permitted to work)

XVI. BASIC METALS PROJECTS

A. Bench metal work

B. Sheet metal

C. Art metal

D. Ornamental ironwork

E. Forging

F. Casting

G. Welding

Title:

Advanced Metals

Course Description:

Involves the use of industrial processes and practices to alter materials through the use of precision measuring instruments, special set-ups, and the machine tools that are the source of our industrial revolution.

Target Grade Levels:

11th and 12th grades

Prerequisite:

General Industrial Arts and Basic Metals

Course Goals:

To provide an understanding of the principles, operation, and industrial applications of machine tools. To develop skills in the care and use of basic machine tools such as the lathe, milling machine, grinder, drill press, and shaper.

To learn the use of precision measuring instruments and how to make the precise "set-ups" of tools and materials for accuracy measured in thousandths of an inch.

Course Outline:

I. THE SAFE USE OF MACHINES

A. Review general safety rules

B. Teach specific safety techniques as needed

II. MACHINEABILITY OF METALS

A. Iron

B. Steel

C. Aluminum

D. Brass

E. Special alloys

III. PRODUCT PROCESSING

A. Use of precise measuring tools

B. Layout techniques

C. Clamping and special set-ups for processing stock

D. Use of inspection instruments

IV. MACHINE TOOLS

A. Drill press

1. Types

2. Processes capable of performing

3. Related information

B. Grinders

1. Types

2. Processes capable of performing

3. Related information

C. Lathe

1. Basic operations

a. Drilling

b. Reaming

c. Turning

d. Knurling

e. Threading

D. Milling machine

1. Types

2. Cutters

3. Processes capable of performing

4. Related information

E. Shaper

1. Cutting procedures

2. Related information

Title:

Welding

Course Description:

Involves the joining of metal by one of the basic welding processes.

Target Grade Levels:

10th - 12th grades

Prerequisite:

General Industrial Arts

Course Goals:

To teach the necessary metallurgical properties so as to provide an understanding of how metals become welded together.

To provide the necessary information to facilitate the setting-up, understanding, and safe using of gas and electrical equipment in the welding laboratory.

To develop skills in the areas of gas and electrical welding.

Course Outline:

I. EARLY HISTORY AND TYPES OF WELDING

A. Forge

B. Shielded Metal-Arc

C. Gas Shielded-Arc

D. Oxy-Acetylene

E. Resistance

F. Other types

II. WELDING METALLURGY

A. Properties of metals

B. Structure of metals

C. Effect of carbon in steel

D. Metal classification systems

E. Stresses and defects

III. TYPES OF WELDING

A. Shielded Metal-Arc

1. Equipment and set-up
2. Safety
3. Electrodes
4. Welding positions and techniques

B. Gas Shielded-Arc

1. Equipment and set-up
2. Safety
3. Gas tungsten arc-Tig
4. Gas metal arc-Mig

C. Resistance

D. Oxy-Acetylene and other gas types

1. Equipment and set-up

2. Safety

3. Flames and rod types

4. Welding positions and techniques

5. Welding different types of metal techniques

IV. WELD TESTING

Title:

Basic Technical Drafting

Course Description:

Basic Technical Drafting is designed to give the student a general overview of the basic concepts that are common to the broad field of technical drawing. Drafting is used by engineers, designers, architects, and other individuals to describe the size, shape, and other details of manufacture that cannot be effectively described with written words of a language. However, one need not be engaged in one of these vocations to benefit from experiences in the drafting field. The ability to read and understand drawings that are concerned with the assembly, installation, and operation of common household products is becoming increasingly important as these items become more complex. For this reason, drafting should be one of the first areas to be offered in the industrial arts program and should be open to males and females.

Target Grade Levels:

Grades 9 - 12

Prerequisite:

None

General Program Goals and Objectives:

1. To develop skills in the proper use of drafting tools and materials.

2. To develop an understanding of the technical aspects of drafting.
3. To develop an appreciation for the value and worth of good designing.
4. To foster an understanding of the importance of drafting in industry.
5. To develop worthy leisure-time interests.

BASIC TECHNICAL DRAFTING

A YEARLY OUTLINE

I. STATE, PARISH, LOCAL SCHOOL, CLASSROOM LEGAL RULES AND REGULATIONS

II. SAFETY IN THE DRAFTING ROOM

- A. Student responsibilities
- B. Safe use of equipment
- C. Safe use of individual drafting equipment
- D. Room arrangement safety
- E. Housekeeping safety
- F. Personal safety

III. INTRODUCTION

- A. History of drafting
  - 1. Earliest forms of communications
    - a. Drawing on cave walls
    - b. Drawing on clay tablets, parchment or papyrus, wood, and slabs of limestone
  - 2. Evolution of modern drafting
    - a. Leonardo DaVinci
    - b. Gaspard Monge (1746-1818)
    - c. Crozet - (1816)
    - d. West Point
    - e. Today's drafting
- B. Types of drawings
  - 1. Artistic
    - a. Aesthetic ideas
    - b. Philosophic expressions

2. Technical

a. Exact representation

b. Standardization

c. Accuracy

C. Careers in drafting

1. Opportunities

a. Aeronautics

b. Electricity and electronics

c. Mechanics

d. Sheet metal

e. Architecture

f. Map

g. Structure

h. Pipe

2. Types of training

a. High school followed by apprenticeship

b. Technical/trade school--technician

c. College/university--engineering

3. Qualifications

a. Accuracy

b. Neatness

c. Aptitude

IV. LETTERING TECHNIQUES

A. Types of lettering

1. Single stroke commercial gothic

a. Vertical

b. Inclined

2. Architectural

B. Guidelines

1. Horizontal

2. Vertical

3. Inclined

C. Lettering Instruments

1. Ames Lettering Guide

2. Braddock-Rowe Triangle

3. Professional lettering instruments

a. Leroy Lettering Set

b. Koh-I-Nor Set

c. Wrico Set

4. Plastic lettering templates

V. SKETCHING

A. Purpose

1. To communicate ideas

2. Time element

3. Record ideas

4. Simplify a technical discussion

B. Aids in sketching

1. Paper and cardboard guides

a. Straight

b. Folded

2. String compass

C. Lines, straight

1. Horizontal

2. Vertical

3. Inclined

D. Lines, curved

1. Circle

2. Arcs

VI. CARE AND USE OF EQUIPMENT

A. Drawing desk

B. Drawing boards

1. Type of boards

a. Bass wood

b. Soft pines

c. Metal edge

2. Size of board

a. 18" x 24"

b. 24" x 36"

C. T-Square

1. Type of T-square

a. Plastic

b. Metal

c. Wood

2. Sizes of T-squares

a. 24"

b. 36"

3. Parallel bar

4. Drafting machine

5. Aligning paper

6. Drawing horizontal lines

D. Drawing Paper/film/cloth

1. Kinds of paper

a. White

b. Tinted

c. Tracing

d. Vellum

e. Polyester

2. Drawing paper sizes

a. First series

1. 8½" x 11"

2. 11" x 17"

3. 17" x 22"

4. 22" x 34"

5. 34" x 44"

b. Second series

1. 9" x 12"

2. 12" x 18"

3. 18" x 24"

4. 24" x 36"

5. 36" x 48"

3. Mounting the paper

a. Tape

b. Tacks

E. Pencil

1. Types of pencils

a. Pentel

b. Lead-holder

c. Wood pencil

2. Leads

a. Degrees of hardness

b. Sharpening

3. Drawing lines

4. Lettering

F. Triangles

1. Types of triangles

a. 30° x 60° - clear

b. 45° - clear

2. Sizes

a. 8"

b. 10"

c. 12"

3. Vertical lines

4. Inclined lines

5. Parallel lines

6. Perpendicular lines

G. Erasers

1. Types of erasers

a. Art gum

b. Plastic

2. Erasing shields

a. Metal

b. Plastic

H. Irregular curves

1. Types of curves

a. French curve

b. Adjustable--flexible

c. Ship curve

2. Connecting plotted points

I. Case instruments

1. Minimum requirement

a. Compass

(1) Types of compasses

(a) Large bow

(b) Small bow

(c) Drop bow

(d) Friction

(e) Beam

(2) Sharpening compass lead

(a) Chisel point

(b) Conical point

b. Divider

(1) Types of dividers

(a) Friction

(b) Proportional

(2) Transferring distances

(3) Dividing lines and arcs into equal segments

2. Advanced equipment optional

J. Scales

1. Types of scales

a. Architect

b. Engineer

c. Metric

d. Combination

2. Material of scales

a. Wood

b. Plastic

c. Metal

3. Shapes of scales

a. Triangular

b. Flat

c. One bevel

d. Two bevel

e. Four bevel

K. Drawing techniques

1. Keeping drawings clean

a. Dusting powder

b. Fix-it spray

2. Drawing straight lines

a. Horizontal

b. Vertical

c. Inclined

d. Parallel

e. Perpendicular

f. Angles

g. Pencil rotation

3. Drawing curved lines

a. Arcs

b. Circles

c. Irregular curves

4. Border line and title strip

5. Problem centering

VII. GEOMETRIC CONSTRUCTION

A. Importance of Geometry

1. A study of size and shape
2. Solving drawing problems

B. Application of Geometry

1. Bisecting lines and angles and arcs
2. Dividing lines, angles and arcs into equal parts
3. Erecting perpendicular
4. Parallel lines
5. Construction of geometric figures
   a. Square
   b. Hexagon
   c. Octagon
   d. Pentagon
6. Tangent lines and circles

VIII. ORTHOGRAPHIC PROJECTION/MULTIVIEW DRAWING/SHAPE DESCRIPTION

A. Projection box/Six possible views

1. Front view
2. Top view
3. Right side view
4. Left side view
5. Rear
6. Bottom

B. Drawing of an object using third angle projection

1. Frontal
2. Horizontal
3. Profile

C. Choice of view

1. Most descriptive view
2. Number of views necessary

D. Location of view

E. Mathematical layout of views

1. Centering within working area
2. Spacing between views

F. Alphabet of lines

1. Construction lines
2. Border lines
3. Object lines
4. Hidden lines
5. Center lines
6. Guide lines

IX. DIMENSIONING-SIZE DESCRIPTION

A. Importance of dimensions

1. Accuracy in size description
2. To complete description of object

B. Alphabet of lines

1. Extension lines
2. Dimension lines
3. Center lines
4. Leaders

C. Termination of dimension lines

1. Arrowheads
2. Dot
3. Diagonal line

D. Direction of dimension figures

1. Unidirectional system

2. Aligned system

E. Dimensioning angles

1. Linear dimensioning

2. Coordinate dimensioning

F. Dimensioning arcs and circles

G. Finish symbols

1. Finish marks

2. Surface roughness

H. Geometric breakdown

1. Size dimension

2. Location dimension

I. Notes

1. Local

2. General

J. Dimension figures

1. Whole numbers

a. Feet

b. Inches

2. Fractions

K. Abbreviations

1. Diameter

2. Radius

3. Required

4. Chamber

5. Countersink

6. Counterbore

7. Degree

8. Material

9. Reference

10. Spot face

11. Stock

12. Thread

13. Center line

14. Millimeter

L. Methods of dimensioning

1. Consecutive

2. Progressive

M. Limit dimensioning

N. Tolerance

1. Unilateral

2. Bilateral

O. Decimal system

P. Metric system

X. PICTORIAL DRAWING

A. Use of pictorial drawings

1. Supplement to working drawings

2. Enables layman to visualize the design represented

B. Types of pictorial drawings

1. Oblique

a. Cabinet

b. Cavalier

2. Isometric

3. Perspectives

a. One-point

b. Two-point

C. Oblique axes

1. Variation of direction

2. Variation of angle

D. Isometric axis

1. Variation of direction

2. Angle of axes

E. Lines in an isometric drawing

F. Angles in pictorial drawings

G. Arcs and circles in pictorial drawings

1. Rhombus

2. Four-center approximate ellipse

H. One-point perspective drawing

1. Front view projection

a. Horizon line

b. Vanishing point

c. Group line

2. Station point projection

a. Horizon line

b. Ground line

c. Vanishing point

d. Top view

e. Picture plane line

I. Two-point perspective

1. Ground line

2. Picture plane line

3. Horizon

4. Station point

5. Two vanishing points

6. Line of sight true length line

7. Top view

8. Elevation view

XI. SECTIONAL DRAWINGS

A. Purpose of section drawings

1. Show interior details of an object

2. Show the complex operation of an object

B. Cutting plane line

1. Show edge of cutting plane

2. Location of cutting plane line

3. Equal dash cutting plane line

4. Alternate dash cutting plane line

C. Section lining symbols

1. General purpose symbol

a. $45^0$ angle section lining

b. 1/8" section line spacing

c. Opposite angle section lining

2. Other symbols- see reference material

D. Types of sections

1. Full section

2. Half section

3. Offset section

4. Broken out section

5. Remove section

E. Conventional break

1. S-break

a. Pipe

b. Solid

2. Rectangular break

XII. AUXILIARY DRAWINGS

A. Purpose of an auxiliary

1. Describes true size and shape of an inclined surface

2. Describes special features of an object not perpendicular to the normal plane of projection

B. Kinds of auxiliary views

1. Primary auxiliary

2. Secondary auxiliary

C. Methods of construction

1. Folding plane

2. Center line

3. Reference line

D. Steps of constructions

E. Plotting curves

XIII. THREAD REPRESENTATION

A. History and functions of the threaded fasteners

1. Archimedes

2. Leonardo da Vinci

3. Whitworth

4. William Sellers

B. Standardization

1. American standard screw thread

2. Unified screw thread

3. ANSI metric fasteners standard

C. Application of screw threads

1. Hold parts together

2. Adjust parts

3. Transmit power

D. Thread terminology

1. Thread nomenclature

2. Thread notes

E. Types of thread fasteners

1. Bolts

a. Hex head

b. Square

2. Screws

F. Schematic representation

1. Internal

2. External

G. Simplified representation

1. Internal

2. External

XIV. WORKING DRAWINGS

A. Application of working drawings

1. To show size, shape, and specifications of an object

2. To show how an object is serviced or put together

B. Methods of layout for working drawings

1. Detail drawing

2. Assembly drawing

C. Specifications

1. Materials and parts lists

2. Notes

Title:

Architectural Drafting

Course Description:

Architectural drafting is fascinating and valuable whether it is pursued as a vocation or for personal use by a future home owner. In this course, the student becomes acquainted with consumer information relative to the problems of housing, such as selection and financing, in addition to the problems of planning a house.

Target Grade Level:

Grades 10 - 12

Prerequisite:

Basic Technical Drafting

General Program Goals and Objectives:

Architectural Drafting is designed to provide each student an opportunity to develop the knowledge and understanding necessary to successfully plan a residence. Each student should also develop a degree of skill with architectural drafting techniques, tools, and materials, and have a basic understanding of the principles of house construction.

# ARCHITECTURAL DRAFTING

I. ARCHITECTURAL STYLES

- A. Brief history of style development
- B. Traditional styles
- C. Relation of style to cost

II. TRENDS IN HOUSING

- A. Prefabricated houses
- B. Precut houses
- C. New materials and processes
- D. Trends in styling

III. GENERAL PLANNING CONSIDERATIONS

- A. Basic functions
- B. Traffic and circulation
- C. Stairways
- D. Hallways
- E. Fireplaces
- F. Planning the rooms
  1. Kitchen
  2. Bathroom
  3. Dining room
  4. Bedrooms
  5. Living room
  6. Utility room
  7. Porches and patios
  8. Garage
  9. Other

IV. DRAFTING TECHNIQUE

A. Lettering

B. Architectural symbols

C. Dimensioning practices

D. Window, door, and finishing schedules

V. FLOOR PLANS

A. Classification of drawings

B. Sequence of preparation

C. Features shown on floor plan

D. Dimensioning procedures

E. Symbols

F. Notes

G. Thicknesses of walls and partitions

H. Foundation plans

VI. ELEVATION VIEWS

A. Definition and purpose

B. Symbols for building materials

1. Brick

2. Wood siding

3. Stone

4. Concrete block

5. Asbestos shingles

6. Asphalt shingles

7. Wood shingles

8. Other

C. Dimensions

VII. DETAILS OF CONSTRUCTION

A. Footings and Foundations

B. Floor Framing

C. Wall and Partition Framing

D. Ceiling and Roof Framing

E. Wall Sheathing and Exterior Siding

F. Roof Sheathing, Coverings, and Sheet Metal Work

G. Windows and Doors

H. Interior Decoration

I. Insulation

J. Cabinet Details

VIII. MECHANICAL EQUIPMENT

A. Common Methods of Heating

B. Air Conditioning

C. Heat Pump Systems

D. Plumbing and Fixtures

E. Electrical Wiring

F. Heating Water

G. Public Sewers and Septic Lines

IX. FINANCIAL CONSIDERATIONS

A. Systems for Computing Construction Costs

B. House Size Based on Family Income

C. Financing Houses

D. Distribution of House Costs

1. Lot

2. Landscaping

3. Architects' fees

4. Construction

5. Other

E. Household insurance

X. PLOT PLAN

XI. PERSPECTIVE

XII. MODELS

XIII. SPECIFICATIONS

A. F.H.A.

B. Building codes

C. Electric codes

D. Plumbing codes

Title:

Advanced Technical Drafting

Course Description:

Technical drafting is a graphic language that is used to express and record ideas. Tangible goods and products of manufacturing industries begin as thoughts and theories in the minds of creative people. Drafting is a tool that must be used to develop and expand these ideas and to convey them to those who produce, use, and service the products.

Advanced Technical Drafting involves the preparation of detail and assembly drawings, including sections, threads and fasteners, and auxiliary views. A survey of specialized areas, such as structural drafting, electrical drafting, and technical illustration is also included.

Target Grade Levels:

Grades 10 - 12

Prerequisite:

Basic Technical Drafting

General Program Goals and Objectives:

In advanced technical drafting, the student will have an opportunity to develop additional skills in visualization and in drafting techniques. The student will also develop skill in the execution of working drawings, production illustrations, primary and secondary auxiliary views, electrical drawings, and structural drawings.

# ADVANCED TECHNICAL DRAFTING

I. FUNCTIONAL DRAFTING

- A. Types of functional drafting
- B. Simplified drafting
- C. Unnecessary views and details
- D. Base-Line dimensioning
- E. Templates
- F. Overlays
- G. Tape drafting

II. INKING

- A. Drafting Ink
- B. Instruments for inking
- C. Inking straight lines
- D. Inking circles and arcs
- E. Order of inking

III. SURFACE DEVELOPMENT AND INTERSECTION

- A. Drafting for sheet materials
- B. Development
- C. Parallel-line development
- D. Radial-line development
- E. Triangulation
- F. Intersections

IV. SECONDARY AUXILIARY VIEWS AND REVOLUTIONS

- A. Secondary auxiliary projection
- B. Axis of revolution

C. Rules of revolution

D. Three kinds of revolutions

V. GRAPHIC CHARTS AND DIAGRAMS

A. Line charts

B. Nomograms

C. Bar charts

D. Pie charts

E. Pictorial charts

F. Organization and flowcharts

VI. DETAIL THREAD REPRESENTATION

A. Detailed screw-threads

B. Screw thread norms

C. Specifying fasteners

VII. MAP DRAFTING

A. Careers in mapping

B. Scales and map sizes

C. Contour maps

D. Geological mapping

VIII. BASIC DESCRIPTIVE GEOMETRY

A. Points and lines

B. Plane surfaces

XI. ELECTRICAL AND ELECTRONICS DRAFTING

A. Careers in the electrical industry

B. Terms for understanding electricity and electronics

C. Symbols

D. Circuits

E. Drafting practice

F. Diagram procedures

X. TECHNICAL ILLUSTRATION

A. Types of illustrations

B. Equipment

C. Pictorial line drawing

D. Line shading

E. Surface shading

F. Airbrush rendering

UNIVERSITY OF SOUTHWESTERN LOUISIANA

REGIONAL CENTER

DEPARTMENT OF INDUSTRIAL AND TECHNICAL EDUCATION

# GENERAL INDUSTRIAL ARTS

Course Description:

This course is designed as an introductory course into a world of technology and industry. The course is designed to provide many different and basic opportunities to students in a broad range of subject areas and activities. Students will design, plan, and build many projects and "mini-projects" by using hand and power tools.

Target Grade Level:

This course is designed for grades 9 through 12. It is a prerequisite course and must be taken by all students before entering into any of the other "technical" industrial arts courses with the exception of the Mechanical Drawing courses. It is also suggested that this be a prerequisite course for many of the "Vocational courses.

Prerequisite: NONE

General Program Goals and Objectives:

The study of General Industrial Arts should provide students with:

1. Learning experiences that will assist students in identifying and evaluating their personal interests, abilities, values, and needs as they relate to the needs of our industrial society.
2. Foundations and exploratory experiences in many basic areas to further progress in other courses of interest.

3. The opportunity to develop general and specific problem-solving and creative abilities involving the tools, materials, processes, and products of industry.
4. Broad introductory experiences in one and, it is hoped, many occupational clusters.

Suggested Content Organization:

I. Industry and technology
   A. Occupations
   B. Career clusters
   C. Job opportunities
II. English and systems international measurements
III. Reading, interpreting, and making production-type working drawings and sketches
IV. Materials technology
   A. Woods
   B. Metals
   C. Plastics
   D. Others
V. Safety
VI. Layout and measurement
VII. Basic hand tools
   A. Use
   B. Operation
   C. Care
VIII. Power tools and equipment
   A. Use
   B. Operation
   C. Care

IX. Construction and assembly techniques of materials

X. Planning, designing, and organizing work

XI. Career opportunities

XII. Mass production

(Subject Area Inclusions)

# BASIC GRAPHIC ARTS

Course Description:

Basic Graphic Arts is a study of the basic processes of graphic communications industries. The student, through varied hands-on experiences will have an opportunity to make tentative career decisions, analyze future and present employment trends, and experience guidance in the various careers related to graphic communications. Students will have opportunities to design, plan, and complete various projects and jobs in the operation and management of the graphic arts laboratory. Work in individual and group educational experiences is encouraged as part of the structure of this course.

Target Grade Level:

This course is designed for students in the 10th, 11th, or 12th grade.

Prerequisite:

General Industrial Arts

Suggested Content Organization:

I. Graphic arts industry

II. Publishing industry

III. Photography and dark room

- A. Film and print processing
- B. Enlargements and care and use of camera and darkroom equipment

IV. Composition, make-up, and layout

V. Letterpress printing

A. Typesetting

B. Proof taking

C. Press make ready

D. Press operation

VI. Offset lithography

A. Preparation of copy

B. Negative preparation

C. Platemaking

D. Press operation

VII. Silk-screen printing

A. Stencil preparation

B. Application of stencil to screen

C. Printing

D. Care and wash-up

VIII. Intaglio printing

Dry Point and etching

IX. Book binding

X. Duplication

A. Copy

B. Spirit

C. Mimeograph

D. Other

XI. Paper

XII. Job opportunities

## ADVANCED GRAPHIC COMMUNICATIONS

Course Description:

Advanced Graphic Communications should provide all students the opportunity to advance technically and expand their skills and experiences in one or more areas previously studied. Students will also have the opportunity to direct their activities into new and more technologically advanced areas of the graphic arts and communications industry.

Target Grade Level:

This course is designed for the 11th and 12th grade levels.

Prerequisite:

General Industrial Arts and Basic Graphic Communications.

Suggested Content Organization:

I. Process camera work
II. Portable camera
III. Printing and publishing industry
IV. Half tones and advanced offset procedures
    A. Black and white
    B. Color
V. Inks
VI. Color dynamics
VII. Photographic and vacuum screen printing
VIII. Computer assisted printing

IX. Display

X. Video techniques

XI. Professional photography

XII. Commercial art and communication

# BASIC WOODWORKING

Course Description:

Basic woodworking is a course designed to provide student opportunities to develop and learn through hands-on experience with hand and power tools in building and shaping articles of wood and wood related materials. Student activities may be directed toward the repair and reconstruction of existing wood based items as well as developing new designs. A wide range of occupations and career opportunities are studied, dealing with wood and wood related industries. This course is designed for all students desiring a broad general industrial and technical background in woodworking and for those students having a special avocational interest in basic woodwork.

Target Grade Level:

This course is designed for students in the 10th, 11th, or 12th grade.

Prerequisite:

General Industrial Arts

General Program Goals and Objectives:

At the conclusion of this course students should be able to:

1. Develop interests in wood product industries and manufacturing plants.
2. Develop skills in using hand and/or power tools.
3. Recognize and develop quality workmanship skills.
4. Develop safe work habits and attitudes.

5. Plan and develop plans and procedures in fabrication of wood and wood related products.

6. Develop and explore occupational skills and opportunities in wood industries.

Suggested Content Organization:

I. Orientation and history of wood

II. Wood technology

A. Trees

B. Materials testing

C. Careers

D. Processes

III. Project design and planning

A. Function

B. Techniques

C. Selections

D. Enrichment

E. Patterns

F. Drawings

G. Bill of materials

H. Buying materials

IV. Woodshop safety

A. General safety review

B. Individual hand and power tools

C. Emergency procedures

V. Layout

A. Pattern and template transfer

B. Pattern development

C. Drawing

VI. Basic hand tool use

A. Kinds

B. Uses

C. Care and maintenance

VII. Basic joinery

A. Kinds and/or uses of joints

B. Joinery methods

VIII. Basic construction techniques

A. Furniture

B. Cabinet

C. Small or large products/projects

D. Veneering

IX. Power tools

A. Portable

B. Stationary

X. Finishing

A. Materials

B. Products

C. Supplies

D. Techniques/processes

XI. Industrial techniques/procedures

A. Mass production

B. Custom millwork

C. Custom manufacturing

D. Modular construction

E. Wood laminating

F. PEG diffusion

G. Wood blower and/or particle moulding

H. Wood plastic composition (WPC)

I. Wood structure, properties, and identification

J. Drying and seasoning wood

XII. Mass production

XIII. Recreation/avocational hobbies and careers in woodworking

A. Field trips

B. Guest speakers

# ADVANCED WOODS

Course Description:

This course is designed for students wishing to further their knowledge and experiences of a more advanced nature dealing with the materials, tools, and processes of the many thousands of man and machine-made wood and wood base products now utilized in the furniture and building construction industries. Students will design, plan, and build articles of furniture, recreational products, of construction/industry-based design, using machine tools, processes, and wood technology. More complex skills are developed in the use of woodworking machines. Students are encouraged to be more selective and creative in the planning and design of projects. Occupations are studied in terms of career goals to meet individual goals of each student.

Target Grade Level:

This course is designed for grades 11 and 12.

Prerequisite:

General Industrial Arts and Basic Woods

Suggested Content Organization:

I. Advanced wood-technology
II. Cabinetry and furniture design and periods
III. Machine tools and shop safety
IV. Machine layout procedures involving special set-ups, jigs, and fixtures
V. Advanced joinery techniques
VI. Advanced construction techniques

VII. Machine tool and portable power tool maintenance, operation, and upkeep

VIII. Wood turning

IX. Wood laminating

X. Wood bending

XI. Carpentry

XII. Patternmaking

XIII. Upholstery

XIV. Advanced finishing techniques

XV. Mass production

# BASIC RECREATION CRAFTS

Course Description:

Basic recreational crafts should provide opportunities for students to express their interests and desires in creative experiences through a variety of materials and projects. This expression may be through the fine arts or through craftwork endeavors. These expressions should be directed toward the creation or re-creation of well-designed, artistic, useful, and esthetic objects for each student enrolled in the course.

Target Grade Level:

This course is designed for the 10th, 11th, and 12th grades.

Prerequisite:

General Industrial Arts

General Program Goals and Objectives:

Below is a list of objectives that should have been accomplished by each student:

1. The student should be able to construct several well-designed projects to meet and express creative needs and desires.
2. The student will show evidence of exposure to many different craft activity areas.
3. The student will be aware of the occupational opportunities in the areas of arts and crafts.
4. The student will be able to prepare sketches depicting the shapes of objects to be constructed.

5. The student will exhibit safe tool, machines, and materials handling practices.

6. The student will show evidence of increased interest in creative activities, both vocational and avocational in nature.

Suggested Content Organization:

I. Desing
   - A. Elements
   - B. Principles
   - C. Requirements
   - D. Process

II. Craftwork/artwork as occupations

III. Safety

IV. Project design-sketching and drawings

V. Layout, measuring, and cutting of materials

VI. Forming and shaping of materials

VII. Shaping of materials

VIII. Fastening and joining of materials

IX. Preparing, coloring, and finishing materials

X. Attaching hardware and implements

XI. Suggested areas of activities by subject/area
   - A. Metal crafts
     1. Enameling
     2. Etching
     3. Tooling ( mbossing)
     4. Scroll
     5. Lost wax casting

B. Plastics

1. Fiberglass laminating
2. Casting
3. Granule forming
4. Sheetwork

C. Woodcraft

1. Carving
2. Whittling
3. Silhouette carvings
4. Driftwood
5. Bench woods
6. Picture framing

D. Leather

1. Sculpture
2. Tooling

E. Ceramic

1. Glass etching
2. Stained glass
3. Slumped glass
4. Mosaic tiles
5. Clay Work
   a. Molding
   b. Slip
   c. Turning

F. Decoupage

G. Macrame

H. Candle making

I. Paper-mache

J. Collage

K. Preserving flowers, fish, reptiles, and animals

# ADVANCED RECREATIONAL CRAFTS

Course Description:

Advanced Recreational Crafts should provide students the opportunities to further develop and expand their interests and desires in several areas of study covered in Basic Recreational Crafts. In addition to the continuation of study in areas of interest, students will have the opportunity to direct their interests into several new subject activity areas.

Target Grade Level:

This course is designed for students at the 11th and 12th grade levels.

Prerequisite:

General Industrial Arts and Basic Recreational Crafts.

Suggested Content Organization:

I. Graphic arts
   - A. Linoleum block printing
   - B. Silk-screen printing
   - C. Commercial layout and design
   - D. Photography

II. Creating a home workshop

III. Basketry

IV. Spinning and dying yarn

V. Weaving

VI. Batik and tie-dying

VII. String art

VIII. Moldmaking

IX. Indoor gardening and solar greenhouses

X. Lapidary

XI. Jewelry

XII. Preserving and drying fruits and vegetables

XIII. Restoring furniture

XIV. Dough art

XV. Winemaking

XVI. Breads