

1960

1960-1961 Southern Illinois University Bulletin Carbondale Campus (School of Applied Science)

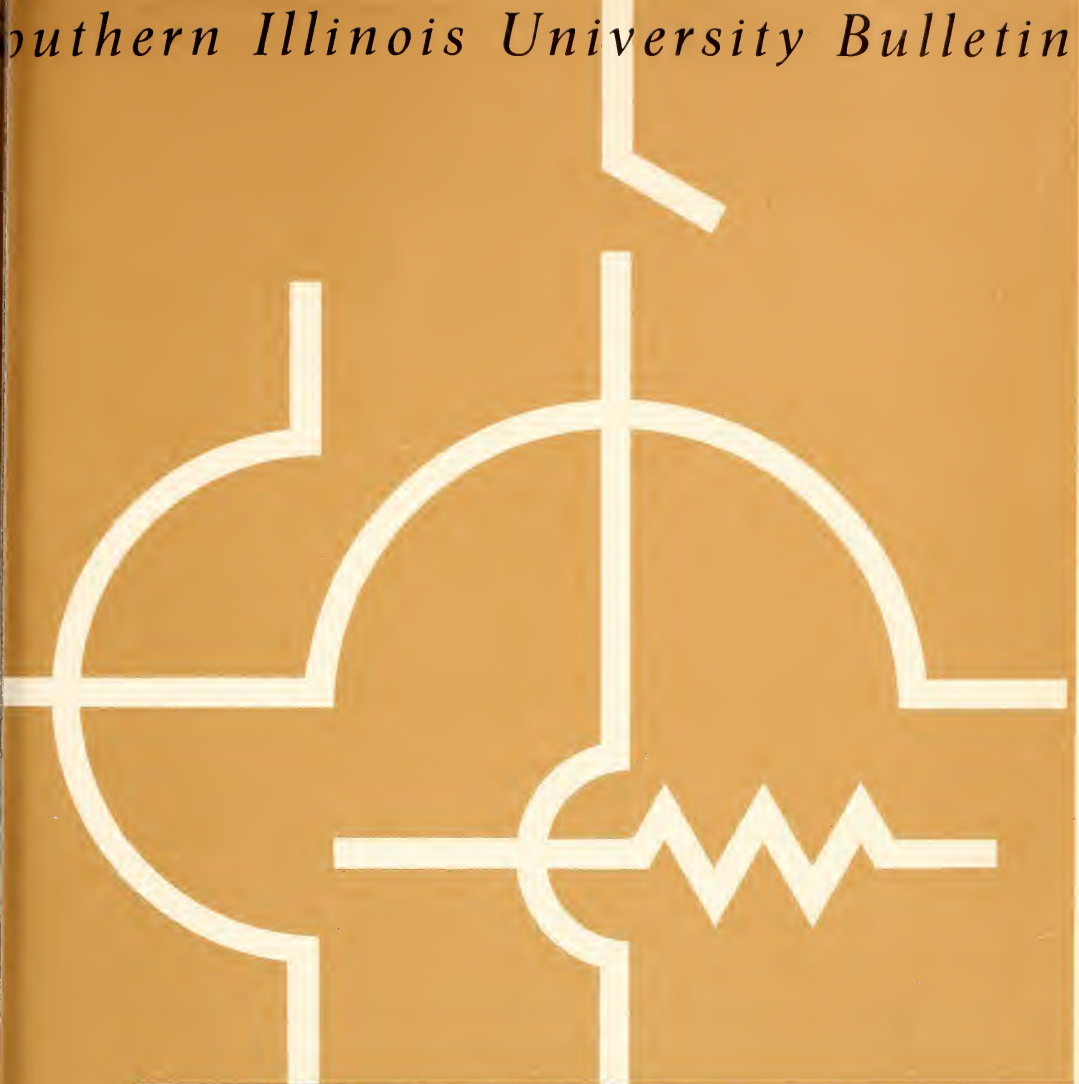
Southern Illinois University Carbondale

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1960 · 1961

School of Applied Science

Carbondale Campus

Vol. 2, No. 4

Objectives of Southern Illinois University

TO EXALT BEAUTY

IN GOD,
IN NATURE,
AND IN ART;
TEACHING HOW TO LOVE THE BEST
BUT TO KEEP THE HUMAN TOUCH;

TO ADVANCE LEARNING

IN ALL LINES OF TRUTH
WHEREVER THEY MAY LEAD,
SHOWING HOW TO THINK
RATHER THAN WHAT TO THINK,
ASSISTING THE POWERS
OF THE MIND
IN THEIR SELF-DEVELOPMENT;

TO FORWARD IDEAS AND IDEALS

IN OUR DEMOCRACY,
INSPIRING RESPECT FOR OTHERS
AS FOR OURSELVES,
EVER PROMOTING FREEDOM
WITH RESPONSIBILITY;

TO BECOME A CENTER OF ORDER AND LIGHT

THAT KNOWLEDGE MAY LEAD
TO UNDERSTANDING
AND UNDERSTANDING
TO WISDOM.

SCHOOL OF APPLIED SCIENCE
Announcements for 1960-1961

The following issues of the *Southern Illinois University Bulletin* may be obtained without charge from General Publications, Southern Illinois University, Carbondale, Illinois.

General Information
Summer Session
Schedule of Classes
Graduate School
College of Education
College of Liberal Arts and Sciences
School of Agriculture
School of Applied Science
School of Business
School of Communications
School of Fine Arts
School of Home Economics

SOUTHERN ILLINOIS UNIVERSITY BULLETIN
Volume 2 Number 4 June, 1960
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School of Applied Science

Announcements for 1960-1961



GENERAL PUBLICATIONS

Southern Illinois University

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Carbondale, Illinois

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Director of Admissions Willis E. Malone, Ph.D. (Ohio State)	1939

This Bulletin . . .

covers in detail questions concerning the School of Applied Science. It does not cover all questions concerning Southern Illinois University. For complete information about the University the prospective student should refer to the General Information bulletin.

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University Calendar, 1960-1961

SUMMER SESSION

Session Begins	Monday, June 20
Independence Day Holiday	Monday, July 4
Final Examinations	Wednesday–Thursday, August 10–11
Commencement	Friday, August 12

FALL QUARTER

New Student Week	Friday–Tuesday, September 16–20
Quarter Begins	Wednesday, September 21
Thanksgiving Recess	Wednesday, 12 noon–Monday, 8 A.M. November 23–28
Final Examinations	Monday–Saturday, December 12–17

WINTER QUARTER

Quarter Begins	Tuesday, January 3
Final Examinations	Monday–Saturday, March 13–18

SPRING QUARTER

Quarter Begins	Monday, March 27
Memorial Day Holiday	Tuesday, May 30
Final Examinations	Wednesday–Tuesday, June 7–13
Commencement	Wednesday, June 14

Summer classes will begin Tuesday, June 21. During a quarter, day classes will begin on the second day of the quarter. Evening classes (5:45 P.M. or later) will begin on the first day of the quarter.

University Calendar, 1961-1962

SUMMER SESSION*

Session Begins	Monday, June 19
Independence Day Holiday	Tuesday, July 4
Final Examinations	Wednesday–Thursday, August 9–10
Commencement	Friday, August 11

SUMMER QUARTER*

Quarter Begins	Monday, June 19
Independence Day Holiday	Tuesday, July 4
Quarter Ends	Friday, September 1

FALL QUARTER

New Student Week	Sunday–Tuesday, September 17–19
Quarter Begins	Wednesday, September 20
Thanksgiving Recess	Wednesday, 12 noon–Monday, 8 A.M. November 22–27
Final Examinations	Monday–Saturday, December 11–16

WINTER QUARTER

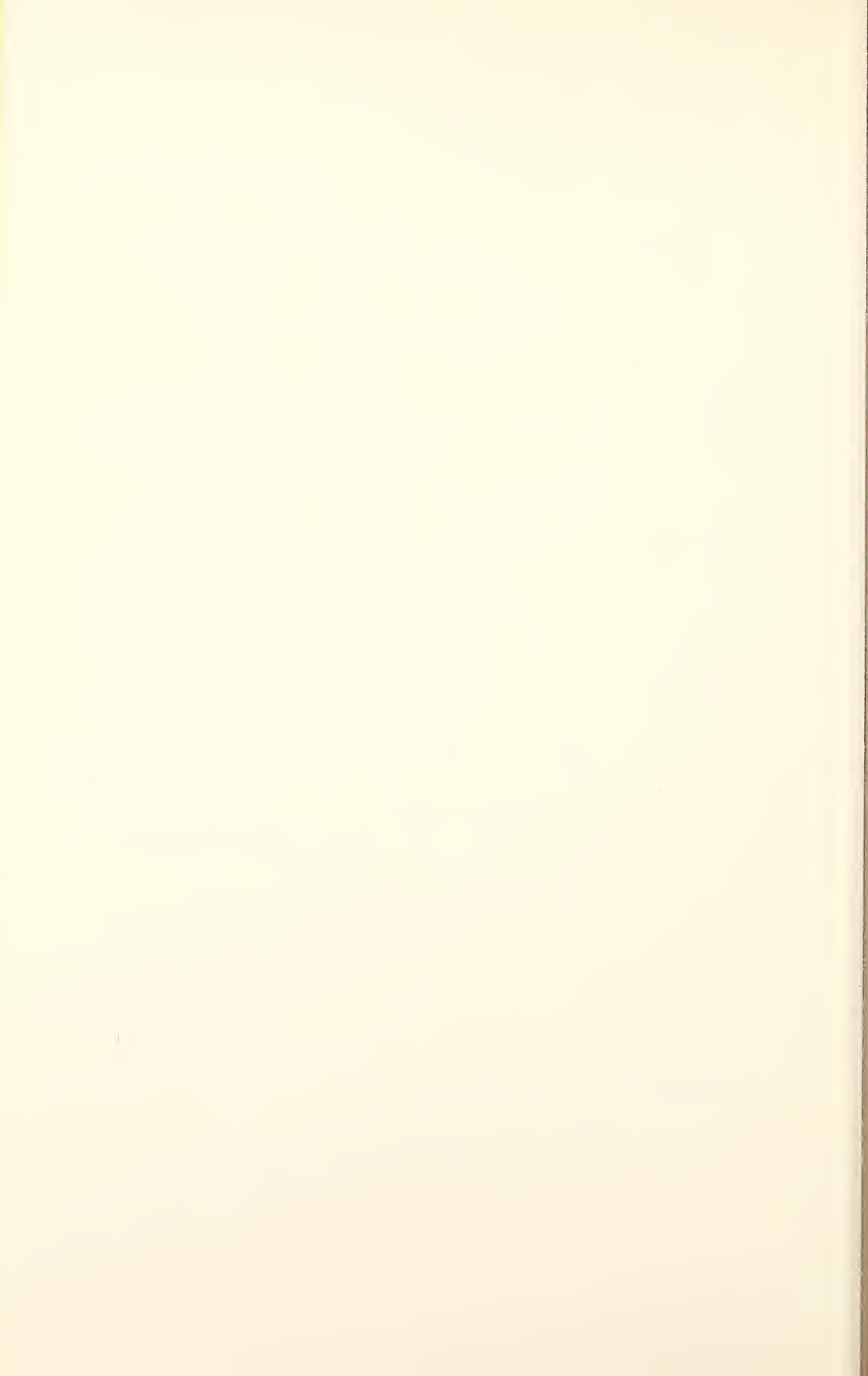
Quarter Begins	Tuesday, January 2
Final Examinations	Monday–Saturday, March 12–17

SPRING QUARTER

Quarter Begins	Monday, March 26
Memorial Day Holiday	Wednesday, May 30
Final Examinations	Wednesday–Tuesday, June 6–12
Commencement	Wednesday, June 13

Summer classes will begin on Tuesday, June 20. During the fall, winter, and spring quarters, day classes will begin on the second day of the quarter. Evening classes (5:45 P.M. or later) will begin on the first day of the quarter.

* Provision has been made for either an eight-week summer session or a regular summer quarter. The one to be followed will not be known until after the Illinois General Assembly acts on the University's budget during the 1961 legislative session.



The University

SOUTHERN ILLINOIS UNIVERSITY was established in 1869 as Southern Illinois Normal University. The shortened name became official in 1947 by action of the state legislature.

For some years after its establishment, Southern operated as a two-year normal school. In 1907 it became a four-year, degree-granting institution, though continuing its two-year course until 1936. In 1943 the state legislature changed the institution, which had been in theory exclusively a teacher-training school, into a university, thereby taking official recognition of the great demand in the area for diversified training.

The Graduate School, approved in 1943, at first granted only the Master of Science in Education degree. In 1948 it was authorized to grant also the Master of Arts and Master of Science degrees. In 1952 the Master of Fine Arts degree was added to this list, and in 1955 the Doctor of Philosophy degree was added. The Master of Music and the Master of Music Education degrees were authorized in 1956.

In 1949 the Belleville Residence Center was established and the Alton and East St. Louis residence centers in 1957. In 1958 the Southwestern Illinois Residence Office was created to co-ordinate and direct the University's educational activities in the Madison-St. Clair counties area. In 1959 its name was changed to the Southwestern Illinois Campus and the residence centers to the Alton Center and the East St. Louis Center.

LOCATION

The general administrative offices for the University's campuses at Carbondale, Southern Acres, and Little Grassy Lake are located at Carbondale. The Southwestern Illinois Campus, the administrative office for the Alton Center and the East St. Louis Center, is located at Edwardsville.

The facilities at Carbondale now include more than twenty-three hundred acres of land, thirty-six permanent buildings, and numerous temporary buildings. These buildings house classrooms, auditoriums, laboratories, libraries, offices, living quarters, cafeterias, and farm equipment and animals. The Little Grassy Lake and Southern Acres campuses are each about ten miles from Carbondale.

The Southwestern Illinois Campus at Edwardsville offers classes at the Alton and East St. Louis centers. The facilities of the former Shurtleff College have been leased by the University for the operation of the Alton Center. The East St. Louis Center is located at the former East St. Louis High School building.

SESSIONS

The academic year is divided into three quarters. Each quarter is approximately twelve weeks in length.

The fall quarter opens near the middle of September and closes just prior to the Christmas vacation period. The winter quarter begins early in January and ends about the middle of March. The spring quarter begins the latter part of March and ends about the second week in June. Definite dates for each quarter may be found in the University Calendar.

In addition to the three quarters, there is an eight-week summer session which begins immediately following the close of the spring quarter. The summer session consists of a comprehensive program of courses offered by the departments of the University. In addition to the courses which run the full eight weeks, there are workshops and short courses covering shorter periods of time.

REGULATIONS

The University and its various instructional units reserve the right to change the rules regulating admission, instruction, and graduation; to change courses and fees; and to change any other regulation affecting the student body. Such regulations shall go into force whenever the proper authorities so determine, and shall apply both to prospective students and to those who have enrolled in the University.

School of Applied Science

THE SCHOOL OF APPLIED SCIENCE was established by action of the Board of Trustees on July 1, 1959. The school includes the Department of Applied Science and the Department of Industrial Education.

As early as 1908, courses in "manual arts" were offered primarily for those preparing to teach industrial arts in the public schools. The program developed slowly for a number of years. Later as the public schools placed more emphasis on industrial arts for its industrial informational and exploratory values, more and more teachers were needed. Simultaneously industry's demands for more industrially trained educators and supervisors increased.

From 1946 the Department of Industrial Education found itself serving the area by offering pre-engineering courses. Demands steadily increased for the more advanced applied sciences and resulted in the establishment of the Department of Applied Science in 1958. Laboratory facilities were provided for materials testing, power electricity and electronics, and power mechanics. Plans are now being implemented to provide laboratory experiences in fluid mechanics.

OBJECTIVES

In order to make better use of the natural physical resources of the area, the School of Applied Science is dedicated to the task of providing education, consultative services, and physical facilities. Motivated by the characteristics of Southern Illinois and its potential for industrial development, the school is developing a program to meet the present and anticipated needs of the area. To this end the general objectives are

1. The development of industrial personnel who fit into an evolving industrial community, such as is developing in Southern Illinois;
2. The provision of adequate facilities for the practical experiences needed by those pursuing advanced technical curricula;

3. The provision of facilities for assisting industry and education by providing adequate consultative and testing services;

4. The provision of opportunity for research and development in the fields of engineering and industrial teacher education; and

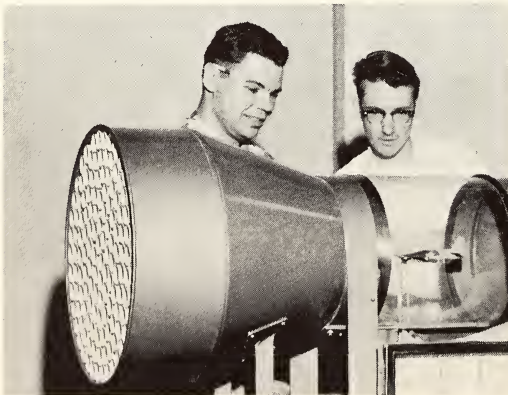
5. Full co-operation with other agencies in Illinois to the end that better living conditions may be developed and that Southern Illinois might be advanced to a higher economic level.

Students enrolled in the School of Applied Science have a choice of (1) pursuing engineering objectives, (2) preparing to teach industrial and technical subjects, (3) training for industrial supervisory positions, or (4) becoming qualified as manual arts therapists.

Graduate work is provided in the Department of Industrial Education. The Master of Science degree requires a research project and the preparation of a thesis. The Master of Science in Education degree is provided for those who have backgrounds in education. The latter degree requires specified course work in research and report writing, and it is offered in co-operation with the College of Education. A minor in industrial education has recently been provided for the Ph.D. candidate whose major field is in the College of Education.

FACILITIES

Present applied science laboratories include an electrical and electronics laboratory, a mechanical laboratory, a strength of materials laboratory, and a surveying locker room. These laboratories are spacious and the equipment is new and modern. Also a fluid mechanics laboratory is being installed. These laboratories are constantly being improved and offer complete and adequate facilities for the courses in the four-year applied science curriculum. The area devoted to laboratory space amounts



*Students experimenting
with a model wind tunnel.*

Students are given instruction in electrical engineering fundamentals.



to more than 11,000 square feet. In addition, engineering drawing and design space is provided, as are classrooms and staff offices where students receive both group and individual attention.

The Department of Industrial Education is presently housed in three barracks-type buildings located on the south side of the campus. In all, the department has more than 15,000 square feet of special laboratories equipped for the following subject matter areas:

Architectural and Machine Drawing	General Metals
Electricity and Electronics	Machine Shop
Finishing	Plastics
Graphic Arts	Welding
General Crafts	Woodworking

PROGRAMS OF INSTRUCTION

The Bachelor of Science degree is offered for all undergraduate programs. The Bachelor of Science in Education degree is offered for students in the College of Education who are majoring in industrial education. Students in the School of Applied Science working toward a Bachelor of Science degree may choose either of the following majors:

1. *Applied Science*—for those with engineering objectives;
2. *Industrial Sciences*—for those whose objectives lead to
 - a. Industrial arts teaching,
 - b. Trade and industrial technical teaching,
 - c. Industrial supervisory positions and training directorships within industry, or
 - d. Manual arts therapy.

The Master of Science degree is offered for students interested in the fields of industrial sciences listed above, while the Master of Science in Education degree is offered for those majoring in industrial education. A minor in industrial education is available to Ph.D. candidates.

STUDENT ORGANIZATIONS AND ACTIVITIES

The Applied Science Club sponsors social hours, lectures, demonstrations, and discussions and provides leadership in the co-ordination of its interests with those of engineering societies. Participation in the club's activities provides the student contact with fellow students, practicing engineers, and faculty members. It is a source of valuable engineering and scientific information as well.

The Industrial Education Club is concerned with products, procedures, industrial organization, management, industrial education, and training within industry. Group projects are undertaken involving campus life and the professions appropriate to the various undergraduate programs. All students in the School of Applied Science are eligible for membership.

Iota Lambda Sigma is a professional fraternity for men in the field of industrial education. Its ideals are based on service. It embraces interest in industry, learning (skills as well as knowledge), and the role of the teacher or supervisor of industrial subjects. Membership is by invitation and is open to those with potential leadership qualities. Scholarship is also a criterion for determining eligibility for membership.

ADMISSION TO THE SCHOOL

High school students preparing for the study of applied science at Southern Illinois University should have four units of English; at least two and one-half units of mathematics (algebra, geometry, trigonometry); two to three units of social studies; and two to three units of science (biology, chemistry, physics). Physics is especially recommended.

Those seeking admission to the curricula in the Department of Industrial Education should have the same basic high school background as those entering applied science. In addition, it is well for students to include in their high school program at least one course in industrial arts.

Inquiries concerning admission to the School of Applied Science should be directed to the Admissions Office, Southern Illinois University, Carbondale, Illinois. Application for admission should be initiated at least thirty days in advance of the desired entrance date to permit necessary

processing to be completed. High school seniors should apply at the beginning of the last semester of their senior year.

COMPLETE DETAILS concerning admission, tuition, fees, housing, financial assistance, and student employment are given in the General Information bulletin. For a free copy write to General Publications, Southern Illinois University, Carbondale, Illinois.

TUITION AND FEES

At the present time legal residents of Illinois registered for more than eight hours pay a total of \$61.50 per quarter. This includes \$42.00 tuition, a \$5.00 book rental fee, a \$5.00 student union building fund fee, and a \$9.50 student activity fee. Out-of-state students pay an additional \$50.00 tuition, or a total of \$111.50. Students registered for eight hours or fewer pay one-half tuition, one-half book rental fee, full student union building fund fee, and have the option of paying the student activity fee.

ADVISEMENT

To approve a student's schedule of classes each term and to help him interpret the various requirements in his curriculum, the School of Applied Science has a number of advisers who have regular office hours in the Academic Advisement Center. The student should secure an appointment with the adviser who is specifically assigned to advise in his particular curriculum.

REQUIREMENTS FOR THE BACHELOR'S DEGREE

Each candidate for the degree must complete a minimum of 192 hours of credit in approved courses. At least 64 must be in senior college courses, of which 48 must be earned at Southern, 16 of which may be earned in extension from Southern. Each student must have a "C" average, and grades not lower than "C" in subjects aggregating at least three-fourths of the work. A "C" average is required in the major subject. These aver-

ages are required for the credit made at Southern as well as for the total record.

Throughout this bulletin, hours of credit are *quarter hours* except where otherwise indicated.

The following requirements should be met by all degree candidates of the University within the first two years of attendance.

REQUIREMENTS	HOURS	COURSES
Social Studies	20	Economics 205, Geography 100, Government 101, History 101, 102, 103, Sociology 101 (work in four of the five departments)
Humanities	18	
English	(9)	English 101, 102, 103
English	(6)	English 205, 206, 209, 211, 212
Art or Music	(3)	Art 120, Music 100
Biological Sciences	9	
Health Education	(4)	Health Education 100
Botany or Zoology	(5)	Botany 101, 202, Zoology 100
Mathematics and Physical Sciences	12	Chemistry, physics, and mathematics (work in two of the three departments)
Practical Arts and Crafts	3	Agriculture, business administration, home economics, industrial education (not required if the student has had any of this work in high school)
Physical Education	6	Activity courses
Air Science (Men only)	3	Air Science 110, 210, 220, six quarters of leadership laboratory, and three elective courses must be satisfactorily completed before this requirement is fulfilled.

All curricula require a minimum of 192 hours of credit in approved courses. The applied science curriculum requires somewhat more. Depending upon the student's background, certain preparatory courses may be required. The student's adviser will assist in determining deficiencies, curricula, and graduation requirements.

In addition, all graduates of the School of Applied Science must pass an English proficiency examination. This examination, given in February, should be taken by the student during his sophomore year. This rule applies to all students who will be graduated after June, 1960.

Instructional Units

DEPARTMENT OF APPLIED SCIENCE

Professor Ralph O. Gallington, Ed.D. (George Washington) Acting Chairman	1955
Professor J. Henry Schroeder, M.S. (Iowa)	1923
Associate Professor Charles A. Bunten, Ed.D. (Missouri)	1959
Associate Professor Herbert A. Crosby, M.S.E.E. (Washington University)	1958
Associate Professor Ernest Leon Dunning, M.S.M.E. (Kentucky)	1957
Associate Professor Clifford M. Moeller, M.S.C.E. (Kansas State College)	1956
Assistant Professor Peter D. Anderson, M.S.M.E. (Kansas State College)	1959
Assistant Professor George R. Glenn, M.S.C.E. (Clemson)	1958
Assistant Professor Marvin E. Johnson, Ed.D. (Missouri)	1948
Assistant Professor Mark E. Klopp, M.Ed. (Pennsylvania State)	1956
Instructor John Bruce Miles, M.S.M.E. (Missouri School of Mines)	1958
Instructor Nicholas J. Nigro, M.S.C.E. (Iowa State)	1959
Instructor Benny S. Vineyard, M.S. (Illinois)	1954
<hr/>	
Lecturer Thomas Randall DuBois, B.S.E.E. (Pennsylvania)	1957-60
Visiting Professor Randolph P. Hoelscher, M.S.C.E. (Illinois)	1959-60

Applied science embraces the fields of solid and fluid mechanics, civil architecture and electricity. The Department of Applied Science offers a complete course of study leading to the Bachelor of Science degree. The first two years follow the requirements of leading engineering schools, and the third and fourth years provide a program in applied science of a general nature. Rapid advances in technology make it desirable for a student to obtain such a broad background before specialization. The degree offered is comparable to a general engineering degree.

THE APPLIED SCIENCE MAJOR

The following courses are required for a major in applied science:

	Hours
<i>General degree courses required</i>	
Air Science (See also page 8.)	3
Art 120 or Music 100	3
Botany 101 or Zoology 100	5
Chemistry 111	5
Economics 205	5
English 101, 102, 103	9
English 205, 206, 209, 211, 212 (two of the five)	6
Geography 100 or Sociology 101	5
Government 101	5
Health Education 100	4
History 202	5
Mathematics 113	5
Physics 211	5
Physical education activity courses	6
<i>Total</i>	71
 <i>School of Applied Science courses required</i>	
Applied Science 000, 101, 205, 206, 260, 261, 262, 263, 300, 301, 302, 311, 312, 313, 315, 316, 318, 320, 321, 331, 332, 333, 334, 335, 336, 340, 342, 343, 344, 345, 346, 347, 361, 363	97
Industrial Education 227	4
<i>Total</i>	101
 <i>Other courses required for the major</i>	
Chemistry 112, 113	10
Management 380	4
Mathematics 251, 252, 253, 305, 306	18
Physics 212, 213	10
Speech 101	4
<i>Total</i>	46
 SUMMARY FOR THE APPLIED SCIENCE MAJOR	
General degree courses required	71
School of Applied Science courses required	101
Other courses required for the major	46
TOTAL	218

COURSE DESCRIPTIONS

- 000-0. ENGINEERING ORIENTATION. Lectures by applied science staff members, other university faculty and personnel, and visiting scientists or engineers in order to acquaint new students with various phases of engineering and the facilities of the University. Slide rule instruction and application to engineering problems. Required of all freshman applied science students.
- 101-3. ENGINEERING DRAWING I. Orthographic projection, sections and conventions, dimensioning, auxiliary views, freehand lettering and sketching, and use of instruments.
- 205-3. ENGINEERING DRAWING II. A continuation of 101. Auxiliary views, threads and fasteners, dimensioning, working drawings, intersections and developments, and charts and graphs. Prerequisite: 101.
- 206-4. DESCRIPTIVE GEOMETRY. Graphical solution of problems involving the understanding of the space relationships of points, lines, and planes; intersections and developments. Prerequisites: 101, Mathematics 112.
- 260-3. ANALYTICAL MECHANICS (STATICS). Resultants of force systems, algebraic and graphical conditions of equilibrium of force systems; analysis of forces acting on members of trusses, forces due to friction; centroids. Prerequisites: registration in Mathematics 251 and Physics 211.
- 261-3. ANALYTICAL MECHANICS (DYNAMICS I). Displacement, velocity, and acceleration of a particle; translation, rotation; plane motion. (Kinematics). Prerequisite: 260.
- 262-3. ANALYTICAL MECHANICS (DYNAMICS II). Solutions using the principles of force, mass and acceleration, work and energy, and impulse and momentum. (Kinetics). Prerequisite: 261.
- 263-4. SURVEYING I. Use and care of surveying instruments. Fundamental principles of surveying, computations, land surveying, topographic surveying. Two hours lecture, six hours laboratory. Prerequisites: 101, Mathematics 112 or equivalent.
- 264-4. SURVEYING II. Topographic surveying, field astronomy, route surveying, introduction to photogrammetry. Two hours lecture, six hours laboratory. Prerequisite: 263.
- 300-3. THERMODYNAMICS I. The study of fundamental energy concepts and the laws of thermodynamics, availability of energy, properties of gases, vapors and gas-vapor mixtures, flow and non-flow processes. Prerequisites: Mathematics 253, Physics 213.
- 301-3. THERMODYNAMICS II. Engine cycles and applications to internal combustion engines, gas turbines, steam turbines, jet devices, air compressors, and air engines. Combustion, refrigeration and air conditioning. Heat transfer principles. Prerequisite: 300.
- 302-3. HEAT TRANSFER. Dimensional analysis and its application to the theory of heat transfer. Mathematical and graphical methods of analyzing problems in conduction, convection, and radiation. Particular attention to the applications of heat transfer principles used in various processes. Prerequisite: 301.
- 303-3. ADVANCED HEAT POWER. A study of the theory related to all types of heat power equipment. The design calculations for various components of heat power machines such as steam and gas turbines, air

- compressors, pumps, refrigeration and air-conditioning equipment. Prerequisite: 301.
- 304-3. ENERGY CONVERSION. Analysis of performance of A.C. and D.C. machines, diesel locomotives, transformers; developments in sources of energy, solar and atomic; hydraulic, hydro-mechanical systems. Prerequisite: 334.
- 306-3. APPLIED MECHANICS I. For students not majoring in applied science. Covered in two quarters: resultants of force systems, equilibrium, truss analysis, friction, centroids, displacement, velocity, acceleration, translation, rotation, plane motion, force-mass-acceleration method on kinetics problems, principles of work and energy, and impulse and momentum. Prerequisite: Mathematics 112.
- 308-5. MACHINE DESIGN I. A machine design course for students not majoring in applied science. Deals with stress and strain analysis of simple machine elements. Practical applications. Prerequisite: 306.
- 309-5. MACHINE DESIGN II. Continuation of 308. Prerequisite: 308.
- 310-3. APPLIED MECHANICS II. A continuation of 306. Prerequisite: 306.
- 311-3. STRENGTH OF MATERIALS I. Relationship between externally loaded bodies and resulting stresses and deformations. Members subjected to tension, compression, shear, torsion and bending. Properties of materials. Prerequisites: 260, Mathematics 251.
- 312-3. STRENGTH OF MATERIALS II. Deflection of beams, combined loads, columns, statically indeterminate members, repeated loads, dynamic loads, reinforced concrete beams. Prerequisite: 315.
- 313-4. FLUID MECHANICS. Fundamentals of fluid statics and fluid flow. Prerequisite: 262 or current registration.
- 314-4. SOIL MECHANICS. Identification and classification of soils, laboratory determination of index properties of soils, character of soil deposits. Three hours lecture, three hours laboratory. Prerequisite: 315.
- 315-1. STRENGTH OF MATERIALS LABORATORY I. Experimental analysis of the mechanical properties of engineering materials; tensile, compressive, torsional, and flexural tests of metals and wood; tests of strength



Testing materials in strength of materials laboratory.

- of connection; hardness tests of metals and plastics; preparation of engineering reports. Prerequisite: 311 or concurrently.
- 316-1. STRENGTH OF MATERIALS LABORATORY II. Flexural testing of steel, concrete, and wood; impact and fatigue studies; creep testing; concrete proportioning and testing; introduction to electronic and photoelastic methods of stress analysis. Prerequisite: 312 or concurrently.
- 317-3. CONSTRUCTION. Study of construction methods, management, and machinery; including estimating, scheduling, and controlling procedures. Prerequisite: junior standing in applied science or consent of instructor.
- 318-1. FLUID MECHANICS LABORATORY. Hydrostatics, the flow of water and air, calibration of metering devices, pipe friction, elementary hydraulic machinery tests. Prerequisite: 313 or concurrently.
- 320-3. MECHANICAL LABORATORY. Study of various types of measuring instruments. Fuels and lubricants testing. Exhaust gas analysis, operating characteristics of internal combustion engines, steam turbines, compressors, pumps, fans, and refrigeration systems. Report writing. One hour lecture, six hours laboratory. Prerequisite: 301.
- 321-3. METALLURGY. The chemistry of metals, equilibrium diagrams, theory of heat treatment. Metallographic laboratory practice. Commercial methods of manufacturing and shaping iron, steel, and nonferrous metals and alloys. Prerequisite: junior standing or consent of instructor.
- 322-3. INTERNAL COMBUSTION ENGINES. The design and principles of operation of internal combustion engines. The Otto, Diesel, Brayton cycles; and fundamental thermodynamic laws involved. Theories of combustion and detonation, combustion charts, fuels, and air tables. Effects of chemical equilibrium and variable specific heats. Cetane and Octane numbers, carburetion and injection. Prerequisite: 301.
- 331-4. ELECTRIC AND MAGNETIC CIRCUITS. Introduction to the theory of circuits. Study of network theorems, sources of electrical energy, basic electric measurements, magnetic circuits. Three hours lecture, three hours laboratory. Prerequisites: Mathematics 253, Physics 213, or consent of instructor.
- 332-4. ELECTRIC AND MAGNETIC FIELDS. Solution of electric and magnetic fields of simple geometry. Study of Coulombs Law, Gauss' Theorem, Maxwell's equations for static fields by vector methods. Three hours lecture, three hours laboratory. Prerequisite: 331.
- 333-3. D.C. AND A.C. MACHINES I. Introduction to direct and alternating current machinery. Theory and operating characteristics. Two lectures, one three-hour laboratory. Prerequisite: 332.
- 334-3. D.C. AND A.C. MACHINES II. Advanced studies on polyphase alternators, motors, transformers. Theory and operating characteristics. Two lectures, one three-hour laboratory. Prerequisites: 333, Mathematics 306
- 335-3. ELECTRONICS. Electronic tube theory, amplifiers, modulation, vacuum tube and transistor circuits; computers. Prerequisites: 332, Mathematics 306.
- 336-3. ELECTRICAL MEASUREMENTS. Theory and use of D.C. and A.C. instruments; analysis of sensitivity, accuracy, precision, and error. Ammeters, voltmeters, wattmeters. Energy measurements, watt-hour and demand meters. Prerequisite: 333.
- 337-3. COMMUNICATIONS Theory of active networks; radio communication, radar, television. Prerequisite: 335.
- 338-3. INSTRUMENTATION. Control elements and techniques for devices

- and processes, dynamics of open and closed cycle control systems. Prerequisite: 335.
- 339-3. TRANSIENT ANALYSIS IN ENGINEERING. A study of electrical and mechanical networks by means of the Laplace Transform. Practical problems of civil, mechanical, and electrical engineering will be discussed. Prerequisite: Mathematics 306.
- 340-4. KINEMATICS AND MECHANISMS. The movement of bodies in space, basic mechanisms including analytical and graphical analyses. Linkages, cams, gears and their manufacture. Vibration, critical speeds, and gyroscopic applications. Three hours lecture, three hours laboratory. Prerequisite: 262.
- 341-3. MECHANICAL VIBRATIONS. Equations of motion applied to systems with free and forced vibrations, damping, multiple degrees of freedom. Applications to engines and rotating machinery. Prerequisite: 340.
- 342-3. DESIGN OF MACHINE ELEMENTS I. Application of principles of mechanics to problems of design and development, mechanisms for specific functions, dynamic effects and friction in mechanisms. Prerequisite: 312.
- 343-3. DESIGN OF MACHINE ELEMENTS II. Advanced studies of design problems, hydraulic and pneumatic machine elements, power amplification devices, automation. Prerequisite: 342.
- 344-3. STRUCTURAL ANALYSIS I. Analysis of statically determinate structures under stationary and moving loads. Prerequisites: 312, 316.
- 345-3. STRUCTURAL ANALYSIS II. Application of the theory of statically determinate structures to deflection computations. Fundamental theory of statically indeterminate structures with applications. Prerequisite: 344.
- 346-3. POWER PLANTS. Theory and practice of the modern stationary power plant. Diesel plant design. The principle vapor cycles in theory and practice. Cycle design and heat balance computations for Rankine, regenerative, reheating, and binary vapor cycles. Study of modern heat transfer theories. Selection of steam boilers, water walls, and superheaters. A short study of nuclear plants. Prerequisite: 301.
- 347-3. STRUCTURES. Application of the theory of statically indeterminate structures to the evaluation of deformations, reactions and moments in continuous structures. Introduction to design. Prerequisite: 345.
- 350-4. JIG AND FIXTURE DESIGN I. A course designed to contribute to the understanding of mass production, planning, and procedures, with special emphasis on the designing of jigs and fixtures. Two hours lecture, six hours laboratory. Prerequisite: 308 or concurrently.
- 351-4. JIG AND FIXTURE DESIGN II. Special tools and dies. Consideration of setups and design of automatic, semi-automatic, and hand-fed production devices. Two hours lecture, six hours laboratory. Prerequisite: 350.
- 352-4. JIG AND FIXTURE DESIGN III. More advanced practices in the design of special devices as they are related to production line procedure. Two hours lecture, six hours laboratory. Prerequisite: 351.
- 361-4. ENGINEERING ECONOMY. A study of factors and methods involved in selecting the most economical and feasible plan in industrial and engineering ventures considering both the business and technical aspects involved. Prerequisites: Economics 205 and junior standing.
- 363-0. INSPECTION TRIP. One- to three-day tours of nearby industrial plants and engineering projects. Prerequisite: senior standing.

DEPARTMENT OF INDUSTRIAL EDUCATION

Professor Ralph O. Gallington, Ed.D. (George Washington)	
Chairman	1955
Professor M. Keith Humble, Ph.D. (Missouri)	1955
Professor J. Henry Schroeder, M.S. (Iowa)	1923
Professor Ernest J. Simon, M.S. (Illinois)	1950
Associate Professor Charles A. Bunten, Ed.D. (Missouri)	1959
Associate Professor John H. Erickson, Ed.D. (Pennsylvania State)	1955
Associate Professor James Jenkins, Jr., Ed.D. (Pennsylvania State)	1956
Associate Professor John M. Pollock, Ed.D. (George Peabody College for Teachers)	1959
Assistant Professor Marvin E. Johnson, Ed.D. (Missouri)	1948
Assistant Professor Wayne S. Ramp, Ed.D. (Bradley)	1957
Assistant Professor Shelby S. Shake, M.S. (Indiana)	1944
Instructor F. W. Culpepper, Jr., M.S. (Teachers College of Oswego)	1957
Instructor Willard C. Hart, B.S. (Illinois)	1950
Instructor W. A. Howe, M.S. (Illinois)	1949
Instructor Benny S. Vineyard, M.S. (Illinois)	1954
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Lecturer James Evans Young, M.S. in Ed. (Southern Illinois)	1957-60

The Department of Industrial Education offers work leading to the Bachelor of Science degree with a major in industrial sciences. A student majoring in industrial sciences may specialize in *industrial arts, trades and industries, industrial supervision, or manual arts therapy*. The department also offers work for a minor in industrial education.

INDUSTRIAL ARTS

This specialization is for students preparing to teach industrial arts. It has two options.

Option 1 includes a major of forty-eight hours in industrial sciences and a teaching minor of twenty-four hours. It is designed for the student who is preparing to teach industrial arts general shop and also to teach in a minor field.

Option 2 provides a more concentrated preparation, including a major of seventy-two hours in industrial sciences and no minor, for the student who is interested in becoming a specialist in one or more areas of industrial arts. It is designed for the student who plans to teach in a school which employs two or more industrial arts teachers.

CURRICULUM FOR SPECIALIZATION IN INDUSTRIAL ARTS

The student specializing in industrial arts must satisfy the requirements listed below under the headings *general degree courses required*, *requirements for teacher certification*, and *School of Applied Science courses required*. He must also complete forty hours according to either *option 1* or *option 2*.

<i>General degree courses required</i>	Hours
Air Science (See also page 8.)	3
Art 120 or Music 100	3
Botany 101 or Zoology 100	5
Chemistry 111 or Physics 208	5
Economics 205	5
English 101, 102, 103	9
English 205, 206, 209, 211, 212 (two of the five)	6
Geography 100 or Sociology 101	5
Government 101 or 231	5
Health Education 100	4
History 201 or 202	5
Mathematics 111, 112	10
Physical education activity courses	6
<i>Total</i>	<hr/> 71
 <i>Requirements for Teacher Certification</i>	
Educational Administration and Supervision 331	3
Guidance 305-4 or Psychology 303-3	3-4
Guidance 422 (Prerequisite: 305) or Instructional Materials 417 (Prerequisite: Guidance 305) or Educational Administration and Supervision 355	4
Psychology 201 (Prerequisite for Guidance 305 and Psychology 303)	4
Industrial Education 490	4
Secondary Education 310, 352	16
Prerequisites for Secondary Education 352:	
English 391 or proficiency exam	3 or 0
Speech 101	4
<i>Total</i>	<hr/> 38-42
 <i>School of Applied Science courses required</i>	
Applied Science 306 and 310, or Physics 206	6 or 5
Industrial Education 100, 112, 122, 130, 145, 226, 233, 306	32
<i>Total</i>	<hr/> 37-38

Option 1

Industrial Education electives	19
Teaching minor	24
The fields of art, chemistry, guidance, mathematics, physics, safety education, and special education are recommended for the teaching minor.	
<i>Total</i>	<u>43</u>

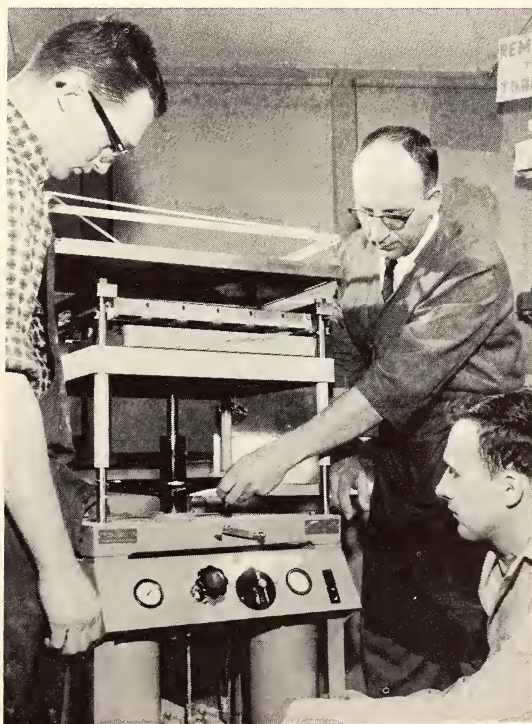
Option 2

Industrial Education 217, 301, 492, 496	16
Special teaching areas elected by student	16
Industrial Education electives	11
<i>Total</i>	<u>43</u>

SUMMARY FOR SPECIALIZATION IN INDUSTRIAL ARTS

General degree courses required	71
Requirements for teacher certification	38-42
School of Applied Science courses required	37-38
Option 1 or Option 2	43
TOTAL	<u>192-194</u>

*Plastic projects are formed
with special molding
machine*

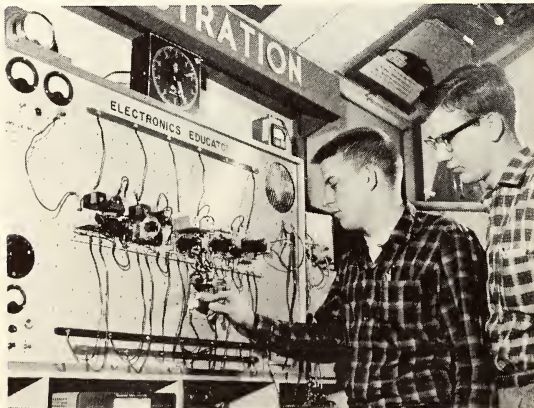


TRADES AND INDUSTRIES

This specialization is for industrial sciences majors who wish to prepare for teaching unit trade courses. Graduates of this program usually find employment in high schools, vocational schools, and post high school teaching in those Illinois schools which maintain vocational trade courses in compliance with the Illinois state plan for vocational education in the provisions of the Smith-Hughes and George-Barden acts. A vocational teacher is prepared to teach one of the following trades: auto mechanics, building trades, drafting, electronics, machine shop, or printing. A student specializing in trades and industries may take the specific courses required for certification in order to qualify for teaching industrial arts and adult education courses. The specialization has two options.

Option 1 includes a major of forty-eight hours in industrial sciences and a teaching minor of twenty-four hours. This four-year program leads to a Bachelor of Science degree and is open to those students who have already completed the necessary industrial trade experience required of vocational teachers. Before enrollment in Option 1 the student should submit documentary evidence of his work experience to the chairman of the Department of Industrial Education.

Option 2 includes a major of ninety-two hours in industrial sciences and no minor. This program leads to a Bachelor of Science degree and is designed for students who lack the industrial trade experience required of vocational teachers. A graduate of a technical institute program who wishes to prepare for a position as a vocational teacher should enroll for this option. The Department of Industrial Education will accept up to sixty hours of shop and drawing credit by evaluation from the technical institute in which the student completed his work. It may also be possible



Circuit fundamentals are studied with the aid of electronic demonstrator.

to transfer some general education credit. A student accepted in this option will be required to complete eighteen to twenty-one months of supervised work experience for which he will receive credit in Industrial Education 319 (Industrial Internship).

CURRICULUM FOR SPECIALIZATION IN TRADES AND INDUSTRIES

The student specializing in trades and industries must satisfy the requirements listed below under the headings *general degree courses required*, *requirements for teacher certification*, and either *option 1* or *option 2*.

	Hours
<i>General degree courses required</i>	
Air Science* (See also page 8.)	0 or 3
Art 120 or Music 100	3
Botany 101 or Zoology 100	5
Economics 205	5
English 101, 102, 103	9
English 205, 206, 209, 211, 212 (two of the five)	6
Geography 100 or Sociology 101	5
Government 101 or 300 for option 1, 101 or 231 for option 2	5
Health Education 100	4
History 201 or 202	5
Mathematics 106c, 111	8
Physical education activity courses	6
Physics 206	5
	<hr/>
<i>Total for Option 1</i>	69
<i>Total for Option 2</i>	66

* Not required under Option 2 if 45 or more hours of acceptable credit are transferred.

Requirements for Teacher Certification

Educational Administration and Supervision 331	3
Guidance 305-4 or Psychology 303-3	3-4
Guidance 422 (Prerequisite: 305) or Instructional Materials 417 (Prerequisite: Guidance 305) or Educational Administration and Supervision 355	4
Psychology 201 (Prerequisite for Guidance 305 and Psychology 303)	4
Secondary Education 310, 352	16
Prerequisites for Secondary Education 352:	
English 391 or proficiency exam	3 or 0
Speech 101	4
	<hr/>
<i>Total</i>	34-38

Option 1

Industrial Education 491, 494, 495, 496	12-16
Industrial Education electives	32-36
<i>Total</i> Industrial Education courses	<u>48</u>
Teaching minor	24
Electives in any field	10-14

Option 2

Industrial Education 491, 494, 495, 496	12-16
Industrial Education 319	18-21
Industrial Education electives	55-62
<i>Total</i> Industrial Education courses	<u>92</u>

SUMMARY FOR SPECIALIZATION IN TRADES AND INDUSTRIES—OPTION 1

General degree courses required	69
Requirements for teacher certification	34-38
Industrial Education courses	48
Teaching minor	24
Electives	13-17
TOTAL	<u>192-196</u>

SUMMARY FOR SPECIALIZATION IN TRADES AND INDUSTRIES—OPTION 2

General degree courses required	66
Requirements for teacher certification	34-38
Industrial Education courses	92
TOTAL	<u>192-196</u>



Students receive instruction on modern inert-gas welding equipment.

INDUSTRIAL SUPERVISION

This specialization is for students who desire technical and supervisory positions in industry. It has four options: industrial design, industrial personnel, industrial planning, and manufacturing processes.

A student specializing in industrial supervision may elect to complete a major of 96 hours, or he may choose a major of 64-72 hours with a minor of 24-32 hours. The fields of art, agriculture, business, chemistry, mathematics, physics, and psychology are recommended minor fields.

CURRICULUM FOR SPECIALIZATION IN INDUSTRIAL SUPERVISION

Graduates of the industrial supervision curriculum may be certified to teach industrial arts by completing twenty-four hours of specified courses in education and fifteen hours in three subject matter areas in industrial arts.

	Hours
<i>General degree courses required</i>	
Air Science (See also page 8.)	3
Art 120 or Music 100	3
Botany 101 or Zoology 100	5
Economics 205	5
English 101, 102, 103	9
English 205, 206, 209, 211, 212 (two of the five)	6
Geography 100 or Sociology 101	5
Government 101	5
Health Education 100	4
History 201 or 202	5
Mathematics 111, 112	10
Physical education activity courses	6
Physics 206 or 211 or Chemistry 111	5
<i>Total</i>	71
<i>School of Applied Science courses required</i>	
Applied Science 101 and 205	6
Industrial Education 112, 122, 145, 222, and 226 or 212	20
<i>Total</i>	26
<i>Other courses required for the specialization</i>	
Management 380	4
Physics 206 or 208 or 213; or Applied Science 306, 310	5-6
Psychology 201	4

Speech 101	4
<i>Total</i>	<u>17-18</u>
<i>Option 1—Industrial Design</i>	
Industrial Education 305 and 322	8
Applied Science 206, 306, 308, 309, 310, 350, 351, 352	32
Industrial Education electives and/or minor	33
Electives	4-5
<i>Total</i>	<u>77-78</u>
<i>Option 2—Industrial Planning</i>	
Applied Science 206, 306, 308, 309, 310, 350, 351, 352, 361	36
Industrial Education 305	4
Industrial Education electives	9-10
Accounting 250	4
Economics 307	4
Management 340, 382, 385	11
Mathematics 113	5
Psychology 320	4
<i>Total</i>	<u>77-78</u>
<i>Option 3—Industrial personnel</i>	
Industrial Education 365, 495	7
Industrial Education electives and/or minor	35
Electives	4-5
Economics 310, 411	8
Management 382, 385	7
Psychology 305, 320, 321, 322	16
<i>Total</i>	<u>77-78</u>
<i>Option 4—Manufacturing processes</i>	
Industrial Education 314, 318, 322, 325, 360	36
Industrial Education electives and/or minor	32
Electives	9-10
<i>Total</i>	<u>77-78</u>
SUMMARY FOR SPECIALIZATION IN INDUSTRIAL SUPERVISION	
General degree courses required	71
School of Applied Science courses required	26
Other courses required for the specialization	17-18
Option 1, 2, 3, or 4	77-78
TOTAL	<u>192</u>

MANUAL ARTS THERAPY

This specialization is for students preparing for positions as manual arts therapists in hospitals. The program provides for a broad general education with concentration in activities which have vocational significance in the rehabilitation of hospital patients. Each student is encouraged to concentrate in at least three of the following options: drawing, general metal, electricity, woodwork, machine shop, arts and crafts, and agriculture. At least sixteen hours of industrial education are required in two of the options. An outstanding feature of the program is a twelve-hour internship to be served in selected hospitals. A student who specializes in manual arts therapy and intends to qualify for teaching industrial arts in the public schools must take additional courses to meet all of the specific requirements for certification.

CURRICULUM FOR SPECIALIZATION IN MANUAL ARTS THERAPY

	Hours
<i>General degree courses required</i>	
Air Science (See also page 8.)	3
Art 120 or Music 100	3
Economics 205	5
English 101, 102, 103	9
English 205, 206, 209, 211, 212 (two of the five)	6
Government 101	5
Health Education 100	4
History 201 or 202	5
Mathematics 111, 112	10
Physical education activity courses	6
Physics 206 or Chemistry 111	5
Sociology 102	5
Zoology 100	5
<i>Total</i>	71
<i>Industrial Education courses required</i>	
Industrial Education 100, 112, 122, 130, 145, 200, 212, 226, 233, 234, 306, 490, and 435	60
Industrial Education electives	26
<i>Total</i>	86
<i>Other requirements for the specialization</i>	
Educational Administration 331, 355 or Guidance 422	7
English 391	3

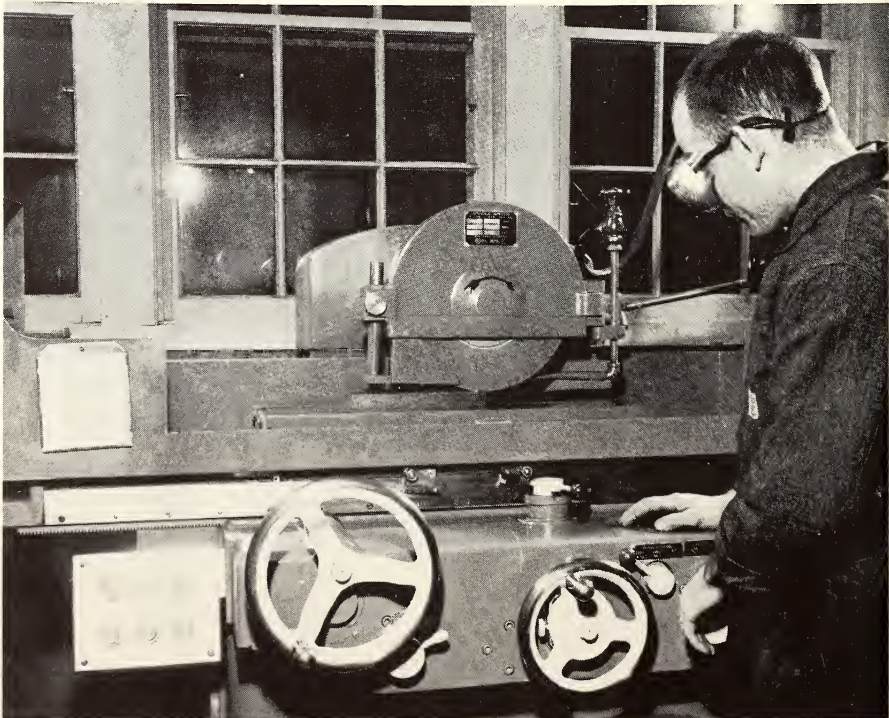
Health Education 334	4
Physiology 300, 420, 455	9
Psychology 201, 305, 438, 465	16
Secondary Education 310	4
Speech 101	4
<i>Total</i>	<u>47</u>

SUMMARY FOR SPECIALIZATION IN MANUAL ARTS THERAPY

General degree courses required	71
School of Applied Science courses required	86
Requirements for the specialization	<u>47</u>
TOTAL	204

MINORS IN INDUSTRIAL EDUCATION

For those not seeking a teacher-education degree, a minor of twenty-four hours is provided. The courses are not specified. It is recommended



Modern grinding techniques are taught in machine metal courses.

that students pursue either a broad selection of basic courses or a narrow specialization in some area such as metalworking.

A minor for anyone seeking a teacher-education degree must meet certification requirements. The preparation is primarily for general shop or general industrial arts, and consists of thirty-six hours in industrial education. The courses are Industrial Education 100, 112, 122, 130, 145, 212, 226, 233 or 306, and 490.

SPECIAL INTEREST GROUPS

Students majoring in elementary education, recreation, home economics, etc., will find the following Industrial Education courses of particular interest: 200, 216, 300, 301, 302, 303, 321, 324, and 480.

GRADUATE PROGRAMS

The Master of Science degree in industrial education is provided. Also, through a co-operative program with the College of Education, a major or a minor in industrial education is provided for those seeking a Master of Science in Education degree. A minor in industrial education is provided for Ph.D. candidates.

COURSE DESCRIPTIONS

Courses on the 100, 200, and 300 levels are for undergraduate students. Those on the 400 level may be taken by undergraduate and graduate students. Those on the 500 level are for graduate students only.

- 100-4. INTRODUCTION TO TEACHING INDUSTRIAL EDUCATION. An orientation to the various areas of industrial education. Lecture, discussion, and laboratory to present a broad exploratory experience. General shop basis. Introduction of teaching methods and problems.
- 112-4. BASIC WOODWORK. Use of woodworking hand tools involving common joints and fasteners. Elementary carving and finishing. Use of the wood lathe, drill press, jig saw, and portable machines. Prerequisite: one course in mechanical drawing.
- 122-4. MACHINE SHOP I. Designed to aid in the development of fundamental skills and information needed when operating the basic machine tools.
- 130-4. INDUSTRIAL ARTS DRAWING I. Designed to acquaint prospective teachers with the purposes and problems of teaching elementary and secondary school students. Emphasizes orthographic projection, pictorial representations, freehand sketches, and the reading of drawings and diagrams.
- 145-4. BASIC ELECTRICITY. Application of electrical theory to the use of simple electrical equipment. Lecture, discussion and laboratory work to present a broad background in basic electrical theory.

- 200-4. GENERAL CRAFTS. Laboratory experiences with various craft media such as leather, block printing, plastics, wood, metal and silkscreen printing. Planning and developing problems suitable for camp, leisure time, clubs, special education, and manual and occupational therapy activities.
- 204-4. ARCHITECTURAL DRAWING I. Introduction to design of small structures with special emphasis on house planning; including the selection of building elevations, building materials, decorating, landscaping and contractual aspects. Prerequisite: 130 or Applied Science 101.
- 212-4. MACHINE WOODWORK. Operation, care, and use of woodworking machines for making useful projects involving the more advanced types of joints and construction; finishing; safety. Prerequisite: 112 or equivalent.
- 216-4. FURNITURE UPHOLSTERING AND FINISHING. Care and use of the tools, materials, and fundamental processes of upholstering and finishing furniture.
- 217-4. GENERAL TYPOGRAPHY. (Same as Printing and Photography 217B.) After brief introductory work in screen and block typography, major portion of course is devoted to study of foundry type, type classifications, use of job cases, hand typesetting, layout, use of illustrations, and proof-pulling.
- 222-4. MACHINE SHOP II. Operation, care, and use of machine tools with emphasis on engine lathe, shaper, planer, and milling machine. Prerequisite: 122 or equivalent.
- 226-4. GENERAL METAL I. Fabricating, molding, shaping, and heat treating common metals. Study of tools, processes, and related technical information as related to bench metal, sheet metal, foundry, heat treating, and oxy-acetylene welding.
- 227-4. MANUFACTURING PROCESSES. Required of applied science majors. Machine tool processes; welding, forming, patternmaking, and foundry techniques of modern industry. The use of jigs and fixtures and mass production techniques are emphasized.
- 233-4. INDUSTRIAL ARTS DRAWING II. A continuation of 130. Problem solving, revolutions, developments, intersections, auxiliaries, screw threads, fasteners, working drawings, inking, tracing, reproduction of drawings, and practice in the use of the chalk board as a teaching aid. Prerequisite: 130 or equivalent.
- 259-3 to 60. SHOP AND MECHANICAL DRAFTING SUBJECTS. This is a shop and mechanical drafting credits designation used when shop or drafting course credit is established in some other accredited institution above the high school level. It may be transferred toward degree requirements in industrial education. This credit is especially appropriate to Option 2 of the Trades and Industries specialization. Before final acceptance of the transfer credits, the department chairman will evaluate them.
- 271-4. PRESSWORK I. (Same as Printing and Photography 271B.) Introduction to platen press operation; imposition and lockup, preparation of the press, feeding and care of the press.
- 300-4. PLASTIC MATERIALS. Experiences in designing; vacuum, pressure, and mold forming of extruded, liquid, and other plastic materials. Prerequisite: 112 or equivalent.

- 301-4. LEATHER AND OTHER INDUSTRIAL FABRICS. Experiences in planning, designing, and enriching surfaces, using leather and other industrial fabrics as media.
- 302-4. CONSTRUCTION METHODS FOR PRIMARY TEACHERS. Various media such as wood, metal, and paper. Acquainting the primary teacher with the materials, tools, and processes which students at the primary level can manipulate and use in the classroom.
- 303-4. DIVERSIFIED CRAFTS FOR TEACHERS AND RECREATIONAL LEADERS. Experience in constructional activities involving the use of wood, metals, leathers, plastics, reed, raffia, clay, and other materials adaptable to the needs and interests of camp counselors and elementary school teachers.
- 304-4. ARCHITECTURAL DRAWING II. A continuation of 204. Instrument drawings of an original design of a residence, set of prints and complete specifications. Prerequisite: 204.
- 305-4. MACHINE DRAWING. Piping layouts, gears, cams, keys, rivets, springs, precision and limit dimensioning, assembly drawings, parts lists, and details with emphasis on established industrial practices. Prerequisite: 205 or 233.
- 306-4. INDUSTRIAL ARTS DESIGN. Principles of structural design, contour and surface enrichment applied to shop projects. Prerequisite: 233.
- 308-4. PHOTOLITHOGRAPHY I. (Same as Printing and Photography 308B.) Theory and practice of photography, copy preparation, layout and stripping, and plate-making for offset lithography.
- 313-4. FURNITURE CONSTRUCTION AND CABINET MAKING. Design and construction of special pieces of furniture and elementary cabinet work. Prerequisite: 212.
- 314-4. WOOD PATTERN MAKING AND FOUNDRY. The making of wood patterns of machine parts; molding (involving cutting and tempering) sand; melting, handling, and pouring of the molten metals. Prerequisite: 112 or equivalent.
- 318-4. GENERAL WELDING I. A course covering basic working knowledge of electric arc welding, oxy-acetylene welding, and flame cutting. Emphasis placed on shop safety, care and use of welding equipment, and preparation of related instructional materials. Prerequisite: 226.
- 319-3 to 21. INDUSTRIAL INTERNSHIP. The course is co-operating with selected industries and the Department of Industrial Education. It is required of persons lacking trade experience who plan to teach vocational education under the Illinois state plan for vocational education. Industrial experience includes job skills, manufacturing processes, technical information, and labor-management relationships with supervised instruction, conferences, and examinations. Prerequisite: approval of department.
- 321-2. CANE, REED, AND RAFFIA WORK. Provides experiences in basketry and hand weaving. Prerequisite: 112 or equivalent.
- 322-4. MACHINE SHOP III. Machine shop practices involving the construction of machines and tools of practical use. Advanced industrial production practices and related technical information. Prerequisite: 222.
- 324-4. METAL CRAFTS. Provides experiences in nonferrous metallurgy involving heat treating, enameling, designing, chasing, etching, forming, piercing, raising, and tooling.

- 325-4 to 12. **ADVANCED MACHINE SHOP.** Designed for students preparing for specific jobs in industry. Prerequisite: 322.
- 328-4. **GENERAL WELDING II.** Specialized training in oxy-acetylene and electric welding. Related information including a study of welding safety, torches, manifolds, tanks, filler rods, Students to pass tests of welding proficiency. Prerequisite: 318 or equivalent.
- 329-4. **GENERAL METAL II.** Designed to provide experience in patternmaking, founding, forging, heat-treating, raising, etching, and spinning metals. Study of tools, machines, and information relating to those processes. Prerequisite: 226 or equivalent.
- 332-4. **FUNDAMENTALS OF TRANSPORTATION.** Driver training involving responsibilities for detecting unsafe operating conditions. Required accessories and uses. Care, functions and condition of major operating parts. Knowledge and use of tools and equipment necessary for making emergency adjustments for safe driving.
- 341-4. **MACHINE AND TOOL MAINTENANCE.** Sources, manufacturing, supply, cost, sharpening, adjusting and repairing saws, drills, drill-presses, jointers, lathes, milling machines, shapers, sanders, and other machines, as well as hand tools used in the various industrial education shops. Prerequisites: 112 and 226, or equivalent.
- 342-4. **PAINTING AND FINISHING.** Practices and procedures in painting, staining, varnishing, enameling, lacquering, using transfers; practice in the use of the spray gun. Study of the chemical elements of various finishes; proper care of finishing equipment and materials. Prerequisite: 112 and 226, or equivalent.
- 344-4. **COMMUNICATIONS EQUIPMENT.** A study of the basic divisions of the communications industry—telephone, AM and FM receivers, AM and FM transmitters, and television. Construction, testing, maintenance, and related technical information of basic electrical circuits and devices in each division. Prerequisite: 145 or Physics 207.
- 345-4. **INDUSTRIAL ELECTRONICS.** A study of basic electronic circuits and devices used in industry. Construction, testing, maintenance, and related technical information of such circuits as induction heating, photoelectric, time delay, rectifier, and electro-plating. Emphasizing electronic testing equipment studies and correct use of such equipment. Prerequisite: 344 or consent of instructor.
- 346-4. **ELECTRONIC SYSTEMS.** Advanced industrial electric and electronic circuits and the combination of control methods into an integrated electronic system featuring telemetering, servo systems, production control, and analog and digital computers. Related technical information stressed. Prerequisite: 345.
- 360-4 to 12. **SPECIALIZED ADVANCED MACHINE SHOPS.** Designed to continue student specialization in metal fabrication. Production process or operation sheet writing. Prerequisite: 325.
- 365-4. **INDUSTRIAL SAFETY.** Study of the frequency and occurrences of accidents in industrial pursuits, their causes, means of reduction and prevention through education, supervision, and the use of functional safety devices.
- 380-1 to 6. **SPECIAL SKILLS IN TEACHING INDUSTRIAL SUBJECTS.** A laboratory course designed to develop new and special industrial skills for teaching industrial education subjects. Problems, projects, procedures,

and methods will be adapted to the needs and interests of each student. Planned for advanced students and teachers of industrial education to develop new but basic manipulative skills and understandings in selected areas of woodwork, metalwork, electronics, crafts, drafting, etc.

- 430-2 to 6. SPECIAL PROBLEMS IN THE ARTS AND INDUSTRIES. An opportunity for students to obtain special instruction in the solution of problems in specific subject matter fields. Prerequisite: consent of department.
- 435-6 to 12. MANUAL ARTS INTERNSHIP. Supervised hospital experience featuring various applications of manual arts therapeutical treatments. A maximum of twelve hours allowed for course with a maximum of six hours for any one enrollment period.
- 450-1 to 6. ADVANCED SKILLS IN TECHNICAL SUBJECTS. Modern industrial practices and techniques in various selected technical fields. For experienced persons seeking opportunities to develop advanced skills and to increase understandings in specialized industrial fields. Emphasis on modern industrial processes, methods, materials, and techniques used in school shops, drafting rooms, and industrial organizations. Prerequisite: basic training in area selected for study.
- 480-4. PROBLEMS OF INDUSTRIAL ARTS CRAFTS IN ELEMENTARY SCHOOLS AND RECREATIONAL PROGRAMS. For elementary school teachers and supervisors of elementary education craft programs. Three lectures and one laboratory.
- 490-4. PRINCIPLES OF INDUSTRIAL TEACHING. Activities of industrial arts and motivation of learning in industrial subjects. Emphasis on planning and methods of presentation. Prerequisite: consent of department.
- 491-3 to 4. METHODS OF TEACHING TRADE AND TECHNICAL SUBJECTS. Emphasis on teaching methods especially appropriate for vocational trade programs and technical schools. Required in the Trades and Industries specialization. Prerequisite: consent of department.
- 492-4. SCHOOL SHOP PLANNING. Principles and practices underlying modern school shop planning. Actual school shop plans required.
- 494-3 to 4. ORGANIZATION AND ADMINISTRATION OF INDUSTRIAL EDUCATION. Principles and policies governing the administration of industrial education programs in elementary, junior, senior high schools; relation of federal and state supervision of industrial education to local administration.
- 495-3 to 4. OCCUPATIONAL ANALYSIS. Involves the fundamental steps for analyzing trades, and other occupations, with some thought toward establishing appropriate units of instruction for the apprentice or student. Jobs, operations, and essential related information analyzed.
- 496-3 to 4. SELECTION AND ORGANIZATION OF SUBJECT MATTER. Selection and arrangement of teaching content, preparation of assignment, operation, information and job sheets; preparation of tests.
- 497-4. THE LITERATURE OF INDUSTRIAL EDUCATION. An introduction to the literature in the field of industrial arts and vocational industrial education. Important to any person who expects to make industrial teacher education a career.
- 498-4. ORGANIZING AND ADMINISTERING THE GENERAL SHOP. Study and practice in the development of a general shop featuring

- multiple offerings. Development and organization of appropriate instructional materials and teaching aids.
- 502-4. MEASUREMENTS AND EVALUATION OF PRODUCTS AND PROCEDURES. Criteria and instrument development, testing techniques, and appraisals. Special emphasis is given to the principles and methods of evaluation of progress in laboratory and shop subjects of a practical arts nature. Experience in development and construction of pertinent and effective evaluative devices.
- 504-4. HISTORY AND PHILOSOPHY OF INDUSTRIAL EDUCATION. Leaders, organizations, and movements in development and progress of industrial education.
- 505-4. SUPERVISION OF INDUSTRIAL EDUCATION. Study of basic philosophy, purposes, and procedures in specified state and national plans. Qualifications of the supervisor, of adopted plans, his duties and responsibilities at the various school levels with respect to development and improvement of instruction in shop and drawing subjects. Study of procedures used in upgrading teachers and facilities, development and use of professional incentives.
- 506-4. PROBLEMS OF CO-ORDINATOR. Problems and procedures involved in setting up and operating co-operative part-time and evening school programs.
- 508-4. TEACHING AIDS IN INDUSTRIAL EDUCATION. Selection, development, and use of industrial illustrations and instructional aids and devices.
- 540-3 to 6. RESEARCH IN INDUSTRIAL EDUCATION.
- 541-4. OCCUPATIONAL INFORMATION AND GUIDANCE. (Same as Guidance 541.) Designed for school counselors, industrial supervisors, and teachers to give them orientation to, and experience with, occupational information and vocational adjustment.
- 550-4. COLLEGE TEACHING OF INDUSTRIAL AND TECHNICAL SUBJECTS. Problems of college students and their adjustments to college level industrial and technical subject matter. Organization of instructional materials; methods of instruction; organization and administration of college laboratory facilities; and the professional problems, ethics, and advancement of college technical teachers. Prerequisite: 540 or Educational Administration and Supervision 500.
- 560-1 to 8. NEW DEVELOPMENTS IN INDUSTRIAL EDUCATION. An intensive course designed to acquaint graduate students and teachers with the most recent and significant developments, pressing problems, and emerging trends in the industrial education and technical fields. Selected subjects will be considered by recognized authorities in the field, who will present their ideas and conduct discussions on the selected topics. Credit is available in one- or two-hour units as scheduled.
- 570-2 to 4. SPECIAL INVESTIGATIONS IN INDUSTRIAL EDUCATION. For students who wish to make a thorough study or investigation of a specific problem in industrial education.
- 580-3 to 9. SEMINAR IN INDUSTRIAL EDUCATION.
- 599-1 to 9. THESIS.