

George Norak

THE GRADUATE
DEGREE
PROGRAMS



1964 - 1965



ELEMENTARY EDUCATION
INDUSTRIAL ARTS EDUCATION
ENGLISH
BIOLOGY



CALIFORNIA STATE COLLEGE
California, Pennsylvania

CALENDAR 1964-65

FALL TRIMESTER

Registration and OrientationMonday, Sept. 28, 1964
 Registration and OrientationTuesday, Sept. 29, 1964
 Classes BeginWednesday, Sept. 30, 1964
 Thanksgiving Recess beginsThursday, Nov. 26, 1964
 Thanksgiving Recess ends (8:00 A.M.) ..Monday, Nov. 30, 1964
 Christmas Recess beginsSaturday, Dec. 19, 1964
 Christmas Recess ends (8:00 A.M.)Monday, Jan. 4, 1965
 Winter CommencementSaturday, Jan. 23, 1965
 Trimester endsThursday, Jan. 28, 1965

SPRING TRIMESTER

Registration and OrientationMonday, Feb. 8, 1965
 Registration and OrientationTuesday, Feb. 9, 1965
 Classes beginWednesday, Feb. 10, 1965
 Easter Recess beginsThursday, April 15, 1965
 Easter Recess ends (8:00 A.M.)Monday, April 19, 1965
 Spring CommencementSaturday, May 22, 1965
 Trimester endsThursday, May 27, 1965

1965 SUMMER SESSION

CALENDAR FOR GRADUATE STUDIES

First Six WeeksJune 8-July 16, 1965
 Second Six WeeksJuly 19-August 27, 1965
 Trimester (Monday Evening)June 8-September 24, 1965
 RegistrationJune 8-6:00 P. M. Herron Hall

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CALIFORNIA STATE COLLEGE
 California, Pennsylvania

THE GRADUATE
DEGREE
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THIS COLLEGE IS A MEMBER
OF THE
AMERICAN ASSOCIATION OF COLLEGES
AND IS FULLY ACCREDITED BY
THE MIDDLE STATES ASSOCIATION OF COLLEGES
AND SECONDARY SCHOOLS
AND
THE NATIONAL COUNCIL
FOR THE ACCREDITATION OF TEACHER EDUCATION



CALIFORNIA STATE COLLEGE
California, Pennsylvania

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I. The College

The College

The California State College is a state supported institution established and maintained to help provide the schools of Pennsylvania with well trained, competent teachers, as well as to provide a liberal education for those not planning to teach. The program for teachers provides the student with a background in general education that is characteristic of educated men and women everywhere, a thorough training in the selected area of specialization and well designed courses in professional education. In addition, the college offers a variety of co-curricular activities of a social-cultural-academic nature designed to provide the student with the opportunity to develop his potentialities as an individual.

To these ends the Commonwealth of Pennsylvania has provided the buildings, the professional and the non-professional staff through many years of legislative support. The several fees paid by students represent only a portion of the cost of operating the college. Public support is the primary source of the college's funds.

As a result of its financial interest, the Commonwealth has established control of the state colleges through the Department of Public Instruction. Since there are fourteen such institutions the Department and the Board of College Presidents coordinate certain activities common to all state controlled schools. In addition, each school has a Board of Trustees which assists the President in administration. Other supervision and control comes from such state agencies as the State Board of Education, the Auditor General, the Department of Property and Supplies and the General State Authority. Each state college has the support of many vital agencies whose resources may be utilized at any time.

The curricula at California are established in broad outline by the Department of Public Instruction by means of its several councils and study groups. The special curricula are assigned to each college with California being assigned Industrial Arts, Atypical Education, Elementary, Secondary Education and Liberal Arts. Students may elect to specialize in any of these areas or their sub-divisions. Other state colleges offer additional specializations.

In order that additional study opportunities might be made available the college sponsors Summer Tours which

make available low cost travel-study trips for interested persons.

Another constantly expanding feature of the state college is its in-service program for teachers in the service area. Under the leadership of its several departments, the college sponsors evening programs for colleges students and experienced teachers wherein exchanges of experiences result in a more effective college program and a stimulated public school program.

The faculty at California represents a geographic cross-section of the United States, a long list of colleges and universities, and many years of graduate training. In addition to instruction and extra-curricular activities, many members of the staff are engaged in writing and research in their field of interest.

Additional information on the faculty, administrative procedures, curriculum and student life are to be found in the appropriate division of the *California Bulletin*.

The California State College has had a history of continuous growth in stature, size and influence since its early days as an academy. Founded by the public spirited citizens of the borough in 1852 it became a normal school under a state charter and in 1914 was acquired by the Commonwealth of Pennsylvania and thus became a state owned institution.

In 1928, the State Council of Education granted to the college the right to offer a four-year curriculum in elementary and secondary education. In 1929, the school became the State Teachers College and has graduated students with the degree of Bachelor of Science in Education since that time. In 1959, the State Legislature voted to delete the word Teachers from the school's title and, as a result, all of the fourteen state teachers colleges are now state colleges. California is now known as California State College.

The present prospects for future growth are exceptional. The college enrollment in 1963-64 was 2940 and a special program for teachers-in-service attracted more than 280 part-time students.

A program of graduate education, initiated in 1961, leads to the degree of Master of Education. In addition, a series of workshops and conferences provide in-service training and

professional stimulation for the college service area consisting of Washington, Fayette, Greene and Somerset Counties.

A Liberal Arts curriculum was approved and classes started in September 1962.

The college is located at California, Pennsylvania; a community of 7,500 persons located on the Monongahela River, 35 miles south of Pittsburgh; 16 miles from Uniontown; 25 miles from Washington, Pennsylvania; and 25 miles from Waynesburg. The college can be most easily reached over U.S. Route 40 which comes within four miles of California at Malden or over Pennsylvania Route 88. From the eastern part of the state Interstate Route 70-S connecting with the Pennsylvania Turnpike at New Stanton offers easy access to Route 88 at Speers (near Charleroi).

The community is within easy reach of the lower Monongahela steel and coal producing region and is served by several bus lines. A network of secondary roads provide transportation for a large commuting population.

OBJECTIVES OF THE COLLEGE

California recognizes that an educated person must have a background of general knowledge, a mastery of his area of specialization, and adequate professional training. The California program of teacher education is designed to provide this training through its competent faculty and a revised curricular and co-curricular program.

To secure these goals the faculty and administrative staff, after long and free discussion, have adopted the following resolution:

The primary purpose for maintaining California State College, is to educate people for the teaching profession. To accomplish this goal the College seeks:

To provide the opportunity for a general education in those areas necessary to help students become responsible citizens and capable leaders in a democratic society.

To develop their intellectual, social, physical, cultural, spiritual, and aesthetic potentialities.

To prepare students for teaching by requiring a mastery of professional knowledge and skills essential to all teaching and special proficiency in their areas of specialization.

To lead the student to develop a deep and abiding commitment to the concepts, methods, and procedures of a democratic society.

To help the student become a creative person capable of making critical judgments based upon knowledge and reason.

A secondary purpose of the college and faculty is to encourage the teaching profession to gain strength, prestige, and standards through research, faculty professional activities and continued evaluation.

To summarize: In educating a student at California State College, the goal is to help in the development of a person who will be generally educated, professionally oriented, creative, critical, and loyal.

Students come to California to become teachers and in addition to the standards established by the Admissions Committee, should possess a love of learning and a spirit of inquiry that will enable them to formulate questions, seek the solutions to such questions and join with enthusiasm as others seek to achieve similar goals.

Graduate Study

HISTORY OF THE GRADUATE PROGRAM

Graduate work leading to the degree of Master of Education was inaugurated at California State College in the Fall Semester of 1951. The initial program included graduate study in the Elementary and Instructional and Curriculum.

During the 1954 Session, California State College extended its graduate program to include the following areas of specialization: Biology and English.

OBJECTIVES FOR GRADUATE STUDY

AREA OF GENERAL EDUCATION

1. To afford the student an opportunity to pursue his interests in fields other than his area of specialization.
2. To enable the student to strengthen and enrich his appreciation and understanding in broad cultural areas.
3. To develop an understanding of local, national, and international affairs as they relate to the functions of the public school.

AREAS OF SPECIALIZATION

1. To increase the competency of the student in his area of specialization.
2. To provide teachers with an opportunity for professional growth.
3. To enable teachers to assume more responsible leadership roles in the educational program.
4. To contribute basic research techniques for improving instruction.
5. To provide a further understanding of the teaching and learning processes.

REQUIREMENTS FOR ADMISSION TO GRADUATE CLASSES

The following policy established by the Graduate Council governs admission to graduate classes:

1. The applicant shall present a baccalaureate degree from a college or university that is accredited by the National

II. Graduate Study

OBJECTIVES

ADMISSION

CANDIDACY

Graduate Study

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AREA OF GENERAL EDUCATION

1. To afford the student an opportunity to pursue his interests in fields other than his area of specialization.
2. To enable the student to strengthen and enrich his appreciation and understanding in broad cultural areas.
3. To develop an understanding of local, national, and international affairs as they relate to the functions of the public school.

AREAS OF SPECIALIZATION

1. To increase the competency of teachers.
2. To provide teachers with an incentive to continue professional growth.
3. To enable teachers to assume more responsible leadership roles in the educational program.
4. To emphasize basic research techniques and their use for improving instruction.
5. To provide a further understanding of the teaching and learning processes.

REQUIREMENTS FOR ADMISSION TO GRADUATE CLASSES

The following policy established by the Graduate Council governs admission to graduate classes:

1. The applicant shall present a bachelor's degree from a college or university that is accredited by the National

Commission on Accreditation or the appropriate regional accrediting agency.

2. The applicant shall present an official transcript of his work showing at least a 2.5 honor point value of his undergraduate work as determined by a grading system based on a four-point scale, or he shall give other indication of academic competence.
3. Applicants who fail to satisfy the foregoing requirements may be admitted conditionally upon the basis of the Miller Analogies Test.
4. Graduate study does not carry with it admission to candidacy for the master's degree. Admission to candidacy for the degree can be made only after six semester hours of graduate work have been successfully completed at California State College.
5. The applicant must have a teaching certificate with certification in the field in which he wishes to enroll for graduate study.

PROCEDURE FOR ADMISSION TO GRADUATE CLASSES

1. Each applicant will file with the Director of Graduate Studies an application for admission to graduate classes as early as possible and preferably not later than three weeks prior to the session in which he wishes to begin his graduate program. Application forms may be obtained by writing to the Director of Graduate Studies.
2. At the same time the applicant should have official transcripts sent to the Director of Graduate Studies by the institutions at which he has taken undergraduate and graduate work. It is not necessary to submit a transcript of work taken at California.
3. When submitting his application, each applicant should request an appointment for a personal interview with the Director of Graduate Studies.

APPLICATION FORMS AND ADDITIONAL INFORMATION

Application forms and additional information concerning the graduate program may be obtained by writing to the Director of Graduate Studies, California State College, California, Pennsylvania.

REQUIREMENTS FOR ADMISSION TO CANDIDACY FOR THE MASTER'S DEGREE

In order to complete a program of graduate study leading to the Master of Education degree the student must apply for and be admitted to candidacy for the degree. The following policy governs admission to candidacy.

1. The applicant shall file with the Director of Graduate Studies an official application and a letter applying for admission to candidacy.
2. The applicant shall have completed not less than six semester hours of graduate credit at this college at the time of making application for candidacy.
3. The applicant shall have maintained a grade point average of not less than 3.0 (equivalent to an average of B) in graduate courses.
4. Approval for admission to candidacy for the master's degree will be determined by individual departments.
5. Admission to candidacy requires the approval of the Director of Graduate Studies and of the Graduate Council. The college reserves the right to refuse the applicant's request for admission to candidacy for the master's degree.

RESEARCH REQUIREMENT

One of the requisites for fulfilling the requirements for a Master of Education degree at California State College is the preparation of a research project or thesis. The research project and the thesis may be distinguished in the following manner:

The research project should make a contribution to the graduate student; it should make him a more understanding and competent teacher. The project may pertain to the teacher's own classroom situation or to some other type of limited research. The project needs the approval only of the adviser, but the adviser may request the meeting of a special committee who would also review and evaluate the proposed study. Two (2) credit hours are given for the research project.

The thesis should make a contribution to the student and to his field; it treats a problem to a deeper degree. Better controls, wider sampling, and further basic research techniques must be employed for a thesis. Before a research proposal can be accepted for a thesis, it must be approved by a

committee of three graduate faculty members—the candidate's adviser, a faculty member of the candidate's department, and a member of another department. Four (4) credit hours are given for a thesis.

The research project and thesis may differ in the nature of research and in details, but they should follow the same format and regulations as prescribed in the bulletin, *Preparation of Theses and Research Projects*, which is available in the Graduate Office.

A Manual for Writers of Term Papers, Theses, and Dissertations by Kate L. Turabian is the adopted style sheet for the graduate program at California State College.

STEPS IN SATISFYING THE RESEARCH REQUIREMENT

1. Completion of the course, "Methods of Research."
2. Admission to Candidacy for the Master's degree.
3. Selection of an adviser.
4. Overview for the proposed research project or thesis.
5. Rough draft of the research project or thesis.
6. Final draft of the study.
7. Presentation of three copies of the final draft of the research study for committee evaluation.
8. Oral examination on the research study.
9. Preparation of an abstract of the study.
10. Binding of the final approved copies of the study.

(The detailed procedures and deadline dates for the completion of the above steps are available in the Graduate Office.)

The Graduate Programs

GRADUATE STUDIES

California State College offers work leading to the Master of Education degree with specialization in Elementary Education, Industrial Arts Education, Biology and English.

The program is available to qualified teachers, in-service and other graduate students who meet the standards approved by the college and the State Board of Education. Graduate work is offered during evening and on Saturday during each regular session. Graduate work is also offered during the summer sessions.

III. The Graduate Programs

GENERAL REQUIREMENTS

ELEMENTARY

INDUSTRIAL ARTS

ENGLISH

BIOLOGY

A minimum of thirty semester hours is required of all students. Of these thirty hours, four to ten hours are in general and professional education, sixteen to twenty-two are in the field of specialization, and four to six hours are in research.

Since standards of proficiency described elsewhere must be met, it should be understood that requirements listed in the preceding paragraphs without degrees of minimum or maximum are not minimum or maximum requirements for all candidates.

The Graduate Programs

GRADUATE STUDIES

California State College offers work leading to the Master of Education degree with specialization in Elementary Education, Industrial Arts Education, Biology and English.

The program is available to qualified teachers-in-service and other graduate students who meet the standards approved by the college and the State Board of Education. Graduate work is offered during evenings and on Saturdays during each regular session. Graduate work is also offered during the summer sessions.

Graduate work at California is especially designed for the classroom teacher and includes class room, laboratory, clinical and research experience that will add breadth and depth to the preparation of the teacher. The program for each person admitted to the graduate school will be planned in cooperation with the adviser and will be based upon the previous training and experience of the student. The graduate degree is meant to be a meaningful program for the classroom teacher and will be custom made for each individual candidate.

A minimum of thirty semester hours is required of all students. Of these thirty hours, four to ten hours are in general and professional education, sixteen to twenty-two are in the field of specialization, and four to six hours are in research.

Since standards of proficiency described elsewhere must be met, it should be understood that requirements listed in the preceding paragraph constitute minimum requirements and do not guarantee graduation.

CURRICULUM FOR THE MASTER OF EDUCATION DEGREE

I. GENERAL AND PROFESSIONAL EDUCATION—The selection of courses will be based on the student's needs as determined by the curriculum directors and the director of graduate studies. Requirements may vary with the program.

II. RESEARCH—Four to six (4-6) semester hours.

- *Res 800. Methods of Research2
- **Res 801. Research Project2
- **Res 802. Master's Thesis4

*Required

**Either is required

III. SPECIALIZATION

ELEMENTARY—*Field of Specialization*—Sixteen to twenty-two (16-22) semester hours of work to be selected from the courses listed under "Graduate Elementary Courses."

INDUSTRIAL ARTS—*Field of Specialization*—Sixteen to twenty-two (16-22) semester hours of work to be selected from the courses listed under "Graduate Industrial Arts Courses."

ENGLISH—*Field of Specialization*—Sixteen to twenty-two (16-22) semester hours of work to be selected from the courses listed under English.

BIOLOGICAL SCIENCE—*Field of Specialization*—Eighteen (18) to twenty-two (22) semester hours of work to be selected from the courses listed under Biological Science in appropriate selected areas. Six hours of Organic Chemistry or six hours of Biochemistry required for those who have not had an adequate background in Chemistry.

GRADUATE GENERAL AND PROFESSIONAL EDUCATION COURSES

Four to ten (4-10) semester hours of work to be selected from the following courses for Elementary, Industrial Arts and English:

- GE 500. Comparative Studies in Literature2
- GE 501. Great Works in Drama2
- GE 502. Philosophy and Philosophers2
- GE 503. Comparative Music2
- GE 504. Science and Technology2
- GE 505. History of Mathematics2
- GE 506. Science Biographies2
- GE 507. World Resources and Population Problems2
- GE 508. American Civilization2
- GE 509. Comparative Institutions2
- GE 510. Language in Society2
- GE 511. Community Problems of Health and Safety2
- GE 512. Mass Communications2
- GE 513. Community Resource Problems4
- PE 600. General History of Education2
- PE 601. Philosophy of Education2
- PE 602. Statistical Methods2
- PE 603. Advanced Educational Psychology2
- PE 604. Comparative Education2
- PE 605. Educational Sociology2
- PE 606. Seminar in Audio-Visual Techniques2
- PE 607. Guidance and Counseling2
- PE 608. Psychology of Growth and Development2

Biology students will take the following General Education and Professional Education courses:

General Education: 2 semester hours from the following:

- GE 502. Philosophy & Philosophers2
- GE 504. Science and Technology2
- GE 505. History of Mathematics2
- GE 506. Science Biographies2

Professional Education: 4 semester hours

- PE 610. BSCS Methods and Philosophy2
- PE 602. Statistical Methods2

CURRICULUM FOR THE MASTER OF EDUCATION DEGREE

I. GENERAL AND PROFESSIONAL EDUCATION—The selection of courses will be based on the student's needs as determined by the curriculum directors and the director of graduate studies. Requirements may vary with the program.

II. RESEARCH—Four to six (4-6) semester hours.

*Res 800. Methods of Research2

**Res 801. Research Project2

**Res 802. Master's Thesis4

*Required

**Either is required

III. SPECIALIZATION

ELEMENTARY—*Field of Specialization*—Sixteen to twenty-two (16-22) semester hours of work to be selected from the courses listed under "Graduate Elementary Courses."

INDUSTRIAL ARTS—*Field of Specialization*—Sixteen to twenty-two (16-22) semester hours of work to be selected from the courses listed under "Graduate Industrial Arts Courses."

ENGLISH—*Field of Specialization*—Sixteen to twenty-two (16-22) semester hours of work to be selected from the courses listed under English.

BIOLOGICAL SCIENCE—*Field of Specialization*—Eighteen (18) to twenty-two (22) semester hours of work to be selected from the courses listed under Biological Science in appropriate selected areas. Six hours of Organic Chemistry or six hours of Biochemistry required for those who have not had an adequate background in Chemistry.

GRADUATE GENERAL AND PROFESSIONAL EDUCATION COURSES

Four to ten (4-10) semester hours of work to be selected from the following courses for Elementary, Industrial Arts and English:

GE 500. Comparative Studies in Literature	2
GE 501. Great Works in Drama	2
GE 502. Philosophy and Philosophers	2
GE 503. Comparative Music	2
GE 504. Science and Technology	2
GE 505. History of Mathematics	2
GE 506. Science Biographies	2
GE 507. World Resources and Population Problems	2
GE 508. American Civilization	2
GE 509. Comparative Institutions	2
GE 510. Language in Society	2
GE 511. Community Problems of Health and Safety	2
GE 512. Mass Communications	2
GE 513. Community Resource Problems	4
PE 600. General History of Education	2
PE 601. Philosophy of Education	2
PE 602. Statistical Methods	2
PE 603. Advanced Educational Psychology	2
PE 604. Comparative Education	2
PE 605. Educational Sociology	2
PE 606. Seminar in Audio-Visual Techniques	2
PE 607. Guidance and Counseling	2
PE 608. Psychology of Growth and Development	2

Biology students will take the following General Education and Professional Education courses:

General Education: 2 semester hours from the following:

GE 502. Philosophy & Philosophers	2
GE 504. Science and Technology	2
GE 505. History of Mathematics	2
GE 506. Science Biographies	2

Professional Education: 4 semester hours

PE 610. BSCS Methods and Philosophy	2
PE 602. Statistical Methods	2

GRADUATE ELEMENTARY
COURSES

Elementary—Sixteen to twenty-two (16-22) semester hours of work to be selected from the following:

- *EL 700. Historical Background of the Elementary School ...2
- EL 701. Development and Organization of the Curriculum for the Elementary School2
- EL 702. Tests and Measurements in the Elementary School ...2
- EL 703. Creative Activities in the Elementary School2
- EL 704. Developmental Reading in the Elementary School ...2
- EL 705. Teaching Reading in Content Subjects2
- EL 706. Techniques in Diagnosis of Remedial Reading Problems2
- EL 707. Recent Trends in Language Arts2
- EL 708. Special Problems in Elementary Social Studies2
- EL 709. Geography in the Modern Elementary School2
- EL 710. Arithmetic in the Elementary School2
- EL 711. Resource Materials in Elementary Science2
- EL 712. The Creative Elementary Music Program2
- EL 713. Art Education for the Elementary Grades2
- EL 714. Guidance in the Elementary School2
- EL 715. Problems in Health and Physical Education for the Elementary School2
- EL 716. Teaching in Kindergarten and the Primary Grades ...2
- EL 717. Psychology of the Exceptional Child2
- EL 718. Organization and Administration of the Elementary School2
- EL 719. Clinical Practicum in Reading2
- EL 724. Seminar in Elementary Art Education2

• Required

GRADUATE ELEMENTARY
PROGRAM WITH EMPHASIS
ON READING

Candidates for the Master of Education degree in Elementary Education may complete their degree requirements with an emphasis on reading by completing the following program:

I. GENERAL AND PROFESSIONAL EDUCATION—Four to ten (4-10) semester hours of work to be selected from the courses listed under “General and Professional Education.”

II. ELEMENTARY EDUCATION—Sixteen to twenty-two (16-22) semester hours of work to be selected from the list of “Graduate Elementary Courses.”

A. READING SPECIALIZATION—ten (10) credits

- El 704—Developmental Reading in the Elementary School2
- El 705—Teaching Reading in the Content Subjects2
- El 706—Techniques in Diagnosis of Remedial Reading Problems2
- El 719—Clinical Practicum in Reading (Prerequisite—El 706) .2
- El 707—Recent Trends in Language Arts2

B. An additional six to twelve (6-12) semester hours of work in Elementary Education are required.

III. RESEARCH—Four to six (4-6) semester hours of work to be selected from the courses listed under “Research Course Description”.

IV. COURSES TO BE INCLUDED FROM ELEMENTARY EDUCATION OR GENERAL AND PROFESSIONAL EDUCATION—

- A. Tests and Measurements or Educational Statistics (2 credits)
- El 702—Tests and Measurements in the Elementary School ...2
 - PE 602—Statistical Methods2

- B. Psychology (2 credits)
- PE 603—Education Psychology2
 - PE 608—Psychology of Growth and Development2
 - El 717—Psychology of the Exceptional Child2

GRADUATE INDUSTRIAL ARTS COURSES

Industrial Arts—Sixteen to twenty-two (16-22) semester hours of work to be selected from the following:

- *IA 700. Organization and Administration of Industrial Arts . . . 2
- IA 701. Curriculum Development in Industrial Arts 2
- IA 702. History and Philosophy of Industrial Arts Education . 2
- IA 703. Planning the Industrial Arts Laboratory 2
- IA 704. Supervision of Industrial Arts Education 2

THE DRAWING AREA

- IA 710. Research in Technical Drawing Problems I 2
- IA 711. Research in Technical Drawing Problems II 2
- IA 712. Representational Drawing I 2
- IA 713. Representational Drawing II 2
- IA 714. Problems in Architectural Design I 2
- IA 715. Problems in Architectural Design II 2

THE ART AND DESIGN AREA

- IA 720. The History and Philosophy of Contemporary Industrial Design 2
- IA 721. Advanced Crafts 4
- IA 722. Problems in Industrial Arts Design 2
- IA 723. Advanced Ceramics 4

THE WOOD AREA

- IA 730. Research in the Problems of Woodworking 4
- IA 731. Studies in Industrial Patternmaking Techniques 4

THE METAL AREA

- IA 740. Studies in General Metals 4
- IA 741. Research in the Problems of Metal Machining 4

THE ELECTRICITY-ELECTRONICS AREA

- IA 750. Advanced Studies in Electricity-Electronics 4
- IA 751. Problems Relating to Light and Power 4
- IA 752. Seminar in New Electrical Practices 2

THE GRAPHIC ARTS AREA

- IA 760. Research in and Development of Graphic Arts Techniques 4
- IA 761. Design Problems Relating to Graphic Arts Reproduction 2
- IA 762. Research in Photographic Techniques 4
- IA 763. Book Production 4

THE PLASTICS AREA

- IA 770. Plastics and Their Application to Industrial Arts 4

* Required.

GRADUATE COURSES IN ENGLISH

English—Sixteen to twenty-two (16-22) semester hours to be selected and distributed as follows:

A. FIELD OF LANGUAGE—A minimum of four (4) semester hours to be selected from the following courses:

- Eng 701. Introduction to Old English 2
- Eng 702. Middle English 2
- Eng 703. History of the English Language 2
- *Eng 704. Advanced Linguistics 2

B. FIELD OF LITERATURE—A minimum of twelve (12) semester hours to be selected from the following courses:

- Eng 711. Chaucer 2
- Eng 715. Development of the English Drama before Shakespeare 2
- Eng 717. Shakespeare 2
- Eng 721. Seventeenth Century Non-dramatic Literature 2
- Eng 725. The Age of Reason—Prose 2
- Eng 726. The Age of Reason—Poetry 2
- Eng 731. Nineteenth Century Prose 2
- Eng 732. Nineteenth Century Poetry 2
- Eng 735. Selected Masters of English Literature A 2
- Eng 736. Selected Masters of English Literature B 2
- Eng 741. Selected Masters of American Literature A 2
- Eng 742. Selected Masters of American Literature B 2
- Eng 751. Contemporary Literature 2
- Eng 761. Seminar in Literary Criticism 2

* Required.

GRADUATE COURSES IN BIOLOGICAL SCIENCE

Biological Science—Eighteen to twenty-two (18-22) semester hours of work to be selected from the following:

Biol 701. Developmental Anatomy	4
Biol 702. Cellular Physiology	4
Biol 703. Animal Histology	2
Biol 704. Comparative Skeletal Anatomy	2
Biol 705. Comparative Anatomy of the Muscles and Nervous System	2
Biol 706. Comparative Visceral Anatomy	2
Biol 707. Animal Parasitology	3
Biol 708. Animal Behavior and Adaptation	3
Biol 710. Plant Anatomy	4
Biol 711. Plant Growth and Development	4
Biol 712. Plant Physiology	4
Biol 713. Taxonomy of the Vascular Plants	4
Biol 716. Animal Systematics	3
Biol 720. Bacteriology	4
Biol 721. Cytology	4
Biol 725. Biological Chemistry	4
Biol 731. Advanced Problems in Genetics	4
Biol 732. Organic Evolution in the Twentieth Century	2
Biol 733. Genetics of Population and Evolution	2
Biol 740. Laboratory Techniques in Biology	3
Biol 741. Microtechniques	3
Biol 742. Radiobiology	4
Biol 750. Ecology	4
Biol 752. Limnology	4
Biol 790-799. Special Problems in Biology	1-2 each

For the area of specialization, students should concentrate in one of the following sets of courses:

- (1) Cellular Physiology, Biochemistry, Radiology, Microbiology, Genetics, Population Genetics.
- (2) Ecology, Limnology, Systematics and Taxonomy (Animal and Plant), growth and Development, Organic Evolution, Genetics.

A program of course work and research, following an area of concentration, will be devised with the individual's past school background, experience, and his future plans serving as guidelines. These will be implemented by the judgment of the advisor and the department head to build a program which will, when successfully completed, give adequate academic and professional competency required of a modern master teacher of biology.

An applicant for admission to a graduate course who lacks a certain prerequisite for this specific course may apply for waiver of this prerequisite. A committee composed of the instructor, the department head and a member of the graduate council will review such application and may admit the applicant to the course conditionally if, in their judgment, the applicant's academic record and experience indicate ability to pursue the course work successfully. A student so admitted may be asked by the same committee to withdraw from the course should the quality of his work fall below the standard expected of a graduate student.

The class and laboratory hours listed in these class descriptions are based upon the trimester term of fifteen weeks. An equivalent time schedule will be arranged for six and twelve week summer terms and for night and Saturday classes.

It is highly probable that those candidates whose undergraduate work was not planned with careful considerations for a graduate program will need to complete course work in excess of the minimum thirty (30) hours.

IV. General Information

General Information

STUDENT RESPONSIBILITY

Responsibility for knowing and following the academic rules and regulations, including requirements for graduation, rests with the student. Faculty advisers assist students in planning their academic programs and research requirements but are not expected to relieve the students of their responsibility.

COURSE LOAD

Part-time graduate students will be limited to four (4) semester hours of graduate work per trimester.

During the summer sessions a graduate student may earn a maximum of ten (10) semester hours of graduate work.

A full-time graduate student may carry ten (10) or twelve (12) semester hours of graduate work within a sixteen-week period.

RESIDENCE REQUIREMENT

A total of thirty (30) semester hours of work, in addition to the fulfillment of other requirements and conditions stipulated in this bulletin, will be required for the master of education degree. A total of twenty-four (24) semester hours must be earned in residence at this college.

TRANSFER OF CREDIT

A maximum of six (6) semester hours of resident (on main campus) graduate work done at another accredited graduate school may be transferred to the Graduate Program at California State College. Transferred credits must represent courses that fit the program of California State College and which have been passed with a grade of at least "B". Transfer credits to be acceptable must fall within five years of the date of the application for admission to Graduate Studies.

SCHOLARSHIP REQUIREMENT

The graduate student will be required to maintain a "B" grade average in all work after receiving the bachelor's degree. Only grades of "A", "B", or "C" are acceptable toward a master's degree. Marking system: Grade of "A", 4 quality points; "B", 3 quality points; "C", 2 quality points.

TIME LIMIT

All course work and research must be completed within five years after admission to candidacy for the degree of Master of Education unless extension has been approved by the Graduate Council because of extenuating circumstances.

PLANNING A PROGRAM

As soon as the applicant has been admitted to the Graduate Studies Program, he will be referred to the Director of Graduate Studies for advisement. An adviser will be assigned to the graduate student after he has been admitted to candidacy for the master's degree. The candidate may request an adviser in his area of study with the approval of the department head. Each graduate student's program will be planned specifically for him in conference with his adviser.

The student is required to consult with his adviser throughout his graduate program on a regularly scheduled program basis. His program of studies must be approved by his adviser prior to registration.

COMPREHENSIVE EXAMINATION

Following the completion of the thesis or research project and all course requirements for the degree, each student who is a candidate for the master's degree will be required to pass a comprehensive examination in his area or field of specialization. The type of examination may vary in different departments. The purpose of the examination is to evaluate the student's ability to organize his thoughts, to express himself adequately, and to demonstrate a knowledge of his field.

NOTICE OF ANTICIPATION FOR GRADUATION

It is the responsibility of the student to check with the Graduate Office at least three months before the date of his anticipated graduation. The Graduate Office prepares a list of prospective graduates several months before each commencement. It is the student's responsibility to see that his name is included on the graduation list and to indicate the way his name should appear on the diploma. If the degree candidate fails to check with the Graduate Office and fails to complete the application for graduation, it will be necessary to postpone his graduation until the next regular commencement.

HOUSING FACILITIES

Housing in the College dormitories for the summer sessions is available to graduate students. Students desiring housing facilities are requested to write to the Dean of Men.

The housing fee, which includes room and board, is \$17.00 per week. Meals—\$9.00. Room—\$8.00.

The availability of living accommodations in the college dormitories depends upon the enrollment and demand for housing. Interested students are urged to make the necessary arrangements as early as possible.

PERMANENT CERTIFICATION

The provisional college certificates issued after October 1, 1959, shall require for validation for the permanent form of the certificate, the completion of twelve (12) semester hours of post-baccalaureate work and at least three full years of successful teaching experience. Provisional College Certificates issued after October 1, 1963, shall require for validation for the permanent form of the certificate the completion of 24 semester hours of approved post-baccalaureate or graduate work including 12 semester hours in an academic content area unless otherwise specified and the remainder in any one or a combination of general education, professional education, and subject matter specialization.

By enrolling in the graduate program teachers may complete their twelve (12) or twenty-four (24) credit hours of post-baccalaureate work which are required for permanent certification and at the same time begin work on the Master of Education degree.

THE LIBRARY

The J. Albert Reed Library, opened in August of 1961, houses a growing collection of carefully chosen supplementary reading and research materials expanded to meet the needs of the graduate program. Library acquisitions average 6,000 volumes a year, special encouragement being given by the librarians to graduate ordering.

Microcard editions of rare and out-of-print titles are slowly attracting student use. One microcard reader and two film readers are operated near the graduate headquarters on the second floor of the new building. Microfilmed theses supplement a new shelf of bound theses in the Graduate Study, both of which serve as examination samples and as source materials. For the students' convenience, a book copier and a micro-

film reader-printer provide facilities for copying service at a nominal cost.

Two members of the library staff have been assigned to the Education department as order librarians, cataloguers, reference assistants, and consultants in that field. A third professional librarian serves the Industrial Arts and Science departments in the same capacities. Remaining staff members classify titles in the humanities, thus completing a pattern which provides trained assistance in each subject field to professor and student alike.

Open stacks foster an atmosphere of independent study and will do much to encourage serious acquaintance with books on the part of the graduate student. Interlibrary loan service is granted him for the completion and extension of research; privately placed carrels make his library hours more productive, and a generous library budget supplies every reasonable request for materials to broaden and deepen the mastery of his chosen field. The influence of the new graduate program has filtered through all institutional policy-making and has had a particularly invigorating effect on the scope and progress of the Library.

Library hours.

Monday through Friday	8 a.m. to 10 p.m.
Saturday	8 a.m. to 4 p.m.
Sunday	2 p.m. to 5 p.m.

F E E S

Application Fee	\$10.00
Enrollment Fee (Graduate School	\$20.00 (Per Credit)
Activity Fee (Summer Sessions only)	\$ 5.00
Graduate Degree Fee	\$ 5.00
Late Registration Fee	\$ 1.00 (Per day)
	\$ 5.00 (Limit)

Graduate students are also required to pay any fees (activity fee, library fines, etc.) required of undergraduate students.

Checks or money orders must be written in the exact amount of the payment. Make checks or money orders payable as follows:

Application Fee	}	Commonwealth of Pennsylvania
Enrollment Fee		
Graduate Degree Fee		
Activity Fee	}	Student Activities Fund

Candidates who have been approved for the Master's Degree are required to purchase or rent from the College Book Store a Master's cap, gown and hood to be worn at the graduation exercises. The fee for these items is nominal.

Three bound copies of the Master's thesis or the research project must be submitted to the College. The current charge for binding is \$5.00 per copy. Additional copies may be bound for the students at the same charge. Arrangements for binding must be made with the Graduate Office.

Transcripts of one's graduate work may be obtained by contacting the Graduate Office. The fee for this service is \$1.00 per transcript.

R E F U N D S

If a student withdraws from the college, for approved reasons, before one-third of the scheduled class period have been completed, the student shall then be entitled to a refund of one-half of the tuition fees paid.

No portion of the tuition fee shall be refunded if the student has attended one-third or more than one-third of the class periods scheduled during a given semester or session.

The student desiring permission for withdrawal must complete the regular withdrawal forms which are available in the Graduate Office. Students who desire a refund must also write a letter to the President of California State College; the reason for withdrawing must be explained. If the money is to be credited to another trimester, the letter to the President is not necessary.

W I T H D R A W A L S

Withdrawal from a course will be permitted during the first eight weeks of a trimester subject to the approval of the Director of Graduate Studies. A grade of WX will be assigned as a mark for withdrawal during the first eight weeks.

Withdrawal forms must be properly filled in by students who desire to discontinue part of their schedules. When students merely stop attending classes without officially withdrawing, F (failing) grades are recorded on the permanent records.

Students who find it necessary to leave the college during a trimester should, before discontinuing attendance at classes, confer with the Director of Graduate Studies. If after such conference it is found that the student should not continue, official withdrawal forms must be filed in the Graduate Office. Students who leave the college without following this routine, especially the filling in of withdrawal cards, jeopardize their status.

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Course Offerings

GENERAL EDUCATION

GE 200. Comparative Systems in Literature, 3 credits
 Study and dramatic literary classics such as *The Divine Comedy*, *The Spanish Tragedy*, *Leontes*, *The Brothers Karamazov*, *The Merchant of Venice*, *Les Misérables*, a number will be chosen and studied in their own right for the underlying values they offer in themselves and for conclusions that may be drawn from them regarding their culture, aesthetic, and ideological.

GE 201. Career Views in Drama, 3 credits
 Study and comparison of a number of plays by authors of various nationalities (for instance, Aristotle, Plautus, Calderon, Racine, Corneille, Ibsen, Chekov, Shakespeare, Shaw, O'Neill) for the values they represent in themselves and also as a basis for comparison in aesthetic, philosophy and culture.

GE 202. Philosophy and Psychology, 3 credits
 This course proposes to consider the basic problems of philosophy through the writings of Plato, Aristotle, Kant, Schopenhauer, Hegel, James, Dewey and other thinkers. The guiding aim will be to present ideas which have been most influential in the history of thought. The method of instruction will be through lectures and discussion. The method of instruction will be through lectures and discussion.

GE 203. Comparative Music, 3 credits
 The course is designed to study the music of various cultures. It will cover the history and development of music in various parts of the world. It will also cover the social and cultural functions of music in different societies. The course will be taught through lectures and discussion.

GE 204. Science and Technology in Modern Culture, 3 credits
 History of the development of science and technology in modern culture. The course will cover the scientific method, the development of scientific theories, and the application of science to technology. The course will be taught through lectures and discussion.

GE 205. History of Civilization, 3 credits
 A study of the origin and development of human civilization. The course will cover the prehistoric period, the ancient world, the medieval period, and the modern world. The course will be taught through lectures and discussion.

V. Course Offerings

GE 206. Science and Technology in Modern Culture, 3 credits
 History of the development of science and technology in modern culture. The course will cover the scientific method, the development of scientific theories, and the application of science to technology. The course will be taught through lectures and discussion.

GE 207. Science and Technology in Modern Culture, 3 credits
 History of the development of science and technology in modern culture. The course will cover the scientific method, the development of scientific theories, and the application of science to technology. The course will be taught through lectures and discussion.

Course Offerings

GENERAL EDUCATION

GE 500. COMPARATIVE STUDIES IN LITERATURE, 2 credits

From non-dramatic literary classics such as *The Divine Comedy*, *Don Quixote*, *Paradise Lost*, *The Brothers Karamazov*, *The Mahabarata*, *The Iliad*, *Les Miserables*, a number will be chosen and studied in some detail both for the enduring values they offer in themselves and for the conclusions that may be drawn from them regarding their cultures, aesthetics, and philosophies.

GE 501. GREAT WORKS IN DRAMA, 2 credits

Study and comparison of a number of plays by authors of various nationalities (for instance Aeschylus, Plautus, Calderon, Racine, Goethe, Ibsen, Chekov, Shakespeare, Shaw, O'Neill) for the values they represent in themselves and also as a basis for comparisons in aesthetics, philosophy and culture.

GE 502. PHILOSOPHY AND PHILOSOPHERS, 2 credits

This course proposes to consider the basic problems of philosophy through the writings of Plato, Aristotle, Kant, Schopenhauer, Bergson, James Dewey and other thinkers. The guiding aim will be to present diverse views from primary sources. Lecture and discussion will be used. The techniques of the 'Great Books' seminars will be used in discussion.

GE 503. COMPARATIVE MUSIC, 2 credits

This course is designed to analyze music and its effect on our lives. Discussions will be devoted to such areas as Art and Life, why we like music, how we like music, music as an art, music as a humanity and the spiritual factor in music. Some technicalities will be entered into such as the composer's materials, instruments; the means for making music. Many listening experiences will be derived from records. Modern trends in music and our attitude toward "this modern stuff" will be discussed.

GE 504. SCIENCE AND TECHNOLOGY, 2 credits

History of the contributions of Science and Technology to modern culture, with emphasis on the period since the beginning of the Industrial Revolution.

GE 505. HISTORY OF MATHEMATICS, 2 credits

A study of the origin and the development of our number system. The development of the fundamental operations of mathematics are stressed. The importance of mathematics to the various stages of civilization are emphasized.

GE 506. SCIENCE BIOGRAPHIES, 2 credits

A selected series of projects involving the lives of the men of science and the nature of their contributions to science. Emphasis is placed upon the discoveries rather than the lives. Experiments duplicating the pioneer work are utilized wherever possible.

GE 507. WORLD RESOURCES AND POPULATION PROBLEMS, 2 credits

A resume of the world's resources with emphasis upon soils, vegetation (particularly forests), waters, minerals, and human resources. The availability and possible development of these resources in relationship to the world's under-populated and over-populated areas. The availability of a reasonable standard of living in various regions as determined by potential resource development.

GE 508. AMERICAN CIVILIZATION, 2 credits

A treatment of those elements in American life which have given direction to the unique development of the United States.

GE 509. COMPARATIVE INSTITUTIONS, 2 credits

In this course some of the major institutions of a number of modern societies are compared in terms of philosophic defenses, organization, function, alleged outcomes, real outcomes, human costs, etc. Among the institutions examined are: family organization, economic systems, and governmental systems.

GE 510. LANGUAGE IN SOCIETY, 2 credits

This course will view languages as inventions or creations of men. It is based on the premise that speakers of different languages view their words differently, and therefore, evaluate it differently. It assumes that thinking is relative to the languages learned. It emphasizes the point of view that developments in many of the modern sciences has been accelerated by the creation of new systems of representations (languages). It considers also recent evidence that man's creative potential may be seriously impaired by the imposition of prejudices, rigidities and certainties that are passed along through the languages of all cultures.

GE 511. COMMUNITY PROBLEMS OF HEALTH AND SAFETY, 2 credits

An analysis of the program and problems of the community in health and safety. Dealing with the basic facts and principles of public or community health and safety at the local, state and national levels, including the relationships between public health departments, voluntary health agencies and the school's health and safety program.

GE 512. MASS COMMUNICATIONS, 2 credits

The history, development, function and problems of mass media in America. The various theories of mass communication based on the organization of different societies: authoritarian, libertarian and communist. The social responsibility theory of each and the impact of each on their respective societies.

GE 513. COMMUNITY RESOURCE PROBLEMS, 4 credits

To help elementary, junior, and senior high school teachers improve classroom instruction through the identification and proper utilization of community resources. Emphasis is upon the study of systematic ways for making new knowledge available through utilization of community resources in a form that can be readily integrated into the curriculum. To help the teachers gain a better understanding of the economics, cultural, and governmental life of their community. To help develop a functional relationship between education and other segments of community life. To produce teaching materials for use in the schools of the area.

PROFESSIONAL EDUCATION

PE 600. GENERAL HISTORY OF EDUCATION, 2 credits

Examines the concepts of modern education as they are found in the historical development of the school.

PE 601. PHILOSOPHY OF EDUCATION, 2 credits

Shows the foundation of modern education as it developed through the various schools of philosophic thought.

PE 602. STATISTICAL METHODS, 2 credits

Includes the understanding and application of frequency distribution, series analysis, correlation, normal curve, sampling, collection of data, statistical tables and graphic presentations.

PE 603. ADVANCED EDUCATIONAL PSYCHOLOGY, 2 credits

Current issues and recent evidence in the areas of educational psychology, including growth, personality, heredity and environment, intelligence, learning, transfer of learning, emotion, motivation, and teaching methods.

PE 604. COMPARATIVE EDUCATION, 2 credits

Historical foundations, rise and development of national educational systems of Western Europe and nations of the Western hemisphere. Post-war development and extension of educational opportunities in England, Norway, Sweden, Denmark, Holland, Germany, France, Russia, Mexico, and the Republics of Central and South America.

PE 605. EDUCATIONAL SOCIOLOGY, 2 credits

Deals with the role of the school in child socialization, inter-group education, the integration of school and community, group processes and the teacher, teacher problems in human relations, and educating for leadership.

PE 606. SEMINAR IN AUDIO-VISUAL TECHNIQUES, 2 credits

This course is concerned with the more important aspects of developing and expanding audio-visual programs in the elementary and the secondary schools. Demonstrations, lectures, and group discussions will include the utilization, preparation, and administration of audio-visual materials.

PE 607. GUIDANCE AND COUNSELING, 2 credits

For teachers, teacher-counselors, administrators, and other non-specialists in guidance to further the guidance work for which they are responsible. Consideration to guidance programs, the interview, interpretation of test data, observations, case study, and other counseling techniques; to guidance in the classroom and club; to group discussion and committee work; to counseling with pupils and parents regarding study, discipline, health, social, emotional, educational, and vocational problems.

PE 608. PSYCHOLOGY OF GROWTH AND DEVELOPMENT, 2 credits

This course is designed to provide insight into how people grow and develop from infancy to old age. Maturation, learning, and their inter-relationships are studied. Physical growth patterns are noted along with emotional, intellectual, and social development with implications for the school, community, and home.

PE 610. BSCS METHODS AND PHILOSOPHY, 2 credits

The primary object of this course is to acquaint teachers in service with the thinking and philosophy which went into the building of the BSCS courses of study. The three versions will be studied, and an attempt to evaluate each version against the various school backgrounds will be made. Laboratory projects will be pursued which will serve as source material in the teacher's own classes. Two class hours and two lab hours per week.

Prerequisite: Certification to teach biology.

RESEARCH

RES 800. METHODS OF RESEARCH, 2 credits

This course gives a general introduction into the reasons and the procedures for research in education. Types of research, selection of a research problem, the use of the library, collection and application of data, and the research report are studied. The course provides a background for the preparation of a research project or of a thesis.

RES 801. RESEARCH PROJECT, 2 credits

A written report of a scientific investigation is required. It is suggested that the report be based on an actual classroom problem. The report may cover the available literature in the field or it may be based on a classroom experiment. A knowledge of research techniques and scientific reporting is required.

RES 802. MASTER'S THESIS, 4 credits

A thesis is the written report of an exhaustive research made to derive findings and arrive at conclusions in a specific field of investigation. The thesis subject must have the prior approval of a special graduate committee composed of the faculty adviser and two other professors recommended by the Director of Graduate Studies. The student may expect special guidance in this work from his adviser and other members of his graduate committee.

ELEMENTARY EDUCATION

EL 700. HISTORICAL BACKGROUND OF THE ELEMENTARY SCHOOL, 2 credits

Emphasis is given to historical and philosophical backgrounds as they have been developed in the elementary school. In this course the student will have an opportunity to interpret modern educational issues as influenced by the past.

EL 701. DEVELOPMENT AND ORGANIZATION OF THE CURRICULUM FOR THE ELEMENTARY SCHOOL, 2 credits

The student has an opportunity to study the development of the school curriculum in relationship to the philosophy and objectives of the local school. Special emphasis is placed on recent trends in elementary curriculum development.

EL 702. TESTS AND MEASUREMENTS IN THE ELEMENTARY SCHOOL, 2 credits

This course is concerned with the evaluation of pupil progress. The criteria of good evaluating devices are studied. Students have an opportunity to study, administer, score and interpret various types of tests for evaluating pupil behavior.

EL 703. CREATIVE ACTIVITIES IN THE ELEMENTARY SCHOOL, 2 credits

In this course the student is acquainted with creative teaching techniques. The student is given opportunities to demonstrate his own creativity through various projects and special assignments, with emphasis on art, music, writing, and drama.

EL 704. DEVELOPMENTAL READING IN THE ELEMENTARY SCHOOL, 2 credits

Emphasis is placed on reading trends and various procedures for teaching reading. Through research findings, current literature, and discussions the student will be able to organize, administer, and evaluate a developmental reading program.

EL 705. TEACHING READING IN CONTENT SUBJECTS, 2 credits

Developing the basic vocabularies and concepts needed in the fields of arithmetic, social studies, geography and science. Interpreting and using symbols, pictures, tables and graphic materials. Developing an awareness of and proficiency in the various reading skills needed in the selection, interpretation, organization, and presentation of data obtained through reading textbooks and resource materials in these fields. Prerequisite: Teaching of Reading.

EL 706. TECHNIQUES IN DIAGNOSIS OF REMEDIAL READING PROBLEMS, 2 credits

Major emphasis is placed on presenting and discussing the techniques for determining reading difficulties of elementary school children. Practical use of testing devices and their application to individual diagnosis of reading difficulties are emphasized. The case study technique is utilized.

EL 707. RECENT TRENDS IN LANGUAGE ARTS, 2 credits

A study of recent trends, and research findings for teaching language arts in the elementary school is made. The students examine, use, and evaluate current textbooks and materials that are available in the Language Arts Field. Modern methods of teaching language arts are studied through laboratory techniques — observations and discussions.

EL 708. SPECIAL PROBLEMS IN ELEMENTARY SOCIAL STUDIES, 2 credits

This course is organized around current problems of teaching social studies — planning a social studies program, methods of teaching, available materials and textbooks. Opportunities for developing units of learning and making independent studies of trends in teaching Elementary Social Studies are presented.

EL 709. GEOGRAPHY IN THE MODERN ELEMENTARY SCHOOL, 2 credits

The course emphasizes techniques and methods for teaching geography in the elementary school. Proper use of textbooks, maps, and other tools of learning used in teaching geography are studied. The student has an opportunity to work on individual classroom problems or programs. The student becomes acquainted with the various skills that are essential to the study of geography at each grade level.

EL 710. ARITHMETIC IN THE ELEMENTARY SCHOOL, 2 credits

Recent trends and research in teaching arithmetic in the elementary school are studied. The newest techniques for developing basic skills and problem solving are discussed and evaluated. Students have an opportunity to work on individual problems.

EL 711. RESOURCE MATERIALS IN ELEMENTARY SCIENCE, 2 credits

This course is designed to acquaint the student with the various resources which might be utilized to advantage in an elementary science program. The resources to be investigated and studied include plant and animal resources, soil and mineral resources, human resources, and the resources of business and industry. Emphasis is placed on the application of these resources to classroom situations.

EL 712. THE CREATIVE ELEMENTARY MUSIC PROGRAM, 2 credits

This course is designed to show the elementary teacher how to guide the musical activities of his students. Through extensive activities in simulated classroom situations, the teacher learns how to integrate, simultaneously, all aspects of music into a song so that the children may realize a complete and challenging musical experience. These areas include creativeness, rhythmic activity, listening, reading, games, dances, and playing on instruments. Students have many opportunities throughout the course to analyze worthy song material and follow through by planning and teaching to the class appropriate activities in the aforementioned areas.

EL 713. ART EDUCATION FOR THE ELEMENTARY GRADES, 2 credits

A course to provide students who expect to teach in the elementary grades with a basis for ever increasing spiritual and intellectual horizons through the study of art and its historical and contemporary significance as an important creative force in our society. A climate for research and analysis of art forms in the arts will be established to meet the individual needs of students.

EL 714. GUIDANCE IN THE ELEMENTARY SCHOOL, 2 credits

Evaluative instruments and procedures used by the classroom teacher; creation of conditions for mental health; relation of guidance to other phases of instruction. Testing, case studies, and parent-teacher relations are stressed. Prerequisite: Educational Psychology

EL 715. PROBLEMS IN HEALTH AND PHYSICAL EDUCATION FOR THE ELEMENTARY SCHOOL, 2 credits

A survey of the problems and research concerning teachers' responsibilities for the health and physical activities of elementary school children.

EL 716. TEACHING IN KINDERGARTEN AND THE PRIMARY GRADES, 2 credits

The students have opportunities to become acquainted with modern methods of teaching the primary grades, activities, learning materials, and needs of the primary-grade children are analyzed and evaluated according to research findings.

EL 717. PSYCHOLOGY OF THE EXCEPTIONAL CHILD, 2 credits

To provide an enlarged and more precise concept of the characteristics and needs of children who are in some respect exceptional. Basic principles of educational practice with systematic instruction in relation to exploratory charts, sociograms and case studies.

EL 718. ORGANIZATION AND ADMINISTRATION OF THE ELEMENTARY SCHOOL, 2 credits

This course reflects the most recent trends in elementary education and presents a comprehensive picture of major phases of organization, administration and supervision, the practical routine aspects of which are placed on a sound theoretical basis. Emphasis is on the importance of cooperation within the school organization and between the school and community.

EL 719. CLINICAL PRACTICUM IN READING, 2 credits

The student becomes familiar with the many materials and varied methods to be employed in the correction of reading problems through their applications with a retarded reader in a clinical situation.

EL 724. SEMINAR IN ELEMENTARY ART EDUCATION, 2 credits

A course dealing with tools, materials, techniques, and processes suitable for elementary children.

INDUSTRIAL ARTS

IA 700. ORGANIZATION AND ADMINISTRATION IN INDUSTRIAL ARTS, 2 credits

A critical analysis of the administrative and organizational problem related to the various types of industrial arts programs, i.e., general shop, unit shop, and unit general shop. The role of the administrator and teacher in developing and organizing the industrial arts program as an integral part of the total school program is stressed. Experience is provided in the use of administrative techniques and devices peculiar to the field of industrial arts.

IA 701. CURRICULUM DEVELOPMENT IN INDUSTRIAL ARTS, 2 credits

An investigation is made into the significant aspects of our culture which affect the curriculum. Key concepts in curriculum study are related to practice in establishing a curriculum consistent with accepted educational objectives and philosophies. The complete development of an industrial arts curriculum including preparation of courses of study, course outlines, unit organization, and lesson planning constitutes a major phase of the course.

IA 702. HISTORY AND PHILOSOPHY OF INDUSTRIAL ARTS EDUCATION, 2 credits

A study of the evolution and development of industrial education from primitive times to the present is pursued. The establishment of the early European systems of the Renaissance to the development of sloyd, manual training, and eventually industrial arts in this country, represent the major divisions of the course. The educational philosophies and methods of such leaders as Comenius, Locke, Rousseau, Pestalozzi, Froebel, Dewey, and Woodward are contrasted to current philosophies, methods, and objectives of industrial arts education.

IA 703. PLANNING THE INDUSTRIAL ARTS LABORATORY, 2 credits

Design experience is provided in laboratory planning in which the most recent developments in building materials and fixtures are used. Principles of school plant design are utilized to establish a relationship between the industrial arts laboratory and the total school plant. Consideration is given to the problem of statutory demands and limitations, architectural techniques, acoustics, machine utilization, area planning, storage, and planning facilities.

IA 704. SUPERVISION OF INDUSTRIAL ARTS EDUCATION, 2 credits

An analysis is made of current research in supervision as related to curriculum improvement in industrial arts. Emphasis is placed on methods of coordination and upgrading teaching techniques, safety education, inventory control, requisitioning methods, evaluative criteria, and student planning methods.

IA 710. RESEARCH IN TECHNICAL DRAWING PROBLEMS I, 2 credits

Research is conducted to determine current and proposed technical advances in industrial drafting methods and techniques and their possible assimilation into secondary school and college drafting courses. Pilot courses are developed utilizing new concepts and techniques developed in industry.

IA 711. RESEARCH IN TECHNICAL DRAWING PROBLEMS II, 2 credits

Pertinent experiments and investigations pertaining to the teaching of technical drawing are conducted. Course content, teaching methods, textbooks, instruction sheets, sensory aids and evaluative techniques are reviewed and evaluated.

IA 712. REPRESENTATIONAL DRAWING I, 2 credits

Refinement in the technique of rendering the essential appearance of an actual or imaginary product is stressed. Freehand sketching in a variety of media, including pastels, pen and ink, and wash drawing are explored.

IA 713. REPRESENTATIONAL DRAWING II, 2 credits

Emphasis is placed on experiencing more advanced graphic media in the technique of freehand sketching. Extensive experience is provided in air brush rendering. Experimentation in the use of graphic media is encouraged in order to achieve unusual but effective visual effects in representational drawing.

IA 714. PROBLEMS IN ARCHITECTURAL DESIGN I, 2 credits

Emphasis is placed on new concepts and techniques in architectural design and drafting. Current developments in building materials and fabrication methods are applied to residence, commercial and industrial structures. The organic approach to architectural design is utilized to evolve functional designs in the various types of structures.

IA 715. PROBLEMS IN ARCHITECTURAL DESIGN II, 2 credits

Methods and techniques of teaching architectural drafting and design are presented. Group problem solving, activity planning, course construction, and providing for individual differences constitute some major instructional problems included in the course. Methods of motivating students toward architectural creativity are stressed.

IA 720. THE HISTORY AND PHILOSOPHY OF CONTEMPORARY INDUSTRIAL DESIGN, 2 credits

Industrial design is presented as a distinct and significant part of American industry and of contemporary American culture. The development of industrial design is traced from the outset of the industrial revolution to the present. The historical and philosophical roots of industrial design are studied in order to better understand its aesthetic impact upon the American culture.

IA 721. ADVANCED CRAFTS, 4 credits

This course develops a considerable depth and breadth of technique and overall design ability for those who wish to pursue any major craft media. Creative and aesthetic design coupled with technical refinement is stressed. Research in a particular craft medium accompanies the laboratory experience. Any craft area except Ceramics may be selected for advanced work.

IA 722. PROBLEMS IN INDUSTRIAL ARTS DESIGN, 2 credits

A problem solving approach to design is emphasized. Students completely plan and develop products that are original in conception and aesthetic in appearance. The individual is encouraged to work experimentally and independently. Final products are crystallized with the aid of representational drawings, working drawings, and detailed plans.

IA 723. ADVANCED CERAMICS, 4 credits

Advanced techniques in the art and craft of ceramics is provided in this course. Experiences in three and four piece mold making, glaze experimentation, and advanced work on the potter's wheel are included. The technology of ceramics is presented through the process of individual research on some phase of the ceramic industry.

IA 730. RESEARCH IN THE PROBLEMS OF WOODWORKING, 4 credits

Research experiences are provided in current industrial developments in the woodworking industries. Emphasis is placed upon research techniques and finding in such areas as wood finishing, production methods, wood chemistry, machinery maintenance, and safety programing. Special problems relating to wood storage, requisitioning, inventories and budgeting procedures are also presented.

IA 731. STUDIES IN INDUSTRIAL PATTERNMAKING TECHNIQUES, 4 credits
Modern industrial patternmaking practices are explored. Practice is provided in the application of various materials such as wood, wax, ceramics, and metals to pattern fabrication. Patterns applicable to secondary school industrial arts programs are designed and constructed.

IA 740. STUDIES IN GENERAL METALS, 4 credits

Advanced techniques in working with copper, aluminum, brass, pewter, and stainless steel are studied. Research and practical application of such processes and techniques as tool forging, jigs, and fixture development, metal spinning, electroplating, die cutting, oxyacetylene welding, and brazing are practiced. Creative design in the general metal area is stressed.

IA 741. RESEARCH IN THE PROBLEMS OF METAL MACHINING, 4 credits

Special problems relating to secondary school metal machining programs such as product design, operational sequences, personnel organization, instructional sequences, special jigs and fixtures, and new industrial machining methods are studied. Individual research on a selected metal machining problem is required.

IA 750. ADVANCED STUDIES IN ELECTRICITY-ELECTRONICS, 4 credits

A study is made of the circuit theory and application of such electrical-electronic apparatus as the vacuum tube and transistor. The course is designed primarily to develop depth and experience in this area.

IA 751. PROBLEMS RELATING TO LIGHT AND POWER, 4 credits

Advanced theory and laboratory experiences in light and power circuits including the study of incandescent and fluorescent lighting, transformer connections, motors, and control equipment.

IA 752. SEMINAR IN NEW ELECTRICAL PRACTICES, 2 credits

The latest commercial electrical equipment and technical methods are presented by local power companies, manufacturers, and other agencies related to the electrical industry. This cooperative venture is designed to bring the student abreast of current practices, trends, and research in the electricity-electronics area.

IA 760. RESEARCH IN AND DEVELOPMENT OF GRAPHIC ARTS TECHNIQUES, 4 credits

Research experiences are provided in the development of the materials, methods, and processes currently employed in the printing industry. A study of research findings is conducted in the reproduction phases of printing and allied graphic arts. Problems relating to offset lithography, photo lithography, intaglio methods, advanced book binding, letterpress, photography, hand-cut silk screen, and photographic silk screen provide activities for individual research.

IA 761. DESIGN PROBLEMS RELATING TO GRAPHIC ARTS REPRODUCTION, 2 credits

The basic elements of commercial graphic design, such as shape, color, texture, scale, and balance are studied. Practical work includes designing of book covers, title pages, book jackets, trade-marks, colophons, posters, and show card work.

IA 762. RESEARCH IN PHOTOGRAPHIC TECHNIQUES, 4 credits
View composition, developing and printing constitute the major phases of this course. The mechanics of both miniature and professional photographic equipment are studied. Contact and enlargement printing, the making of zinc cuts, halftones and photographic plates are stressed.

IA 763. BOOK PRODUCTION, 4 credits
Modern book binding methods are investigated with emphasis on the preparation of dummies for school publications. Typical school publications such as handbooks, newspapers, and yearbooks are studied. Early methods of written communications are also studied and the findings reproduced in bound form.

IA 770. PLASTICS AND THEIR APPLICATION TO INDUSTRIAL ARTS, 4 credits
An intensive study of the changing field of plastics and its application to modern trend and progress of Industrial Arts Education.

ENGLISH

Eng 701. INTRODUCTION TO OLD ENGLISH, 2 credits
A study of the grammar of Old English, with some practice in reading the English Literature written before 1100.

Eng 702. MIDDLE ENGLISH, 2 credits
A study of the structure of Middle English, with practice in reading the literature of the period other than Chaucer.

Eng 703. HISTORY OF THE ENGLISH LANGUAGE, 2 credits
A historical study, according to linguistic principles, of the development of Modern English from its beginnings.

Eng 704. ADVANCED LINGUISTICS, 2 credits
A course in the principles and techniques of the analysis of language. The course is designed to provide students of English, foreign languages, anthropology, sociology, and psychology with the concepts and skills necessary for more advanced work in the areas where linguistic analysis forms part of their field of specialization.

Eng 711. CHAUCER, 2 credits
A study of the principal works of Chaucer in their social and literary backgrounds. It is desirable, but not essential, that students electing this course have had Middle English.

Eng 715. DEVELOPMENT OF THE ENGLISH DRAMA BEFORE SHAKESPEARE, 2 credits
A study of the drama, secular and religious, of the middle ages and of the chief pre-Shakespearean dramatists in England.

Eng 717. SHAKESPEARE, 2 credits
An examination in depth of certain of the plays of Shakespeare, with some special consideration given to the critical attitudes which have developed toward the man and his work.

Eng 721. SEVENTEENTH CENTURY NON-DRAMATIC LITERATURE, 2 credits
A survey of prose from Bacon to Browne, and of poetry from Donne to Milton. Special attention will be given to the various literary genres of the century up to the Restoration.

Eng 725. THE AGE OF REASON—PROSE, 2 credits
A consideration of some of the leading works of major writers from Defoe to Boswell, including Addison and Steele, Burke, Chesterfield, and others of the period.

Eng 726. THE AGE OF REASON — POETRY, 2 credits
Considerable time will be spent on the works of Pope, as representative of the period. Other poets will be considered, from Dryden to the Pre-Romantics, such as Burns, Blake, and Collins.

Eng 731. NINETEENTH CENTURY PROSE, 2 credits
Works of the major writers are studied for their literary values and in relation to their contemporary milieu.

Eng 732. NINETEENTH CENTURY POETRY, 2 credits
A study of selected aspects of Romantic and Victorian poetry as manifested in the works of such authors as Wordsworth, Coleridge, Byron, Shelley, Keats, Tennyson, Browning, and Arnold.

Eng 735. SELECTED MASTERS OF ENGLISH LITERATURE A, 2 credits

Eng 736. SELECTED MASTERS OF ENGLISH LITERATURE B, 2 credits
Each of these two courses shall be intensive studies of a small number of great writers for whom individual courses are not established. No writer will be included in both courses, but the courses may change from year to year. The student may take either or both courses.

Eng 741. SELECTED MASTERS OF AMERICAN LITERATURE A, 2 credits

Eng 742. SELECTED MASTERS OF AMERICAN LITERATURE B, 2 credits
Same as Selected Masters of English Literature, except that the writers shall be Americans.

Eng 751. CONTEMPORARY LITERATURE, 2 credits
An attempt to evaluate the most significant aspects and trends of recent literature as exemplified in the works of its chief practitioners, both British and American.

Eng 761. SEMINAR IN LITERARY CRITICISM, 2 credits
The study in detail of a particular critical theory, its history and development, and of those critics who in practice best exemplify this tradition. Opportunity will be given the student to show his ability to examine literary texts in the light of his study of the theory.

BIOLOGICAL SCIENCE

Biol 701. DEVELOPMENTAL ANATOMY4 sem. hrs.
Three class hours and three hours laboratory per week. A study of the development of the vertebrate embryo emphasizing the origin of germ cells, fertilization, growth, and differentiation. Work will be with the frog, chick, and pig embryos. Some laboratory work will utilize prepared serial sections of the chick and pig, while a considerable part will consist of incubation, observation and study of the developing frog and chick embryos. Several lectures will be given in the laboratory with developing embryos prepared to facilitate accurate observation.

Prerequisites: Zoology

Biol 702. CELLULAR PHYSIOLOGY4 sem. hrs.
The physiology of the cell with emphasis of the relation of structure and general properties to metabolism, synthesis and regulation. The role of the nucleus and of the cytoplasm in heredity, including genetic mechanism, mutation and the physiology of gene expression. Physical and chemical foundations of cells; the relation of cells to their environment; membrane phenomena; photosynthesis; enzymes; osmosis and permeability. Three hours lecture and three hours laboratory per week.

Prerequisites: Zoology
Organic Chemistry

Biol. 703. ANIMAL HISTOLOGY2 sem. hrs.
Two hours of class discussion and two hours of laboratory per week. A critical study of animal tissues and their cellular structure. Emphasis will be given to microscopic identification of representative tissues such as muscle, epithelial, endothelial, bony, cartilaginous, fatty, glandular, and nervous. Much of the lab work will consist of the study of prepared slides, and will be of a comparative nature. Some practice will be given in the preparation of temporary tissue mounts, both sections and squashes, for class study.

Prerequisite: Zoology

Biol 704. COMPARATIVE SKELETAL ANATOMY2 sem. hrs.
Two hours class work and two hours laboratory per week. Skeletal structures from the notochord to the mammalian skeleton will be studied with emphasis upon their evolutionary significance. Topics will include: ossification, development of pectoral and pelvic girdles, cranial and vertebral advances, variation of appendages, and the significance of the fusion and loss of primitive skeletal structures during the evolutionary process. Lectures and class discussions will be held in the laboratory with the skeletal specimens under discussion arranged so that comparisons may be made quickly and accurately.

Prerequisites: Zoology
Anatomy, (Vertebrate or comparative)

Biol 705. COMPARATIVE ANATOMY OF THE MUSCLES AND NERVOUS SYSTEM2 sem. hrs.
Two hours class work and two hours laboratory per week. The muscles and nervous systems of chordates from the protochordates to the mammal will be studied with emphasis upon their evolutionary significance. The disappearance of myotomes and the development of specialized muscles of the appendages will be treated with reference to their significance to the emergence of the vertebrate from the aquatic environment and its establishment on the land. Nervous systems with special emphasis upon the brain and spinal cord will be followed from protochordate to mammal. Particular attention will be given to the development of the cerebrum. Typical animals selected from protochordates, cyclostomes, chondrichthyes, bony fishes, reptiles, aves, and mammals will be dissected and studied simultaneously. Lectures and class discussions will be held in the laboratory with the specimens under discussion prepared so that comparisons may be made quickly and accurately.

Prerequisites: Zoology
Anatomy (Vertebrate or Comparative)

Biol 706. COMPARATIVE VISCERAL ANATOMY2 sem. hrs.
Two hours class work and two hours laboratory per week. The digestive, circulatory, excretory, respiratory, and reproductive systems from protochordates to mammals will be studied with emphasis upon the evolutionary significance of their development. Typical animals will be selected from each class and will be dissected simultaneously. Lectures and class discussions will be held in the laboratory with the specimens under discussion prepared so that comparisons may be made quickly and accurately.

Prerequisites: Zoology
Anatomy (Vertebrate or Comparative)

Biol 707. ANIMAL PARASITOLOGY3 sem. hrs.
A study of those phyla of the animal kingdom which contain the parasites that are of unusual zoological interest from the standpoint of morphology, life history, distribution, and disease-producing powers. Autopsies will be performed on animals of the area in order to discover and identify animal parasites.

Prerequisites: Biology I and II
Invertebrate Zoology

Biol 708. ANIMAL BEHAVIOR AND ADAPTION3 sem. hrs.
A study of the reactions of animals, including man. Some experimentation with animals will be carried on.

Prerequisites: Biology I and II and at least two other courses in Biology

Biol 710. PLANT ANATOMY4 sem. hrs.
A course dealing with the macroscopic and microscopic anatomy of the vascular plants. Detailed studies are made of roots, stems, leaves, and reproductive parts through the use of carefully selected prepared microscope slides, slides made by the students, and gross materials collected from the field. Three hours lecture and one three-hour laboratory period.

Prerequisite: Botany

Biol 711. PLANT GROWTH AND DEVELOPMENT4 sem. hrs.
Three hours of class discussion and three hours of laboratory per week. A study of the development of vascular plants with emphasis upon embryology and organogenesis, plus a critical study of such meristematic tissues as terminal meristems, cambium, phellogen, and pericycle and their differentiation into tissues. Laboratory work will consist largely of the growth of representative plants from the seeds in the laboratory and the study of these plants at different stages of their growth and development. Experiments will be devised to show the effects of light, temperature, plant hormones, weed killers, colchicine, and gibberelic acid as growth regulators.

Prerequisite: Botany

Biol 712. PLANT PHYSIOLOGY4 sem. hrs.
Three hours of class discussion and three hours of laboratory per week. A course including the principles of plant physiology with emphasis upon water relations, mineral nutrition, such metabolic activities as photosynthesis, respiration, carbohydrate, lipid, and protein synthesis, and reproduction. Laboratory work will include the use of the pH meter, manometric measurements, radio-isotope tracers, chromatography, and the use of isotonic, hypotonic, and hypertonic solutions for experiment and analysis. Some work will be done with phytohormones, gibberellins, colchicine and weed killers with emphasis upon observation and measurement of their effects upon the physiological activity of the plant.

Prerequisites: Botany
Organic chemistry

Biol 713. TAXONOMY OF THE VASCULAR PLANTS4 sem. hrs.
Three class hours and three hours laboratory or field work per week. A course designed to explore the history of plant classification and its culmination in present-day taxonomic practices, the evolution of the vascular plants, and a definitive study of their representative modern families. An extensive plant collection will be required of each student.

Prerequisite: Botany

Biol 716. ANIMAL SYSTEMATICS3 sem. hrs.
A general survey of the animal kingdom from the taxonomic point of view, with emphasis on morphology and phylogeny as bases for classification. Also some attention to ecological and geographical distribution of animal life.

Prerequisites: 15 credit hours of biology.

Biol 720. BACTERIOLOGY4 sem. hrs.
Three hours of class work and three hours of laboratory per week. A critical study of the biology of the bacteria and their relationships to medicine, public health, and industry. The physiology of various aerobic and anaerobic bacteria will be considered and methods for their culture and control analyzed in both classroom and laboratory. In the laboratory the pH meter, chromatographic equipment, ultra violet lamps, phase microscope, special staining techniques, and biochemical methods will be used. Each student will select, with the approval of the instructor, some special problem concerned with bacteria in public health or industry and will be expected to complete this study to the satisfaction of the instructor.

Prerequisites: Botany
Organic chemistry

Biol 721. CYTOLOGY4 sem. hrs.
A study of the microscopically visible, light and electron, differentiations of the cell, correlated with cellular microstructure and sites of enzyme systems. Attention is given to the formation and replication of such structures in growth and cell division under special cultural conditions.

Biol 725. BIOLOGICAL CHEMISTRY4 sem. hrs.
Three lecture hours per week and four hours laboratory work. This course will include a study of structures and properties of principal organic components of living matter such as carbohydrates, lipids, proteins, and enzymes with emphasis on physico-chemical interpretation. Chromatography and manometric techniques are used freely in this course.

Prerequisites: Inorganic Chemistry I and II and
Organic Chemistry I and II

Biol 731. ADVANCED PROBLEMS IN GENETICS4 sem. hrs.
Three hours of class work and three hours of laboratory per week. This course includes a comprehensive review of late discoveries and theories of modern genetics. Among the topics emphasized are expression and interaction of genes, gene mutation, sex determination, selection and genetic death, inbreeding and heterosis, and biochemical genetics. Especial emphasis is given to the role of the nucleic acids, DNA and RNA, in the modern concept of the gene and its expression. A series of McGraw-Hill films will be used freely to supplement lectures and class discussions. Laboratory work will consist of one or more problems of heredity selected by the student, with the approval of the instructor, and pursued to completion. *Drosophila*, *Sordaria*, Bacteria, Viruses, and selected plants will be utilized for laboratory investigations. Chromatographic treatment, ultra violet irradiation, phase microscopy, and radio-active materials will be available to assist the investigators in analyzing their experimental work. Laboratory data will be processed by acceptable statistical methods, and a clear and concise report will be a vital part of the laboratory work.

Prerequisites: Botany and Zoology
Genetics (undergraduate)
Organic chemistry

Biol 732. ORGANIC EVOLUTION IN THE TWENTIETH CENTURY .2 sem. hrs.
Two hours of class work and two hours of laboratory per week. An intensive study of the impact of evolutionary thought upon the various disciplines of biology, and how each of several disciplines have affected the Darwinian theory. Emphasis will be placed upon the genetic basis of evolution, the fundamental evolutionary processes, and evolutionary divergence. A comparative study of modern concepts of the evolutionary process will be an important part of the course. The laboratory work will consist of studies of fossils showing evolutionary progress, a study of models such as the evolution of the horse, the evolution of the vertebrate brain, the evolution of excretory and reproductive systems, and the evolution of the flowering plants. A series of films produced by McGraw-Hill and Encyclopedia Britannica will supplement the laboratory materials available. A bi-weekly seminar is planned at which time selected readings and reports will be discussed.

Prerequisites: Botany
Zoology

Biol 733. GENETICS OF POPULATION AND EVOLUTION2 sem. hrs.
Two hours of class work and two hours of laboratory each week. This course is based upon the Hardy-Weinburg law of population genetics, and the recent works of Theodosius Dobzhansky when at Columbia University and of Bruce Wallace of Cornell. The role of the Hardy-Weinburg formula in explaining trends in population and the significance of heterozygosity in the retention of unfavorable genes in the population will be emphasized. Laboratory work will be predominantly the use of the algebra of genetics to clarify evolutionary trends. In addition to the Hardy-Weinburg equation, chi-square, probability, and analysis of variance will be used where their use is indicated. A class project in population studies of *Drosophila* will be maintained throughout the course.

Prerequisites: Bi. 531 Advanced Genetics
Bi. 532 Organic Evolution in 20th Century

Biol 740. LABORATORY TECHNIQUES IN BIOLOGY3 sem. hrs.
The selection, collection, preparation and maintenance of biological science materials, including field and laboratory studies of specimens; practice in collecting and mounting insects and plants; plastic embedding; bone staining; skeletal preparations; microtechnique; paraffin method of slide making; construction of vivaria and cages; adapting inexpensive equipment for use in biological science; biological research methods.

Prerequisite: Consent of Instructor 1 hr. lecture
3 hrs. lab.

Biol 741. MICROTECHNIQUES3 sem. hrs.
This course is designed to offer additional skill in the preparation of biological materials for microscopic study following Bi. 540. Rotary, slide, and freezing microtome work; fixation, impregnation, staining and mounting of sectioned materials; and squashing methods will be considered. Analysis and interpretation of microscopic materials as well as the technique of preparation will be emphasized. Six hours of practicum per week.

Prerequisite: Bi. 540

Biol 742. RADIOBIOLOGY4 sem. hrs.
 The major portion of this course will be concerned with the biological effects of ionizing radiation. The physiochemical interaction between radiation and organic matter will be considered on the molecular level. Cellular effects are analyzed and the alteration in the physiological processes produced in organs. The biological significance of some internal emitters are considered, as well as the therapeutical and diagnostic uses of isotopes in practice and research. The course covers radiation and population genetics as well as species response or radioecology. Both the immediate and long term effects will be discussed in terms of man and other organism. Radiobiological dosimetry will be discussed thoroughly.

Laboratory:

The laboratory will amplify the lecture portion of the program by: The statistical significance of radiation responses; Histological analysis of cellular changes: Radiation effects in both microbiological, specimens and macrobiological specimens, in regard to both somatic and genetical changes. Practice in the use of radiation detection and measurement instruments and methods being an essential part of the laboratory, instrument will include, electronic power supplies, amplifiers, scalars, Geiger counters, proportional counters, ion chambers and scintillation spectrometry. Evaluation and control of radiation will be stressed through monitoring, sampling and record keeping.

Prerequisites: Organic Chemistry
 Physiology
 Rad. Bio-physics
 Genetics

Biol 750. ECOLOGY4 sem. hrs.
 This course involves a study of plants and animals with reference to their physical, chemical and biotic environments. Field and laboratory investigations include the concepts of migration, invasion, competition, succession, climax and post-succession aspects of plant and animal communities as they occur in southwestern Pennsylvania.

Biol 752. LIMNOLOGY4 sem. hrs.
 A study of the physical, chemical and biotic characteristics of fresh water environments. Field and laboratory investigations cover ponds, lakes and streams within a 30-mile radius of the college.

Biol 790-799. SPECIAL PROBLEMS IN BIOLOGY1-2 sem. hrs.
 Courses numbered 590-599 include problems in original investigations in the biological field. The nature of the problem and the class and laboratory hours will be adjusted to each project individually. These courses are expected to provide evidence of the ability of the student to follow appropriate research procedures, to analyze the results of his investigations, and to follow accepted standards in the preparation of a written report of his work.

Prerequisites: Dependent upon the nature of the problem and the judgment of the graduate advisor.

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