990C. *Mathematical Economics and Econometrics Workshop*

Fall, Winter, Spring. 3 to 16 credits. 812, 832; or approval of department. Interdepartmental with the Agricultural Economics Department.

Critical evaluation of research reports by staff and other students. Students writing doctoral dissertations in the appropriate areas are encouraged to participate in workshop and may do so while registered for 999.

999. *Research*

Fall, Winter, Spring, Summer. Variable credit. Approval of department.

EDUCATION ED

College of Education

101. *Introduction to Teaching*

A. Elementary Education.

Fall, Winter, Spring. 1(1-0)

Teaching profession, American educational heritage, teaching of children and youth, preparation and opportunities.

B. Special Education.

Fall, Winter, Spring. 1(1-0) Freshmen and Sophomores only.

Opportunities in education of children and youth impaired in vision, hearing, mental ability, emotional adjustment, speech and physical handicaps.

124. *Introduction to Careers in Vocational and Practical Arts Education*

Opportunities in teaching agriculture, business, home economics or industrial education and in closely related fields; analysis of student's potentialities for these fields.

A. Agriculture.

Fall. 2(1-2)

B. Business and Distributive Education.

Fall, Winter. 2(2-0)

C. Home Economics.

Spring. 2(2-0)

D. Industrial Arts.

Winter and Fall of even-numbered years, Spring of odd-numbered years. 2(2-0)

141A. *General Industrial Arts*

Winter and Fall of odd-numbered years, Spring of even-numbered years. 3(0-6) Approval of department.

Introductory experiences in all major areas of industrial arts. Organized under a comprehensive general shop organization similar to that utilized in the modern secondary school.

141B. *General Woodwork*

Winter and Fall of odd-numbered years, Spring of even-numbered years. 3(0-6) Approval of department.

Handwork, patternwork, carpentry, introductory machinework, finishing. Designed to exemplify, in both organization and equipment, desirable practices in today's secondary schools.

200. *Individual and the School*

Fall, Winter, Spring, Summer. 5(3-2) Sophomores.

Major psychological factors in the school learning-teaching situation; concepts in human development related to problems in the school situation; teacher's role in motivation, conceptual learning, problem solving, and the development of emotional behavior, attitudes and values; learning of skills; retention and transfer; and measurement of student abilities and achievement.

200A. *Educational Psychology*

Fall, Winter. 3(3-0) Approval of department.

Same goals as Education 200, but assumes a background in general psychology.

241A. *Advanced Woodwork*

Winter and Fall of even-numbered years, Spring of odd-numbered years. 3(0-6) 141B or approval of department.

Safe operation of woodworking machines in home and school shop. Care and maintenance of shop tools and equipment.

241B. *General Metalwork*

Winter and Fall of odd-numbered years, Spring of even-numbered years. 3(0-6) Approval of department.

Bench metal, sheet metal, forging, welding, plating, casting, and machining. Designed to exemplify desirable facilities and course organization for the modern secondary school.

241C. *Industrial Arts Crafts*

Winter and Fall of even-numbered years, Spring of odd-numbered years. 3(0-6) Approval of department.

Typical crafts in outstanding public school programs of industrial arts. Work in plastics, leather, silver, aluminum, copper, metal enameling, lapidary, ceramics, and model making.

241D. *Printing and Graphics*

Winter and Fall of even-numbered years, Spring of odd-numbered years. 3(0-6) Approval of department.

Hand composition, press work, printing, bookbinding, block printing, plate making, silk screen work, and photography. Designed to exemplify a desirable approach to the work of this area in the modern secondary school.

312. *Human Growth and Development*

Fall, Winter, Spring, Summer. 4(2-4) 200.

Growth of children from birth to adolescence and techniques for measurement. Problems of adjustment and physiological and psychological factors associated with them. Young children observed and studied in laboratory and natural situations.

321. *Curriculum, Methods, and Materials*

Bases, scope, and sequence of curriculum in reading, language arts, and social studies; adaptation of principles to methods and materials of teaching in the elementary and middle school.

A. Elementary Education

Fall, Winter, Spring, Summer. 3(2-1) Must be taken immediately prior to student teaching, concurrently with 321B, 321C. Must have completed September teaching experience and have 2.0 scholastic average.

B. Elementary Mathematics and Science

Fall, Winter, Spring, Summer. 5(4-2) Concurrently with 321A; 321C; MTH 201; B S 202; PHS 203.

C. Elementary Language Arts and Social Studies

Fall, Winter, Spring, Summer. 7(6-3) Concurrently with 321A, 321B.

325A. *Methods of Teaching Reading in the Elementary School*

Fall, Winter, Spring, Summer. 3(3-0) 200.

Methods and materials of instruction of reading at elementary level. Analysis of learning and teaching problems, and study of concrete materials and classroom attack. Consideration of practical bearings of research and progressive theory on current practice.

325B. *Teaching of Language Arts in Elementary Grades*

Fall, Winter, Spring, Summer. 3(3-0) 200.

Course to acquaint prospective elementary teachers with content material and methods in language arts for grades below the seventh. Students also given opportunity to acquire skills in manuscript and blackboard writing.

325C. *Children's Literature*

Fall, Winter, Spring, Summer. 3(3-0) 200, Juniors.

Designed to acquaint elementary school teachers with wide variety of reading materials suitable for various grade levels below junior high school.

325D. *Teaching of Social Studies in Elementary Grades*

Fall, Winter, Spring, Summer. 3(3-0) 200.

To help students develop understanding of philosophy and aims of social studies movement in elementary schools, and ability to further such aims through familiarity with a variety of materials, knowledge of social studies subject matter, and competence in using a variety of methods.

325E. *Teaching of Mathematics in Elementary Grades*

Fall, Winter, Spring, Summer. 3(3-0) Juniors, 200.

Presents methods and materials for teaching mathematics in the elementary school. Methods and techniques of presenting mathematics content meaningfully to elementary pupils will be illustrated.

325F. *Teaching Science in the Elementary School*

Fall, Winter, Spring, Summer. 3(3-0) 200, Juniors, N S 193.

Extends the science background of prospective elementary teachers. Emphasis is placed upon methods and materials for science in elementary classrooms.

325G. *School Music Instrumental Methods*

Fall. 3(2-2) Instrumental music major.

Instrumental instruction program at elementary level.

325H. *School Music Vocal Methods*

Fall. 4(3-2) Approval of the Music Department.

Basic instructional program in primary and intermediate grades.

327. *Methods of Teaching—Secondary*

Specifics of classroom instruction in the various subject-matter fields. Selection of presentation and evaluation techniques based on recognized course objectives.

A. Agriculture.

Winter. 5 credits. 200.

B. Art.

Fall, Winter, Spring. 5 credits. 200.

C. Business and Distributive Education.

Fall, Winter, Spring. 5 credits. 200.

D. English.

Fall, Winter, Spring, Summer. 5 credits. 200.

E. Romance Languages.

Fall, Winter, Spring. 5 credits. 200.

F. Health.

Spring. 5 credits. 200.

G. Physical Education.

Fall, Winter, Spring. 5 credits. 200.

J. History.
Fall, Winter, Spring. 5 credits. 200.

K. Home Economics.
Fall, Winter, Spring. 5 credits. 200.

M. Industrial Arts.
Fall. Winter of even-numbered years, Spring of odd-numbered years. 5 credits. 200.

N. Mathematics.
Fall, Winter, Spring. 5 credits. 200.

P. Music—Instrumental.
Winter. 5 credits. 200.

R. Music—Voice.
Winter. 5 credits. 200.

S. Science.
Fall, Winter, Spring, Summer. 5 credits. 200.

T. Social Science.
Fall, Winter, Spring, Summer. 5 credits. 200.

U. Speech.
Fall, Winter, Spring. 5 credits. 200.

V. German and Russian.
Fall. 5 credits. 200.

341A. Advanced Metalwork
Winter and Fall of even-numbered years, Spring of odd-numbered years. 3(0-6) 241B or approval of department.

Work in bench metal, sheet metal, forging, welding, plating, casting, machining of metals. Designed to provide the industrial arts teacher with sufficient breadth and skill to enable him to establish such a program in a secondary school.

341B. Industrial Arts Mechanics
Winter and Fall of odd-numbered years, Spring of even-numbered years. 3(0-6) Approval of department.

Work with small motors and internal combustion engines, drive and transmission devices. Designed to exemplify desirable practice in course organization and facilities for the modern secondary school.

341C. General Electricity
Winter and Fall of even-numbered years, Spring of odd-numbered years. 3(0-6) Approval of department.

Low voltage wiring, household devices and appliances, motor and general maintenance, house wiring, elementary radio, and elementary television. Designed to exemplify a desirable approach to this area in the industrial education program of the modern secondary school.

400H. Honors Work for Elementary Education Majors
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 15 credits. 200; approval of elementary education honors adviser.

401. Sociology of Education
Winter, Summer. 3(3-0) SOC 241. Interdepartmental with and administered by the Sociology Department.

School as a social institution, school-community relations, social control of education, and structure of school society.

402. Supervising High School Publications
Spring, Summer. 3(3-0) Juniors: non-majors. Interdepartmental with and administered by the School of Journalism.

Staff organization, makeup, illustrations, copy preparation, advertising, and editorial policies of school newspapers and yearbooks.

411. School Learning I
Fall, Winter, Spring, Summer. 3(3-0) 200.

Verbal learning, concept formation, problem solving and transfer with implications for teaching in schools.

413. Mental Health of School Children
Fall, Winter, Spring, Summer. 3(3-0) 200.

Social and emotional adjustments of children. Emphasis on balancing factors favoring prevention and resolution of behavior difficulties and evaluation of school programs on basis of their contribution to mental health.

415. Student Leadership Training
Fall, Winter, Spring. 2(0-3) Approval of the Dean of Students.

Prepares students for leadership roles and responsibilities by encouraging the development of skills and techniques consistent with the principles of our democratic society.

416. Personnel Work in Student Housing
Fall, Spring. 3(3-0) Fifteen credits of Education or approval of department. Fall: primarily for students selected to assist in administration of residence halls. Spring: for graduate students preparing for student personnel work.

Organization, policies, practices, procedures of residence halls at Michigan State University and other educational institutions.

424. Education of Exceptional Children
Fall, Winter, Spring, Summer. 3(3-0)

Dealing with atypical children in regular and special classrooms. Methods of facilitating growth and development of children who are crippled, hard of hearing, defective in vision, defective in speech, etc. Opportunity to observe and participate in instruction of such pupils in Lansing area.

426B. Teaching of Geography in Elementary and Junior High Schools
Summer. 3(3-0) One course in geography or approval of the Geography Department.

Objectives, problems, available materials, instructional techniques, and evaluation aspects of teaching geography in the elementary and junior high schools.

429. Disabling Conditions: Special Education and Rehabilitation
Fall. 3(3-0) 424.

Etiology, medical, educational-vocational implications of disablement for special education and rehabilitation. Emphasis on medical lectures by physicians.

429F. Driver Education and Traffic Safety I
Fall, Winter, Spring, Summer. 3(2-2) 21-year-old Juniors with a valid driver's license.

Fundamentals, principles, practices and content of high school driver education and traffic safety. Laboratory experience in teaching beginners to drive in dual-control cars is provided.

429G. Driver Education and Traffic Safety II
Fall, Spring, Summer. 3(2-2) 429F, 21-year-old Seniors with a valid driver's license.

Advanced professional preparation to meet the traffic safety needs of schools and communities. Laboratory work will be in the multiple car area and the Aetna Drivotrainer.

430A. Education of Visually Handicapped Children and Youth
Fall, Summer. Variable credit. May re-enroll for a maximum of 15 credits.

Educational provisions for the blind. Educational procedures for visually handicapped children. Educational procedures for blind-deaf. Braille, orientation and mobility skills for blind children.

430B. Education of Deaf Children and Youth
Fall, Spring. Variable credit. May re-enroll for a maximum of 15 credits. 321C, 424; ASC 454.

Educational provisions for the deaf; methods, materials, curriculum. Speech and language development in an oral philosophy.

430C. Education of Physically Handicapped Children and Youth
Fall, Spring, Summer. Variable credit. May re-enroll for a maximum of 15 credits. 321C, 424, or approval of department.

Educational, social and psychological provisions for education of crippled, hospitalized or homebound children and youth. Emphasis upon cerebral palsy, multi-handicapped and learning disabilities.

430D. Education of Mentally Retarded Children and Youth
Fall, Spring, Summer. Variable credit. May re-enroll for a maximum of 15 credits. 424 or approval of department.

Educational provisions, social control, and methods and curriculum for mentally retarded children.

430E. Education of Emotionally Disturbed Children and Youth
Fall, Spring, Summer. Variable credit. May re-enroll for a maximum of 15 credits. 424 or approval of department.

Classroom observation and management techniques. Remedial practices for children with specific learning disabilities. Seminar on methods and materials.

431. Educational Media in Instruction
Fall, Winter, Spring. 3(3-1) Juniors.

Educational media for preservice teachers. Selection and utilization of flat pictures, slides, filmstrips, motion picture films, sound, models, radio, television and field trips. Equipment operation acquired through self-instruction laboratory.

436. Student Teaching
Fall, Winter, Spring, Summer. Variable credit. 327 for secondary majors; approval of department; 2.0 scholastic average; ASC 477 for Speech Correction majors.

Participation in activities of school and community. Teaching and related activities, observation, and seminar on the problems of teaching. Usually requires students to live in typical Michigan cities for an entire term.

441A. General Industrial Arts
Winter and Fall of odd-numbered years, Spring of even-numbered years. 3(0-6) 436 or approval of department.

Research in the facilities, materials, and organization of general industrial arts in the modern secondary school.

441B. Advanced Industrial Arts Mechanics
Winter and Fall of even-numbered years, Spring of odd-numbered years. 3(0-6) 341B, approval of department.

Typical applications of power and its control, internal combustion engines, external combus-

tion engines, motors, drive, and transmission devices, hydraulic and pneumatic equipment, experimentation with organizational patterns and teaching devices when taken for graduate credit.

441C. Advanced General Electricity

Winter and Fall of odd-numbered years, Spring of even-numbered years. 3(0-6) 341C or approval of department.

Development and construction of simple electric motors, radios, and electronic devices. Experimentation with the development of organizational patterns appropriate to secondary schools when taken for graduate credit.

441D. Advanced Printing and Graphics

Winter and Fall of odd-numbered years, Spring of even-numbered years. 3(0-6) 241D or approval of department.

Printing, plate making, and photography. Attention to development of adult programs in the area of graphics. Development of resource materials when taken for graduate credit.

441E. Advanced Industrial Arts Crafts

Winter and Fall of odd-numbered years, Spring of even-numbered years. 3(0-6) 241C or approval of department.

Designed to provide the industrial arts teacher with sufficient breadth and skill to enable him to establish such a program in a secondary school.

446. Teaching Internship

Fall, Winter, Spring. Variable credit. May re-enroll for a maximum of 17 credits. 321A.

Internship teaching experience under the guidance and supervision of intern consultants and other MSU faculty. Involves a variety of activities, including full-time teaching experience in a selected school.

450. School and Society

(301.) Fall, Winter, Spring, Summer. 5(3-2) 436.

School as a social institution, teacher as a member of the profession and as a representative of the community, society as basic orientation for both the teacher and the school. Purposes of the public school, major concepts of educational philosophy, and politico-legal-economic support of the schools.

464. Standardized Tests and Testing Programs

Fall, Winter, Spring, Summer. 3(3-0) 200.

History and status of educational measurement. The available standardized tests and sources of information about them. Interpretation of standard test scores. Norms and profiles. Local and widescale testing programs.

465. Testing and Grading

Fall, Winter, Spring, Summer. 3(3-0) 200.

Construction, use, and evaluation of teacher-made classroom tests, objective and essay, in elementary schools, secondary schools, and colleges. Statistical analysis of test scores and item responses. Grading problems.

471A. Instructional Systems in Business and Office Education

Fall, Spring. 4(3-2) 200; 327C concurrently or approval of department.

Application of learning principles to selection of materials, media, and methods. Measurement and evaluation of learning in relation to objectives.

471B. Instructional Systems in Distributive Education

Fall, Spring. 4(3-2) 200; 327C concurrently or approval of department.

Dimensions of the total distributive education programs: the organizational patterns, principles of curriculum formulation, selection and use of appropriate teaching strategies, and the effective use of youth clubs.

472. Organization and Administration of Cooperative Office and Distributive Occupations Programs

Fall, Spring. 3(3-0) 471A or 471B or concurrently; or approval of department.

Development of knowledge and understanding of (1) purpose of preparatory in-school curriculum and its relationship to cooperative programs of office and distributive occupations; (2) organization and administration of a cooperative program; (3) coordination techniques; and (4) correlation of on-the-job and in-school learnings through related instruction class.

476. Canadian-American Studies

For course description, see **Interdisciplinary Courses.**

482. Seminars and Independent Study in Education

Fall, Winter, Spring, Summer. 1 to 8 credits. Approval of department.

Selected professional educational problems will be dealt with on an individual and group basis. Each student is expected to select one or more problems for study.

483. Readings and Independent Study in Education

Fall, Winter, Spring, Summer. 1 to 8 credits. Approval of department.

Study on an individual basis in the various fields of emphasis in education.

484. Field Experience in Education

Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 12 credits. Approval of department.

Supervised undergraduate practicums in education.

800. Crucial Issues in Education

Fall, Winter, Spring, Summer. 3(3-0) Approval of department.

Problem analysis of timely issues in education analyzing their legal, historical, sociological, and philosophical dimensions. Attention centered on problems of continuing concern. Particular attention devoted to the role of the teaching profession in issues involving public policy.

801. Seminars in Social and Philosophical Foundations of Education

A. Philosophy of Education.

Fall, Winter, Spring, Summer. 3(3-0) Approval of department.

Identification of underlying philosophical problems in education. Use of philosophical methodologies in resolving these problems. Development of a consistent personal philosophy of education.

D. Social Criticism and Education.

Fall, Summer. 3(3-0) 801A, approval of department.

Educational implications of critical analyses of contemporary society. Particular attention given to discrepancies between ideology and practice. Building school programs designed to cope with cultural inadequacies.

E. Comparative Educational Philosophies

Winter, Summer. 3(3-0) 801A.

Critical analysis and evaluation of the educational philosophies of Plato and Dewey and their implications for practice.

F. Modern Philosophies of Education.

(801B.) Spring, Summer, 3(3-0) 801A.

Critical analysis and evaluation of leading modern philosophies of education and their implications for practice, such as: existentialism, idealism, perennialism, realism, reconstructionism.

804. Historical and Comparative Foundations of Education

A. History of American Education.

Fall, Winter, Spring, Summer. 3(3-0) Approval of department.

Development of educational thought and practice in the United States. Importance of cultural influences. A critical examination of progress toward educational goals. Implications of historical background for present problems.

B. Higher Education in the United States.

Fall, Winter, Summer. 3(3-0) Approval of department.

Development of higher education in the United States and its foreign antecedents. Survey of higher education today with attention to purposes, curriculum, organization, financing, and the major issues in these areas. Attention is also given to a world view of higher education with special focus upon the influences of United States higher education in foreign countries.

C. Educational History: Plato to Locke.

Winter, Summer. 3(3-0) Approval of department.

Deals historically with relation of school to developing social trends. An intensive study of the works of leading figures in educational thought. Emphasis upon Plato's *Republic*. Works by Aristotle, Comenius, Locke and others examined.

D. Development of Educational Thought and Practice in the Modern World.

Spring, Summer. 3(3-0) Approval of department.

Deals historically with the development of modern education in the last three centuries. An intensive study of the works of leading figures in educational thought. Emphasis upon Rousseau's *Emile*. Works by Pestalozzi, Herbart, Froebel, James, and others examined.

E. Education in the Western World.

Fall. 3(3-0) Approval of department.

Comparative study of educational systems and philosophies of Canada, England, France, Russia, and other Western countries. Visiting foreign educators. Field trip to Canada.

F. Education in the Non-Western World.

Winter. 3(3-0) Approval of department.

Comparative study of educational systems and philosophies of Asian and African countries to gain insight into the American educational system. Visiting foreign educators.

G. Advanced Comparative and International Education

Spring. 3(3-0) 804E; 804F.

Objectives, content, methodology, research problems of comparative and international education analyzed. Social and cultural forces affecting educational planning and institution building studied. Agencies involved in international education identified.

811. School Learning II

Winter, Spring, Summer. 3(3-0) 411.

Survey of research with special attention to applications to teaching and development of school programs.

812. Growth and Behavior

Fall, Summer. 3(3-0) 312.

Survey of research with special attention to applications to teaching and school programs.

813. *Social and Emotional Behavior in the Classroom*

Spring, Summer. 3(3-0) 812.

Survey of research on school class as a social group; the development of attitudes and values.

815B. *Principles of Guidance and Personnel Services*

Fall, Winter, Spring, Summer. 3(3-0)

Survey of guidance services and their application in educational settings—elementary and secondary. Introduction to the field of pupil personnel work in schools. Practical guidance problems are considered.

815C. *Student Personnel Work in Higher Education*

Fall, Summer. 3(3-0)

Overview of student personnel services in colleges and universities. Philosophy, organization, and administration of the personnel program at this level and of specific services provided. Opportunity to visit and study college personnel programs.

816. *Techniques of Counseling and Guidance*

A. Occupational, Educational, and Social Information.

Fall, Winter, Spring Summer. 3(3-0) 815B or approval of department.

Methods for providing occupational, educational and social information in the guidance program. Techniques of teaching units in occupations, orientation or other life-adjustment areas considered. Techniques of placement and follow-up; community, educational or occupational trends; and classification and description of jobs and industries.

B. Procedures in Individual Analysis.

Fall, Winter, Spring, Summer. 3(3-0) 815B or approval of department.

Place of the inventory service in the personnel and instructional programs. Practice in the use and analysis of techniques for understanding the individual including both testing and non-testing procedures.

C. Group Procedures in Guidance.

Fall, Winter, Spring, Summer. 3(3-0) 815B or approval of department.

Principles and practices of group counseling. Students participate in a group to examine in depth their own interaction and motives. Didactic content related to experiences of the course. Enrollment limited.

D. Procedures in Counseling.

Fall, Winter, Spring, Summer. 3(3-0) 464, 816B.

Diagnosis and interpretation of case study materials. Role-playing observation of interviewing procerures. Consideration of basic issues in counseling. Practice in test interpretation.

820. *Principles of Curriculum Improvement*

Fall, Winter, Spring, Summer. 3(3-0) Experience in teaching; approval of department.

Principles of curriculum improvement will be developed through the critical analysis of practices found in public schools.

821A. *Curriculum Construction*

Winter, Summer. 3(3-0) 820.

Approaches to curriculum construction; organization and function of personnel; initiating and evaluating curriculum change; curriculum research.

821B. *The Core Curriculum*

Winter. 3(3-0) 821A.

Critical study of existing core programs. Special attention to techniques of selection and organization of course materials and to cooperative planning of units of work. At least one resource unit developed by students.

821C. *Work Experience in the Curriculum*

Winter, Summer. 3(3-0)

Work environment in schools, colleges, agencies and business and industry; educational objectives and outcomes; administrative aspects of work experience programs, research in the field.

822A. *Community College*

Fall, Winter, Spring, Summer. 3(3-0)

Purposes, functions, and offerings of the community college.

822B. *Adult Education: A General Survey*

Fall, Summer. 3(3-0) Approval of department.

Philosophies, methods and techniques, materials, agencies and facilities for developing and operating a program of adult education. Emphasis on participating in local adult education activities as a laboratory for evaluating ways and means of procedures.

822E. *New Developments in Home Economics Education*

Spring, Summer. 3(3-0) 436.

Planned to assist homemaking teachers in keeping up with trends in curriculum development, methods and materials.

822F. *Occupational Analysis and Course Construction in Vocational Education*

Winter, Summer. 3(3-0) Approval of department.

Techniques of analyzing an occupation to determine the processes; instructional units and curricular arrangements.

822G. *Curriculum Construction in Industrial Education*

Winter, Summer. 3(3-0) Approval of department.

Selection of general and specialized areas of study in junior and senior high school and adult industrial education courses. Industrial problems, their relation to a particular community and its needs in relation to instruction.

822J. *Organization and Management of School Shops*

Spring, Summer. 3(3-0) Approval of department.

Planning and organization of school shops in terms of adequacy, adaptability, efficiency, economy, and safety.

822K. *Curricula in Home Economics*

Fall, Summer. 3(3-0) Approval of department.

Clarification and use of a rationale in curriculum development in home economics. Special problem in application.

822M. *Programs in Home and Family Life Education*

Summer. 3(3-0) Approval of department.

Develops depth in home and family living courses offered in secondary school programs.

822N. *Principles and Programs of Vocational Education and Practical Arts*

Fall, Summer. 3(3-0)

Principles of vocational and technical education, comprehensive school program characteristics, program planning. Special emphasis is given to programs in agriculture, distributive, health, home economics, industrial, and office education. For vocational and practical arts teachers and local coordinators and directors of programs.

822P. *Coordination in Occupational Training Programs*

Winter, Summer. 3(3-0) Approval of department.

Analysis of objectives and scope of distributive, office, trade and industrial cooperative education programs, apprenticeship, and general education work experience. Emphasizes organization and administration, instructional procedures, coordination techniques, club activities, and evaluation of cooperative occupational education.

822Q. *Current Issues and Developments in Occupational Education*

Fall, Winter, Spring, Summer. 3(3-0)

Examination of issues and problems in occupational education. Special emphasis on the emerging role of various governmental and private agencies in manpower development. Designed for majors in fields other than vocational education.

822R. *Foundations of Business and Distributive Education*

Fall, Summer. 3(3-0)

Critical study of the effect of socio-economic forces on education for business and examination of the development, scope and purposes of secondary and beyond-the-high-school curricula.

822S. *Developing Occupational Curricula in Two-Year Colleges*

Winter, Summer. 3(3-0) 822N, 822A, or approval of department.

Occupational curriculum development and course construction. Developmental projects involving community college faculty, students and employers. For prospective teachers and administrative personnel in two-year colleges.

828A. *Methods of Teaching Adults in Homemaking*

Spring. 3(3-0) Approval of department.

Developmental needs of adults and changes in society affecting families as a basis for development of adult programs in homemaking education. Experiences will be provided with programs in progress.

828B. *Teaching Adult and Young Farmer Classes in Agriculture*

Fall, Summer. 3(3-0) Approval of department.

Objectives of adult education in agriculture. organizing and promoting classes, course planning, instructional procedures, follow-up and evaluation.

828D. *Instructional Methods in Business and Industry*

Winter, Summer. 3(3-0) Approval of department.

Designed for personnel responsible for the training function. Various instructional methods examined with emphasis on the conference method of problem solving.

828E. *Principles and Problems of Instruction in Higher Education*

Spring, Summer. 3(3-0) Approval of department.

Instructional problems in the various areas of higher education with emphasis on common principles underlying each of them.

829A. Education of the Gifted Student

Winter, Spring, Summer. 3(3-0) Approval of department.

Study of the dimensions of giftedness — identification, characteristics, development, and societal role — is made. Emphasis will be placed upon the problems of curriculum, teaching, administration, and guidance. Literature in areas of creativity, critical thinking, and motivation will be reviewed as this applies to the development of gifted children.

830A. Special Methods and Materials of Teaching

Fall, Winter, Spring, Summer. 3(3-0) May re-enroll in different subject-matter areas for a maximum of 15 credits. Experience in teaching; approval of department.

Develops an understanding of the basic principles and techniques of effective instruction in the various subject-matter areas in the school curriculum. Students will be expected to investigate research as it relates to the improvement of instruction in a special field of study.

830C. Problems in Elementary Reading Instruction

Fall, Winter, Spring, Summer. 3(3-0) Undergraduate methods course in reading or approval of department.

For experienced teachers. Includes consideration of the basic aspects of ability to read, desirable reading attitudes, habits, and skills. Practices and materials used in reading programs are examined and appraised. Outstanding investigations dealing with problems in this area are studied and evaluated.

830D. Methods in Reading at the Secondary Level

Fall, Winter, Spring, Summer. 3(3-0) Approval of department.

An analysis of the reading problems of high school and college students. Material and procedures for identifying the reading attainments and needs of the individual. Basic principles and techniques for improving reading skills.

830E. Diagnosis of Reading Difficulties

Fall, Winter, Spring, Summer. 3(2-2) 830C or 830D.

Causes and types of reading retardation are considered, and procedures for working with retarded readers are examined. Laboratory experiences in administering and interpreting standardized and informal tests are provided.

830F. Clinical Practice in Remedial Reading

Fall, Winter, Spring, Summer. 3(2-2) 830C or 830D; 830E recommended.

Students work with individual cases, observe and practice group procedures in the University reading clinic.

830G. Methods of Teaching Agricultural Mechanics

Winter. 3(3-0) Approval of department.

Methods of instruction including program planning, scheduling, use of teaching aids, management of buildings, facilities and equipment; the selection, organization, and evaluation of activities in farm mechanics.

831A. Educational Media in Instruction

Fall, Winter, Spring, Summer. 3(3-1) Students may not receive credit in both 431 and 831A.

Improvement of teaching through educational media. Learning principles; nature and application of films, filmstrips, slides, transparencies, flat pictures, developmental boards, models, tape recordings, radio and television, and equipment operation.

831B. Graphics Design and Use in Instruction

Fall, Winter, Spring, Summer. 3(3-1) 831A or approval of department.

Concepts, principles and techniques for preparation and use of graphics in instruction. Design and presentation of materials for developmental boards, slides, transparencies, models, and exhibits. Simple production techniques for teaching.

831C. Photography in Instruction

Winter, Summer. 3(2-2) 831B, or approval of department.

Design, production, and use of photographic materials for instruction. Production of photographs, slides, filmstrips, overhead transparencies, sound tapes, and motion pictures. 35mm still camera (preferably a single lens reflex) required.

831D. Instructional Materials in Vocational and Practical Arts Education

Winter of odd-numbered years, Summer. 3(3-0) Approval of department.

For teachers of agriculture, business, home economics, industrial arts and vocational-industrial education. Selection, preparation and use of distinctive materials that characterize shop and laboratory instruction.

832. Advanced Methods and Materials in Special Education

A. Visually Handicapped Children and Youth.

Spring. 3(3-0) 424, 430A, student teaching or clinical experience with visually handicapped children or approval of department.

Relationship of research, theories in education and related disciplines to educational practice, curriculum development, instructional modification, and guidance of visually handicapped pupils in a variety of organizational arrangements.

B. Deaf Children and Youth.

Winter, Summer. 3(3-0) 430B, student teaching or clinical experience with acoustically handicapped children or approval of department.

A review of recent research, and a study of its implications for the education of deaf children. History, legislation, service agencies, social adjustment, educational and vocational programs will be investigated and discussed.

C. Learning Disabilities

Winter, Summer of odd-numbered years. 3(3-0) 430C, student teaching or clinical experience with physically handicapped children or approval of department.

Approaches to remediation of learning disabilities in the classroom. Identification, evaluation, methods, materials, aids, and programs, are considered within major theoretical structures.

D. Mentally Handicapped Children and Youth.

Winter. 3(3-0) 430D, student teaching or clinical experience with mentally handicapped children or approval of department.

An analysis of research, trends, and programs in the area of mental retardation. Emphasis upon the relationship these factors have to problems of curriculum, teaching methods, guidance of students, and general classroom management.

E. Emotionally Disturbed Children and Youth.

Winter. 3(3-0) 430E, student teaching or clinical experience with emotionally disturbed children or approval of department.

An analysis of the organization, operation, and supervision of classrooms in open and closed treatment settings. Specific psychoeducational procedures, instructional material modifications, and classroom management techniques will be examined and appraised from the standpoint of theory and research.

837A. Supervision of Student Teaching

Summer. 3(3-0) Approval of department.

Designed to assist supervising teachers in guidance of student teachers. In addition to a general overview of the problems of student teaching, the following topics will be studied: trends in teacher education, orientation of student teachers to student teaching, responsibilities of the supervising teacher, relationships between supervising teachers and college personnel, conferences with student teachers, and evaluation of student teaching.

837B. Supervision in Home Economics

Summer. 3(3-0) Approval of department.

Objectives, techniques, and organization of supervised teaching in teacher training and city programs.

838. Interdisciplinary Seminar on Africa

For course description, see **Interdisciplinary Courses.**

840. Improving Instruction in Business and Distributive Education

Summer. 3(3-0) May re-enroll for a maximum of 6 credits. Experience in teaching.

Problem areas in classroom instruction: developing objectives, course construction, selection of learning activities, evaluation of student achievement, classroom equipment and layout and selection of instructional materials.

850. Teacher and the Administrative Leadership

Fall, Winter, Spring, Summer. 3(3-0) Twelve credits in Education and approval of department.

Not intended for school administration majors. Theory and practice underlying administration of schools in a democratic society. Intended for educational personnel seeking basic information in such areas as educational organization, roles of administrative leadership in schools and communities, and teacher's roles in administration.

851. Foundations of Administration

Emphasizes basic administrative theory and research, focuses on current practice and emerging trends in such problems and issues as personnel, plant, finance, community school programs, and instructional improvement. Intended primarily for persons actively preparing for administrative positions in schools and other educational agencies.

A. Theory and Organization.

Fall, Winter, Summer. 3(3-0) Approval of department.

B. Practice and Problems.

Winter, Spring, Summer. 3(3-0) 851A or approval of department.

852. Administration of Educational Institutions

Exploration of the nature and scope of responsibilities of areas in educational administration. Designed to serve as an initial application of administrative theory for those aspiring to one of the several areas.

A. Elementary School Administration.

Winter, Summer. 3(3-0) Twelve graduate credits in Education including 851A, 851B, or approval of department.

B. Secondary School Administration.

Spring, Summer. 3(3-0) Twelve graduate credits in Education including 851A, 851B, or approval of department.

C. Instructional Supervision.

Fall, Summer. 3(3-0) Twelve graduate credits in Education including 851A, 851B, or approval of department.

D. Business Administration of Schools.

Winter, Summer. 3(3-0) Twelve graduate credits in Education including 851A, 851B, or approval of department.

853. *Administration of Educational Programs*

Designed to promote the study of application of theory and research to specialized program areas. Persons will normally select the section allied to their major program area.

A. Audio-Visual Programs.

Winter, Summer. 3(3-0) Twelve graduate credits in Education including 850 or approval of department.

B. Vocational Education Programs.

Summer. 3(3-0) Twelve graduate credits in Education including 850 or approval of department.

C. Pupil Personnel Programs.

Fall, Spring, Summer. 3(3-0) 815B.

D. Administration of Special Education Programs.

Winter, Summer. 3(3-0) Approval of department.

Organization and administrative aspects of special education programming. Federal, state, intermediate and local district level programs in special education are reviewed.

865. *Principles of Educational Measurement*

Winter, Spring, Summer. 3(3-0) 464 or 465; 869.

Nature of measurement and types of scales. Units, scores, norms, sampling, item analysis, batteries and profiles. Principles of reliability and validity. Use of test scores in decision making.

866. *Appraisal of Individual Intelligence and Personality*

A. Individual Measurement I.

Winter, Summer. 3(3-0) 464 or 465 or PSY 415; approval of department.

Fundamentals of individual intelligence measurement. Measurement of intelligence with the Stanford-Binet. Observation, practice, and interpretation in an educational setting.

B. Individual Measurement II.

Fall, Spring, Summer. 3(3-0) 464 or 465 or PSY 415; approval of department.

Measurement of intelligence with the Wechsler scales. Observation, practice, supervision, and interpretation.

C. Personality Assessment in Education.

Spring. 3(3-0) 464 or 465; 813 or PSY 826.

Study of general personality structure and methods in personality assessment related to education.

867. *Educational Research Methods*

Fall, Winter, Spring, Summer. 3(3-0) Approval of department.

Rationale for and methods of research in education. Emphasis is given to the identification of researchable problems and the interpretation of research studies in the student's major field.

868. *Evaluation of Programs of Vocational and Practical Arts Education*

Fall, Winter, Spring, Summer. 3(3-0) Approval of department.

Evaluation principles and practices in the specialized areas of agricultural, business, home economics, and industrial education.

869. *Quantitative Methods in Educational Research*

(969A.) Fall, Winter, Spring, Summer. 4(3-2) Approval of department.

Application of descriptive statistical techniques to educational data. Introduction to estimation and tests of hypotheses. Interpretation of statistical reports.

871. *The Secondary School: Role, Function and Structure*

Fall, Winter, Spring, Summer. 3(3-0) Teaching experience in secondary school classrooms.

Examines the role, function and structure of various secondary schools. Emphasizes the relationships that do and should exist with other segments of the educational enterprise as well as with external agencies, organizations and institutions.

872. *The American Secondary School Student*

Fall, Winter, Spring, Summer. 3(3-0) Teaching experience in secondary school classrooms.

Focuses upon the issues and problems confronting the secondary school student as an adolescent and/or young adult. Attention is given to the relevance of school curriculums and staff competencies to meeting these needs of secondary students. Emphasis will be placed upon developing guidelines for needed change.

881. *Workshops in Education*

Summer. 2 to 10 credits. May reenroll for a maximum of 10 credits. Approval of department.

Laboratory approach which provides opportunities for experienced educational personnel to concentrate their study on common administrative and supervisory problems.

882. *Seminars in Education*

Fall, Winter, Spring, Summer. Variable credit. Approval of department.

Seminars in the various fields of emphasis.

883. *Readings and Independent Study in Education*

Fall, Winter, Spring, Summer. Variable credit. Approval of department.

Study on an individual or group basis in the various fields of emphasis.

884. *Laboratory and Field Experience in Education*

Fall, Winter, Spring, Summer. Variable credit. Approval of department.

Supervised graduate practicums, observation, internships, and externships in the various areas of emphasis.

899. *Research*

Fall, Winter, Spring Summer. 2 to 12 credits. Approval of department.

901D. *Educational Sociology: Seminar*

Fall, Winter, Spring. Variable credit. Approval of department. Interdepartmental with and administered by the Sociology Department.

911. *Educational Psychology Seminar*

Fall, Winter, Spring. 5(3-4) May reenroll for a maximum of 15 credits. Approval of department. First enrollment must be in Fall.

Review of major areas with concurrent laboratory and field studies.

928A. *Methods and Materials of Instruction in Continuing Education*

Winter, Summer. 3(2-2) Twelve credits in Education, approval of department.

Differences in methods used with children and adults. Psychology of adult learner and techniques for stimulating new interests and purposes. Various methods of instruction evaluated and teaching skills demonstrated. Materials of instruction including books and pamphlets. visual and auditory aids, recorder, etc. Use of field trip as adult learning device.

940. *Theory of Instruction in Business and Distributive Education*

Spring, Summer. 3(3-0) Graduate course in learning theory or approval of department.

Analysis of research and literature in learning theory and application to problems: self-instructional programming, selection of learning activities and materials, skill building, measurement and curriculum. Emphasis upon independent study in selected specializations.

950. *Theory and Practice of Administration*

Fall, Winter, Spring, Summer. 3(3-0) Approval of department.

Administrative process as exemplified in agencies such as schools, colleges, universities, government agencies, business enterprises, and voluntary organizations. Relation of administrative theory to the practice of administration and to scientific knowledge of human relations in a free society.

965A. *Psychometric Theory*

Spring. 3(3-0) 865, 969B.

Advanced theoretical aspects and derivation of formulas involved in reliability, validity, item analysis, weighting and differential prediction, sampling and norm construction, and the relation of item characteristics to test statistics.

965B. *Problems of Educational Measurement*

(965.) Fall, Winter. 3(3-0) 865, approval of department.

Advanced consideration of the logical and philosophical bases of educational measurement. Theory of test planning and development and evaluation. Problems of test administration and scoring. Issues in test use.

965C. *Evaluation of Higher Education*

(968A.) Spring. 3(3-0) 828E.

Ways in which evaluation takes place in higher education: course examinations, grading, comprehensive examinations, teacher evaluation, institutional evaluation, state surveys, and regional and national studies of higher education problems.

967. *Advanced Research Methods in Education*

Spring, Summer. 4(3-2) 867 and 869, or 969B.

The research process in survey, clinical, and historical studies. Sampling data collection techniques and data analysis. Emphasis on nonexperimental research.

968B. *Research Analysis in Personnel Work*

Winter, Summer. 3(3-0) Approval of department.

Critical review of research and literature in counseling and personnel services.

969. *Quantitative Methods in Educational Research*

B. Advanced Quantitative Methods in Educational Research.

Fall, Winter, Spring, Summer. 4(3-2) 869.

Principles and techniques in the application of inferential statistics to educational data with emphasis on the analysis of variance. Overview of correlation methods, non-parametric procedures and multi-variate techniques.

C. Experimental Design in Education.

Winter, Spring, Summer. 4(3-2) 969B.

Theory and practice in the design, analysis, and interpretation of experimental and quasi-experimental research.

982. *Seminars in Education*

Fall, Winter, Spring, Summer. Variable credit. Approval of department.

Seminars in the various fields of emphasis.

983. *Readings and Independent Study in Education*

Fall, Winter, Spring, Summer. Variable credit. Approval of department.

Study on an individual or group basis in the various fields of emphasis.

984. *Laboratory and Field Experience in Education*

Fall, Winter, Spring, Summer. Variable credit. Approval of department.

Supervised advanced graduate practicums, observation, internships, and externships in the various areas of emphasis.

999. *Research*

Fall, Winter, Spring, Summer. Variable credit. Approval of department.

ELECTRICAL ENGINEERING AND SYSTEMS SCIENCE*

College of Engineering

Electrical Engineering — E E

305. *Introduction to Electromagnetic Theory*

Fall, Winter. 4(4-0) MTH 215, PHY 288.

Vector analysis; electrostatic fields and sources; scalar potential; Poisson's and Laplace's equations; dielectric media; capacitance; energy storage; boundary value problems in electromagnetic fields.

306. *Electromagnetic Fields and Waves*

Winter, Spring. 4(4-0) 305.

Magnetostatic fields and sources; vector potential; magnetic media; inductance; energy storage; time-varying fields; Maxwell's equations; energy conservation; potential theory; radiation concepts, plane waves, skin-effect, surface impedance.

311. *Fundamentals of System Modeling*

Fall, Winter. 4(4-0) MTH 334; PHY 288.

System measurements; signal representations; mathematical models for systems of lumped physical components, Kirchhoff's laws; linearity; impulse response; phasors, sinusoidal steady-state analysis; impedance, transfer functions.

*Effective March 1, 1969.

312. *Analysis of Linear Systems*

Winter, Spring. 4(4-0) 311.

Topological constraint equations; linear graph theory and its application to modeling electrical, mechanical, hydraulic and other systems; state models for general systems; numerical and analytical solutions.

313. *Analysis of Large Scale Systems*

Spring, Summer. 4(4-0) 312.

Solution of state models by functions of a matrix, stability, pulse and frequency response characteristics, analysis by Laplace and Z transforms, subassemblies of multi-terminal components.

322. *Properties of Semiconductors*

Winter, Spring. 4(4-0) PHY 288.

Elementary principles of wave mechanics and statistical mechanics and their use in developing the basic properties of semiconductors. Study of dielectric and magnetic properties of materials.

323. *Solid State Devices*

Spring, Summer. 4(4-0) 322, 311 or approval of department.

Formation and properties of a p-n junction. Fabrication and characteristics of transitors; terminal and thermal properties; biasing circuits.

345. *Instrumentation and Computation Laboratory*

Fall, Winter, Spring. 4(2-6) PHY 288.

Signal measuring and generating devices; accuracy and error considerations in laboratory measurements; terminal characteristics of components from measurements; use of analog computers.

347. *Electrical Properties Laboratory*

Spring, Summer. 3(1-6) 322, 345.

Investigation of dielectric and magnetic properties, contact voltage, Hall effect, energy gap and drift mobility. Transistor fabrication, evaluation, and biasing.

403. *Special Problems*

Fall, Winter, Spring, Summer. 1 to 4 credits. Approval of department.

Investigation of a topic in electrical circuits or systems compatible with the student's prerequisites, interest, and ability.

415. *Control Systems*

Fall. 3(3-0) 313 or M E 325; MTH 334.

Formulation of automatic control problems; review of modeling method; specifications, controllability and stability; controller design via root locus and state-vector methods; survey of digital control.

416. *Control System Design*

Winter. 4(3-3) 415.

Realization of linear controllers; consistent models for plant and computer sampling; algorithms for digital control; organization of digital controllers; simulation of control systems.

417. *Static Optimization*

Spring. 3(3-0) MTH 214, 334.

Mathematical formulation of engineering steady-state optimization problems; linear and quadratic performance functions; gradient methods, direct search, simulation, and introduction to dynamic optimization.

418. *Introduction to Network Synthesis*

Spring. 3(3-0) 313.

Overview: specification, approximation, synthesis. Physical realizability of passive two-element kind one-port and two-port functions. Foster and Cauer one-port syntheses. Lattice, ladder and cascade two-port syntheses. Selected active network synthesis.

425. *Small-Signal Electronics*

Fall. 3(3-0) 323.

Determination of small-signal parameters and their interrelationship. Small-signal amplifier voltage, current, and power amplification. Stability, noise, and transient effects.

426. *Large-Signal Electronics*

Winter. 4(3-3) 425.

Design and analysis of simple Class A, B, and C power amplifiers and of complementary and quasi-complementary amplifiers. Servo and operational amplifiers. Experiments on single and multistage signal and power amplifiers.

427. *Computer Electronics*

Spring. 4(3-3) 426.

Design, analysis, construction and evaluation of monostable, astable, and bistable multivibrator circuits and of linear sweep and logic circuits. Integrated circuits. Aspects of reliability.

435. *Guided Transmission Systems*

Fall. 3(3-0) 306.

Guided wave theory; classification of modes; mode impedance, propagation constant, wave velocities; traveling and standing waves; transmission lines; normal models in cylindrical waveguides; waveguide components; EM resonators.

436. *Microwave Networks and Antennas*

Winter. 4(3-3) 435.

Circuit theory for wave guiding systems; equivalent voltages and currents; impedance descriptions; scattering matrix; excitation and coupling; radiating systems; linear antennas; arrays; impedance; radiation fields; microwave antennas.

437. *Field-Charged-Particle Interactions*

Spring. 4(3-3) 436.

Dynamics of charged particles in static fields; microwave generation; space-charge-waves; klystron; traveling wave tubes; gas discharges; plasmas; plasma parameters; sheath formation; EM waves in plasmas; five laboratory exercises.

455. *Communications Systems*

Fall. 3(3-0) 313.

Study of systems for transmitting information at high frequencies over long distances. Relation between system parameers, such as bandwidth and signal-to-noise ratio, to performance of AM, FM, and digital communication systems.

456. *Information Transmission*

Winter. 3(3-0) 455.

Application of probability theory to the theoretical study of information transmission. Entropy and channel capacity as a basis for comparing modulation schemes.

457. *Communication Theory*

Spring. 4(3-3) 456.

Analysis of systems processing noise-like signals, including models for communication channels. Introduction to optimum detectors for pulse communication systems.