

- 876. Statistical Inference in Economics I**  
Fall. 3(3-0) EC 812A or EC 801; STT 443 or STT 863; or approval of department. Interdepartmental with the departments of Agricultural Economics, and Statistics and Probability.  
Review and extension of single-equation regression models. Properties of least-squares estimators under alternative specifications. Problems of analyzing nonexperimental data. Errors in variables, autoregressive and heteroscedastic models.
- 877. Statistical Inference in Economics II**  
Winter. 3(3-0) EC 876 or approval of department. Interdepartmental with the departments of Agricultural Economics, and Statistics and Probability.  
Specification interpretation and estimation of simultaneous equation models. Nonlinear models. Bayesian approach to estimation problems. Recent developments in econometrics.
- 878. Statistical Inference in Economics III**  
Spring. 3(3-0) EC 877 or approval of department. Interdepartmental with the departments of Agricultural Economics, and Statistics and Probability.  
Validation and application of dynamic econometric models. Bayesian approach to estimation problems. Recent developments in econometric methods and in applied econometric research.
- 880. Organization and Control in the Political Economy: Institutions and Theory**  
Winter of even-numbered years. 4(4-0) Interdepartmental with the Department of Management.  
Organization and technique in choice and implementation of economic (especially planning, programming) functions of political authority.
- 881. Organization and Control in the Political Economy: Selected Problems**  
Winter of odd-numbered years. 4(4-0) Approval of instructor. Interdepartmental with the Department of Management.  
Analysis of role and tasks, appropriate techniques and organizational structures of political agencies in planning and management of complex programs.
- 891. Topics in Applied Econometrics**  
Spring. 3(3-0) EC 835 or EC 877.  
Topics in applied econometrics with particular attention to problems of testing hypotheses in the context of economic models.
- 895. Graduate Reading in Economics**  
Fall, Winter, Spring, Summer. Variable credit.
- 899. Master's Thesis Research**  
Fall, Winter, Spring, Summer. Variable credit. Approval of department.
- 900. Selected Problems in Advanced Microeconomic Theory**  
Fall, Winter, Spring, Summer. 3(3-0) May reenroll for a maximum of 12 credits. EC 812A, EC 812B, EC 812C; EC 813C.  
Advanced applications of economic methodology to the analysis of household and firm behavior; risk, uncertainty, and transactions costs.

- 901. Selected Problems in Advanced Macroeconomic Theory**  
Fall, Winter, Spring, Summer. 3(3-0) May reenroll for a maximum of 12 credits. EC 813A, EC 813B.  
Analysis of the behavior and interaction of multilateral systems.
- 972. Methodological Approaches to Research**  
Fall of even-numbered years, Summer of odd-numbered years. 3(3-0) Two terms of graduate study in social science or approval of department. Interdepartmental with and administered by the Department of Agricultural Economics.  
Selection, planning and conduct of research. Alternative research approaches. Role of theory, beliefs and valuations. Critical appraisal of research studies.
- 990B. Industrial Organization and Public Policy Workshop**  
Fall, Winter, Spring. 3 to 16 credits. Approval of 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 EC 999.
- 990C. Mathematical Economics and Econometrics Workshop**  
Fall, Winter, Spring. 3 to 16 credits. EC 812A, EC 832; or approval of department. Interdepartmental with the Department of Agricultural Economics.  
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 EC 999.
- 990D. Economic Development Workshop**  
Fall, Winter, Spring, Summer. 3 to 16 credits. EC 850, EC 851, EC 852 or approval of department.  
Critical evaluation of research reports by staff and students. Students writing doctoral dissertations in Development are encouraged to participate in the workshop and may do so while registered for EC 999.
- 999. Doctoral Dissertation Research**  
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

## EDUCATION ED

### College of Education

- 101A. Exploring Elementary Teaching**  
Fall, Winter, Spring. 3(1-4) Preeducation major.  
Emphasis on the nature of teaching in the elementary school achieved through field experience while serving as a teacher aide in an elementary classroom. Concurrent lecture sessions focus on techniques of classroom management and operation.

- 1235. Introduction to Careers in Vocational and Practical Arts Education: Industrial Arts**  
(124D.) Winter and Fall of even-numbered years, Spring of odd-numbered years. 2(2-0) Credits earned in this course are included in computation of GPA and MAPS but are not included in the 180 credits required for graduation.  
Opportunities in teaching industrial education; analysis of students' potentialities for this field.
- 1245. Career Planning in Agriculture and Natural Resources for Secondary School Students**  
(124A.) Fall. 2(1-2) Credits earned in this course are included in computation of GPA and MAPS but are not included in the 180 credits required for graduation. Interdepartmental with Agriculture and Natural Resources.  
Introducing prospective teachers to the process of guiding high school students to careers in agriculture and natural resources.
- 1255. Career Planning in Business and Distributive Education for Secondary School Students**  
Fall, Spring. 2(2-0) Credits earned in this course are included in computation of GPA and MAPS but are not included in the 180 credits required for graduation.  
Introducing prospective teachers to the process of guiding high school students to careers in business and distributive education.
- 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. Must be admitted to a teacher education program.  
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.
- 241A. Advanced Woodwork**  
Winter and Fall of even-numbered years, Spring of odd-numbered years. 3(0-6) ED 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.

## Descriptions – Education

### of Courses

#### 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, book-binding, 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.

#### 321A. Curriculum Methods and Materials-Elementary Education

Fall, Winter, Spring, Summer. 3(1-7) Juniors, ED 101A, ED 200. Must be taken concurrently with or prior to courses in ED 325 series.

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.

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

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

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) ED 200, Juniors.

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. Critical Reading and Children's Literature

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

Development of strategies for helping children to develop critical reading skills through literary experience.

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

Fall, Winter, Spring, Summer. 3(3-0) ED 200, Juniors; three terms of social science.

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) ED 200, Juniors; MTH 201.

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 and Middle School

Fall, Winter, Spring, Summer. 3(2-2) ED 200, Juniors; three terms of Natural Science.

Extends the science education background of prospective elementary and middle school teachers. Emphasis is placed upon methods and materials for teaching science at the elementary and middle school levels.

#### 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 Department of Music.

Basic instructional program in primary and intermediate grades.

#### 327. Methods of Teaching--Secondary Common Elements

Fall, Winter, Spring, Summer. 2(2-0) ED 200; a subject area methods course ED 327A to ED 327V concurrently.

Instructional issues common to all subject areas. Selection of instructional techniques based on teacher values and belief systems, learner needs and characteristics, and sound education principles and policies.

#### 327A-V. Methods of Teaching--Secondary Subject Areas

Specifics of classroom instruction in the various subject matter fields. Selection of instructional techniques based on recognized course objectives, needs and characteristics of learners, and sound educational principles and policies.

##### A. Agriculture

Fall, Spring. 3 credits. ED 200; ED 327 or concurrently.

##### B. Art

Fall, Winter, Spring. 3 credits. ED 200; STA 303, STA 320; ED 327 or concurrently.

##### C. Business and Distributive Education

Fall, Winter, Spring. 3 credits. ED 200; ED 327 or concurrently

##### D. English

Fall, Winter, Spring, Summer. 3 credits. ED 200; ED 327 or concurrently.

##### E. Romance Languages

Fall. 3 credits. ED 200; ED 327 or concurrently.

##### F. Health

Spring. 3 credits. ED 200; ED 327 or concurrently.

##### G. Physical Education

Fall, Winter, Spring. 3 credits. ED 200; ED 327 or concurrently.

##### J. History

Fall, Winter, Spring. 3 credits. ED 200; ED 327 or concurrently.

##### K. Home Economics

Fall, Winter, Spring. 3 credits. ED 200; ED 327 or concurrently.

##### L. Natural Resources, Environmental Education and Earth Science

Fall, Spring. 3(3-0) ED 200 for education majors; other, approval of department.

##### M. Industrial Arts

Fall, Spring. 3 credits. ED 200; ED 327 or concurrently.

##### N. Mathematics

Fall, Spring. 3 credits. ED 200, ED 327 or concurrently.

##### P. Music-Instrumental

Winter. 3 credits. ED 200; ED 327 or concurrently.

##### R. Music-Voice.

Winter. 3 credits. ED 200; ED 327 or concurrently.

##### S. Science

Fall, Winter, Spring, Summer. 3(2-2) ED 200; ED 327 or concurrently.

##### T. Social Science

Fall, Winter, Spring, Summer. 3 credits. ED 200; ED 327 or concurrently.

##### U. Communication

Fall, Winter, Spring. 3 credits. ED 200; ED 327 or concurrently.

##### V. German and Russian

Fall. 3 credits. ED 200; ED 327 or concurrently.

#### 329F. Introduction to Driver and Traffic Education

Fall, Spring, Summer. 4(3-2) Valid driver's license.

Introduction to and an analysis of the driving task. Theory and practical application will be provided.

#### 341A. Advanced Metalwork

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

#### 401. Sociology of Education

Winter, Summer. 4(4-0) SOC 241. Interdepartmental with and administered by the Department of Sociology.

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

#### 409. Supervising High School Publications

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

Staff organization, finance, law, function, and editorial policies of school newspaper and year-books.

- 410. Instructional Design and Technology**  
Fall, Spring. 2 to 4 credits. May reenroll for a maximum of 6 credits. ED 200.  
Students design plans for implementing instruction via systems approach and application of learning principles.
- 411. School Learning I**  
Fall, Winter, Spring, Summer. 3(3-0) ED 200.  
Verbal learning, concept formation, problem solving and transfer with implications for teaching in schools.
- 412. Human Growth and Development**  
Fall, Winter, Spring, Summer. 4(2-4) ED 200.  
Patterns in human growth and mental and emotional development of children 3 through 12 and adolescents 12 through 18; observation and participation in schools is an integral part of the course.
- 413. Mental Health of School Children**  
Fall, Winter, Spring, Summer. 3(3-0) ED 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.
- 414. Interpersonal Process Recall**  
Fall, Winter, Spring, Summer. 3(3-2) Approval of instructor.  
Interpersonal communication focusing on one's own interpersonal style through self study of video-recorded interviews.
- 415. Student Leadership Training**  
Fall, Winter, Spring. 2(0-3) May reenroll for a maximum of 4 credits if different topic is taken. Approval of instructor.  
Prepares students for leadership roles and responsibilities by encouraging the development of skills and techniques consistent with the principles of our democratic society.
- 423A. Educational Provisions for the Visually Handicapped**  
Fall, Summer. 3(3-0) ED 424A, ASC 454.  
Causes and effects of visual impairment; definitions, statistics and trends; history and legislation; program and services for children and adults through schools, agencies and institutions; medical and psychological aspects.
- 423B. Curriculum, Methods and Materials for the Visually Handicapped**  
Fall, Summer. 4(3-2) ED 424A, ED 423C; or concurrently.  
Comprehensive curriculum essentials; required teacher competencies; and special principles of instruction. Resources, materials and methods of teaching at the elementary school level. Concurrent laboratory experience in classrooms with visually handicapped pupils.
- 423C. Braille**  
Fall, Summer. 4(3-2) ED 424A, ASC 454.  
A laboratory course designed to teach the skills of reading and writing standard English Braille using required tools.
- 423D. Low Vision and Its Facilitation**  
Winter, Summer of odd-numbered years. 3(3-0) PSL 323.  
Medical lectures and laboratory demonstrations regarding various pathologies leading to reduced vision. Visual and optical aids for utilization of residual vision. Educational implications of pathologies, reduced vision and optical aids.
- 423E. Daily Living Skills for Visually Handicapped Children**  
Fall, Summer. 3(3-0) ED 424A.  
Basic techniques for developing competencies in daily living skills including grooming, eating, orientation and mobility. Readiness activities. Use of cane as mode of travel.
- 423F. Communication Modifications for Visually Handicapped Children**  
Spring. 3(2-2) ED 423C.  
A laboratory course including Nemeth Code of Mathematics; science, music and language notations; preparation of classroom materials; establishing text reference materials. Emphasis upon instruction at the secondary level.
- 423G. Education of the Blind-Deaf**  
Fall, Winter, Spring. 3(2-2) May reenroll for a maximum of 9 credits. ASC 222, ASC 277, ASC 454; or concurrently.  
Methods of teaching blind-deaf children including guiding principles; curriculum structure; readiness activities; sensory development; discipline; evaluation; methods of communication; speech and speech reading, and language, including language methods and principles.
- 424A. Education of Exceptional Children**  
Fall, Winter, Spring, Summer. 3(3-0)  
Emphasis on the nature of handicapping conditions and educational needs and approaches. Includes mental retardation; emotional disturbance; visual, auditory and physical handicaps.
- 424B. Psycho-Educational Evaluation of the Handicapped**  
Fall, Winter, Spring. 3(3-0) ED 424A.  
Screening and placement procedures. Terminology and interpretation of tests used for assessment of intelligence, aptitude, achievement, personality and interests of the handicapped.
- 424C. Organization of Services for the Handicapped**  
Fall, Winter, Spring. 3(3-0) ED 424A.  
Identification and study of organizations important to the operation of special education programs including educational, state and voluntary agencies.
- 425A. Educational Provisions for Deaf Children and Youth**  
Winter, Spring. 3(3-0) ED 424A, ED 436, ASC 454.  
Adaptation of educational methods, materials and curriculum to the needs of individuals with severe and profound hearing impairment.
- 425B. Language Development for the Deaf**  
Fall. 3(3-0) ED 424A, ED 436, ASC 222, ASC 454.  
Theories of language development; considerations of systems in both oral and total communication philosophies; practice in manual communication.
- 425C. Speech Development for the Deaf**  
Fall. 3(3-0) ED 425B or concurrently.  
Techniques for aiding development of intelligible speech in individuals with severe and profound hearing loss.
- 425D. Manual Communication of the Deaf**  
Fall, Winter, Spring, Summer of odd-numbered years. 3(2-2) May reenroll for a maximum of 6 credits. Approval of department.  
Development of basic skills in finger spelling and the language of signs, with emphasis on signed English; practice in simultaneous use with spoken English.
- 427A. Educational Provisions for the Physically Handicapped**  
(430C.) Fall. 3(3-0) ED 424A, ED 436.  
Facilities, programs, trends, methods, materials and terminology in education of the physically handicapped. Field trips to special classes and hospital school programs.
- 427B. Educational Provisions for Learning Disabilities**  
Fall, Winter, Spring. 3(3-0) ED 424A.  
Characteristics and terminology of basic learning theories and learning disabilities. Educational practices and programs and major contributors. Field practicum with learning disability children.
- 428A. Psycho-Educational Characteristics of the Mentally Retarded**  
Fall, Summer. 3(3-0) ED 424A or approval of department.  
Cognitive, affective and social characteristics of the mentally retarded. Implications for school learning and life adjustment. Differentiation of mental retardation from related conditions.
- 428B. Curriculum for the Mentally Retarded**  
Fall, Summer. 3(3-0) ED 424A or approval of department.  
The development of curriculum for mentally retarded children and youth emphasizing current practice in pre-school through secondary school programs for educable and trainable mentally retarded.
- 428C. Educational Procedures for the Mentally Retarded**  
Fall, Summer. 3(3-0) ED 424A or approval of department.  
Methods of instruction for mentally retarded children and youth, including the development of objectives, assessment of individual abilities, the development of learning skills, and the teaching of non-academic and academic skills.
- 428D. Education of the Severely Retarded**  
Fall, Winter, Spring. 3(3-0) ED 424A.  
Procedures in teaching severely mentally retarded children and youth.
- 429G. Laboratory Programs in Driver and Traffic Education**  
Fall, Spring, Summer. 5(3-4) ED 329F, valid driver's license.  
Examination of the aims, objectives and role of laboratory programs in driver and traffic education. Directed laboratory experiences with new drivers will be provided.

## Descriptions – Education

### of

### Courses

#### 429H. *Organization and Administration of Driver and Traffic Education*

Fall, Summer of even-numbered years. 3(3-0) ED 329F.

Organizational and administrative aspects of driver and traffic education as they relate to the total school and other specialized programs. Historical and philosophical aspects, evaluation, related professional organizations, and occupational opportunities.

#### 429J. *Personality Factors in Driver and Traffic Education*

Winter, Summer of odd-numbered years. 3(3-0) ED 329F, PSY 225.

Study of behavior with emphasis on attitudes, motivation, and adjustment and their relationship to unsafe driving. Investigation of principles, and methods appropriate in identifying, understanding, and modifying unsatisfactory behavior.

#### 429K. *Fundamentals of Traffic Law*

Spring, Summer of odd-numbered years. 3(3-0) Interdepartmental with the School of Criminal Justice.

Nature, function and application of traffic law as it applies to the safe and efficient movement of people and goods in a broadly conceived traffic accident prevention program.

#### 429L. *Methods and Materials in Driver and Traffic Education*

Winter. 3(3-0) ED 329F.

Classroom instruction in driver education. Selection and presentation of appropriate classroom materials. Evaluation of classroom teaching techniques.

#### 429M. *Curriculum Development in Driver and Traffic Education*

Spring. 3(3-0) ED 429G, ED 429L.

Philosophical basis of curriculum construction. Trends in driver education curriculum development. Development of model curricula for two, three and four phase driver education programs using accepted principles of curriculum construction.

#### 431A. *Educational Media in Instruction*

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

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.

#### 431B. *Basic Educational Graphics*

Fall, Winter, Spring, Summer. 3(3-0) ED 431A or approval of department.

A course for teachers and prospective teachers in the local production of visual instructional materials.

#### 432A. *Psycho-Educational Characteristics of the Emotionally Disturbed*

Fall, Winter, Spring. 3(3-0) ED 424A.

Psycho-educational characteristics of the emotionally disturbed are surveyed and evaluated. Additionally, various strategies which purport to educate the disturbed child are studied and evaluated.

#### 432B. *Remedial Practices with the Emotionally Disturbed*

Fall, Winter. 3(3-0) ED 432A.

Emphasis is on the specific learning disabilities of the emotionally disturbed, both in the area of assessment and remediation. Specific methods and materials are surveyed and described in terms of their use.

#### 432C. *Classroom Management: Emotionally Disturbed*

Fall, Winter, Spring. 3(3-0) ED 424A, ED 432A, ED 432B; and student teaching with emotionally disturbed.

For student teachers in the area of the emotionally disturbed only. The primary emphasis is on psycho-educational curriculum, and management of the emotionally disturbed in school settings.

#### 433. *Alcohol: A Social Dilemma*

Winter. 3(3-0) Juniors or approval of college. Interdepartmental with and administered by the School of Criminal Justice.

Substance abuse with emphasis on beverage alcohol. Sociological, psychological and medical aspects. Prevention, treatment, rehabilitation.

#### 436A. *Student Teaching*

(436.) Fall, Winter, Spring. 15(5-25) May reenroll for a maximum of 30 credits. 2.00 cumulative grade-point average; ED 327 for Secondary Education majors; ASC 477 for Audiology and Speech Sciences majors; approval of college. Applications must be made to the Student Teaching Office as follows: Fall—during previous October; Winter—during the previous February; Spring—during the previous May.

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.

#### 436B. *Student Teaching*

(436.) Fall, Winter, Spring. 5(3-6) 2.00 cumulative grade-point average; ED 327 for Secondary Education majors; ASC 477 for Audiology and Speech Sciences majors; approval of college. Application must be made to the Student Teaching Office as follows: Fall—during the previous October; Winter—during the previous February; Spring—during the previous May.

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. A competency based course.

#### 436C. *Student Teaching*

Fall, Winter, Spring. 10(3-20) ED 436B. Application must be made to the Student Teaching Office as follows: Fall—during the previous October; Winter—during the previous February; Spring—during the previous May.

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. A competency based course.

#### 436S. *Student Teaching-Special Education 2nd Term*

Fall, Winter, Spring. 15(5-25) ED

436A.

School and community participation: Planning, conducting and evaluating instruction in special education; management techniques; observations and seminars; working with other special education professionals. An off-campus course in selected Michigan locations.

#### 441A. *General Industrial Arts*

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

Typical applications of power and its control, internal combustion engines, external combustion 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) ED 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) ED 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) ED 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.

#### 442. *Principles and Practices in Home Economics*

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

436.

Analysis of the student teaching experience. Professional expectations, role of the teacher, and scope of home economics programs.

#### 446. *Teaching Internship*

Fall, Winter, Spring. 5 to 15 credits. May reenroll for a maximum of 22 credits. ED 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*

Fall, Winter, Spring, Summer. 5(3-2) ED 200.

Study of the structure, function and purposes of educational institutions. Course provides options for students in meeting professional needs recognized in directed teaching and desired before entering full professional practice.

#### 464. *Standardized Tests and Testing Programs*

Fall, Winter, Spring, Summer. 3(3-0) ED 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) ED 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.
- 470. Science Instruction in Selected Areas for Elementary and Middle School Teachers**  
*Winter, Spring. 3(3-0) May reenroll for a maximum of 6 credits. ED 325F.*  
Extends instructional techniques and knowledge of teaching materials in various science-related curricula for elementary and middle school children. Limited to examination of selected topics during any one term.
- 471B. Classroom Management in Business and Distributive Education**  
*Fall, Spring. 4(3-2) ED 200, ED 327C concurrently or approval of department.*  
Principles and practices of using materials and media; using community resources; providing directed occupational experiences; how-to-individualize instruction; evaluating student achievement.
- 472. Organization and Administration of Cooperative Office and Distributive Occupations Programs**  
*Fall, Spring. 3(3-0) ED 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.
- 473. Individualized Study in Industrial Education**  
*Fall, Winter. 3 credits. May reenroll for a maximum of 9 credits. Approval of department.*  
Development of professional and technical competencies in industrial education using laboratory, library, school, government, and industrial settings.
- 475. Practicum in Developmental and Corrective Reading**  
*Fall, Winter, Spring. 3(1-2) ED 325A.*  
Application in a field setting of instructional principles introduced in ED 325A. Also a broad theoretical base for teaching reading.
- IDC. Canadian-American Studies**  
*For course description, see Interdisciplinary Courses.*
- 477. Use of Paraprofessionals in Counseling**  
*Fall, Spring. 3(3-0)*  
History and current status of the paraprofessional movement. Review of the selection, training, and evaluation processes; identification of issues and problems in the use of support personnel.
- 481. Museum as an Educational Tool**  
*Spring. 4(4-0) Juniors.*  
The museum as an educational tool. Classroom preparation for the museum experience. Museum strategies including dioramas, collections, models, exhibits and reconstructions. Application of museum strategies to other educational settings.
- 482. Seminars in Education**  
*Fall, Winter, Spring, Summer. 1 to 8 credits. Approval of department.*  
Seminars in the various fields of emphasis in education.
- 483. Readings and Independent Study in Education**  
*Fall, Winter, Spring, Summer. 1 to 8 credits. May reenroll for a maximum of 8 credits. Juniors; 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 reenroll for a maximum of 12 credits. Approval of department.*  
Supervised undergraduate practicums in education.
- 485. Elementary Pre-Intern Seminar**  
*Winter, Spring. 4(4-0) Approval of department. Completion of Phase 1 of Internship Teaching.*  
Selected professional and clinical educational problems are studied in a field setting as an integrated part of the pre-intern twenty-week block of courses.
- 486. Foreign Field Experience in Elementary Education**  
*Winter, Spring. 4(4-0) Approval of department. ED 321A.*  
Supervised undergraduate practicum combining a study of a foreign country's culture and related educational practices as an integral part of Phase 1 (student teaching) of Internship Teaching in a foreign country.
- 489. Core Seminar in Special Education**  
*Fall, Winter, Spring. 2(2-0) ED 101A, ED 424A, admission to special education, core students only.*  
Consideration of affective interactions with children, parents, other professionals, and self. Attention to sharing field experiences, examining belief-behavior consistency, teaching in the affective domain, and the parent-teacher partnership.
- 490A. Field Experience: Deaf Education**  
*Fall, Winter. 2(0-6) ED 436; ED 425B, ED 425C or concurrently.*  
Observation/participation in day classes for hearing impaired learners at elementary, secondary or post-secondary levels. Minimum 60 clock hours.
- 490B. Field Experience: Emotionally Impaired**  
*Fall, Winter, Spring. 3(1-6) May reenroll for a maximum of 12 credits. ED 101A.*  
Supervised practicum in an educational program for emotionally impaired learners accompanied by a discussion period on application of educational strategies.
- 490C. Field Experience: Mental Retardation**  
*Fall, Winter, Spring. 3(0-9) May reenroll for a maximum of 9 credits. Approval of department.*  
Supervised practicum in an educational program for mentally retarded learners.
- 490D. Aiding Teachers of Visually Handicapped Learners**  
*Fall, Winter, Spring. 1(0-3) May reenroll for a maximum of 4 credits. Juniors and majors in education of visually handicapped or blind-deaf children.*  
Three separate experiences aiding teachers of preschool, primary, intermediate and adolescent-young adult, multi-impaired visually handicapped learners in public and residential school programs.
- 490E. Aiding Teachers of Blind/Deaf Learners**  
*Fall, Winter, Spring. 1(0-3) May reenroll for a maximum of 3 credits. Juniors and majors in education of blind/deaf children.*  
Three separate experiences aiding teachers of blind/deaf learners in teaching low-functioning, preacademic and primary level children.
- 490F. Teaching Low Vision Skills**  
*Fall, Winter, Spring. 1(0-3) Juniors and majors in education of visually handicapped or blind/deaf children.*  
Assisting learners with limited residual vision make maximal use of prescribed low vision aids; and interpreting the use of such aids to teachers of nonhandicapped children.
- 490G. Teaching Daily Living Skills to Visually Handicapped Learners**  
*Fall, Winter, Spring. 1(0-3) Juniors and majors in education of visually handicapped or blind/deaf children.*  
Supervised practice with visually handicapped and blind/deaf learners to develop competencies in teaching orientation and mobility, and the other skills of daily living.
- 490J. Field Experience: Special Education Core**  
*Fall, Winter, Spring. 4(0-16) ED 101A, ED 424A, admission to special education, core students only.*  
Supervised practicum in an educational program for handicapped learners, taken concurrently with ED 424B and ED 424C.
- 495. Reading in the Content Areas of the Secondary Level**  
*Fall, Winter, Spring. 3(3-0) Approval of instructor.*  
Strategies for reading assessment and instruction compatible with content area teaching objectives. Practical applications in classroom settings for learners in grades 4-12 as well as adults. Performance based.
- 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.

## Descriptions – Education

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### Courses

#### D. Social Criticism and Education

Fall, Summer. 3(3-0) ED 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) ED 801A.

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

#### F. Modern Philosophies of Education

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

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

#### 802A. Education in the U.S.A.

Fall. 3(2-4) Passed English Language Center examination or approval of department.

Designed to provide first term foreign students in graduate programs with theoretical and experiential background in American education.

#### 802B. Education in the U.S.A.

Winter. 3(2-4) ED 802A or approval of department.

Designed to provide foreign students in graduate programs with theoretical and experiential background in American education.

#### 803. Curriculum Innovation in Elementary and Middle School Science

Summer of odd-numbered years. 3(3-0) Experience in teaching, ED 325F or approval of department.

In-depth examination of the objectives, learning theory, instructional strategies, classroom activities, and science content of a single elementary science program selected from among such curriculum revision projects.

#### 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, Spring, 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, Summer. 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.

#### 805. Seminar in Urban Teaching

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

Exploration of literature related to problems, programs, and techniques of effective teaching in urban schools. Importance of student and teacher characteristics and program organization and goals will be assessed as they relate to quality education.

#### 806. Problems of the Professional in Higher Education Administration: Men and Women

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

Presents academic, administrative, legal, sociological and psychological factors which affect members of both sexes in the fields of teaching and administration.

#### 807. Contemporary Issues in American Higher Education Administration

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

External and internal demands and stresses facing American higher education. How administrators should respond to critical issues and problems.

#### 808. Methods and Materials in Children's Literature

Fall, Winter, Spring, Summer. 3(3-0) Undergraduate course in children's literature, graduate students.

Critical evaluation and utilization of literature for children.

#### 809. Advanced Methods of Teaching Language Arts

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

Survey of principles and instructional methods for teaching listening, speaking and writing attitudes and skills at the elementary and middle school levels; examination of current references and resources through self-selected area of special study.

#### 810. Teaching Elementary School Social Studies

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

Methods and materials used in teaching social studies in kindergarten through the eighth grade.

#### 811. School Learning II

Fall, Winter, Spring, Summer. 3(3-0) ED 410 or ED 411.

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

#### 812. Growth and Behavior

Fall, Winter, Spring, Summer. 3(3-0) ED 412 or approval of instructor.

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

#### 813. Social and Emotional Behavior in the Classroom

Fall, Winter, Spring, Summer. 3(3-0) Six credits in Psychology or Educational Psychology

Survey of experimental and clinical research related to life factors which affect social-emotional development; implications for teaching.

#### 814. Classroom Discipline

Summer. 3(3-0) Experience in teaching or pupil personnel work.

The study and practice of positive strategies for the resolution of classroom discipline problems.

#### 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.

#### 815D. Introduction to Rehabilitation Counseling

Fall. 3(3-0) Open to rehabilitation counseling majors only.

Overview of field of rehabilitation. Orientation to the Michigan Division of Vocational Rehabilitation. Rehabilitation counseling practicum experience with Michigan Department of Vocational Rehabilitation.

#### 815E. Rehabilitation Internship

Winter, Spring. 3 to 21 credits. May reenroll for a maximum of 21 credits. ED 819F.

Supervised graduate internship in rehabilitation counseling.

#### 815F. Overview of Rehabilitation Placement

Winter. 3(3-0) ED 815D.

An overview of the impact areas of job placement for the handicapped. Presentations on placement models, state agency approaches, pertinent legislation, and employer, counselor, and client perspectives.

**815G. Assessing Vocational Potential**  
*Spring. 3(3-0) ED 815F.*

Techniques for assessing the vocational potential of disabled individuals including use of vocational tests, medical information, and occupational information for an integrated vocational appraisal.

**815H. Assessing Employer Needs**  
*Fall. 3(3-0) ED 815F, ED 815G.*

Techniques for surveying employers, gaining entry for an interview, presenting oneself, client, and agency, and assisting clients in their search for employment.

**815J. Research Applications in Rehabilitation**  
*Fall, Winter, Spring, Summer. 3(3-0) ED 815E concurrently or approval of department.*

Individual study and research related to an aspect of rehabilitation.

**816. Procedures in Guidance**

**A. Career Development Services**

*Fall, Winter, Summer. 3(3-0) ED 815B; or concurrently.*

Analysis of group and individual methods providing information related to career planning, educational opportunities, and person-social concerns. Utilization of information from placement agencies, follow-up studies, and community surveys in curriculum revision is stressed.

**B. Counseling and Guidance in the Classroom**

*Fall, Winter, Spring, Summer. 3(3-0) ED 815B; or concurrently.*

Examination of factors underlying counseling activities of teachers and administrators. Basic principles, methods and techniques related to diagnosing, interviewing consulting and referring counselees for special assistance are included.

**C. Practice in Group Counseling Techniques**

*Winter, Summer. 3(3-0) ED 816B.*

Emphasis upon development of counseling skills through analyzing and leading small groups. Students participate in a group to examine in depth their own self-image and motives. Didactic content is related to experiences in the group.

**D. Practice in Individual Interviewing Techniques**

*Spring, Summer. 3(3-0) ED 816A and ED 816B.*

Role-playing, video tapes, audio tapes and demonstrations are utilized in helping each student develop skills in counseling with children and consulting with parents. Techniques appropriate for various age levels and problems will be practiced.

**817A. Introduction to Urban Counseling**  
*Fall. 3(3-0) ED 819A and ED 819B concurrently.*

Problems—health, socio-cultural, economic, educational, legal, vocational—as manifested by urban residents and their resolution through counseling. Emphasis on systems and personal change mechanisms.

**817B. Systemic Counseling**  
*Fall. 3(3-0) Approval of department.*

An evaluation of the theory and philosophy of systemic counseling. Issues pertaining to systemic change will be examined.

**817C. Urban Counseling Practicum**  
*Fall, Winter, Spring, Summer. 3 credits. May reenroll for a maximum of 12 credits. ED 817A or approval of instructor.*

A minimum of 12 hours per week of supervised counseling will be performed in an urban agency setting. Emphasis on developing counseling skills applicable to urban residents and urban agencies.

**817D. Urban Career Development System Analysis**  
*Winter. 3(3-0) ED 817A and approval of department.*

Critique of existing theories of vocational (career) development and interest inventories for use with urban residents, examination of barriers to urban residents, and development of alternative models.

**817K. Community Evaluative Research**  
*Spring. 3(3-0) ED 817A, ED 867, and ED 869, or approval of department.*

Application of evaluative research methods to the solution of urban problems; review of current evaluative techniques; identification of problems, design, experiments; review of selected studies.

**818A. Behavior Disorders in Children**  
*Spring. 3(3-0) 12 graduate credits in educational psychology or a related area.*

Characteristics, causes and treatment of school related behavior disorders in children considered within a developmental framework.

**818B. Roles and Functions of School Psychologists**  
*Spring. 3(3-0) Admission to Ed.S. program or approval of instructor.*

History and current status of the field. Current concerns in assessment, reporting of findings, consultation and legal-ethical responsibilities.

**819A. Counseling Practice**  
*Fall. 3(3-0) Admission to M.A. Counseling Program.*

The practice of counseling and guidance in schools, community colleges, and rehabilitation agencies.

**819B. Introduction to Counseling Theory**  
*Fall. 3(3-0) Admission to M.A. Counseling Program.*

Selected theories of counseling with special attention to the application of theories of learning in the counseling process.

**819C. The Guidance Information Service**  
*Spring. 3(3-0) ED 819A and ED 819B.*

The use of occupational, educational and social information in counseling interviews and in guidance programs.

**819D. The Counseling Process**  
*Winter. 3(3-0) ED 819A and ED 819B.*

The counseling process with emphasis given to students learning a systematic approach to counseling. Students practice interviewing skills in a counseling laboratory.

**819E. Counseling and Consulting Strategies**  
*Winter. 3(3-0) ED 819A and ED 819B.*

Selected remedial and preventative counseling strategies will be studied. Methods and techniques for assisting with individual and environmental change will be examined. Procedures for consulting with parents, teachers, and agency personnel will be studied.

**819F. Counseling Practicum I**  
*Fall, Winter, Spring. 6(4-8) ED 819C and ED 819D.*

Supervised counseling experienced in selected schools and agencies followed by analysis and critique of these experiences through group and individual consultation with instructor.

**819G. Counseling Practicum II**  
*Fall. 6(4-8) ED 819F.*

Continuation of ED 819F.

**819H. Development Counseling Services**  
*Fall. 3(3-0) ED 819F.*

A systems approach to the management of pupil personnel services. Students will use the approach in solving simulated problems.

**819J. Group Procedures in Counseling**  
*Summer. 3(3-0) ED 819F.*

An examination of theories of group counseling with special attention to goal-directed groups. Tapes of group counseling will be analyzed and practice in leading groups under simulated conditions will be provided.

**819K. Research in Counseling**  
*Summer. 3(3-0) ED 869.*

Emphasis on research methods useful to counselors; measuring counseling outcomes, developing local test norms and expectancy tables, evaluating guidance services, studying behavior change in the single case.

**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**  
*Fall, Winter, Spring, Summer. 3(3-0) ED 820.*

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

**821C. Work Experience in the Curriculum**  
*Fall. 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.

**821D. Seminar in Middle School Curriculum**  
*Fall, Spring, Summer. 3(3-0)*

Contrasting patterns of programs for early adolescents; age range and characteristics of middle school pupils; problems and potential of the middle school.

**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, Spring, Summer. 3(2-2) Approval of department.*

Overview of extent, origins, forms, purposes, content, sponsors, methods and guiding theories of continuing education and its significance for individuals, institutions, communities and nations.



## Descriptions – Education

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### Courses

#### 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.

#### 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

Fall, Winter. 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.

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

Fall, Winter. 3(3-0) ED 822N, ED 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.

#### 823. Instructional Simulation

Winter. 3(3-0) Teaching experience.

Design and use of simulations and instructional games in the curriculum for development of social skills, values and affects.

#### 824. Seminar in Instructional Development

Winter, Summer. 3(3-0)

Skills and competencies in applying instructional systems principles to learning and teaching problems.

#### 825. Seminar in Instructional Television

Spring, Summer. 3(3-0) Approval of department. Interdepartmental with the Department of Telecommunication.

Television use in instruction, particularly as it concerns the learner, the classroom teacher, the instructional developer and the administration.

#### 826. Social Studies Curriculum K-12

Winter. 3(3-0) Teaching experience.

Social studies curriculum planning, development and improvement. Emphasis on holistic K-12 view but each student will be encouraged to concentrate on a selected area or topic.

#### 827. Improving Secondary Social Studies Instruction

Fall, Spring, Summer. 3(3-0) Teaching experience.

Recent literature, curricular materials, and research in secondary social studies. Individual projects on new curricular developments in one of the following areas: history, geography, civics, economics, sociology, anthropology, or psychology.

#### 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.

#### 828C. Continuing Education: Learning Theory and Program Development

(928A.) Winter, Summer. 3(2-2) Twelve credits in Education, approval of department.

Theories of adult learning and community development, their implications for design and management of continuing education, and alternative methods for integrating social and physical environments, materials, media and personnel to increase knowledge and enhance personal and social maturity.

#### 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.

#### 828F. Principles and Problems of Instruction in Higher Education

Fall, Winter, 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.

#### 829. Medical Information for Human Service Professionals

(429.) Fall. 3(3-0) Approval of instructor.

Provide a basic understanding of the major body systems and the chronic diseases and disabilities associated with these systems. Emphasis on medical lectures by physicians.

#### 829A. Career Education

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

Historical background, curricular implications and instructional strategies related to kindergarten through adult career education programs. Program content and organization for developing awareness, exploration, decision making and planning skills.

#### 830A. Special Methods and Materials of Teaching

Fall, Winter, Spring, Summer. 3(3-0) May reenroll in different subject-matter areas for a maximum of 15 credits. Graduate student in education; experience in teaching; undergraduate course in the area; 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) Graduate student in education; undergraduate methods course in reading; 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) Graduate students; teaching experience; 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) Graduate students in education; ED 830C or ED 830D; approval of department.

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) Graduate students in education; ED 830C or ED 830D; ED 830E recommended, approval of department.

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.



**830H. Seminar in Developmental Reading**

*Fall, Winter, Spring, Summer. 3(3-0) ED 830F.*

Focuses on subject matter of reading and reading instruction factors which psychologically influence the acquisition of reading skills, the implementation of developmental reading programs and evaluation of such programs.

**830J. Seminar in Diagnostic and Remedial Reading**

*Fall, Winter, Spring, Summer. 3(3-0) ED 830F.*

Focuses on the psychological and physiological nature of reading retardation, the relationships between clinical reading programs and the larger curriculum environment, and the role of the reading diagnostician.

**831A. Educational Media in Instruction**

*Fall, Winter, Spring, Summer. 3(3-0) Students may not receive credit in both ED 431 and ED 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(3-0) ED 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**

*Fall, Summer. 3(3-0) ED 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**

**C. Learning Disabilities**

*Winter. Summer of odd-numbered years. 3(3-0) ED 427B, student teaching or clinical experience with handicapped 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) ED 428A, ED 428B, ED 428C.*

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 Impaired**

*Summer. 3(3-0) ED 432A, ED 432B, ED 432C.*

Review and analysis of recent research findings, intervention strategies, and curriculum developments applicable to emotionally impaired children and youth.

**833. Teaching Elementary School Mathematics**

*Fall, Summer. 3(3-0) Experience in teaching and approval of department.*

Advanced methods and materials used in teaching mathematics concepts in the elementary school.

**834. Teaching Elementary School Geometry**

*Winter. Summer of odd-numbered years. 3(3-0) Experience in teaching and approval of department.*

Advanced methods and materials used in teaching concepts of informal geometry, coordinate geometry, metric geometry, transformational geometry and measurement topics.

**835. Teaching Elementary School Arithmetic**

*Spring. Summer of even-numbered years. 3(3-0) Experience in teaching and approval of department.*

Advanced methods and materials used in teaching concepts of the whole, integer, rational and real number systems including systems of numeration.

**836. Elementary Education: School Mathematics Instruction**

*Winter, Summer. 3(3-0) Experience in teaching and enrolled in mathematics education.*

Review of the literature--theoretical and research--on instruction in school mathematics including planning, group instruction, individual instruction, evaluation and instructional materials.

**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.

**838A. Classroom Analysis**

*Fall, Winter, Spring. 3(3-0) Admission to M.A. in Classroom Teaching Program (MACT).*

Development of procedures and skills essential for analyzing and improving teaching performance. Students will establish programs of self-modification where needed. Offered only in an off-campus setting.

**838B. Instructional Development**

*Fall, Winter, Spring. 2 to 4 credits. May re-enroll for a maximum of 12 credits. ED 838A.*

Designed to improve a teacher's effectiveness in classroom instruction through individualized projects. Offered only in an off-campus setting.

**838C. Classroom Synthesis**

*Fall, Winter, Spring, Summer. 3(3-0) ED 838B; 36 credits applicable toward the MACT.*

Designed to refine one's personal educational philosophy, and establish long and short-term goals for improvement of teaching effectiveness. Offered only in off-campus setting.

**IDC. Interdisciplinary Seminar on Africa**

*For course description, see Interdisciplinary Courses.*

**839. Program Development in Distributive Education**

**A. Principles and Organization**

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

Goals, historical background, and trends; contributions to individual development and manpower needs; program organization for secondary, post-secondary, and adult levels; overview of curriculum and instructional strategies; program evaluation.

**B. Curriculum Development**

*Winter, Summer. 3(3-0) ED 839A or approval of department.*

Adapting content of marketing and related disciplines to develop occupational competencies; selection of learning experiences; materials, and media; development of performance goals related to career objectives; scope and sequence patterns.

**D. Seminar in Distributive Education**

*Summer. 2 to 3 credits. Advanced graduate standing or approval of department.*

Focus on current issues and problems, curriculum development projects, and research; emphasis upon individual investigations and writing.

**840. Improving Instruction in Business Education**

Improving instructional processes through research findings, readings, and experience: Objectives, scope and sequence, diagnosis of learning difficulties, selecting learning activities, evaluating achievement, selecting materials, media and equipment.

**A. Typewriting and Office Procedures**

*Summer. 3(3-0) Experience in teaching.*

**B. Shorthand and Transcription**

*Summer. 3(3-0) Experience in teaching.*

**C. Data Processing**

*Summer. 3(3-0) Experience in teaching.*

**D. Distributive Subject**

*(839C.) Summer. 3(3-0) Experience in teaching.*

Selecting appropriate teaching strategies; use of the project method, laboratory simulations, on-the-job training, youth organizations, and other methods; evaluation of student achievement.

**841. Driver and Traffic Education**

**A. Innovations in Driver and Traffic Education.**

*Fall. Summer of odd-numbered years. 3(3-0)*

Explanation of the broad spectrum of innovations in driver and traffic education. Particular emphasis will be placed on their adoption and application for improving classroom and laboratory instruction.

## Descriptions – Education

### of

### Courses

#### B. The Highway Transportation System

Spring, Summer of even-numbered years. 3(3-0)

Overview of the development, management and operation of the highway transportation system and its implications for the traffic safety educator.

#### C. Principles of Traffic Communications

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

Specialized problems involved in traffic safety communications in a transportation centered society. Design and manipulation of the communication process to better understand and influence driver behavior. Planning public information and community support programs.

#### D. Motor Vehicle Administration

Fall, Summer of even-numbered years. 3(3-0)

Functions of motor vehicle administration in highway traffic administration. Driver licensing, motor vehicle inspection, vehicle titling and registration, and financial responsibility as legal and administrative methods of driver and vehicle control.

#### 842A. Curriculum and Program Planning

Summer. 3(3-0)

Needs and goals in education and manpower training for business, general business and economic education; program structure; professional and youth organizations; related legislation and historical background.

#### 842B. Contemporary Issues in Education for Business

Summer. 3(3-0) Twenty-four graduate credits or approval of department.

Analysis and discussion of selected issues relating to: 1. education for business--structure, manpower needs, legislation, curriculum, training by government and business, 2. curriculum and instruction. Emphasis upon problem-solving and extensive reading.

#### 842D. Seminar--Research in Business Education

Summer. 2 to 8 credits. Prior course in research or approval of department.

Emphasis on review of research and developmental projects and application to business education program; study of design particularly to student's personal research interests.

#### 843. Program Development in Office Education

##### A. Strategy and Structure

Fall, Summer. 3(3-0) Twelve graduate credits in Business or Vocational Education or approval of department.

Criteria of vocational office education planning/organizing a program; curriculum patterns including block-time and senior intensive; content scope and sequence; program evaluation; special attention to legislation and curriculum research.

##### B. Classroom Systems

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

The initiation of new classroom systems in office education, the scope and sequence in office education systems, their curriculum content and instructional objectives. Emphasis on follow up and evaluation design.

#### C. Seminar

Spring, Summer. 2 or 3 credits. Advanced graduate standing or approval of department.

Focus as needed on current issues and problems; curriculum development projects; contemporary research. Emphasis on individual investigations and writing.

#### 845. New Social Studies Curricula

Spring of odd-numbered years. 3(3-0) ED 830A.

Focuses on new and emerging elementary and middle school social studies curricula. Specific attention given to selection and analysis of curricular models, programs, and materials; adaptation to specific needs of schools.

#### 846. Specialized Methods and Materials for Teaching Elementary Science

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

Develops additional competency in science education for the experienced teacher at elementary and middle school levels. Specialized methods for individual and group instruction are emphasized and evaluated.

#### 847. Seminar in Elementary Science Education I

Winter, Summer. 3(3-0) Experience in teaching; ED 325F or ED 846 or approval of department.

Philosophical and psychological concepts relevant to the objectives and implementation of science education and a review of research in teaching science at the elementary level.

#### 848. Individual Problems in Elementary and Middle School Science Education

Fall, Winter, Spring, Summer. 1 to 3 credits. May reenroll for a maximum of 6 credits. ED 846 or ED 847; teaching experience.

Identification of one or more problems in elementary or middle school science to be studied independently. Problem analysis would typically include readings, action research and original composition.

#### 849. Trends and Issues in Language Arts

Fall, Summer of odd-numbered years. 3(3-0) ED 830A.

To investigate and criticize trends, issues and research in language arts programming and instruction.

#### 850. The Teacher and 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) ED 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 ED 851A, ED 851B, or approval of department.

##### B. Secondary School Administration

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

##### C. Instructional Supervision

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

##### D. Business Administration of Schools

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

##### E. Middle School Administration

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

Organization and administrative aspects of middle schools. Emphasis on basic characteristics of a middle school and how the administrator implements these characteristics. Research on middle schools studied.

#### 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 ED 850 or approval of department.

##### B. Vocational Education Programs.

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

##### C. Administration of Pupil Personnel and Guidance Programs

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

#### 854. Environmental Education in the School

Spring, Summer. 3(3-0)

Environmental issues and their implications for educational practices and policies. The role of the school in developing environmental consciousness.

#### 855. Research in Educational Administration

Fall, Winter, Spring, Summer. 3(3-0) ED 851A, ED 851B, ED 867.

The identification of an individual research problem and the application of principles and techniques of educational research in seeking a solution to the problem.

- 856. Creativity in Education**  
*Fall. 3(3-0) Teaching Experience.*  
Definitions, manifestations, processes and theories of creativity, experiences with modes of creative expression and problem solving techniques. Development and application to the education profession. Field trips may be required.
- 857. Futuristics and Education**  
*Spring, Summer. 3(3-0) Teaching experience.*  
Current educational programs in futuristics. Development of concepts, materials and programs related to education in and for the future. Proposed methodology for the future.
- 861. Elementary School Curriculum**  
*Winter, Summer. 3(3-0) Regular admission to graduate program and approval of department.*  
Curriculum definition as related to purposes of the elementary school; foundations and rationale for curriculum study, revision, and improvement; procedures and organizational aspects of curriculum planning; key components of new educational curricular designs.
- 862. Elementary Education Trends and Current Research**  
*Fall, Winter, Spring, Summer. 3(3-0)*  
*Completion of 27 credits of graduate course work on a regular program and approval of department.*  
Advanced graduate students (those nearing completion of the M.A. program or on the doctoral program) are given an opportunity to explore current research activities.
- 863. Trends and Issues in Children's Literature**  
*Winter and Summer of odd-numbered years. 3(3-0) ED 830A.*  
Provides graduate students an opportunity to discuss and evaluate current research related to children's literature as well as juvenile books and to conduct an in-depth study in the field of children's literature.
- 864. The Teaching of Critical Reading**  
*Winter and Summer of even-numbered years. 3(3-0) ED 830A.*  
Provides graduate students an opportunity to study current research in critical reading, to identify and evaluate appropriate instructional materials, and to conduct an in-depth study in the field of critical reading.
- 865. Principles of Educational Measurement**  
*Winter, Summer. 3(3-0) ED 464 or ED 465; ED 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—Binet**  
*Winter, Summer. 3(3-0) ED 464 or ED 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—Wechsler**  
*Fall, Spring, Summer. 3(3-0) ED 464 or ED 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) ED 464 or ED 465; ED 813 or PSY 427.*  
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, and industrial education.
- 869. Quantitative Methods in Educational Research**  
*Fall, Winter, Spring, Summer. 4(3-1)*  
*Pretest and approval of instructor.*  
Application of descriptive statistical techniques to educational data. Introduction to estimation and tests of hypotheses. Interpretation of statistical reports.
- 870. Non-Formal Education for Rural Development**  
*Fall. 3(3-0)*  
General principles relating non-formal education and rural development. Comparison of non-formal, extension, continuing education systems in African, Asian, American, European rural societies; impact on continuity and change in rural social systems.
- 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.
- 873. Student Development and College Personnel Services I**  
*Fall. 3(3-0) Majors in College Student Personnel; approval of department.*  
History, development, philosophy, organization and administration of college student personnel as a profession. Emphasis upon the college student as an individual and a study of services, programs and staff skills needed to provide for his growth, needs and development.
- 874. Student Development and College Personnel Programs II**  
*Winter. 3(3-0) Majors in College Student Personnel; approval of department.*  
Emphasis upon the student as a member of groups; peer and group influence and behavior; student organizations and group activities; services, strategies and staff skills for conducting such programs.
- 875. Student Development and College Personnel Programs III**  
*Spring. 3(3-0) Majors in College Student Personnel; approval of department.*  
Study of living and learning environments and related staff skills, facilities and programs which affect student behavior and development; examination of personal qualities, professional organizations and other factors associated with being a professional person.
- 876. The American College Student**  
*Fall, Winter, Summer. 3(3-0) Students in graduate degree programs or approval of department.*  
Analysis of research data, theory, hypotheses and strategies regarding the nature of the college student and his learning environment.
- 877. Educational Program Evaluation**  
*Winter, Summer. 3(3-0) ED 869.*  
History and current status of program evaluation, including a review of various evaluation models, common problems of implementation and alternative evaluation designs.
- 878. Research in Higher Education**  
*Fall, Winter, Spring, Summer. 2 to 6 credits. May reenroll for a maximum of 9 credits. Master's students in Administration and Higher Education; ED 867.*  
Problems and practices in Higher Education Administration. Development of research prospectus, review of significant literature, conduct of research under supervision, and presentation of findings and conclusions.
- 879. Educational Development Planning: Basic Concepts**  
*Winter. 3(3-0) Approval of department.*  
Basic concepts of economic, social and political development are studied as they place demands upon educational planners to cope with them. The distribution of development benefits is stressed.
- 880. Educational Planning and National Development**  
*Spring 3(3-0) ED 879.*  
Formulation of educational development strategies and plans to deal with crucial national and community development problem areas paying particular attention to meeting the special needs of audiences with special problems.
- 881. Workshops in Education**  
*Fall, Winter, Spring, Summer. 1 to 6 credits. May reenroll for credit. Approval of department.*  
Laboratory approach which provides opportunities for experienced educational personnel to concentrate their study on common administrative and supervisory problems.

## Descriptions – Education

### of Courses

- 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. 1 to 6 credits. May reenroll for a maximum of 9 credits. 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.
- 886. Development of Self-Understanding**  
*Fall, Winter, Spring, Summer. 3(3-0)*  
Development of self-awareness and understanding of how one's personal and interpersonal style influences and is influenced by human relationships in educational settings.
- 887. Seminar: Continuing Education Leadership in Local Communities**  
*Spring. 3(3-0) May reenroll for a maximum of 6 credits. Majors or approval of department.*  
Formal and non-formal community education for adults. Administration, agency cooperation, accountability, ethical and political concerns, managing controversy, and balancing objective study with advocacy in programs of personal and community development.
- 889A. Issues in Education of Deaf**  
*Spring. 3(2-3) Graduate students.*  
Designed for graduate non-majors seeking to expand information and understanding of severe and profound hearing loss; educational implications, programs.
- 889B. Issues in Education of Emotionally Impaired**  
*Fall, Spring. 3(3-0) Special Education majors only, approval of instructor.*  
This seminar focuses on crucial issues related to programming for emotionally impaired students.
- 889C. Issues in Mental Retardation**  
*Spring, Summer. 3(3-0) Approval of department.*  
Current issues in the area of mental retardation are identified, researched, and discussed.
- 889D. Psychoeducational Diagnosis of the Handicapped**  
*Fall, Spring. 3(3-0) Approval of department.*  
Emphasis upon principles of assessment and their utilization in the classroom. An interdisciplinary approach in assessment techniques delineating theory and application.
- 889E. Analysis of Special Education Research**  
*Winter. 3(3-0)*  
Analysis of research studies in each special education disability area. Study of research design and procedures; discussion of theoretical and applied issues relating to the contents of the studies.
- 889F. Parent-Teacher Relationships in Special Education**  
*Fall, Spring. 3(3-0)*  
Development of skills for parent-teacher conferences and consultant-teacher relationships. Strategies for managing home-school relationships in special education. Special problems of parents of handicapped children.
- 889G. Community Agency Programs for the Handicapped**  
*Summer. 3(3-0) Approval of department.*  
Various official and voluntary agencies and organizations which offer programs and services for the handicapped and the relationship of these programs to special education.
- 889H. Special Education Finance**  
*Fall of odd-numbered years. 3(3-0) Graduate students.*  
Analysis of major special education funding systems, the Michigan system, intermediate school district special education tax, constituent district reimbursement policies and approaches to special education budgeting.
- 890A. Field Experience: Education of Deaf**  
*Spring of odd-numbered years. 2 to 8 credits. May reenroll for a maximum of 10 credits. Graduate students, prior teaching or clinical experience.*  
Supervised graduate field experience in educational programs for the deaf and hearing impaired.
- 890B. Field Experience: Emotionally Impaired**  
*Fall, Winter, Spring, Summer. 3 to 12 credits. May reenroll for a maximum of 18 credits. M.A. candidates in special education-emotionally impaired, approval of department.*  
Supervised graduate field experience in educational programs for the emotionally impaired.
- 890C. Field Experience: Mental Retardation**  
*Fall, Winter, Spring, Summer. 1 to 12 credits. May reenroll for a maximum of 12 credits. Approval of instructor.*  
Supervised graduate field experience in educational programs for the mentally retarded.
- 890D. Field Experience: Teaching Visually Handicapped Learners**  
*Fall, Winter, Spring. 3 to 12 credits. May reenroll for a maximum of 18 credits. Approval of department.*  
Supervised graduate field experience in educational programs for the visually handicapped.
- 890E. Field Experience: Teaching Blind/Deaf Learners**  
*Fall, Winter, Spring. 3 to 12 credits. May reenroll for a maximum of 18 credits. Approval of department.*  
Supervised graduate field experience in educational programs for the blind/deaf.
- 890F. Field Experience: Learning Disabilities**  
*Summer. 3 to 12 credits. May reenroll for a maximum of 12 credits. ED 427B, ED 889D, ED 832C.*  
Supervised graduate field experience in educational programs for those with learning disabilities.
- 891A. Independent Study: Education of Deaf**  
*Spring. 2 to 5 credits. May reenroll for a maximum of 10 credits. Graduate students.*  
Supervised study in deaf education conducted according to a written agreement stating the problem or topical area of study, the methodology and the product of the study.
- 891B. Independent Study: Emotional Impairment**  
*Winter, Spring. 2 to 6 credits. May reenroll for a maximum of 12 credits. Graduate students.*  
Supervised study in emotional impairment conducted according to a written agreement stating the problem or topical area of study, the methodology and the product of the study.
- 891C. Independent Study: Mental Retardation**  
*Fall, Winter, Spring, Summer. 1 to 12 credits. May reenroll for a maximum of 12 credits. Approval of instructor.*  
Supervised study in mental retardation conducted according to a written agreement stating the problem or topical area of study, the methodology and the product of the study.
- 891D. Independent Study: Visually Handicapped or Blind/Deaf**  
*Fall, Spring. 3 to 12 credits. May reenroll for a maximum of 12 credits.*  
Supervised study in visually handicapped or blind/deaf conducted according to a written agreement stating the problem or topical area of study, the methodology and the product of the study.
- 891E. Independent Study: Learning Disabilities**  
*Spring. 3 to 12 credits. May reenroll for a maximum of 12 credits. ED 427B, ED 889D, ED 832C.*  
Supervised study in learning disabilities conducted according to a written agreement stating the problem or topical area of study, the methodology and the product of the study.
- 891F. Independent Study: Special Education**  
*Fall, Winter, Spring. 3 to 6 credits. May reenroll for a maximum of 12 credits. Approval of instructor.*  
Supervised study in special education conducted according to a written agreement stating the problem or topical area of study, the methodology and the product of the study.
- 899. Master's Thesis Research**  
*Fall, Winter, Spring, Summer. 2 to 12 credits. Approval of department.*
- 901. Educational Sociology: Seminar**  
*Fall, Winter. 3 or 4 credits. Approval of department. Interdepartmental with and administered by the Department of Sociology.*
- 904. Historical and Comparative Foundations of Education: Advanced Comparative and International Education**  
*Spring. 3(3-0) ED 804E; ED 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.

- 911. Educational Psychology Seminar**  
Fall, Winter, Spring. 3(3-0) May reenroll for a maximum of 15 credits. Doctoral candidates or approval of instructor. Educational psychology doctoral candidates must enroll in the fall.  
History of educational psychology, learning and cognition, personality and self-concept development, social psychology of classroom behavior, social learning theory, school psychology, research on teaching.
- 917C. Counseling Supervision in Urban Settings**  
Fall, Winter, Spring. 3(1-12) May reenroll for a maximum of 9 credits. ED 817C (12 credits).  
Development of supervisory skills in relation to the systemic counseling model with urban settings as a focus. Practice in supervising master's level students in Urban Counseling field experiences.
- 921. Curriculum Research Seminar**  
Spring. 3(3-0) ED 867; ED 821A.  
Identification of researchable variables in the curriculum of an educational institution or program. Design of descriptive, evaluative and experimental studies within ongoing complex social systems.
- 922. Research on Teaching**  
Fall. 3(3-0) ED 867.  
Implications from findings of the major investigations into teaching processes. Relates to the curriculum of in-service and pre-service teacher education.
- 923. Seminar: Curriculum Competencies and Careers**  
Fall. 3(3-0) Doctoral students in curriculum or approval of department.  
Identification of generic competencies related to curriculum development. Analysis and development of student competencies. Exploration of careers in the curriculum field.
- 924. Seminar: Curriculum Issues**  
Spring. 3(3-0) Doctoral students in curriculum or approval of department.  
In-depth exploration of the nature, history and significance of several perennial issues such as curriculum balance and curriculum control. Overview of selected current and probable future issues.
- 925. Seminar: Curriculum Innovation**  
Summer. 3(3-0) Doctoral students in curriculum or approval of department.  
Theories of and models for curriculum innovation and change. Use of models to effect change. Analysis and evaluation of past and present curriculum innovations. Characteristics and roles of change agents.
- 931A. Seminar in Instructional Technology: Research and Development**  
Fall. 3(3-0) Approval of department.  
History and development of instructional technology emphasizing leaders, events, research and legislation affecting use of instructional technology in education.
- 931B. Seminar in Instructional Technology: Research and Development**  
Winter. 3(3-0) Approval of department.  
Analysis and appraisal of selected research studies in instructional technology with attention to purposes, rationales, assumptions, designs, methodologies and findings.
- 931C. Seminar in Instructional Technology: Research and Development**  
Spring. 3(3-0) Approval of department.  
Analysis and appraisal of student's dissertation proposals and reports on surveys of related literature.
- 933. Elementary Education: School Mathematics Learning**  
Spring. 3(3-0) Experience in teaching and enrolled in mathematics education.  
Extensive review of the research of Bruner, Piaget, Gagne, etc., on how students learn in general and how they learn mathematics in particular.
- 934. Elementary Education: School Mathematics Curriculum**  
Fall. 3(3-0) Experience in teaching and enrolled in mathematics education.  
Emphasizes the place of mathematics in the curriculum, the strands of mathematics that should be included—the ordering of topics of each strand and emphasis of the respective strands.
- 940. Research Study in Higher Education Administration**  
Winter, Spring. 1 to 6 credits. May reenroll for a maximum of 6 credits. Doctoral students in Administration and Higher Education programs.  
Supervised and guided in-depth readings in literature and research specific to higher education administration which lead to the development of materials such as position papers, articles for publication, and grant and dissertation proposals.
- 944. Administration of Athletic Medicine and Health**  
Fall, Winter, Summer. 3(3-0) Graduate students or interscholastic coaches.  
Administration of health care in K-12 athletic programs; preventive medicine, legal implications, recognition of trauma and emergency medical management stressed. Growth and development concepts introduced in selection of student athletes.
- 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.
- 951. Community Relations**  
Winter, Spring, Summer. 3(3-0) Approval of department.  
Communications strategies and problems for administrator of educational institutions. Problem identification and analysis are stressed.
- 952. Educational Finance**  
Fall, Summer. 3(3-0) Approval of department.  
Current issues concerning financing public elementary and secondary education in the United States. Current and historical analysis of patterns of revenue and sources and expenditures.
- 953. Education Law**  
Fall, Winter, Summer. 3(3-0) Approval of department.  
Designed to discover general legal principles and examine laws and lawmaking agencies that affect educators and educational institutions and appropriate means to influence law development.
- 954. Planning Facility Learning Environments**  
Spring, Summer. 3(3-0) Approval of department.  
A multi-discipline approach to the learning environment of the individual through life-long educational experiences. Role of the educator and specialists in facilitating the educational program. Sites, building and equipment.
- 955. Educational Personnel Administration**  
Fall, Spring, Summer. 3(3-0) Approval of department.  
Recruitment, selection, orientation, training, salary and fringe benefits, welfare, morale, negotiations, etc., to assist the administrator to function more effectively with personnel.
- 956. Planning Change in Educational Organizations**  
Winter, Summer. 3(3-0) Approval of instructor.  
Analysis of research, theory and practice of the change process in educational organizations. Planned change concepts and methods are examined and tested by laboratory and field experiences.
- 957. The Department in Higher Education**  
Winter. 3(3-0) Approval of department.  
The Department as an administrative structural element of the University. The duties and responsibilities of the chairperson as they relate to the management of the Department.
- 958. Management Systems in Higher Education Administration**  
Fall, Spring. 3(3-0) Approval of department.  
The application of National Center for Higher Education Management Systems tools to decision making in higher education administration. Resource Requirement Prediction Model 1.6, student flow and faculty activity analysis are major tools investigated.
- 959. Using Standardized Tests for Decision Making**  
Fall, Spring. 3(3-0) Approval of department.  
School administrative decision-making based on information yielded by standardized tests. Participants will also engage in private consultations with the instructor concerning system or building data.
- 960. Counseling Theories**  
Winter, Summer. 3(3-0) Approval of instructor.  
Survey of counseling theories and research with emphasis on current issues which have implications for counseling practice or for counselor education.
- 961. Field Research Methods in Education**  
Spring. 3(3-0)  
Methods of interview, participant observation or observation for carrying on educational research.

**Descriptions – Education  
of  
Courses**

- 965A. Psychometric Theory**  
*Spring of even-numbered years. 3(3-0)*  
ED 865, ED 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**  
*Winter of even-numbered years. 3(3-0)*  
ED 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**  
*Spring. 3(3-0) ED 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**  
*Fall, Spring. 4(3-1) ED 867 and ED 869, or Ed 969B.*  
Principles and techniques in survey research with limited consideration of content analysis and observational studies. Sampling, instrumentation, data collection, and data analysis.
- 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, Summer. 4(3-1) ED 869 or pretest and approval of instructor.*  
Principles and techniques in the application of inferential statistics to educational data with emphasis on the analysis of variance and multiple comparison procedures. Overview of regression techniques.  
**C. Experimental Design in Education**  
*Winter, Spring, Summer. 4(3-1) ED 969B.*  
Theory and practice in the design, analysis and interpretation of experimental and quasi-experimental research.
- 970. Reading and Research in Student Teaching**  
*Spring. 3(3-0) Approval of department.*  
Literature, research and practice in teacher education field experiences. Concentration on issues, problems and skills needed in supervision of student teachers.
- 971. Externship in Educational Administration**  
*Fall, Winter, Spring. 3 credits. May reenroll for a maximum of 27 credits. Present or past position as an educational administrator.*  
Discussion of participants' current administrative problems and solution strategies, faculty visits to participants' schools and speakers on issues in educational administration.
- 972. Multidisciplinary Seminar in Educational Administration**  
*Fall, Winter, Spring. 3 credits. May reenroll for a maximum of 18 credits. 9 credits of ED 971.*  
Discussion of generic problems and issues in administration identified and interpreted through selected readings and speakers from the several behavioral sciences.
- 973. College Student Personnel Administration I**  
*Fall. 3(3-0) Approval of department.*  
Emphasis on planning, organization, financing, research, evaluation and administration for programs and services which exist principally to serve individual student needs: counseling, orientation, health, placement, financial aids, etc.
- 974. College Student Personnel Administration II**  
*Winter. 3(3-0) Approval of department.*  
Student organizations and activities; student union; on and off-campus living environments. Emphasis on planning, organization, financing, research, evaluation and administration of these programs and services.
- 975. College Student Personnel Administration III**  
*Spring. 3(3-0) Approval of department.*  
Analysis of student rights and responsibilities; academic freedom; regulation of student conduct; systems of governance and judicial processes; legal basis for student personnel programs and administration.
- 977. Teacher Assessment and Development**  
*Fall. 3(3-0) Completion of 27 credits at graduate level.*  
Concepts of teacher assessment, techniques and instruments for analysis of teaching, current assessment practices, and strategies for teacher development based on needs.
- 978. Professional Lectures in Educational Administration.**  
*Fall. 3(3-0) Graduate students in Educational Administration.*  
Lectures by faculty in Educational Administration in individual faculty research and service interests, exploration of recent research and other scholarly publications.
- 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.
- 985. Counseling Pre-Practicum**  
*Spring. 3(2-1) Doctoral status in college counseling or related area and approval of department.*  
Seminar emphasizing establishing good interpersonal relationships, self-understanding, an understanding of psychodynamics, and test interpretation as preparation for assuming counseling responsibilities. Approach is didactic and experimental with limited contacts with clients.
- 986A. Counseling Practicum I**  
*Fall. 3(0-3) ED 985 or approval of department.*  
Supervised experience working with college students in a counseling relationship. Group discussions, group supervision and observation of counseling interviews, and individual supervision.
- 986B. Counseling Practicum II**  
*Winter. 3(3-0) ED 986A.*  
Supervised experience working with college students in a counseling relationship. Group discussions, group supervision and observation of counseling interviews, and individual supervision.
- 986C. Counseling Practicum III**  
*Spring. 3(0-3) ED 986B.*  
Supervised experience working with college students in a counseling relationship in the residence halls. Individual supervision, increased client contact hours, and participation in staff activities.
- 987A. Seminar: Continuing Education and Social Policy**  
*Fall. 3(3-0) May reenroll for a maximum of 6 credits. Majors or approval of department.*  
Continuing education, as social force impacting and impacted by government and corporate policy. Examination of domestic and foreign examples of interaction between social policy and continuing education.
- 987B. Seminar: Continuing Education in Higher Education Institutions**  
*Winter. 3(3-0) May reenroll for a maximum of 6 credits. Majors or approval of department.*  
Patterns, problems, and potential for continuing education in two and four year colleges. Problems of governance, reward system, leadership roles, etc.
- 988. Behavioral Counseling Laboratory**  
*Fall, Winter, Spring. 1 to 6 credits. May reenroll for a maximum of 21 credits.*  
Supervised experience in behavioral counseling (individual and group), community consultation, applied behavioral research, journal manuscript preparation, preparing instructional materials, and instructional management.
- 990A. Field Experience: Special Education Administration Simulation**  
*Spring. 3(0-9) Approval of department.*  
Supervised graduate practicum in administration of the Special Education program of a simulated school district.
- 990B. Field Experience: Special Education Administration**  
*Fall, Winter, Spring, Summer. 3 to 12 credits. May reenroll for a maximum of 18 credits. Approval of department.*  
Supervised graduate practicum or internship in special education administration.

**990C. Field Experience: Special Education**  
Spring. 3 to 12 credits. May reenroll for a maximum of 18 credits. Approval of department.  
Supervised graduate practicum in special education teacher training.

**999. Doctoral Dissertation Research**  
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

## ELECTRICAL ENGINEERING AND SYSTEMS SCIENCE

### College of Engineering

#### Electrical Engineering

E E

**275. Consumer Electronics**  
Fall, Winter, Spring. 3(3-0)

Electronic circuit components and devices; their operation in transmitters, receivers, stereoamplifiers, etc. Electronic measurements, magnetic recording, speaker systems, and other topics will be considered.

**300. Electric Circuits I**  
Fall, Winter. 4(4-0) MTH 113.

Current voltage and power. DC and transient circuit analysis. Forced response. Sinusoids and the phasor concept. Bridges.

**301. Electric Circuits II**  
Winter, Spring. 4(4-0) E E 300, MTH 214.

Sinusoidal steady-state response. Average power and rms concepts. Complex frequency response. Magnetically coupled circuits. Two-port networks. Transfer functions.

**302. Basic Electronic Circuits**  
Spring, Summer. 4(4-0) E E 301, MTH 215.

Volt-ampere characteristics of diodes and transistors. Voltage, current and power amplification. Stability, transient and high-frequency effects. Feedback, oscillators and operational amplifiers.

**303. Electronics Laboratory I**  
Winter, Spring. 1(0-3) E E 300; E E 301 concurrently.

Electronic test equipment and measurement fundamentals. Experimental verification of topics covered in E E 300 and E E 301. Computer-aided circuit analysis and design.

**304. Electronics Laboratory II**  
Fall. 1(0-3) E E 302.

Experimental verification of topics covered in E E 302. Single-stage and multi-stage transistor amplifier design and analysis. Applications of linear integrated circuits. Computer-aided circuit design.

**305. Electromagnetic Fields and Waves I**  
Fall, Winter. 3(3-0) MTH 310, PHY 288.

Vector analysis, Electrostatic fields; EM sources, scalar potential, Poisson's and Laplace's equations, dielectric media, capacitance, and energy storage. Boundary value problems for electrostatic fields.

**306. Electromagnetic Fields and Waves II**  
Winter, Spring. 3(3-0) E E 305.

Magnetostatic fields; EM sources, vector potential, magnetic media, inductance, and energy storage. Time-varying fields and Maxwell's equations; energy conservation, potential theory, and EM boundary-value problems.

**307. Electromagnetic Fields and Waves III**  
Spring, Summer. 3(3-0) E E 306; E E 308 concurrently.

Application of Maxwell's equations; radiation, propagation, reflection, and power flow of plane EM waves; EM boundary value problems. Transmission line theory: transient and steady state waves, standing and traveling waves, reflections and standing-wave-ratio.

**308. Fields and Waves Laboratory**  
Spring, Summer. 1(0-3) E E 306; E E 307 concurrently.

Experimental investigation of: charged particle motion in EM fields, dielectric and magnetic properties and materials, probing of currents and charges, and propagation of transient and steady-state waves. Digital computer solutions for EM field and wave problems.

**345. Introduction to Electronic Instrumentation Systems**  
Fall, Winter, Spring. 4(3-3) PHY 288.

Basic electronic concepts; passive and active components; operational amplifiers; switching devices, equivalent circuits; transducers; signal conditioning; recording; data management; basic elements of control.

**415. Control Systems Design**  
Winter. 3(3-0) SYS 313. Interdepartmental with Systems Science.

Controller design via root locus and frequency response methods; controllability, observability; state-space design techniques for continuous and computer-controlled feedback systems; survey of digital control.

**418. Introduction to Computer-Aided Circuit Design**  
Spring. 3(3-0) CPS 120, E E 302.

Introduces the techniques used for automatic formulation, analysis and optimization of linear and nonlinear electronic circuits. Students will write a modest but useful analysis program package.

**419. Physical Phenomena and Electronic Instrumentation I**  
Winter. 4(3-3) PHY 289, PHY 298 or approval of department, MTH 215. Interdepartmental with and administered by the Department of Physics.

Concepts of electronics relative to uses in investigations of physical phenomena and their subsequent applications to provide reliable instrumentation. Nuclear radiation detectors, photometers and magnetometers are examples of specific topics covered.

**420. Electromechanical Energy Conversion**  
Winter. 3(3-0) E E 301, E E 305.

Review of electromagnetics; design, specification, and use of d.c. machines in industrial and servo-control application, synchronous generators and transformers for power systems; three phase power, per unit notation.

**421. Power System Analysis**  
Spring. 3(3-0) E E 420.

Model of power system components; analysis and planning techniques including load flow, short circuit, transient stability; voltage and frequency control; economic operation of power systems.

**430. Digital Electronics I**  
Fall. 3(3-0) E E 302.

Characteristics and applications of digital integrated circuits. Number systems and Boolean algebra. Gates, flip-flops, clocks, counters, shift registers, A/D and D/A converters. Basic applications of these devices.

**431. Digital Electronics II**  
Winter. 3(3-0) E E 430 or CPS 421.

Basics of minicomputer and microcomputer based systems. Programming fundamentals. The I/O bus. Interfacing, data acquisition, data storage, and data communication. Practical design problems.

**433. Digital Electronics Laboratory**  
Winter, Spring. 1(0-3) May reenroll for a maximum of 2 credits. E E 431 or concurrently.

Design, construct and test representative digital electronic circuits. Hands-on experience with minicomputer, microcomputers and programmable calculators. Applications in data acquisition and control.

**435. Guided Transmission Systems**  
Fall. 3(3-0) E E 307.

Guided wave theory; normal modes, propagation characteristics in rectangular and circular waveguides. Stripline and microstrip. Electromagnetic resonators; frequency and Q. Circuit theory of waveguiding systems. Scattering matrix; system applications.

**436. Radiation and Propagation of Electromagnetic Waves**  
Winter. 3(3-0) E E 307.

Radiation, propagation, scattering and reception of electromagnetic waves; circuit and radiation characteristics of wire and microwave and antennas; radiation fields, self and mutual impedances of antennas and arrays; microwave aperture antennas.

**438. Transmission and Radiation Laboratory**  
Winter. 1(0-3) E E 435; E E 436 concurrently.

Microwave transmission and radiation laboratory. Measurement of frequency, wavelength, standing waves, impedance, and power. Experiments on transmission lines, waveguides, cavity resonators, microwave circuits, and circuit and radiation properties of antennas.

**455. Deterministic Communication Systems**  
Fall. 3(3-0) Approval of department.

Communication systems. Representation of signals in time and frequency domain. Processing of signals by linear, simple nonlinear and time-variant systems. Linear and nonlinear, analog and digital modulation and demodulation; for example, AM, FM, PCM.

**456. Applied Probability in Communication Theory**  
Winter. 3(3-0) E E 455 or approval of department.

Probability theory applied to communications. Representation of random signals as stochastic processes. Autocorrelation and spectral density. Noise in components and systems, performance of analog linear and nonlinear systems with noise.