337. Forest and Shade Tree Entomology
Fall. 4(3-2) N S 193.
Provides an understanding of significance and nature of insect injury to forest and shade trees, based upon morphology, physiology, biology and taxonomy of insect and host. Analyzes biological, chemical, cultural and silvicultural approaches to insect control in order to equip student with competence to carry out survey and action program assignments.

401. Problems
Fall, Winter, Spring, Summer. 1 to 6 credits. May be re-enrolled for a maximum of 12 credits. Approval of department. Advanced individual work on a field or laboratory research problem or a study of published literature on a selected topic.

404. Field Entomology
Summer. 6 credits. One year of zoological science or teaching major in general science or approval of department. Given at W. K. Kellogg Biological Station.
Basic field work in entomology. Emphasis on the biology, collection and identification of insects common to the Gull Lake Biological Station area.

410. Apiculture and Pollination
Spring. 3(2-2)
Biology of the honey bee and some of the wild bees. Relationships between bees and flowering plants. Value of bees in crop pollination. Introduction to management with visits to the University apiary.

411. Seminar
Fall, Winter. 1(1-0) Majors or approval of department. Reports by students, faculty, and representatives of the profession, with emphasis on current problems not covered in regular college subjects.

418. Systematic Entomology
Winter. 4(3-0) 301, 302.
General taxonomic course to acquaint the student with the various groups of insects.

420. Aquatic Insects
Fall. 4(2-4) 301, 302.
Biology, ecology and systematics of aquatic insects.

421. Stream Ecology
Summer. 3 credits. 420 or approval of department. Given at W. K. Kellogg Biological Station.
An in-depth examination of stream ecosystems—physical, chemical and biological aspects. Field work will be centered on local streams. Laboratory exercises will involve manipulations necessary for the determination of population energy budgets, with special emphasis on aquatic insects.

430. Economic Entomology
Winter. 3(3-2) 301, 302.
Recognition, life histories, behavior, ecology and integrated control of insects of economic importance.

438. Taxonomy of Immature Insects
Spring of even-numbered years. 4(1-9)
418.
Identification of immature insects with particular emphasis on the Holometabola.

440. External Morphology of Insects
Fall. 4(2-8) 301, 302, or approval of department.
Morphological concepts of external skeletal parts of insects. Emphasis on evolutionary development of structures from the Apterygota through the Pterygota.

441. Internal Morphology
Winter. 4(2-6) 440 or approval of department.
Morphology of the internal structure of insects. Emphasis on the evolutionary development of organs and organ systems of various representative insects.

450. Insect Physiology
Spring. 4(3-3) 441; PSL 401; 1 year of chemistry or approval of department.
Comparative physiology of insects with historical and functional aspects of organs and organ systems.

460. Medical Entomology
Winter. 4(3-3) 301, 302, or approval of department.
Distribution and biology of important arthropod vectors of diseases to man, disease symptoms, life cycle of the infectious agent, reservoirs, urticating arthropods, anaerobic reactions, myiasis, and parasitic measures.

470. Introductory Nematology
Winter of odd-numbered years. 3(2-2) Interdepartmental with the Department of Botany and Plant Pathology.
Biology, taxonomy and control of plant parasitic and saprophytic nematodes.

480. Insects in Relation to Plant Diseases
(860.) Winter of even-numbered years. 4(2-4) 302. Interdepartmental with the Department of Botany and Plant Pathology.
Relationships of insects, mites and nematodes to important plant diseases incited by bacteria, fungi, viruses and toxins. Mode of transmission and means of control. Transmission techniques and important plant-pathogen-insect relationships.

490. Topics in Entomology
(870.) Fall, Winter, Spring, Summer. Variable credit. Majors or approval of department.
Advanced work in medical entomology, acarology, advanced forest entomology, soil arthropods, behavior and biological control.

508. Advanced Taxonomy
Fall, Winter, Spring. 4(0-15) May re-enroll for a maximum of 24 credits.
Classification in depth of a single order of insects, including comparative studies of the group and survey of recent and classical literature.

811. Ecology of Aquatic Insects
Summers of even years given in 1969. 3 credits. 420 or approval of department. Given at W. K. Kellogg Biological Station.
Aquatic insects, their physiology, distribution, and density. Preparation of energy budgets for natural populations.

820. Insect Ecology
Fall of even-numbered years. 3(3-3)
Approval of department.
Insects and various invertebrates in relation to their environment. Factors affecting populations, speciation and distribution. Application of basic ecological principles to integrated control measures.

821. Advanced Stream Ecology
Summer. 3 credits. 421 or approval of instructor. Given at W. K. Kellogg Biological Station.
Stream ecosystem energy budget models with emphasis on individual projects involving both laboratory and field experiments. Particular use will be made of artificial streams and locally abundant species of aquatic insects.

530. Insect Biochemistry
Spring of even-numbered years 4(4-6). 450; BCH 401.
Energy metabolism, intermediary metabolism and the biochemistry of development in insects; stresses biochemical differences between insects and higher animals.

583. Insect Biochemistry Laboratory
Summer of even-numbered years. 2(0-6) 530 or concurrently.
Laboratory to accompany 830. Experiments designed to elucidate the biochemical mechanisms of importance to insects.

583. Principles of Taxonomy
Spring of odd-numbered years. 3(3-0)
Twenty credits in zoology and/or entomology, or approval of department.
Methods and principles of systematic zoology and entomology, including a historical survey of the pre-Linnaean and post-Linnaean systems of classification. International rules of zoological nomenclature and their emendations.

540. Insect Toxicology
Winter of odd-numbered years. 5(3-6) 301, 302; organic chemistry.
Chemical and physical properties of insecticides, relationship of chemical structure to mode of action, and physiological basis of toxicological action.

881. Biology of the Arthropoda
Winter. 5(3-8) ZOL 481 or approval of department. Interdepartmental with and administered by the Zoology Department.
Ecology, life cycles, morphology, taxonomy, and distribution of arthropods other than insects.

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

940. Analytical Techniques for Biological Compounds I
Fall. 4(3-6) Organic chemistry, approval of department.
Application, extraction, cleanup and purification techniques employed in analysis of biologically active compounds. Stresses use of radioisotopes, and column, paper, thin-layer, and molecular sieve chromatography.

941. Analytical Techniques for Biological Compounds II
Winter. 4(2-6) 940.
Analytical techniques used for identification and quantitation of biologically active compounds. Emphasis on spectroscopy and gas-liquid chromatography.

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

EXTENSION PERSONNEL DEVELOPMENT — Descriptions of Courses

College of Agriculture and Natural Resources

501. Seminar in Cooperative Extension Service
Fall, Winter, Spring. Summer. 1 to 3 credits. Approval of department.
880. Special Problems
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 6 credits.
Supervised readings and independent study of selected topics, for students of tera to term; application of social research to extension, marketing and 4-H programs, and special problem papers.

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

FAMILY AND CHILD
SCIENCES*

College of Human Ecology

145. Relationships in the Modern Family
Fall, Winter, Spring. 3(3-0) Freshmen or Sophomores or approval of department. Students may not receive credit in both 145 and S 228.
Family relationships throughout the life cycle. Changing nature of families in contemporary society; approval of attitudes and roles in family living; development of realistic patterns for cohesiveness and marriage in an increasingly complex world.

261. Human Development in the Family
Fall, Winter, Spring. Summer of odd-numbered years. 3(3-0) Sophomores. Influences of values in a society upon the patterns of family life; normal growth and development of family members; changing roles of family members; conflicts in roles; family structure around the world; family authority patterns; value orientations.

362A. Child Study
(Fall) Fall, Winter, Spring. Summer of odd-numbered years. 3(3-0) Sophomores. Study of young children. Observation of development in pre-natal through adolescent period. Observation of children of various ages.

362B. Child Study-Laboratory
(Fall) Fall, Winter, Spring. 1(0-3) 362A concurrently and approval of department.

364. Guidance of Young Children
Fall, Winter, Spring. 3(2-2) 362 or PSY 345 or approval of department. Examination of philosophy of child guidance and their relation to knowledge of child development and behavior. Supervised practice in guiding young children in a nursery school setting.

365. Human Sexuality in the Family
Winter. 3(3-0) Credit may not be earned in both FCS 365 and PSY 290. Juniors. Emphasizes a life process approach of human sexuality—biologically, psychologically, socially as it develops from prenatal life to old age within the family.

369A. Learning Resources in the Nursery School
(Fall) Winter, Spring. 3(3-0) Majors, 362, others, ED 319. Selection and use of play materials and equipment for group work with young children and function of these materials in development of child.

369B. Learning Resources in the Nursery School—Laboratory
(Fall) Winter, Spring. 1(3-0) 369A concurrently and approval of department.

400H. Honors Work
Fall, Winter, Spring. Summer. Variable credit. May re-enroll for a maximum of 16 credits. Seniors; approval of department.

444. Interpersonal Relations Within the Home
Fall, Spring. Summer of even-numbered years. 3(3-0) 201 or approval of department.
Develops an understanding of the dynamics of the various relationships within families. Planned to meet personal needs as well as preparation for those entering professions related to the family-life field. Current family-life literature.

446. Approaches to Studying the Family
Fall, Winter. Summer of odd-numbered years. 3(3-0) 145, S 223, PSY 160 or 170 or ED 200, or approval of department. Course to increase understanding of human relations in families and other small groups, and of one's self in a group. Readings, case studies, literary materials, films, and observations of living situations are included.

461. Growth and Behavior of the Individual Child
Fall, Winter. 3(3-2) 364; others: 362 or PSY 345 or ED 312. Child's progress as he interacts with his environment followed through observations in nursery school and at home and through use of nursery school records. Various measuring and summarizing devices.

463. Physical Development of Children
Winter. 3(2-2) 362 or ED 312; HNF 162. Growth patterns and factors influencing them. Experimental evidence of nutritional requirements.

464A. Participation in the Nursery School
Fall, Winter, Spring. Summer of odd-numbered years. 3 to 6 credits. Majors: 364, 369; others: 362 or ED 312 and approval of department, 463 concurrently.

467. Nursery School Administration
Spring. 3(3-3) 464A or concurrently. Housing and equipment, costs, staff, program, health protection, and community relations. School planning and organization.

484. Nursery School and Parent Education
Fall, Winter, Spring. Summer of odd-numbered years. 3 credits. Majors: 364, 369; others: 362 or ED 312 and approval of department, 464A concurrently.

495. Independent Study
Fall, Winter, Spring, Summer. 4 to 12 credits. May re-enroll for a maximum of 12 credits. Approval of department. Study of a selected topic under the guidance of a faculty adviser in the area of specialty.

496. Field Study
Fall, Winter, Spring, Summer. 4 to 12 credits. May re-enroll for a maximum of 12 credits. Approval of department. Study in off-campus situations in a variety of ways using involvement in volunteer, governmental or business-sponsored community service agencies to further insights into interaction among the individual, the family and the community.

501A. Seminar in Family Life
(Fall) Fall, Winter, Spring. 3(3-0) May re-enroll for a maximum of 12 credits. Approval of department.

501B. Seminar in Child Development
(Fall) Fall, Winter, Spring. 3(3-0) May re-enroll for a maximum of 12 credits. Approval of department.

810. Workshop
Summer. Variable credit. Approval of department.
Content varies depending on nature of workshop.

813B. Special Studies in Family Life and Child Development
Fall, Winter, Spring. Variable credit. Approval of department.

820. Human Development in the Family: Psychological Development
Fall. 4(4-0) Six credits in child development or approval of department. Selected aspects of family members' psychological potential, development, status explored. Family's contributions to members' psychological potential for growth and development and to realization of human potential are seen as fundamental.

821. Human Development in the Family: Personality
Winter. 4(4-0) Six credits in child development or approval of department. Influence of child-rearing practices and parent-child relationships on developing human personality. Application of research findings and theoretical approaches to psychological development in the family and family-related situations.

822. Human Development in the Family: Socialization
Spring. 4(4-0) Basic course in sociology; 6 credits in child development or family life or approval of department. Influence of family structure and interaction upon socialization from infancy to adulthood. Relationship of family to processes in larger social environment, and influence of these on human social development.

830. Individual Readings
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

862. Advanced Child Study
Spring. Summer of odd-numbered years. 3(3-0) 362 or ED 312 or approval of department.
Current trends in field of child development based on research and on significant new books. Careful observations of children in a variety of informal situations will be made within the limits of available resources.

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