440. Automation in Packaging
Fall. 3(2-2)
P: MTH 124.
Automated systems: configurations, components, sensors, drive mechanisms, and control systems. Robotic safety. Material handling, line inspection, vision systems, automated storage and retrieval systems. Economics. Field trips requi red.

452. Medical Packaging
Fall. 4(3-2)
P: PKG 322 or PKG 323.
Special requirements for packaging pharmaceuticals and medical devices. Evaluation of package systems and packaging procedures.

455. Food Packaging
Spring. 3(3-1)
P: PKG 322, PKG 323. R: Open only to juniors or seniors or graduate students in the Packaging major.
Food package systems related to specific products and processes. Product composition: problems and packaging solutions, shelf life considerations, and packaging lines.

460. Distribution Packaging and Performance Testing
Spring. 3(2-2)
P: PKG 410. R: Open only to sophomores or juniors or seniors or graduate students in the School of Packaging.
Interrelationships between packaging and distribution systems. Transportation, material handling, warehousing. Logistics and management systems. Performance testing and industry practices. Package container design and testing.

475. Packaging Economics
Fall. 3(3-0)
P: EC 201 or EC 202.
Economic issues in packaging as they relate to policies of the firm and of government. Relationships between economic policy and societal issues.

480. Packaging Laws and Regulations
Spring. 3(3-0)
P: PKG 322 or PKG 323. R: Open only to sophomores or juniors or seniors or graduate students in the School of Packaging.
History and development of packaging laws and regulations. Relationships among law, government regulation and commercial regulation. Effect of current laws and regulations on packaging.

485. Packaging Development (W)
Fall, Spring. 4(4-0)
P: PKG 410, PKG 415, PKG 432. R: Open only to seniors or graduate students in a Packaging major. Completion of Tier I writing requirement.
Package development including selection, design and implementation of package systems for protection, distribution, merchandising, use and disposal.

490. Directed Studies in Packaging Problems
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
P: PKG 322, PKG 323. R: Open only to sophomores or juniors or seniors or graduate students in the School of Packaging. Approval of department; application required.
Development of solutions to specific packaging problems. Supervised individual study.

491. Special Topics
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course.
Selected topics of current interest.

492. Senior Seminar
Fall, Spring. 1(2-0)
R: Open only to seniors in Packaging.
Seminar on current packaging issues, business organization and operations, and accepted practices in a corporate environment.

805. Advanced Packaging Dynamics
Spring. 3(2-2)
P: PKG 410.
Shock and vibration. Distribution hazards and product fragility. Cushion performance and package design. Environmental measurement and simulation.

815. Permeability and Shelf Life
Spring. 3(2-2)
P: MTH 124 or MTH 132; PKG 322, PKG 323.
Relationship between the storage life of packaged food and pharmaceutical products and the gas, moisture, and organic vapor permeability of packages in various environments.

817. Instruments for Analysis of Packaging Materials
Fall of even-numbered years. 4(3-2)
P: PKG 322, PKG 323.
Analytical methods for packaging including spectrophotometry and chromatography. Material identification and characterization. Migration and permeation measurements.

825. Polymeric Packaging Materials
Fall. 4(3-2)
P: PKG 323.
Physical and chemical properties of polymeric materials and structures used in packaging. Relationship of properties to performance.

875. Stability and Recyclability of Packaging Materials
Fall of odd-numbered years. 3(3-0)
P: PKG 322, PKG 323.
Interactions between packaging materials and environments: corrosion, degradation, stabilization, and recycling. Impacts of packaging disposal.

890. Independent Study in Packaging
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 4 credits in all enrollments for this course.
R: Open only to graduate students in Packaging. Approval of department; application required.
Special investigations of unique packaging problems.

891. Selected Topics
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course.
R: Open only to graduate students in Packaging.
Selected topics of interest to graduate packaging students.

899. Master's Thesis Research
Fall, Spring, Summer. 1 to 8 credits. A student may earn a maximum of 99 credits in all enrollments for this course.
R: Open only to Master's students in Packaging.

985. Analytical Solutions to Packaging Design
Spring of odd-numbered years. 3(3-0)
P: PKG 825 R: Open only to graduate students in the College of Agriculture and Natural Resources, College of Engineering, and College of Natural Science. Approval of department; application required.
Analytical and quantitative techniques for packaging design and evaluation.

992. Packaging Seminar
Fall. 1(2-0) A student may earn a maximum of 3 credits in all enrollments for this course.
R: Open only to graduate students in packaging.
Presentations of detailed studies on specialized aspects of packaging.

999. Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 50 credits in all enrollments for this course.
R: Open only to Doctoral students in packaging.

PARK, RECREATION AND TOURISM RESOURCES PRR

Department of Park, Recreation and Tourism Resources
College of Agriculture and Natural Resources

100. Recreation in Michigan Natural Resources
Spring. 3(3-0)
The scope and status of Michigan natural resources used for recreation. Historical and philosophical foundations of management and policy. Analysis of contemporary environmental and recreational policy issues.

200. Leisure and Society
Fall, Spring, Summer. 3(3-0)
Leisure and recreation as part of daily life. Leisure as a social, psychological, political, economic and cultural force in the United States.

210. Our National Parks and Recreation Lands
Fall, Spring, Summer. 3(3-0)
Scope and history of federal recreation lands. Comparisons of national parks to other federal lands. Recreation land management in other nations. Future federal land management options.

213. Introduction to Parks, Recreation, and Leisure
Fall, Spring, Summer. 3(3-0)
The scope and management of recreation services and resources. Historical and philosophical foundations. Influence of recreation behavior on state, national, international, economic, political and social institutions.

215. Recreation Program Management
Fall, Spring. 4(3-2)
Programming and leadership principles for planning, management, and evaluation. Program design and conduct to service different clienteles, using leisure education, program development, and small group processes. Field trips required.

293. Field Work in Park and Recreation Resources
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 4 credits in all enrollments for this course.
P: PRR 213, PRR 215. R: Open only to students in Park and Recreation Resources. Approval of department.
Professional field experience in a park or recreation setting.

300B. Coaching Sports for Athletes with Disabilities
Spring of even-numbered years. 2(2-0) Interdepartmental with Physical Education and Exercise Science. Administered by Physical Education and Exercise Science.
Rules, strategies, and training. Developing and evaluating player skills. Planning, conducting, and evaluating sport practices. Health and safety concerns.

302. Environmental Attitudes and Concepts
Fall. 3(3-0)
P: One ISS course or one PSY course or one SOC course. R: Not open to freshmen.
History of attitudes and values associated with the environment, wilderness, environmentalism, environmental quality, conservation, and preservation. Perceptions and assessment of modern environmental problems.

320. Human Behavior in Park and Recreation Settings
Spring. 3(3-0)
P: One PSY course or one SOC course.
Antecedents, intervening conditions, and outcomes of human behavior in park, recreation, and leisure settings. Interactions between recreation behavior and the natural environment. Problem solving in recreation.

351. Recreation and Natural Resources Communication (W)
Fall. 3(2-2)
P: PRR 213. R: Not open to freshmen. Completion of Tier I writing requirement.
Principles of communication for recreation and natural resource audiences. Application to various forms of interpretive media including verbal, graphic, and written. Field trips required.

362. Recreation for Special Populations
Spring. 3(3-0)
P: PRR 213. R: Not open to freshmen.
Therapeutic recreation services emphasizing handicapper and geriatric characteristics. Chemical dependency issues. Leisure lifestyle issues. Philosophical foundations and service models. Integration, normalization, inclusion, and em powerment concepts.

370. Administration and Operation of Park and Recreation Systems
Fall. 3(3-0)
P: PRR 213, PRR 215. R: Not open to freshmen and sophomores.
Policy, administration, and operations of park, recreation and tourism organizations.

371. Management of Park and Recreation Agencies and Organizations
Spring. 3(3-0)
P: PRR 213, PRR 215. R: Not open to freshmen and sophomores.
Management concepts and methods. Budgeting, service marketing, and strategic planning in park, recreation and tourism organizations.

393. Professional Seminar
Fall, Spring. 1(1-0)
P: PRR 293. R: Open only to majors in Park and Recreation Resources.
Linkage of field work and internship. Integration of course work with professional practice.

410. International Studies in Tourism, Parks and Recreation
Fall, Spring, Summer. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course.
R: Not open to freshmen and sophomores. Approval of department; application required.
Influence of tourism, parks and recreation on social, economic and political systems. Management of cultural, historical and natural resources as they relate to tourism, parks and recreation.

419. Geographical Information Systems in Natural Resource Management
Spring. 4 credits. Interdepartmental with Fisheries and Wildlife, Geography, Forestry, Resource Development, and Agricultural Engineering. Administered by Fisheries and Wildlife.
P: GEO 221.
The application of geographic information systems, remote sensing, and global positioning systems to integrated planning and management for fish, wildlife, and related resources.

443. Parks and Recreation Planning and Design Concepts
Spring. 4(2-4)
P: PRR 351. R: Not open to freshmen and sophomores.
Planning models and design analysis, synthesis, and communication and recreation and tourism subsystem and supply analysis.

449. Management of Natural Resource Based Recreation
Fall. 3(3-0)
R: Not open to freshmen and sophomores.
The history of natural resource recreation management in the U.S. Techniques for dispersed and developed recreation management. Security of facilities, visitors, and personnel.

451. Park Interpretive Services and Visitor Information Systems
Spring of odd-numbered years. 3(2-2)
R: Not open to freshmen and sophomores.
Orientation, management, and education information systems. Influencing visitor behaviors. Goals and functions of interpretation. Types of services. Nature/visitor center programming and facility design and layout. Historical-cultura l interpretation.Field trips required.

460. Resource and Environmental Economics
Spring. 3(3-0) Interdepartmental with Resource Development, Public Resource Management, and Biosystems Engineering. Administered by Resource Development.
P: RD 200; EC 201 or EC 202 or PRM 201 or RD 302.
Economics of land and related environmental resources. Production and consumption processes. Resource allocations and scarcity. Market failure and externalities. Market and institutional remedial approaches.

464. Natural Resource Economics and Social Science (W)
Fall. 3 credits. Interdepartmental with Forestry, Fisheries and Wildlife, and Resource Development. Administered by Forestry.
P: EC 201 or EC 202. R: Not open to freshmen and sophomores. Completion of Tier I writing requirement.
Application of economic and social science principles and techniques to production and consumption of natural resources. Benefit-cost analysis. Regional impact analysis. Social impact assessment.

466. Natural Resources Planning and Policy
Spring. 3 credits. Interdepartmental with Forestry, Fisheries and Wildlife, and Resource Development. Administered by Forestry.
R: Open only to seniors and graduate students in Forestry; Fisheries and Wildlife; Park, Recreation and Tourism Resources; and Resource Development. Approval of department; application required.
Scientific, environmental, social, and institutional factors affecting planning and policy-making. Focus on ecosystem-based planning and policy issues through development of a multiple-use plan. Case studies.

467. Programming in Therapeutic Recreation
Fall. 3(3-0)
P: PRR 362.
Comprehensive and individual program planning methods. Standards of practice, quality assurance, interview techniques, professional ethics, and terminology. Field trips required.

468. Therapeutic Recreation Techniques
Spring. 3(3-0)
P: PRR 467.
Health care documentation. Leisure education. Facilitation techniques. Assistive recreation devices. Principles of pharmacology related to therapeutic recreation. Professional and certification issues.

473. Commercial Recreation and Tourism Enterprises
Fall. 3(3-0)
P: EC 201, PRR 371. R: Not open to freshmen and sophomores.
Management and operation of resort, recreation, and tourism enterprises. Emphasis on small business. Strategic planning, feasibility studies, market assessment, and quality assurance.

474. Community and Natural Resource Based Tourism
Spring of even-numbered years. 3(3-0)
R: Not open to freshmen and sophomores.
Developing and sustaining tourism. Environmental, social, and economic considerations. Roles and responsibilities of agencies and organizations. Impact management. Tourism-based community and rural development.

475. Evaluation in Parks and Recreation
Fall. 3(2-2)
P: STT 200 or STT 201 or PSY 295 or GEO 427. R: Open only to seniors or graduate students.
Evaluation concepts, approaches, and methods. Evaluation in management and administrative functions.

485. Legal Aspects of Parks, Recreation, and Sport
Fall. 3(3-0)
R: Open only to seniors or graduate students.
Legal concepts in management and operation of public and private programs, areas and facilities. Tort liability and risk management planning. Rights and behavior constraints of clientele. Legal foundations of authority.

489. Capstone: Seminar in Zoo and Aquarium Science
Fall, Spring. 1 credit. A student may earn a maximum of 3 credits in all enrollments for this course. Interdepartmental with Zoology, and Fisheries and Wildlife. Administered by Zoology.
R: Approval of department.
Scientific writing and oral presentations related to zoo and aquarium studies.

490. Independent Study
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
P: PRR 215, PRR 320. R: Approval of department; application required.
Individualized readings and research compatible with students' interests and abilities under the guidance of a faculty member.

491. Special Topics in Park and Recreation Resources
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
P: PRR 215; PRR 320. R: Approval of department; application required.
Group studies for advanced undergraduate students having special interests in Park and Recreation Resources.

815. Park and Recreation Program Services
Fall. 3(3-0)
Concepts, theories, and philosophies of leisure and recreation. Role and function of delivery systems in communities. Management of the program-planning process and provision of recreation services to diverse groups.

829. The Economics of Environmental Resources
Fall. 3(3-0) Interdepartmental with Agricultural Economics, Resource Development, Forestry, and Economics. Administered by Agricultural Economics.
Economic principles related to environmental conflicts and public policy alternatives. Applications to water quality, land use, conservation, development, and global environmental issues.

840. Recreation and Tourism Economics
Fall. 3(3-0)
Economic concepts in public and private sector recreation and tourism decisions. Non-market valuation techniques. Regional economic impact. Demand and supply. Forecasting consumption trends. Financial and benefit cost analysis.

841. Park and Recreation Administration and Policy
Fall. 3(3-0)
Administration and management of park and recreation services in urban and rural environments. Policy development and evaluation. Planning, financing, staffing, operating and evaluating organizational structures.

844. Research Methods in Recreation, Parks, and Tourism
Spring. 3(3-0)
Recreation research needs, techniques, assessment and application. Management problems and decision making.

848. The Law and Leisure Services
Spring. 3(3-0)
Risk control. Legal audits. Human rights mandates. Legal information systems. Contracts and participant forms. Intentional tort and negligence concepts. Personnel legal processes.

870. Park, Recreation and Natural Resources Marketing
Fall of odd-numbered years. 3(3-0)
R: Open only to graduate students in Park and Recreation Resources, Resource Development, Forestry, and Fisheries and Wildlife.
Integration of marketing concepts and methods into agency planning and decision making.

874. Leisure, Travel and Tourism
Spring. 3(3-0)
Modern concepts of leisure, travel, and tourism. Historical antecedents and current concepts of leisure, travel, and tourism.

879. Case Studies in Park and Recreation Resources
Spring. 3(3-0)
P: PRR 840, PRR 841.
Integrated approach to policy, planning, and management problems.

890. Independent Study
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 7 credits in all enrollments for this course.
Supervised individual study in an area of parks, recreation, leisure, or tourism.

891. Selected Topics
Fall, Spring, Summer. 3 to 6 credits. A student may earn a maximum of 8 credits in all enrollments for this course.
Selected topics in park and recreation resources of current interest and importance.

892. Park and Recreation Resources Seminar
Fall, Spring. 1 to 2 credits. A student may earn a maximum of 2 credits in all enrollments for this course.
Current policy issues, problems and research in parks, recreation and tourism.

899. Master's Thesis Research
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 99 credits in all enrollments for this course.
R: Open only to graduate students in Park and Recreation Resources. Approval of department.

923. Theory of Resource and Environmental Economics
Spring of even-numbered years. 3(3-0) Interdepartmental with Agricultural Economics, Resource Development, Forestry, and Economics. Administered by Agricultural Economics.
P: AEC 829, EC 805.
Economic theory of environmental change and control. Market and non-market allocation mechanisms. Temporal issues of conservation and growth. Contemporary issues in research and policy.

944. Advanced Research Methods
Summer. 3(3-0)
P: PRR 844.
Applications of advanced and specialized research methods to problems in recreation and tourism. Measurement, sampling, and research design.

999. Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course.
R: Open only to Ph.D. students in Park and Recreational Resources.

PATHOLOGY PTH

Department of Pathology
College of Human Medicine
College of Osteopathic Medicine
College of Veterinary Medicine

525. Neuropathology Problem Solving Exercises
Fall, Spring, Summer. 2 credits.
R: Open only to graduate-professional students in College of Human Medicine or Osteopathic Medicine.
Independent study of 24 neuropathology problem solving exercises.

542. Basic Principles of Pathology
Spring. 2 credits.
R: Graduate-professional students in colleges of Human and Osteopathic Medicine.
Fundamental pathologic processes; clinical applications.

551. General Pathology
Spring. 3(2-2)
R: Completion of 1 semester of the graduate-professional program in the College of Veterinary Medicine. Not open to students with credit in PTH 550.
Host responses to injury, including cell degeneration, necrosis, disturbances of growth and development, neoplasia, circulatory disturbances and inflammation.

553. Clinical and Systemic Pathology
Fall. 5(4-2)
R: Completion of 2 semesters of the graduate-professional program in the College of Veterinary Medicine. Not open to students with credit in PTH 552.
Hematology. Pathology of hematopoietic, lymphatic, digestive, urinary, respiratory, integumentary, cardiovascular, nervous, reproductive, musculoskeletal, endocrine, ocular, and otic systems.

590. Special Problems in Pathology
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 8 credits in all enrollments for this course.
R: Open only to graduate-professional students in College of Human Medicine or Osteopathic Medicine.
Individual directed work on an experimental, theoretical, or applied problem in pathology.

608. Pathology Clerkship
Fall, Spring, Summer. 1 to 8 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
R: Open only to graduate-professional students in College of Human Medicine or Osteopathic Medicine.
Anatomic and clinical pathology with emphasis on clinical-pathological correlation. Conducted in pathology departments of affiliated hospitals.

609. Laboratory Medicine Clerkship
Fall, Spring, Summer. 1 to 8 credits. A student may earn a maximum of 16 credits in all enrollments for this course.
P: For graduate-professional students in College of Human Medicine: FMP 602, FMP 608, MED 608, PHD 600. For graduate-professional students in College of Osteopathic Medicine: Completion of Units I and II. R: Open only to graduate-professional students in College of Human Medicine or Osteopathic Medicine.
Laboratory procedures. Correlation of laboratory data with morphologic abnormalities in patients with pathophysiology.

630. Diagnostic Pathology Clerkship
Fall, Spring. 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
P: Completion of semester 5 of the graduate-professional program in the College of Veterinary Medicine. R: Not open to students with credit in PTH 651 or PTH 652.
Necropsy and surgical and clinical pathology. Interpretation of gross findings and laboratory data.

631. Necropsy Clerkship
Fall, Spring. 3 credits.
P: PTH 630. R: Completion of 5 semesters of the graduate-professional program in the College of Veterinary Medicine.
Supervised necropsy. Interpretation and presentation of findings.

632. Problems in Veterinary Pathology
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
R: Completion of 5 semesters in the graduate-professional program in the College of Veterinary Medicine. Approval of department.
Supervised projects involving gross pathology, histopathology, clinical pathology, or molecular pathology.