Other Graduate Courses

The 400- and 500-level courses listed below are offered by Southern Illinois University for graduate credit.

AGRICULTURE

Courses (AGRI)

AGRI 401-3 Fundamentals of Environmental Education. (Same as FOR 401 and REC 401) A survey course designed to help education majors develop an understanding of environmental education principles and teaching both inside and outside the classroom. Requires field trip transportation fee not to exceed $25 per course registration. Prerequisite: Ten hours of biological science or ten hours of recreation and/or education, or consent of instructor.

AGRI 423-3 Environmental Interpretation. (Same as FOR 423 and REC 423) Principles and techniques of natural and cultural interpretation. Two hours lecture, three hours laboratory. Prerequisite: ten hours biological science or ten hours of recreation. Requires field trip transportation fee not to exceed $40 per course registration.

AGRI 450-2 Farming Systems Research and Development. An introduction to farming systems, which is an interdisciplinary approach to agricultural research and development emphasizing small farms. The whole farm is viewed as a system of interdependent components controlled by the farm household. Focuses on analyzing interactions of these components as well as the physical, biological, and socioeconomic factors not controlled by the household. Techniques of analysis are applicable domestically and internationally.

AGRI 481-1 International Agricultural Seminar. Discussion of special topics relating to worldwide agricultural development. Special approval needed from the instructor.

AGRI 595-1 to 6 Instruction in Agricultural Sciences. Acquaints the student with different teaching environments and styles. Students will be expected to participate in instructing agricultural sciences courses. Special approval needed by the instructor.

AGRICULTURE SYSTEMS

Courses (AGSE)

AGSE 402A-3 Problems in Agricultural Education. (Same as PSAS 402A) Designed to improve the techniques related to award programs and application processes of agricultural education specialists through discussion, application, organization, and assignment to problems in the field of agricultural education. Emphasis will be placed on conceptual understanding of FFA and Agriculture Education award programs, applications, Supervised Agricultural Experience Program, and National Chapter Award Program, affiliated professional partnerships, and external sources for developing the entire Agricultural Education program. Prerequisite: AGSE 110 Introduction to Agricultural Education with a grade of B or better.

AGSE 402B-1 to 6 Problems in Agricultural Technologies. (Same as PSAS 402B) Designed to improve the techniques of agricultural mechanization workers through discussion, assignment, and special workshops on problems related to their field. Emphasis will be placed on new innovative and currently developed techniques for the field. Not for graduate credit. Special approval needed from the department.

ARMY MILITARY SCIENCE

Courses (AMS)

AMS 404-3 U.S. Military History. This course provides a historical perspective to decisions made by American military leaders; emphasizing solutions to challenges future Army officers might face: battlefield complexity, resource limitations, teamwork deficiencies, etc. The student will learn how former military leaders confronted and coped with similar issues, using their experiences and approaches to arm students with the ability to create their own solutions. Commissioning requirement for Army ROTC cadets. Course not restricted to ROTC cadets.

AVIATION

Courses (AVM)

AVM 551-3 Aviation Policy, Law, and Regulation. (Same as POLS 551) Examination of the history of American aviation policy, law and regulation. The course focuses primarily on the development, implementation and enforcement of aviation policies and regulations at the federal level. Special attention is paid to the interaction of various government agencies and constituency groups, such as the aircraft industry, airport authorities, airlines, private pilots and passengers. In addition to the historical survey, students will analyze current policy and regulatory trends and identify future problems and opportunities for American aviation policy. Restricted to enrollment in MPAA graduate program or consent of instructor.

AVM 552-3 Advanced Airport Administration. (Same as POLS 552) This course will address the role and function of the airport administrator, especially related to the tasks of developing, operating and maintaining various airport services to meet the needs of key airport users. This course will study key airport administration cases at primary, commercial service, reliever and general aviation airports. Meeting key airport regulations concerning operations and security will be a focus of the course. Restricted to enrollment in MPAA graduate program or consent of instructor.

AVM 553-3 Advanced Airport Safety Administration. (Same as POLS 553) The Aviation Safety Administrator`s job function and responsibility for safety and accident prevention within an aviation organization is examined using the case study method. The relevant theory, concepts, procedures and techniques of resource allocation, organizational design, decision modeling, task assignment, delegation of authority and responsibility, establishment of organizational goals and priorities and risk management as they relate to Aviation Safety are included. The job functions of an Aircraft Accident Investigation Team and of an Aviation Safety Inspector will be studied. Aviation safety administration literature will be reviewed. Restricted to enrollment in MPAA graduate program or consent of instructor.

AVM 554-3 Aviation Planning. (Same as POLS 554) Examination of aviation planning at the international, federal, state and local levels. The course focuses primarily on federal aviation planning, but considerable attention is paid to the interdependent relationship between the various levels of planning. Special attention is paid to the planning process and the role of various agencies and client groups within the aviation community. Restricted to enrollment in MPAA graduate program or consent of instructor.

BIOCHEMISTRY

Courses (BCHM)

BCHM 451A-3 Biochemistry. (Same as CHEM 451A and MBMB 451A) First half of the 451A,B two semester course. Must be taken in A,B sequence. Three lectures per week. Introduction to biomolecules, biochemical techniques, expression of genetic information, basic thermodynamics, ligand binding, aqueous solutions, protein structure, hemoglobin, spectroscopy. Prerequisites: CHEM 340 and CHEM 342 or 442, or equivalents.

BCHM 451B-3 Biochemistry. (Same as CHEM 451B and MBMB 451B) Second half of 451A,B two semester course. Must be taken in A,B sequence. Basic kinetics, enzyme kinetics, enzyme inhibitors, regulation of enzymes, oxidation-reduction, high energy bonds, transport across membranes, intermediary metabolism, hormonal control of metabolism. Prerequisites: MBMB 451A or BCHM 451A or CHEM 451A or equivalent.

BCHM 456-3 Biophysical Chemistry. (Same as CHEM 456 and MBMB 456) A one-semester course in Biophysical Chemistry intended for biochemists and molecular biologists. Emphasis will be on solution thermodynamics, kinetics and spectroscopy applied to biological systems. Prerequisites: CHEM 340 and CHEM 342 or 442, MATH 141 or 150, MBMB 451A or BCHM 451A or CHEM 451A, or equivalents.

ENGINEERING TECHNOLOGY

Courses (ET)

There is no graduate program offered through engineering technology. See manufacturing systems for graduate program description. Four-hundred-level courses in this listing may be taken for graduate credit unless otherwise indicated in the course description.

The student is required to purchase photographs and maps for certain courses, and a suitable slide rule is strongly recommended for most courses. Cost is approximately $10 to $25.

EET 403A-4 Electronic Circuit Analysis. This course studies fundamental solid-state electronic concepts, the application and design of transistor amplifiers, and operational amplifier circuits. Course topics include the ideal operational amplifier, diodes, rectifiers, analysis and design of bipolar transistor (BJT) amplifiers, and the analysis and design of field effect transistor (FET) amplifiers. A laboratory emphasizes electronics circuit design and analysis. Prerequisite: EET 304B. Restricted to Junior/Senior standing. Restricted to College of Engineering students or departmental approval required.

EET 403B-4 Electronics Application and Design. This course focuses on system-level design and application of electronics circuits. Circuits include linear integrated circuits, quasi-linear circuits, integrated digital circuits, and pulse waveform generating and timing circuits. Topics include power amplifiers, Schmitt triggers, comparators, timers, and active filters. A design laboratory allows students to implement several design projects with increasing complexity. Prerequisite: EET 403A. Restricted to Junior/Senior standing. Restricted to College of Engineering students or departmental approval required.

EET 437A-4 Telecommunication Systems Fundamentals. This course is a study of the fundamental concepts of analog and digital communication systems in addition to a survey of the state of the art of current and emerging communication technologies. Topics include modulation, signal encoding, transmission media, multiplexing, cellular, bluetooth, Wi-Fi, WiMAX and LTE-Advanced. Associated labs reinforce the concepts introduced and allow students to simulate and build real systems. (Lecture + Lab). Prerequisite: EET 304B with a minimum grade of C. Restricted to Junior/Senior standing. Restricted to College of Engineering students or departmental approval required.

EET 437B-4 Data and Computer Communication. This course is a study of data and computer networks. Students are introduced to communication protocols, networking technologies and the various computer networks topologies. The OSI (Open Systems Interconnection) model is used as a guide in introducing the purpose and underlying principles of the existing communication protocol standards. The course concludes with an overview of emerging communication standards and technologies. Topics include LAN, WAN, TCP/IP, Routing, and Data Link layer. Associated labs reinforce the concepts introduced and allow students to simulate and build real systems. Lecture + Lab. Prerequisite: EET 437A with a minimum grade of C. Restricted to Junior/Senior standing.Restricted to College of Engineering students or departmental approval required.

EET 438A-4 Automatic Control Systems Technology. The mathematical concepts and tools used to model and design automatic control systems. The mathematical models for electric, hydraulic, mechanical and thermal processes found in industry. The course uses Laplace transforms, transfer functions, block diagrams and signal flow graphs to represent systems, determine system response and design control systems. A laboratory demonstrates applications. Prerequisite: EET 304B with a C or better, or consent of instructor; and EET 332A.

EET 438B-4 Sequential Digital Control and Data Acquisition. Concepts and components used in data acquisition and sequential control systems. The course covers sensors, signal conditioning, analog-to-digital/digital-to-analog conversion devices, relay logic design and programmable logic controllers. A laboratory demonstrates lecture topics and gives students experience with data acquisition and control languages and ladder logic programming within a design team. Prerequisites: CS 202 or ENGR 222 or ECE 222 with a C or better; EET 438A with a C or better, or consent of instructor.

EET 439-4 Microcontroller Application and Design. This course introduces embedded systems design and microcontroller programming. Students study microcontroller architectures and design applications. The course emphasizes interfacing microcontrollers with sensors and actuators. Software tools like Matlab and Simulink aid in visualization and Model-Based Design. Prerequisites: EET 238 with a C or better; CS 202 or ENGR 222 or ECE 222 with a C or better; or consent of instructor.

EET 445-3 Computer-Aided Manufacturing. (Same as IMAE 445) Introduction to the use of computers in the manufacturing of products. Includes the study of direct and computer numerical control of machine tools as well as interaction with process planning, inventory control and quality control. Laboratory. Prerequisite: IMAE 105 or IMAE 110, IMAE 208, MATH 111 or equivalent. Restricted to Junior/Senior standing. Restricted to College of Engineering students or departmental approval required.

EET 455-3 Industrial Robotics. (Same as IMAE 455) Study of robotics within a wide variety of application areas. Topics covered include classification of robots, sensor technology, machine vision; control systems, including programmable logic controllers (PLCs); robot safety and maintenance; and economic justification of robotic systems. Prerequisite: Mathematics 111 or equivalent. Restricted to Junior/Senior standing. Restricted to College of Engineering students or departmental approval required.

FASHION DESIGN AND MERCHANDISING

Courses (FDM)

FDM 431-3 Ethnic Dress. The study of ethnic dress in non-western cultures, with attention to aesthetics, symbolism and uses of ethnic dress. Cultures studied may vary with each offering. May be repeated for credit.

FDM 432-3 Historic Clothing: Western Cultures. Development of clothing in Western civilization to 1850. Consideration of social, economic, aesthetic factors and technical innovations influencing clothing.

FDM 433-3 History of Western Costume, 1860 to Present. Evolution of Western costume from 1860 through the present time. Emphasis on the interrelationship between costume, social, political, economic, and technical changes.

FDM 441-3 Fashion Product Analysis. Examines how quality and value of apparel products are visually evaluated by industry and consumers. Prerequisite: FDM 101, 241.

FDM 497-1 to 6 Practicum. Application of work education skills and knowledge. Cooperative arrangements with corporations and professional agencies to study under specialist. Prerequisite: twenty hours in specialty.

FERMENTATION SCIENCES

Courses (FERM)

FERM 460-4 Sensory Analysis. The course covers the science of the human senses as applied to alcoholic beverages. The physiological and neurological basis of human sensing are covered from the perspective of detecting and identifying both desirable traits and perceived flaws in products. The concepts of experimental design and statistical analysis are covered, as well as practical aspects of designing and maintaining sensory panels. Two hours lecture and three hours laboratory per week. Prerequisite: CHEM 181 or HORT 333 with a grade of C or better or consent of instructor. Age Restricted: Students must be 21 years of age prior to first lab meeting. Lab Fee: $45.

FERM 462-4 Yeast Science and Technology. An in-depth look at yeast from the perspective of fermentation science, with an emphasis on brewing science and enology. The effects of genetics will be examined with respect to how various strains and genetic mutations affect the fermentation process and the quality of the final product. The course will emphasize yeast metabolism and the various parameters and conditions that affect fermentation processes. The techniques dealing with yeast collection, storage and culturing will be covered from both theoretical and practical perspectives. Lectures will be supplemented with hands-on laboratory experiments. Two hours lecture and four hours laboratory per week. Prerequisite: MICR 301 with a grade of C or better or consent of instructor. Lab Fee: $60.

FERM 480-4 Advanced Brewing Science and Analysis. An advanced coverage of concepts in brewing, providing in-depth coverage of beer, brewing and quality control processes. Students will gain an understanding of the raw materials used in the production of beer. Specific coverage will be given to the processing and effects of raw materials, technical and scientific aspects of the brewing process, and the various processes that occur during fermentation, conditioning and packaging. In addition, the concept of beer quality and methods of ensuring quality control will be covered in detail, including the various methods of analysis that are used in the brewing industry. Two hours lecture and four hours laboratory per week. Age Restricted: Students must be 21 years of age prior to the first class meeting. Prerequisite: CHEM 180, CHEM 181, FERM 100 and CHEM 330 all with grades of C or better or consent of instructor. Lab Fee: $60.

Industrial Management and Applied Engineering

There is no graduate degree program offered through industrial management and applied engineering. See Manufacturing Systems for graduate program descriptions.

Courses (IMAE)

IMAE 405-4 Applied Robotics and Control Lab. Laboratory experiments to familiarize the student with writing robotic programs for performing specific tasks, developing and debugging PLC code, integrating robotic programming and PLC programming in the control of a robotics cell, developing basic programming skills using computer simulation packages; milling and lathing applications of CNC machining. Prerequisite: IMAE 445 or ET 445 and IMAE 455 or concurrent enrollment in both. Restricted to Junior/Senior standing.Restricted to College of Engineering students or departmental approval required.

IMAE 430-3 Health and Injury Control in a Work Setting. (Same as PH 430) Assesses the health and injury control programs present in a work setting. Emphasis given to employee programs in health, wellness, and injury control that are effective. Field trips to work sites are included. Restricted to College of Engineering students or departmental approval required.

IMAE 440-3 Manufacturing Policy. Review of all areas covered by the industrial technology program. Includes problems which simulate existing conditions in industry. Students present their solutions to the class and to the instructor in a formal manner. Restricted to College of Engineering students or departmental approval required.

IMAE 445-3 Computer-Aided Manufacturing. (Same as EET 445) Introduction to the use of computers in the manufacturing of products. Includes the study of direct and computer numerical control of machine tools as well as interaction with process planning, inventory control and quality control. Laboratory. Prerequisite: IMAE 208, MATH 108 or equivalent. Restricted to Junior/Senior standing. Restricted to College of Engineering students or departmental approval required.

IMAE 450-3 Project Management. This course is designed to provide students with an overview of the project management process followed by an in-depth examination of the activities needed to successfully initiate, plan, schedule, and control the time and cost factors of the project. Prerequisite: none. Restricted to Junior/Senior standing. Restricted to College of Engineering students or departmental approval required.

IMAE 455-3 Industrial Robotics. (Same as EET 455) Study

of robotics within a wide variety of application areas. Topics covered include classification of robots, sensor technology, machine vision; control systems, including programmable logic controllers (PLCs); robot safety and maintenance; and economic justification of robotic systems. Prerequisite: MATH 111 or equivalent. Restricted to Junior/Senior standing. Restricted to College of Engineering students or departmental approval required.

IMAE 465-3 Lean Manufacturing. This course will cover the principles and techniques of lean manufacturing. Major topics covered include lean principles, 5S, value stream mapping, total productive maintenance, manufacturing/office cells, setup reduction/quick changeover, pull system/Kanbans, continuous improvement/Kaizen, lean six sigma, lean simulation, and other modern lean manufacturing techniques and issues. Restricted to Junior/Senior standing. Restricted to College of Engineering students or departmental approval required.

IMAE 470A-3 Six Sigma Green Belt. Study the knowledge areas of Six Sigma Green Belt. Topics include six sigma goals, lean principles, theory of constraints, design for six sigma, quality function deployment, failure mode and effects analysis, process management, team dynamics, project management basics, data and process analysis, probability and statistics, measurement system analysis, and process capability. Restricted to Junior/Senior standing. Restricted to College of Engineering students or departmental approval required.

IMAE 470B-3 Six Sigma Green Belt II. The objective of this course is to provide the student with a complete coverage of the statistical and analytical tools used and applied in the "Six Sigma" methodology at the green-belt level. Topics include: discrete probability distributions, continuous probability distributions, statistical process control tools, quality control charts, process capability analysis, gauge and measurement capability studies, cumulative sum control charts and exponentially-weighted moving average control charts. Prerequisite: IMAE 307 or equivalent, IMAE 470A or consent of instructor. Restricted to Junior/Senior standing. Restricted to College of Engineering students or departmental approval required.

IMAE 475-3 Quality Control. Study the principles and techniques of modern quality control practices. Topics include total quality management, fundamentals of statistics, control charts for variables and other quality related issues and techniques. Restricted to senior standing. Restricted to College of Engineering students or departmental approval required.

IMAE 476-3 Supply Chain Design and Strategy. The objective of this course is to introduce the basic principles and techniques of supply chain design and strategy. Major topics covered include supply chain network analysis and design, sourcing materials and services, producing goods and services, supply chain sustainability, strategic challenges and change for supply chains, supply chain relationships, supply chain performance measurement and financial analysis, managing information flow and other modern supply chain management techniques and issues. Prerequisite: IMAE 376 with a minimum grade of C. Restricted to Junior/Senior standing. Restricted to College of Engineering students or departmental approval required.

IMAE 485-3 Quality Control II. Study the principles and techniques of modern quality control practices. Topics include fundamentals of probability, control charts for attributes, acceptance sampling systems, reliability and other quality related issues and techniques. Restricted to senior standing. Restricted to College of Engineering students or departmental approval required.

IMAE 490-3 Six Sigma. Six Sigma is a data-driven management system with near-perfect-performance objectives that has been employed by leading corporations. Its name is derived from the statistical target of operating with no more than 3.4 defects per one million chances, but its principles can be applied in business of all types to routinely reduce costs and improve productivity. This overview describes what Six Sigma is, and what is techniques and tools are. Prerequisite: IMAE 475. Restricted to College of Engineering students or departmental approval required.

MICROBIOLOGY

Courses (MICR)

MICR 403-3 Medical Microbiology Lecture. (Same as MBMB 403) A survey of the more common bacterial, mycotic and viral infections of humans with particular emphasis on the distinctive properties, pathogenic mechanisms, epidemiology, immunology, diagnosis and control of disease-causing microorganisms. Three hours lecture. Spring semester. Prerequisite: MICR 301, or consent of instructor.

MICR 405-3 Clinical Microbiology. (Same as MBMB 405) This course will be offered in Springfield only. A comprehensive course for health science professionals covering the biology, virulence mechanisms, and identification of infectious agents important in human disease and host-defense mechanisms. Clinical applications emphasized. Three hours lecture. Prerequisite: MICR 301, or consent of instructor.

MICR 421-3 Biotechnology. (Same as MBMB 421) Topics covered will include the genetic basis of the revolution in biotechnology, medical applications including genetic screening and therapeutic agents, industrial biotechnology and fermentation, and agricultural applications. Three hours lecture. Fall semester. Prerequisite: MICR 302, or consent of instructor.

MICR 423-3 Geomicrobiology. (Same as MBMB 423 and GEOL 423) The course will focus on the role that microorganisms play in fundamental geological processes. Topics will include an outline of the present understanding of microbial involvement of weathering of rocks, formation and transformation of soils and sediments, and genesis and degradation of minerals. Elemental cycles will also be covered with emphasis on the interrelationships between the various geochemical cycles and the microbial trophic groups involved. Prerequisite: MICR 301 and CHEM 210 and 211. Recommended: GEOL 220, 221 or 222.

MICR 441-3 Viruses and Disease. (Same as MBMB 441) An intensive, lecture-based course in virology which will emphasize principles of molecular virology, the ubiquity of viruses in nature, evolutionary relationships between viruses, co-evolution between virus and host, and the pathogenic consequences of some viral infections (e.g., AIDS, hepatitis, cancer, etc.). Prerequisites: MICR 460 or MBMB 460 or consent of instructor.

MICR 453-3 Immunology Lecture. (Same as MBMB 453) Principles of molecular and cellular immunology. Particular emphasis is given to molecular mechanisms involved in activation and maintenance of the immune response at the basic science level. The role of the immune system in medical

diagnostic procedures and in human health is also discussed. Spring semester. Prerequisite: MICR 403, or consent of instructor.

MICR 454-4 Soil Microbiology. (Same as CSEM 454, PSAS 454) A study of microbial numbers, characteristics, and biochemical activities of soil microorganisms with emphasis on transformation of organic matter, minerals, and nitrogen in soil. Prerequisite: MICR 301 or CSEM 240. Lab fee: $15.

MICR 455-2 Medical Immunology. (Same as MBMB 455) This course will be offered in Springfield only. A survey of the components of the immune system and how they interact with each other to produce responses that are important in the control or mediation of human disease. Two hours lecture. Prerequisite: MICR 301 or consent of instructor.

MICR 460-3 Bacterial and Viral Genetics. (Same as MBMB 460) The genetic mechanisms and regulatory events that control gene transfer, lambda phage infection, recombination, and metabolic pathways including a brief introduction to bioinformatics, genome analysis and global regulatory functions. Three hours lecture. Fall semester. Prerequisite: MICR 301 and 302, or consent of instructor.

MICR 470-3 Prokaryotic Diversity Lecture. (Same as MBMB 470) A consideration of the major groups of prokaryotes with special emphasis on their comparative physiology and ecology. Three hours lecture. Spring semester. Prerequisite: MICR 301 or consent of instructor.

MICR 477-3 Microbial Ecology. (Same as MBMB 477) Concepts of ecology applied to microorganisms; methods in microbial ecology; interactions of microbes with their living and non-living environment; microbial habitats and functions. Roles and regulation of microbes in natural and man-made environments, from cellular to community level. Prerequisite: MICR 301 or instructor`s consent (based on proven background in both microbiology and ecology).

MICR 480-4 Molecular Biology of Microorganisms Laboratory. (Same as MBMB 480) Genetic and biochemical analyses of microorganisms using a variety of techniques in molecular biology, molecular genetics and biotechnology. Six hours laboratory per week plus two hours of supervised unstructured laboratory work in most weeks. Fall semester. Prerequisite: MICR 301 and 302 with a C grade or better and two (or concurrent enrollment in two) of the following: MICR 421, 423, 425 or 460. Lab fee: $60.

MICR 481-4 Diagnostic and Applied Microbiology Laboratory. (Same as MBMB 481) Enrichment and isolation of prokaryotes from natural samples, diagnostic methods for the identification of pathogenic bacteria, and the nature of the immune response. Six hours laboratory per week plus two hours supervised unstructured laboratory work in most weeks. Spring semester. Prerequisite: MICR 301 and 302 with a C grade or better and two (or concurrent enrollment in two) of the following: MICR 403, 453 or 470. Lab fee: $60.

MEDICAL EDUCATION PREPARATION

No graduate degree program is offered through medical education preparation. Four-hundred-level courses may be taken for graduate credit only with written permission of the relevant department and the graduate dean.

Courses (MEDP)

MEDP 503B-1 to 3 Medical Pharmacology. Content may be supplemental (to concurrent biological science courses), additional (permitting acceleration), or preparational for the MCAT/DAT. Restricted to MEDPREP students enrolled in Master`s level program.

MEDP 503E-1 to 3 MEDPREP Medical Immunology. Content may be supplemental (to concurrent biological science courses), additional (permitting acceleration), or preparational for the MCAT/DAT. Restricted to MEDPREP students enrolled in Master`s level program.

MEDP 504E-1 to 3 Biochemistry. Content may be supplemental (to concurrent biological science courses), additional (permitting acceleration), or preparational for the MCAT/DAT. Restricted to MEDPREP students enrolled in Master`s level program.

SCIENCE

Courses (SCI)

SCI 500-2 Science Information Sources. Methods and procedures to efficiently exploit the scientific literature are discussed. The two-hour class discussion will be supplemented by practical exercises in library usage. Special approval needed from the instructor.

SCI 501A-2 Research Transmission Electron Microscopy. Theory of design of electron microscope, lenses, vacuum systems, alignment, specimen preparation and darkroom.

SCI 501B-2 Research Transmission Electron Microscopy. Practical experience in use of transmission electron microscope and specimen preparation.

SCI 502A-2 Research Scanning Electron Microscopy. Theory of design for scanning electron microscope, lenses, vacuum systems, alignment, specimen preparation for biologists and materials scientists, darkroom. Laboratory fee: $100.

SCI 502B-2 Research Scanning Electron Microscopy. Laboratory practical experience in use of scanning electron microscope and specimen preparation. Laboratory fee: $100.

SCI 503A-1 to 3 Science for Elementary School Teachers. In-depth studies of selected basic concepts in general science for teachers of upper-level elementary grades. Topics include cells and simple organisms, characteristics of vertebrates, plate tectonics, solar system, nature of matter and magnetism. Prerequisite: currently teaching in an elementary school.

SCI 503B-1 to 3 Science for Elementary School Teachers. In depth studies of selected basic concepts in general science for teachers of upper-level elementary grades. Topics include human biology, characteristics of high plants, Earth`s building blocks, the atmosphere, forces and simple machines. Prerequisite: currently teaching in an elementary school.

SCI 504A-9 (1 to 3 per topic) Selected Topics in Science for Teachers-Basic Stream Ecology. The course consists of selected basic concepts in general science for practicing teachers. Within a given semester a broad area is selected within either the biological sciences or the physical/earth sciences. Other topics

may be added as deemed necessary. This course may not be used for graduate credit by College of Science majors. Prerequisite: currently teaching in an elementary school.

SCI 504B-9 (1 to 3 per topic) Selected Topics in Science for Teachers-Biological Assessment of Polluted Streams. The course consists of selected basic concepts in general science for practicing teachers. Within a given semester a broad area is selected within either the biological sciences or the physical/earth sciences. Other topics may be added as deemed necessary. This course may not be used for graduate credit by College of Science majors. Prerequisite: currently teaching in an elementary school.

SCI 504C-9 (1 to 3 per topic) Selected Topics in Science for Teachers-Wetland Ecosystems. The course consists of selected basic concepts in general science for practicing teachers. Within a given semester a broad area is selected within either the biological sciences or the physical/earth sciences. Other topics may be added as deemed necessary. This course may not be used for graduate credit by College of Science majors. Prerequisite: currently teaching in an elementary school.

Post BS Certificate in MRI

Courses (RAD)

RAD 444-3 Central Nervous System Imaging in Magnetic Resonance Imaging. Lecture includes discussion of imaging applications of the central nervous system. Review of related anatomy and common pathologies. Special approval needed from the instructor.

RAD 454-3 Body Imaging in Magnetic Resonance Imaging. Lecture includes discussion of imaging applications of the gastrointestinal, genitourinary, hepatobiliary and musculoskeletal systems. Review of related anatomy and common pathologies. Special approval needed from the instructor.

RAD 464-3 Cardiovascular Imaging in Magnetic Resonance Imaging. Lecture includes discussion of imaging applications of the heart and coronary arteries. Review of related anatomy and common pathologies. Special approval needed from the instructor.

RAD 474-6 Advanced MRI Internship. During this clinical internship, the student will be assigned to a selected clinical education center for the entire semester. During this semester, while performing routine MRI procedures, the student will perform MRI procedures of the heart, body, and extremities. Special approval needed from the instructor.

RAD 484-3 Special Topics in MRI/MRA. Supervised readings of selected topics in MRI. Special approval needed from the instructor.

RAD 494-1 - 6 Independent Study in Magnetic Resonance Imaging. The selection and investigation of a topic related to MRI. Special approval needed from the instructor.