Inclusive Early Childhood Education

**College of Education**

IECE 200. Introduction to Inclusive Early Childhood Education. 1 credit.

This course is designed to introduce students to inclusive early childhood education as a profession. Students will become acquainted with professional ethics and standards, professional organizations and the roles and responsibilities of teachers in inclusive environments. Students will engage in observation of and reflection on practices in inclusive early childhood education.

IECE 300. Programming and Practices in Inclusive Early Childhood Education. 3 credits.

This course is designed to introduce students to the issues and trends in the education of all infants, toddlers and young children. It will provide the historical, philosophical, social and legal background for current practices in the field and will engage students in synthesizing and analyzing this information along with research as it pertains to professional practice. Prerequisite: Admission to teacher education pre-professional licensure program.

IECE 301. Inclusive Early Childhood Education Programming and Practices Practicum. 1 credit.

This practicum supports IECE 300. Students will further their understanding of the issues and trends impacting young children and their families in our community and evaluate their own perspectives and skills as they pertain to working with young children and families from diverse backgrounds, with diverse abilities and in diverse settings. Prerequisite: Admission to teacher education pre-professional licensure program.

IECE 320. Development and Assessment of Infants. 3 credits.

This course provides students with an understanding of the development of infants and toddlers with and without exceptionalities. Students will acquire knowledge and skills in authentic assessment to be used in decision making and service planning. Prerequisites: IECE 300 and IECE 301. Corequisites: IECE 321 and IECE 322.

IECE 321. Practicum Supporting the Development of Infants and Toddlers. 2 credits.

This practicum supports IECE 320 and 322 by requiring students to engage in supervised and planned naturalistic interactions with infants and toddlers, who are typically developing or have developmental delays or disabilities, and their families. Students will have the opportunity to observe, assess and support infants and toddlers’ development while collaborating with families. Prerequisites: IECE 300 and IECE 301. Corequisites: IECE 320 and IECE 322.

IECE 322. Supporting the Development of Infants and Toddlers. 3 credits.

This course explores, analyzes and evaluates curriculum and methodology related to designing and managing nurturing, supportive and enriching learning environments for infants and toddlers. Focus is on naturalistic teaching methods, curricula planning, implementation strategies, environmental arrangements and accommodation for all infants and toddlers, in collaboration with the primary caregiver. Students will learn to use technology to support children’s learning. Prerequisites: IECE 300 and IECE 301. Corequisites: IECE 320 and IECE 321.

IECE 420. Development of the Young Child. 3 credits.

This course provides students with an understanding of the development of young children, ages four to nine years, with and without exceptionalities. Students will be introduced to and apply informal and formal assessment...
to be used in decision making and educational planning and delivery. Prerequisites: IECE 320, IECE 321 and IECE 322. Corequisites: IECE 421 and IECE 422.

IECE 421. Practicum in Development of the Young Child. 1 credit. This practicum is designed to support IECE 420 and IECE 421, by giving students experience in a preschool classroom. Students will observe young children, collect data, assist classroom teachers and interact appropriately with the individuals within the learning environment. Students will analyze the preschool environments for access by all young children. Prerequisites: IECE 300, IECE 301, IECE 320 and IECE 322. Corequisites: IECE 420 and IECE 422.

IECE 422. Teaching Young Children. 3 credits. This course explores, analyzes, and evaluates curriculum and methodology related to the design and management of a nurturing, supportive, and challenging learning environment for children ages 3-8 years. Emphasis is on the physical environment, design and selection of curricular components, the role of play in the curriculum, skills for professional intervention and interaction, and use of technology to facilitate young children's learning. Prerequisites: IECE 320, IECE 321 and IECE 322. Corequisites: IECE 420 and IECE 421.

IECE 423. Practicum: Teaching Young Children. 1 credit. This practicum is designed to give students the opportunity to practice knowledge and skills learned in IECE 422. Students will participate as a member of the teaching team, demonstrate professional behavior and interactions with young children and adults and support instruction in a preschool setting. Prerequisites: IECE 320, IECE 321 and IECE 322. Corequisites: IECE 420, IECE 421 and IECE 422.

IECE 460. Instructional Practices in Numeracy. 3 credits. This course provides students with the knowledge, skills, and understandings necessary to design and implement effective mathematics programs for young children, birth to age eight, with and without exceptionalities. Focus is on appropriate mathematical content, teaching strategies, and manipulative materials from a developmental perspective with special emphasis on adaptations designed to meet the needs of all children. Prerequisites: IECE 420, IECE 421, IECE 422 and IECE 423. Corequisites: IECE 461, IECE 462, IECE 464 and IECE 466.

IECE 461. Practicum in Primary Grades. 3 credits. This practicum allows students to develop educational decision-making skills through planning, implementing and evaluating appropriate activities for young children of diverse interests, needs, and abilities. Students apply strategies to assess learning, guide behavior, and collaborate with other service providers and families. Students engage in conversations designed to make connections between their experiences and IECE content. Prerequisites: IECE 420, IECE 421, IECE 422, IECE 423 and READ 366. Corequisites: IECE 460, IECE 462, IECE 464, IECE 466 and READ 436.

IECE 462. Instructional Practices in Natural Sciences for Young Children. 3 credits. This course provides students with the knowledge, skills and understandings to design and implement effective natural science programs for all young children, birth to age eight. Focus is on appropriate science content, teaching strategies and materials from a developmental perspective with special emphasis on adaptations designed to meet the needs of children with disabilities. Prerequisites: IECE 420, IECE 421, IECE 422 and IECE 423. Corequisites: IECE 460, IECE 461, IECE 464 and IECE 466.

IECE 464. Instructional Practices in Social Studies for Young Children. 3 credits. This course provides students with the knowledge, skills and understandings to design and implement effective social studies programs for all young children, birth to age eight. Focus is on appropriate social studies content, teaching strategies, and materials from a developmental perspective designed to meet the needs of all young children. Students will use technology to support access to the learning environment and curriculum. Prerequisites: IECE 420, IECE 421, IECE 422 and IECE 423. Corequisites: IECE 460, IECE 461, IECE 462, and IECE 466.

IECE 466. Seminar in Managing Classrooms and Guiding Behavior. 1 credit. This seminar examines research and professional literature on effective strategies for guiding young children’s behavior and managing groups. IECE 466 uses experiences in IECE 461 as a foundation for reflection, dialogue and development of a personal philosophy of classroom management. Prerequisites: IECE 420, IECE 421, IECE 422 and IECE 423. Corequisites: IECE 460, IECE 461, IECE 462 and IECE 464.

Individualized Study

Outreach and Engagement

IS 200. Individualized Studies Major Program Development. 3 credits. An introductory course designed to prepare students for transition into higher education programs. Specific content includes focusing a concentration, selecting an academic adviser, creating an individualized program, technology in higher education, accessing career resources, career decision making skills, self-awareness, life planning, identifying college level experiential learning, documenting experiential learning, determining a credit request and organizing a portfolio for assessment. Prerequisite: Individualized studies majors and individualized studies special students only.

IS 202. Orientation to Career and Life Planning. 1 credit. A short orientation course designed to prepare students for transition into higher learning education programs. Specific content includes accessing career resources, career decision-making skills, self-awareness and life planning.

IS 203. Portfolio Development Workshop. 1 credit. A short orientation course designed to prepare students for transition into higher learning education programs. Specific content includes identifying college-level experiential learning, documenting experiential learning, determining a credit request and organizing a portfolio for assessment. Prerequisite: Individualized studies majors and individualized studies special students only.

IS 250. Service Learning. 1-6 credits, repeatable to 6 credits. Leadership, citizenship and professional competencies may be acquired through community service experiences. Documented service learning competence will be assessed by the Center for Leadership, Service and Transition and credit awarded as appropriate. Prerequisite: IS 203.

IS 270. Selected Topics. 1-6 credits, repeatable. In-depth study of selected topics with current importance and interest to lower division students that are not otherwise covered in the regular course offerings of academic units. Course content will vary. Prerequisites: Approval of the “Course Agreement Form” by the Individualized Study department head.

IS 290. Special Studies. 1-6 credits, repeatable. Designed to give students an opportunity to do lower-division independent study in selected interdisciplinary areas under the supervision of a faculty member in the appropriate academic unit. Prerequisite: Approval of the “Course Agreement Form” by the Individualized Study department head.

IS 300. Sponsored Learning. 1-6 credits, repeatable. A structured learning activity related to a student’s area of study and sponsored by an employer, volunteer agency or other appropriate organization. Prerequisite: Approval of “Course Agreement Form” by the Individualized Study department head.

IS 490. Special Studies. 1-6 credits, repeatable. Designed to give students an opportunity to do upper-division independent study in selected interdisciplinary areas under the supervision of a faculty member in the appropriate academic unit.

IS 498. Bachelor of Individualized Study Project. 3-6 credits. An in-depth study of an interdisciplinary topic directly related to the student’s areas of concentration. A final oral report is required. Prerequisite: Approval of the “Course Agreement Form” by the Individualized Study department head.

IS 499. Honors. 6 credits. Multiple-semester course. Prerequisite: Approval of the “Course Agreement Form” by the individualized study department head.

Industrial Design

School of Art, Design and Art History

All INDU courses are restricted to declared art, art history, graphic design, and interior design majors in art and art history during the fall and spring semesters. During May and summer sessions, INDU courses are open to all students who meet the additional stated course prerequisites. Non-majors wishing to enroll in an INDU course during the fall and spring semesters may request permission of the instructor.

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INDU/INDE 220. CAD I: Digital Design. 3 credits.
A studio course introducing computer-aided design experiences. Exploration of CAD, including terms, conventions and drawing techniques from beginning to intermediate concepts to two and three-dimensional tools and commands.

INDU/INDE 320. CAD II: Digital Design. 3 credits.
An intermediate studio course incorporating computer-aided design experience in digital design. Continuation of CAD success processes from the foundation course toward advanced three-dimensional drawing techniques, solid modeling and rendering, lighting theory, plotting, and animation. Prerequisite: INDU/INDE 220.

Independent activity at the intermediate level, such as research or studio practice, under faculty supervision. Projected studies in any area of the school’s offering must be arranged with the instructors who will direct them. Offered only with the consent of the instructor.

INDU/INDE 420. CAD III: Digital Design. 3 credits.
An advanced studio course expanding computer-aided design knowledge. Continued exploration of the digital virtual space from intermediate to advanced concepts of the design process, communication with diverse design programs, animation, sound and digital transformation. Prerequisite: INDU/INDE 320.

INDU 490. Independent Studies Industrial Design. 1-3 credits, repeatable.
Offering varies.
Independent activity, such as research or studio practice, under faculty supervision. Projected studies in any area of the school’s offering must be arranged with the instructors who will direct them. Offered only with consent of the instructor.

INDU 491. Studio Assistant. 1-3 credits, repeatable. Offering varies.
An on-campus program monitored on an individual basis designed to provide practical studio experience in the visual arts. Students will learn safe studio practices and management skills, including material use, inventory control and the proper operation of equipment found within various individual classroom studios. Prerequisites: Permission of the instructor.

INDU 492. Topics in Industrial Design. 3 credits. Offering varies.
Study of selected topics in industrial design at the advanced level. May be repeated when course content changes. See MyMadison for current topics.

INDU 496. Internship in Industrial Design. 1-8 credits.
An off-campus program prepared and monitored on an individual basis. Internships are designed to provide practical experience in the arts. Prerequisites: Permission of the instructor.

Integrated Science and Technology
Department of Integrated Science and Technology

First Year Student – Sophomore Sequence

ISAT 100. Environmental and Energy Sustainability. 3 credits.
This course explores scientific and technical issues important to environmental and energy sustainability. Students study fundamental chemistry and physics and then apply this knowledge to better understand air quality, water quality, and conventional and alternative energy processes. The class also explores the societal impacts of our energy choices and the potential impact we as individuals can have through personal initiative.

ISAT 101. ISAT Freshman Seminar. 1 credit. Offered fall.
This seminar course will introduce the ISAT curriculum and career options to freshmen students and will describe various elements of the curriculum and available ISAT elective sequences in each technology sector relating to the goals and objectives of the program. Prerequisite: Freshman standing at JMU.

ISAT 112. Environmental Issues in Science and Technology (2, 2). 4 credits. Offered fall and spring.
This course integrates the study of biology, chemistry and statistics within the context of environmental issues that include ozone depletion, acid rain, global warming, waste management and biodiversity.

ISAT 113. Biotechnology Issues in Science and Technology (2, 2). 4 credits. Offered fall and spring.
This course introduces current topics in the life science technologies through lecture and laboratory exercises. Topics include advances in genetic engineering, the hierarchy of life and the rise of infectious diseases.

ISAT 131. Technology, Science and Society (1, 2). 3 credits. Offered spring.
This course introduces the social aspects of technology and science. It covers social science methods and related philosophical and ethical analyses. Students learn how the practice of science relates to the human-built world and why critical evaluations of science and technology policies are important.

ISAT 150. Algebra Essentials. 1 credit.
This course provides review and practice in algebra concepts that are needed to succeed. Conclusively complete ISAT 151. Various mathematical models, including trigonometric, are also reviewed. The course is designed for students who possess a basic understanding of algebra but are not proficient in its application. Prerequisite: Permission of instructor. Corequisite: ISAT 151 and permission of instructor.

ISAT 151. Topics in Applied Calculus in ISAT. 4 credits. Offered fall and spring.
This course introduces the concepts of differential and integral calculus and ordinary differential equations to model real-world applications in science, business, technology and economics. This course includes a computer laboratory component emphasizing modeling and numerical methods. Course assumes familiarity with algebra and trigonometry.

ISAT 151L. Analytical Methods I: Applied Calculus Laboratory. 1 credit. Offered fall and spring.
This course is the computer laboratory portion of ISAT 151. Topics in Applied Calculus in ISAT. It is intended for students who already have AP credit or calculus lecture credit. Students will use numerical methods to solve mathematical modeling and calculus problems with Microsoft Excel. Students will study linear, polynomial, exponential, logarithmic, 5-curve and trigonometric models in business and the physical and natural sciences. Prerequisites: Permission of instructor or academic unit head required.

ISAT 152. Topics in Applied Physics in Integrated Science and Technology. 4 credits. Offered spring.
This course introduces topics in general physics including one- and two-dimensional motion, mechanics, energy, waves, electricity, magnetism, optics, lasers, and early quantum theory. Vectors, algebra, and differential and integral calculus, are used to model physical system behavior. Laboratory experiments and computer exercises enhance understanding of the concepts. Prerequisites: ISAT 151 or permission of instructor.

ISAT 160. Problem Solving Applications in Science and Technology. 3 credits. Offered fall and spring.
This course examines issues in modern science and technology as a means to introduce, develop and enhance critical thinking and problem solving skills. Current scientific and technological research and applications will be introduced to reinforce problem solving, instruction in systems thinking and critical inquiry. The course provides opportunities for using both oral and written communication in a variety of learning activities.

ISAT165/BIO 203. Viral Discovery. 1 credit.
This course is an exploratory laboratory experience, designed for incoming freshmen. In the course, the students will learn about the life cycle and ecology of viruses infecting bacteria. Soil samples will be collected, and techniques for isolation and purification of the viruses will be performed by the students. Isolated viruses will be visualized using electron microscopy. The genomic material will be isolated and prepared for nucleic acid sequencing.

ISAT 166/BIO 204. Viral Genome and Bioinformatics. 2 credits.
This is a computer-based laboratory experience, designed for those students completing the Viral Discovery course. Students will learn how to identify genes in a viral genome, compare the predicted proteins with known proteins in databases, describe the contents of the genome, and notate all the relevant information for publication. Students will also research the ecology of soil and the role played by bacteriophages in ecology and evolution. Prerequisites: ISAT 165 or BIO 203.

ISAT 180. Topics in Integrated Science and Technology. 1-4 credits. Offered fall and spring.
This course is an exploratory laboratory experience, designed for incoming freshmen. In the course, the students will learn about the life cycle and ecology of viruses infecting bacteria. Soil samples will be collected, and techniques for isolation and purification of the viruses will be performed by the students. Isolated viruses will be visualized using electron microscopy. The genomic material will be isolated and prepared for nucleic acid sequencing.

ISAT 181. Student Research Report. 1-6 credits, variable.
Research project on a science and technology topic of interest, as arranged with a faculty research adviser. Projects will include assessment of the non-technical issues that surround the technical problem.

ISAT 211. Modern Production Issues in Science & Technology (2, 2). 3 credits. Offered fall.
This course introduces the structure and function of a manufacturing enterprise and product design and process selection with emphasis on
ISAT 212. Energy Issues in Science and Technology (2, 2). 3 credits.
Offered fall.
Prerequisites: ISAT 211 or ISAT 253 or consent of instructor.

ISAT 211. Quality Control in Science and Technology (0, 2). 1 credit.
Offered fall.
Prerequisites: ISAT 112 or consent of instructor. This course introduces the principles and methods of quality control in scientific and technical fields. Emphasis is placed on efficient and effective processes in scientific and technical environments.

ISAT 231. Political Economy of Technology and Science. 3 credits.
Offered fall.
Prerequisite: ISAT 212 or ISAT 253 or consent of instructor. This course examines the political economy of technology and science, focusing on the economic and social implications of technological innovation and scientific research.

ISAT 303. Instrumentation and Measurement in Engineering and Manufacturing (0, 2). 1 credit. Offered spring.
Instrumentation is used to acquire data from representative systems that are relevant to modern manufacturing processes. Process control instrumentation is also studied. Topics include shop floor data collection, electronic sensors and actuators, pneumatics and hydraulics. Computer-based data acquisition is emphasized. Prerequisites: ISAT 211 and ISAT 253 or permission of instructor.

ISAT 305. Instrumentation and Measurement in Biotechnology (0, 2). 1 credit. Offered fall.
This course provides a hands-on experience of the techniques and instrumentation used in the modern biotechnology laboratory. Topics include aseptic techniques for establishing microbial cultures, detection and analysis of recombinant DNA molecules, protein purification, SDS gel electrophoresis and the use of PCR technology for genetic analysis.

ISAT 306. Instrumentation and Measurements in Data Communications and Networking. 1 credit.
This is an introductory course on hands-on performance measurements of data, computer and telecommunications channel transmission techniques. The course includes a set of lab experiments focusing on the physical and data link layers of data communications and telecommunications networks. Prerequisites: CIS/CS 320 and ISAT 152 or PHYS 250 or permission of instructor.

ISAT 301. Instrumentation and Measurement in Energy (0, 2). 1 credit.
Offered fall.
Instrumentation is used to acquire data from representative systems that include mechanical, thermal, solar, chemical and nuclear energy. Students analyze the data to enhance understanding of these forms of energy. Emphasis is placed on understanding the physical, chemical and biological basis of these techniques. Hands-on laboratory and field work will be emphasized, in addition to quality control/assurance of environmental data.

ISAT 250. Programming and Problem Solving: Knowledge Based Systems. 1 credit. Offered spring.
Introduction to computational thinking and formal logic. Students create software to solve problems in applied science, business, and engineering taking social context into account. The declarative programming paradigm is covered. Emphasis is placed on effective analysis, planning, documentation, communication, and teamwork in professional software development settings. Prerequisite: Sophomore standing or permission of instructor.

ISAT 320. Fundamentals of Environmental Science and Technology I. 3 credits. Offered fall.
This course covers the role of energy in the U.S. and world economies. Geology of energy-valued natural resources: size, quality and economics of domestic and world resource base. Models for energy use by different sectors. The role of energy in global climate change; other energy-related environmental concerns; and the implications for national and international security will be studied. Prerequisite: ISAT 212 or consent of instructor.

ISAT 321. Fundamentals of Environmental Science and Technology II. 3 credits. Offered spring.
This course continues to build on the student’s basic understanding of environmental pollution, processes and control technologies. The course considers solid and hazardous waste and its management, discusses the principles of environmental risk assessment, and addresses air quality analysis and management, culminating in independent team projects in this area. Prerequisite: GISAT 112 or permission of instructor.

Junior – Senior Sequence

The course will introduce students to the various manufacturing systems within a manufacturing organization. The systems studied will be selected from the following areas: manufacturing/production management – batch and continuous resources utilization, material management, and scheduling and inventory control. Prerequisites: ISAT 152 and ISAT 211 or permission of instructor.

ISAT 331. Automation in Manufacturing. 3 credits. Offered spring.
This course offers an in-depth treatment of the structure and function of computer integrated manufacturing processes; integration and automation in design and manufacturing; product and process design, computer-aided design and computer-aided manufacturing, process planning, robotics and flexible manufacturing systems; production planning and product data management. Prerequisites: ISAT 152 and ISAT 211 or permission of instructor.

ISAT 340. Software Development. 3 credits. Offered fall.
This course is an introduction to the processes, methods and techniques of efficient and effective software application development. Students will create or enhance software systems in a sophisticated development environment. Prerequisite: ISAT 252.
ISAT 341. Modeling and Simulation. 3 credits. Offered spring.
The development and use of models to understand, analyze and improve systems in several areas of science and technology. Students will use computer simulation in a variety of modeling projects. Prerequisites: Junior standing and ISAT 340 or CS 139 or permission of instructor.

ISAT/CS 344. Intelligent Systems. 3 credits. Offered fall and spring.
In-depth introduction to current and future intelligent systems, including expert systems, neural networks, hybrid intelligent systems and other intelligent system technologies and their development, uses and limitations. Prerequisites: Junior standing and ISAT 340 or CS 139.

ISAT/CS 345. The Software Industry. 3 credits. Offered fall and spring.
Study of means for the development and maintenance of high quality software products delivered on time and within budget. Topics include requirements analysis and specification, software design, implementation, testing, maintenance, project management, ethics and the responsibilities of software engineering professionals. Prerequisites: CS 139 or ISAT 340 and sophomore standing.

ISAT 348. The Multimedia Industry. 3 credits. Offered fall and spring.
Students are introduced to a variety of tools for viewing multimedia and to the issues in designing effective human-computer interactions. This includes an introduction to the many forms of media that occur in computing systems (text, graphics, images, sound, animation) and to the characteristics of well-produced media. Prerequisite: CS 139, ISAT 340 or permission of the instructor.

ISAT 350. Biotechnology for the New Millennium I. 3 credits. Offered fall.
This course covers the scientific foundations and historical development of biotechnology. Specific topics include living system nanotechnology; cell structure and function; origins of genetic engineering; and recombinant DNA technology. Prerequisite: ISAT 113 or equivalent.

ISAT 351. Biotechnology for the New Millennium II. 3 credits. Offered spring.
This course is a continuation of ISAT 350 and describes applications of biotechnology in agriculture, industry and medical science as well as associated social, ethical and philosophical issues. Topics include study of an emerging infectious disease; energy transduction in living systems; and novel applications of biotechnology. Prerequisite: ISAT 350. Corequisite: ISAT 305.

ISAT 361. Fundamentals of Data Communications and Networking II. 3 credits.
The course is an introduction to data communications, telecommunications and networking. The focus is on the physical and data link layers. At the physical layer, it includes network models, data and signal rates, digital and analog transmission (modulations), bandwidth utilization (multiplexing), switching (packet versus circuit), and the data link layer, it includes error detection and correction, multiple access methods, LANs (wired, wireless, connecting), WANs (SONET, ATM, cellular, satellite). Prerequisites: CIS/CS 320 and ISAT 152 or PHYS 250 or permission of instructor.

This is a laboratory course in which students build and program their own instruments. Topics include programming techniques for real-time instrumentation programming; buffered analog and digital input and output; timing considerations; passive analog filters and active analog filters; digital filtering techniques; and real-time programming issues. Prerequisites: ISAT 253 and ISAT 262 or permission of instructor.

Students design and build their own instruments. Topics include representative sensor techniques as applied to physical, chemical and biological systems as well as basic and advanced circuits for signal manipulation: buffers, amplifiers and active and passive filters. An instrument design project is the capstone of the course. Prerequisites: ISAT 253 and ISAT 262 or permission of the instructor.

This practical laboratory course provides hands-on experience in the preparation and examination of biological specimens with the transmission electron microscope. Techniques to be mastered include support film preparation for negative staining of bacteria and viruses, fixation, embedding, and thin sectioning of tissues, electron optical alignment and microscope operation. Prerequisite: ISAT 253 or permission of instructor.

ISAT 410. Sustainable Energy Development. 3 credits. Offered spring.
This course is concerned with the science and the applications of solar and other renewable technologies, e.g., solar thermal electric, photovoltaics, wind power, biomass-derived alcohols, solar hydrogen and ocean thermal energy conversion Energy storage systems and materials, combined renewable-conventional systems for peaking and load management and alternative energy sources for transportation will be studied. Prerequisite: ISAT 310 or permission of instructor.

ISAT 411. Energy Economics and Policy. 3 credits. Offered fall.
This course is concerned with methods for analyzing the economics, environmental and societal benefits of energy technologies. Topics include optimization techniques, utility planning and finance, cost-benefit techniques, discounting for time and risk, econometric models and input-output analysis. The role of government in determining energy costs supply and markets will be considered. Prerequisite: ISAT 311 or permission of instructor.

ISAT 412. Dynamic Control of Energy Systems. 3 credits. Offered spring.
This course considers methods for developing dynamic models of energy processes and technologies to achieve improved process control and increased efficiency with applications of differential equations and discrete math equations. Dynamic models are used to evaluate load management strategies and to develop computer control algorithms for building energy systems. Prerequisite: ISAT 310 or consent of instructor.

ISAT 413. Options for Energy Efficiency. 3 credits. Offered fall.
This course makes detailed examination of new technologies to increase the efficiency of energy conversion, transportation systems and end-use technologies. Examples include MHD, combined-cycle systems, advanced nuclear reactors, intelligent transportation systems, high-efficiency lighting, energy management and utilization of low-temperature heat. Consideration is made of the socioeconomic and governmental barriers to energy efficiency. Prerequisites: ISAT 310 and ISAT 311 or consent of instructor.

ISAT 414. Energy Fundamentals II. 3 credits. Offered once a year.
Introduction to the sciences of fluid mechanics and heat transfer and the physical laws governing the mechanical behavior of liquids and gasses. Conservation of mass, energy and momentum. Discussion of heat transfer by one-dimensional conduction, convection and radiation. Fluid statics, internal and externalfluid flow. Pipe networks and heat exchanger analysis. Prerequisite: ISAT 310 or permission of instructor.

ISAT 416. International Energy Studies. 3 credits. Offered summer as study abroad course only.
Study-abroad course examining international energy problems and providing team-oriented project experiences. Addresses energy issues associated with economic and social development. Project participation, tours and meetings with local experts illustrate energy-related problems that are compared with those in the United States. Prerequisites: ISAT 212 and ISAT 253.

ISAT 420. Environmental Analysis and Modeling. 3 credits. Offered fall.
This course explores applications of mathematical techniques and computer models to the environmental field. The course introduces the principles underlying environmental analysis and modeling, including limitations and pitfalls. Several environmental models and analytical systems are then discussed and applied, using a variety of computational platforms. Prerequisite: ISAT 321 or permission of instructor.

ISAT 421. Environmental Policy and Regulation. 3 credits. Offered spring.
This course will familiarize students with basic environmental laws and regulations. The course discusses the purpose of environmental policy, the role of environmental economics in policy decisions and the policy instruments available to environmental regulators. Current federal and state statutes affecting waste disposal, air quality and water quality are discussed. Corequisite: ISAT 321 or permission of instructor.

ISAT 422. Industrial Environmental Management. 3 credits. Offered fall.
This course addresses environmental issues faced by industry, including such topics as waste management, chemical inventories, pollution prevention and discharge permitting. Industrial ecology is introduced as an approach to the development of a sustainable industrial society, including treatment of life cycle analysis, design for environment, environmentally conscious manufacturiing and ISO14000.

ISAT 423. Environmental Remediation. 3 credits. Offered spring.
This course will examine chemical, physical, economic and regulatory aspects of the remediation of contaminated soil and groundwater. Topics include chemical properties of major contaminants, environmental site assessment, remediation design, and current and emerging remediation technologies and their limitations in soil and groundwater restoration. Prerequisites: ISAT 320 and ISAT 321 or permission of instructor.

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ISAT 424. Natural Resource Management. 3 credits. Offered fall.
This course focuses on how resource management decisions affect the human and natural communities involved. Topics include definition and importance of natural resources, resource management styles and policies, and planning for resource conservation. Conservation biology is introduced as a tool for developing sustainable resource use policies. Mandatory weekend field trip. Prerequisite: ISAT 320 and ISAT 321 or permission of the instructor.

ISAT 425. Environmental Hydrology. 3 credits. Offered spring.
This course integrates the study of surface water and ground water hydrology and examines current technologies used to assess the behavior and quality of water in the environment. Topics include monitoring and management at the watershed level, the influence of wetlands on water quality, and the impact of current regulations. Prerequisite: ISAT 320 or permission of instructor.

ISAT 426. Environmental Information Systems. 3 credits. Offered summer.
This course provides students with practical experience applying advanced environmental informational systems technologies to environmental problems. Students will employ such technologies as decision support systems, geographic information systems, expert systems, relational databases, multimedia systems, and modeling and simulation. This course is often offered in a study-abroad format. Prerequisite: ISAT 320 or permission of instructor.

ISAT 427. Industrial Hygiene. 3 credits. Offered spring.
This course provides an introductory survey of the field of industrial hygiene. Chemical hazards are addressed first, focusing on respiratory and dermal exposures, followed by a treatment of physical hazards including sound, radiation and temperature. The course includes industrial case studies illustrating administrative and engineering controls in common use.

ISAT 428. Industrial Ecology. 3 credits. Offered summer.
Industrial ecology, the science of sustainability, seeks to encourage the development of a sustainable industrial society. This course introduces and examines this relatively new field of inquiry and practice. We address various practical topics which are associated with industrial ecology, including life cycle assessment, design for environment and environmentally conscious manufacturing.

ISAT/GEOG 429. Sustainability: An Ecological Perspective. 3 credits. Offered spring.
This course examines present global environmental impacts and efforts made to change production and consumption patterns toward those that reduce impact on ecosystems or promote increased ecosystems health. The focus lies in understanding the basic resources of productivity including soils, agricultural systems, agroforestry, forestry and aquatic environments and applying solutions on a personal and community level. Prerequisite: ISAT 320 or permission of instructor.

ISAT/MATS 430. Materials Science in Manufacturing. 3 credits. Offered fall.
This course is the study of engineering materials used in the fabrication of products including metals, polymers, ceramics, composites and elastomers. Topics include physical, mechanical and electrical properties of materials, elements of strength of materials, failure criteria and materials selection. Prerequisites: ISAT 211 and ISAT 152 or permission of instructor.

ISAT/MATS 431. Manufacturing Processes. 3 credits. Offered spring.
This course provides an introduction to the processes used for fabricating parts, such as machining, grinding, and casting and sheet-metal fabrication, including both traditional and nontraditional processes. Topics include interaction of materials, processing and design, economics of manufacturing, design for improved processing. Manufacturing processes for metals, plastics and composites are addressed. Prerequisite: ISAT 430 or permission of instructor.

ISAT/MATS 432. Selection and Use of Engineering Materials. 3 credits. Offered fall.
This course deals with the interplay between engineering product specifications, design, economics, environment, energy, materials selection, fabrication route, manufacturing cost and product service requirements. Students will be taught how to perform design projects that involve understanding the behavior of materials and selection of materials for a specific function. Prerequisite: ISAT 211 or permission of instructor.

ISAT 433. Selected Problems in Manufacturing. 3 credits. Offered fall.
This course addresses selected problems in manufacturing and their solutions. Materials, processes and systems will be stressed. Solutions may involve laboratory experiments and/or other analytical tools, such as modeling, system selection and evaluation, and process selection and improvement. Case studies and current projects from industry will be used. Prerequisite: ISAT 330 or permission of instructor.

ISAT 435. Integrated Product and Process Development. 3 credits. Offered spring.
This course focuses on the integrated approach for developing products simultaneously with manufacturing processes. Students learn about successful product development techniques and effective organization of product development teams. Topics include design for manufacturing, design for the environment, rapid prototyping, economics of product development and managing of development projects. Prerequisite: ISAT 331 or permission of instructor.

This course examines processes used in the manufacture of microelectronic devices (VLSI integrated circuits, optoelectronic devices, flat panel displays), microelectromechanical devices (micromotors, microactuators), data storage media (magnetic and optical disks, including CD), optical fibers, and some sensors and transducers. Principles of operation of semiconductor and other devices are also studied. Prerequisite: ISAT 253, PHYS 150, PHYS 250 or permission of instructor.

ISAT 440. Seminar in Knowledge Management. 3 credits. Offered fall and spring.
Philosophical, ethical, social and political issues in information and knowledge management, the information and knowledge management industries and information and knowledge management systems. Prerequisite: Senior standing.

ISAT/CS 447. Interaction Design. 3 credits. Offered fall.
Study of and practice with processes, principles, tools, models and techniques for designing interactions between humans and digital products and systems. Topics include physiological and psychological factors affecting interaction design, interaction design processes, interaction models, styles, and paradigms, design notations and representations, prototyping and interaction design evaluation. Prerequisite: Junior standing.

ISAT 450. Biotechnology and the Environment. 3 credits. Offered fall.
This course will examine the impact of biotechnology on the environment, biotechnology solutions to environmental challenges as well as associated regulatory, ethical and legal issues. Topics include bioremediation, biosensors, release of engineered organisms and risk assessment. Prerequisite: ISAT 320 or ISAT 350.

ISAT 451. Biotechnology in Industry and Agriculture. 3 credits. Offered fall.
This course illustrates the applications of biotechnology in agriculture and industry, linking scientific discoveries to business and manufacturing practices. Topics include pharmaceutical product development, genetic engineering in agriculture, biotechnology in food processing and regulatory issues. Prerequisite: ISAT 330 or ISAT 350.

ISAT 452. Medical Biotechnology. 3 credits. Offered fall.
This course will survey the research development and implementation of select biomedical technologies, including genetic-based medical technologies, biomedical diagnostics, biengineering at the macroscopic and microscopic levels, imaging technologies, lasers in medicine and relevant regulatory and legal issues. Prerequisite: ISAT 351 or permission of instructor.

ISAT 453. Energy and Living Systems. 3 credits. Offered spring.
The potential of living systems as alternative energy sources will be explored by describing energy production and transduction in living systems in the context of current and anticipated applications of biotechnology to energy production. Prerequisite: ISAT 310, ISAT 351 or permission of instructor.

Students learn how complex biological molecules support and regulate processes in living systems through building interactive computer models of protein and nucleic acid structures. Other computer applications include imaging processing, genome data manipulation and NMR data processing. Written and oral presentations are also required. Prerequisite: ISAT 350 or permission of instructor.

ISAT 455. Regulatory Issues in Biotechnology. 3 credits. Offered fall.
This course examines the policies and guidelines of federal government agencies that regulate the use of recombinant DNA technology, genetically engineered organisms and the manufacturing of biotechnology products. Issues of product safety, product labeling, physical and biological containment, environmental release, and mammalian cloning are presented. Prerequisite: ISAT 351 or permission of instructor.
This course introduces transportation as a CLIOS (complex, large-scale, integrated, open system) that has bi-directional interactions with the social, political and economic aspects of society. Fundamental systems operation principles, institutions and regulations are explored with respect to environmental, energy, economic, land use and developmental issues. Building upon this foundation, students develop an understanding of regional planning and regulatory measures. They gain practical experience utilizing transportation and air quality models to quantify transportation impacts and to compare the effectiveness of various transportation control measures. Prerequisite: Junior standing.

ISAT 473. Local Agriculture and Farm Internships. 4 credits. Offered fall and spring. The objectives for this course include understanding local ecology and its impacts on farming, as well as how farming impacts local ecology; practicing diversified farming techniques; understanding how small-scale farms operate as businesses; examining localization and slow-food movements and recognizing the impacts of globalized or industrial food and fiber production; identifying the strengths and limitations of small-scale farming. Prerequisite: Permission of the instructor.

ISAT 477. Complex Systems and How They Fail. 3 credits. Offered fall. Interdisciplinary study of complex system operation, interdependencies and failure focusing on real-world critical infrastructure systems (e.g. electric power, telecommunications and health). Systems response to natural and human-induced hazards, including cascading effects. Examination of risk management strategies including technical and policy solutions.

ISAT 480. Selected Topics in Integrated Science and Technology. 1-4 credits. Offered fall and spring. Topics in integrated science and technology which are of interest to the upper-division student but not otherwise covered in the regular course offerings. Offered only with the approval of the program coordinator. May be repeated for credit when course content changes. Students should consult the instructor prior to enrolling for the course. Prerequisite: Junior or senior standing required. Topic selected may dictate prerequisite.

ISAT/WMST 485. Gender Studies in Science. 3 credits. An interdisciplinary course that looks at the scientific process, science practitioners and science students through the lens of gender analysis. Students read literature, lead discussions, perform experiments and analyze both data and processes to address the effects of educational systems on the preparation and careers of scientists, the influence of politics and culture on scientific inquiry, and the effects of critiques grounded in gender analyses on understanding the scientific process.

ISAT 491. Senior Capstone Project I. 1 credit. Offered fall and spring. First course in a three-course sequence. Student generates an idea for and writes a proposal for an independent or team-based research project. Student must identify and analyze a science- or technology-based problem (broadly defined), identify potential solutions, recommend an approach, and prepare a written proposal.

ISAT 492. Senior Capstone Project II. 2 credits. Offered fall and spring. Second course in a three-course sequence. Student performs the bulk of the research needed for an independent research project, either alone or within an investigative team, to address a technologically based problem.

ISAT 493. Senior Capstone Project III. 3 credits. Offered fall and spring. Third course in a three-course sequence. Student finishes the research and develops an oral and a written report on the work (either alone or within an investigative team), addressing a technologically based problem and developing alternative solutions.

ISAT 495. Technology in our World: Better by Design. 3 credits. Students explore the importance of design in technology and engineering and contrast the design process with the scientific method. This includes evaluating functional requirements, ergonomics, usability, cost, risk and environmental impact. Students complete a design project integrating these factors to address a real-world problem. Prerequisite: Completion of IDLS core science course work.

ISAT 499A. Senior Honors Thesis I. 1 credit. Offered fall and spring. First course of a three-course sequence. Student generates an idea for and writes a proposal for an independent research project that meets the requirements set forth by the Honors program. Student must identify and analyze a science- or technology-based problem (broadly defined), identify potential solutions, recommend an approach, and prepare a written proposal. Equivalent to ISAT 491 for ISAT department credit.

ISAT 499B. Senior Honors Thesis II. 2 credits. Offered fall and spring. Second course in a three-course sequence. Student begins the research necessary for an independent research project that meets the requirements
set forth by the Honors program. Student pursues the approach described in his or her proposal from ISAT 499A. Fulfills same requirements as ISAT 492.

ISAT 499C. Senior Honors Thesis III. 3 credits. Offered fall and spring.

Third course in a three-course sequence. Student completes the research for and prepares an oral and written presentation of their results for an independent research project that meets the requirements set forth by the Honors program. Student contributes and presents (in written and oral form) the project described in his or her proposal from ISAT 499A. Fulfills same requirements as ISAT 493.

### Intelligence Analysis

**College of Integrated Science and Technology**

IA 200. Introduction to National Security Intelligence. 3 credits. Offered yearly.

Intelligence analysis is a complex, dynamic process that includes determining the intelligence needs, data collection, pre-processing, analysis and production of the customer's product. This is an introduction to the history, structure and practices of the national security intelligence community (IC). The course is team-oriented, project-based and grounded in the relevant legal and ethical context. Not open to students in the College of Business.

IA 261. Hypothesis Testing. 3 credits. Offered yearly.

Examines hypothesis testing in national, military, counter, and competitive intelligence. By comparing alternate theories in terms of their explanatory power and predictive success, students will learn the most relevant methods for integrating facts into unified theories, assessing theories, and properly qualifying and reevaluating theories to compensate for risk and uncertainty.

IA 280. Selected Project in Information Analysis. 3 credits. Offered yearly.

This course will examine projects of interest to lower-division students in information (intelligence) analysis not otherwise offered in regular course offerings. They are offered only with the approval of the program director and they may be repeated when course content changes. Students should consult with the instructor prior to enrolling in the course. Prerequisite: Junior standing.

IA/PHIL 312. Causal Analysis. 3 credits. Offered yearly.

Examines causal analysis in national, military, counter, and competitive intelligence. By assessing a factor's amount and kind of efficacy, students will learn the most reliable methods for distinguishing between relevant/irrelevant events and factors, identifying and excluding "pseudo-causes," and anticipating higher order effects of a causal process.

IA/PHIL 313. Counterfactual Reasoning. 3 credits. Offered yearly.

Examines counterfactual reasoning in national, military, counter, and competitive intelligence. By analyzing alternate scenarios and their consequences, students will learn the most relevant methods for employing creative thinking in generating, developing, and assessing possibilities; substantiating "after-action" reports, and structuring futures analysis.

IA/PHIL 314. Strategy Assessment. 3 credits. Offered yearly.

Examines strategy assessment in national, military, counter, and competitive intelligence. By applying probabilities and goals to potential threats and opportunities (short and long-term), students will learn the most relevant methods for formulating and evaluating possible courses of action, and projecting and explaining actions by assessing agents' strategic interests and circumstances.

IA 340. Data Mining, Modeling and Knowledge Discovery. 3 credits. Offered yearly.

Data mining is the nontrivial extraction of previously unknown and potentially useful information from [large] data sets to help explain current behaviors and anticipate future outcomes. Students will apply data mining and knowledge discovery methods to data sets from top business, industry and government. The course is team-oriented, project-based and grounded in the relevant legal and ethical context. Prerequisites: GISAT 251, ISAT 252.

IA 341. System Dynamics Modeling, Simulation and Analysis. 3 credits. Offered yearly.

System dynamics analysis is a perspective and a set of conceptual and computing tools to help us understand the structure and dynamics of complex systems. This course will apply system dynamics analysis to complex systems (problems) that involve the interplay of physical and social-political factors. The course is team-oriented, project-based and grounded in the relevant legal and ethical context. Prerequisites: GISAT 251 and ISAT 252.

IA 342. Visualization Methods, Technologies and Tools for Intelligence Analysis. 3 credits. Offered yearly.

Data visualization presents laboratory or simulation data or the results from sensors out in the field in a way that aids reasoning about and hypothesis building in complex data sets. This course will apply data visualization technologies and tools to timely data sets from business, industry and government. The course is team-oriented, project-based and grounded in the relevant legal and ethical context. Prerequisites: GISAT 251, ISAT 252.

IA/REL 363. Apocalypticism, Religious Terrorism and Peace. 3 credits. Offered yearly.

This course traces apocalypticism from its ancient Jewish and Christian roots to its contemporary manifestations in religious groups around the world. Since apocalypticism is a worldview that cuts across religious traditions, the course covers a variety of religious groups. The last half of the course focuses on the complex relationships between apocalyptic thinking and religious terrorism and entails an independent research project.

IA 400. Cognitive Science and Intelligence Analysis. 3 credits. Offered yearly.

Cognitive science examines a wide range of mind/brain processes, including thinking, learning, language acquisition, pattern recognition, memory, creativity, volition, etc. This course will take an information processing systems approach to study cognitive processes that comprise intelligence analysis. The course is team-oriented, project-based and grounded in the relevant legal and ethical context. Prerequisites: GISAT 251, ISAT 252, IA 340 and either IA 341 or IA 342.

IA 405. Ethics, Law and Intelligence Analysis. 3 credits. Offered yearly.

This course will examine ethical and legal issues raised in the practice of intelligence analysis. It will draw on philosophical ethical theories and reasoning to explicate the issues addressed and will explore the relevant constitutional and other legal constraints on the practice of intelligence analysis, particularly issues of information privacy, civil liberties and limitations on government action. Prerequisite: Senior standing.

IA 440. Seminar in Intelligence Analysis. 3 credits. Offered yearly.

This seminar will focus on important issues in the theory and practice of intelligence analysis as the basis for implementing team projects in the IA Capstone Seminar. Students will individually identify, analyze, plan and report on a feasible capstone seminar project. Students will then organize teams and develop plans to complete a subset of the most promising projects in the Capstone Seminar. Prerequisite: Senior standing in the IA program.

IA 450. Capstone Project in Intelligence Analysis. 3 credits. Offered yearly.

Building on the Seminar in Intelligence Analysis students will complete and present solutions for team-based intelligence community or competitive intelligence IA projects. Students will produce written and oral technical reports/briefs of their results. Prerequisite: IA 440.

IA 480. Selected Topics in Intelligence Analysis. 3 credits. Offered yearly.

This course will examine topics of interest to upper-division students in intelligence analysis not otherwise offered in regular course offerings. They are offered only with the approval of the program director and they may be repeated when course content changes. Students should consult with the instructor prior to enrolling in the course. Prerequisite: Junior standing.

### Interdisciplinary Liberal Studies

**Interdisciplinary Liberal Studies**

IDLS 350. Literacy and Society. 3 credits. Offered fall and spring.

An exploration and analysis of societal literacy practices as viewed through cognitive, cultural, class, workplace, and technological lenses. Prerequisite: GWRTC 103 or equivalent.

IDLS 391. Study Abroad. 1-5 credits.

Credit for academically-grounded, interdisciplinary study abroad. Students seeking credit must secure the approval of the department head and a faculty supervisor who will provide the academic structure, assignments and student evaluation.

IDLS 395. Topics in Interdisciplinary Liberal Studies. 1-6 credits.

Examination of selected interdisciplinary topics of importance to teacher education content areas. May be taken for a maximum of six credit hours toward the major.

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http://www.jmu.edu/catalog/12
IDLS 400. Seminar in Liberal Studies. 3 credits.
Capstone seminar for IDLS students in the humanities/social sciences content area. Students will apply different disciplinary perspectives to a single topic. Course requirements will emphasize superior written and oral communication skills and the integration and application of content area knowledge to the teaching environment. Prerequisites: Students must have completed their IDLS core requirements and be within one course of completing the track. Education students should be in their third semester of their teacher education program.

IDLS 486. Internship and Field Experience. 1-6 credits.
IDLS credit for academically-grounded internships and field experiences. Students seeking credit must secure the approval of the department head for the use of academic structures, assignments and evaluation plans provided by qualified internship or field experience supervisors.

IDLS 490. Independent Study in Interdisciplinary Liberal Studies. 3 credits.
Individualized projects in interdisciplinary liberal studies. Prerequisite: Permission of the director.

IDLS 499A, B and C. Honors. 1-6 credits.

Interdisciplinary Social Science

Cross Disciplinary Studies

ISS 200. Introduction to the Social Sciences. 3 credits.
The course serves as an introduction to the social sciences. It includes a review of the general content of selected social sciences with emphasis on primary foci, methods employed and perspectives guiding each disciplinary approach. The course will vary each semester according to the interests and specialization of the instructor(s).

ISS 300. Experiential/Service Applications. 3 credits.
Provides students with practical work experience through an internship, service learning program, etc. This experience culminates in the application of knowledge and skills emerging from previous courses. Prerequisite: Junior standing.

ISS 400. Senior Seminar in Social Science. 3 credits.
The course builds upon all previous course listings and serves as the final integrating experience providing closure to the interdisciplinary social sciences. Students are expected to integrate theories, research and/or methods from several social science disciplines to present a senior level research paper. The course will vary each semester according to the interests and specialization of the instructor.

Interior Design

School of Art, Design and Art History

All 200-level INDE courses are restricted to declared art, art history, graphic design and interior design majors during the fall and spring semesters. INDE courses at the 300-level and above are restricted to declared INDE majors. During May and summer sessions, INDE courses are open to all students who meet the additional stated course prerequisites. Non-majors wishing to enroll in an INDE course during the fall and spring semesters may request permission of the instructor.

INDE 200. Interior Design Studio I. 3 credits.
Studio focusing upon the design process and creating interior spaces. Projects involve investigations into syntax and design language, program interpretation, ritual, use and the constructed order of built space. Emphasis is upon experimentation, risk and play. Design studies will incorporate drawing, diagramming, models and writing.

INDE 202. Interior Design Studio II. 3 credits.
Design studio building on the fundamentals of INDE 201. Projects will address both three-dimensional design of spaces and the objects within the spaces. Projects will include questions of ritual, ergonomics, material properties and full-scale prototypes. Introduction of workshop, digital graphics and photography incorporated in studio work. Prerequisite: INDE 200.

INDE 208. Portfolio Review. 0 credits.
Portfolio review required to enroll in interior design courses at 300 level and above. Prerequisite: INDE 200. Corequisite: INDE 202.

INDE 210. Architectural Graphics. 3 credits.
Introduction to the tools and craft of the constructed drawing. Drawing types include plan, elevation, section, axonometric and perspective with emphasis upon synthesis and understanding of volumetric space. Media explorations used to increase sensitivity to materials, craft and precision of drawing.

INDE/INDU 220. CAD I: Digital Design. 3 credits.
A studio course introducing computer-aided design experiences. Exploration of CAD, including terms, conventions and drawing techniques from beginning to intermediate concepts to two and three-dimensional tools and commands.

INDE 230. Interior Design Studio III. 3 credits.
Intermediate design studio building upon skills of INDE 200-202 sequence. Projects will be of greater complexity, scope and technical requirement. Design studies will incorporate drawing, diagramming, models, digital studies and writing. Legal, industry and engineering requirements will be integrated into the learned poetics of design. Prerequisite: INDE 208.

INDE 302. Interior Design Studio IV. 3 credits.
Intermediate design studio building upon skills of INDE 300. Projects will be an extension of INDE 301 but with greater complexity, scope and technical requirement. Design studies will incorporate drawing, diagramming, models, digital studies and writing. Legal, industry and engineering requirements will be integrated into the learned poetics of design. Prerequisite: INDE 300.

INDE/INDU 320. CAD II: Digital Design. 3 credits.
An intermediate studio course incorporating computer-aided design experience in digital design. Continuation of CAD design processes from the foundation course toward advanced three-dimensional drawing techniques, solid modeling and rendering, lighting theory, plotting, and animation. Prerequisite: INDE 220.

INDE 330. Materials and Methods I. 3 credits.
A lecture course introducing components and materials used in construction and building systems. Prerequisite: INDE 208.

INDE 332. Materials and Methods II. 3 credits.
The second lecture class in a required sequence focused on building systems and materials. Topics introduced in INDE 330 are studied in greater depth with an emphasis on understanding the interrelationships among elements found in a complete construction documents package. Prerequisite: INDE 330.

Independent activity at the intermediate level, such as research or studio practice, under faculty supervision. Projected studies in any area of the school's offering must be arranged with the instructors who will direct them. Offered only with the consent of the instructor.

INDE 392. Topics in Interior Design. 3 credits. Offering varies.
Study of selected topics in interior design at the intermediate level. May be repeated when course content changes. See MyMadison for current topics.

INDE 400. Interior Design Studio V. 3 credits.
An upper-level design studio building upon the design rigor and technical craft acquired in the INDE 300-302 sequence. Expansion of the design role into collaborative teams, interdisciplinary teams, actual clients, service projects and competition projects. Prerequisite: INDE 302.

INDE 402. Interior Design Studio VI. 3 credits.
Final upper-level interior design studio culminating in a thesis project. Complete student initiative across every phase of the project. Prerequisite: INDE 400.

INDE/INDU 420. CAD III: Digital Design. 3 credits.
An advanced studio course expanding computer-aided design knowledge. Continued exploration of the digital virtual space from intermediate to advanced concepts of the design process, communication with diverse design programs, animation, sound and digital transformation. Prerequisite: INDE 320.

INDE 440. Professional Practices in Interior Design. 3 credits.
Projects and practices involved in the interior design profession. Prerequisite: INDE 302.

INDE 470. Contemporary Design Theory. 3 credits.
Seminar format class which explores influential ideas in contemporary design, including critical regionalism, postmodernism, minimalism, the neo-avant-garde, green design, Marxism and post-structuralism. Prerequisite: GARTH 206.

Independent activity, such as research or studio practice, under faculty supervision. Projected studies in any area of the school's offering must be arranged with the instructors who will direct them. Offered only with consent of the instructor.

INDE 491. Studio Assistant. 1-3 credits, repeatable. Offering varies.
An on-campus program monitored on an individual basis designed to provide practical studio experience in the visual arts. Students will learn safe studio
practices and management skills, including material use, inventory control, and the proper operation of equipment found within various individual classroom studios. Prerequisite: Permission of the instructor.

INDE 492. Topics Interior Design. 3 credits. Offering varies. Study of selected topics in interior design at the advanced level. May be repeated when course content changes. See MyMadison for current topics.

INDE 496. Internship in Interior Design. 1-8 credits. An off-campus program prepared and monitored on an individual basis. Internships are designed to provide practical experience in the arts. Prerequisite: Permission of the instructor.

International Affairs

College of Arts and Letters

INTA 295. Cross-National Research Skills. 4 credits. Students learn how to conduct research from theory formulation through data collection and hypothesis testing in the field of international affairs. Special emphasis on research and computer literacy. Prerequisite: MATH 220.

INTA 301W. The Washington Semester Experience: Global Affairs. 3 credits. Part of the “Global Affairs” Washington Semester program, the course entails intensive study of a global theme. The theme’s dynamics will be explored in varied settings: localities, nation-states, global geographic regions and international organizations (both governmental and non-governmental). The course provides outlets for engagement with policy actors and institutions based in Washington, D.C., as well as for individual and group experiential learning activities. Prerequisite: Enrollment in the Washington Semester program.

INTA 489. Seminar in International Affairs. 4 credits. This is the capstone course in the international affairs major. It provides an interdisciplinary overview of the fields within international affairs and an opportunity for students to complete individual research projects on international problems. Prerequisites: Completion of all courses in the core requirement of the major and senior standing.

International Business

College of Business

IBUS 298. Special Topics in International Business. 3 credits. Offered fall, spring and summer. The course is designed to allow exploration of current topics in international business. Course content will vary. See program director for current content.

IBUS 480. International Business Theory and Policy. 3 credits. Offered spring. The course is designed to serve as an application of theory for business students to allow them to put the total picture of international business together. Prerequisites: IBUS major, senior standing and permission of instructor.

IBUS 490. Special Studies in International Business. 1-3 credits. Offered fall and spring. Designed to give capable students in international business an opportunity to complete independent study under faculty supervision. Prerequisites: GPA of 2.8, recommendation of the instructor and approval of the director prior to registration.

IBUS 494. International Business Internship. 3 credits. Offered fall, spring. A course providing students an opportunity to work in and with an organization in order to gain insight into the practical side of modern international business operations. Prerequisites: IBUS major, completion of 85 credit hours and COB 300, minimum cumulative GPA of 3.0, and approval of director of International Business program prior to registration.

IBUS 498. Special Topics in International Business. 3 credits. Offered fall and spring. An advanced course designed to allow exploration of current topics in international business. Course content will vary. See the program director for current content. Prerequisite: COB 300 and permission of the instructor.

IBUS 499. Honors. 6 credits. Year course. Offered fall and spring. See catalog section “Graduation With Honors.”

Interprofessional Education

Institute for Innovation in Health and Human Services

IPE 201. Health Professionals in Diverse Communities. 1 credit. Offered fall. An introduction to skills in professionalism and interprofessional collaboration in addressing local and global health challenges. First-year pre-professional health students examine social determinants of health and diverse communities, and learn skills in reflection as they interact with health professionals and faculty. Prerequisites: Membership in the Huber Learning Community.

IPE 202. Health Care Service in Diverse Communities. 2 credits. Offered spring. IPE 201 is the second in a two-course sequence for first year pre-professional health students in the Huber Learning Community. Students examine interprofessional perspectives on complex global health issues and apply skills in professionalism, integration, collaboration and reflection to community-based, experiential service learning. Prerequisites: IPE 201 and Membership in the Huber Learning Community.

IPE 220. Adult Health and Development Program. 3 credits. Offered fall and spring. In this academic course and outreach program to adults age 55+ in the surrounding community, JMU students are trained to work 1:1 with the older adults, to apply aging and intergenerational theory, and to critically analyze the outcomes from their interactions.

IPE/ATH/NSG/SDWK 314. Rural Health: An Interdisciplinary Approach. 3 credits. Offered May. Students study, observe and participate in interdisciplinary assessment, planning and delivery of community-based primary health care in partnership with residents and agencies of a host rural county. Learning activities will emphasize rural culture, rural health care and interdisciplinary practice.

IPE 320. Adult Health and Development Program – Leadership. 3 credits. Offered fall and spring. Both an academic course and an outreach program to adults age 55+ in the surrounding community, this course offers JMU students who have previously participated in the program the opportunity to become Senior Staff who provide program leadership, oversight and implementation to the program. Prerequisite: Permission of the instructor and completion of one semester of AHDP.

IPE 381. Introduction to Informatics for Health Care Professionals. 1 credit. A multidisciplinary introduction to informatics in health care focusing on technology, data, information and knowledge and their applications in health care. Emerging trends and issues are examined.

IPE 401. Workshops In Interprofessional Education And Practice. 0 credits. IPE workshops offer a time-limited and concentrated focus on issues that are specific to interprofessional education and/or practice.

IPE 415. Ethical Decision-Making in Healthcare: An Interprofessional Approach. 1 credit. Offered fall and spring. Health care ethics is a shared, relevant concern among health and human service disciplines and is an ideal vehicle for students from different fields to learn about one another’s disciplines and to participate in inter-professional team analysis, discussion, and problem solving. We have designed an integrated cross-disciplinary learning experience for students interested in the complex, real-world dilemmas encountered in practice. The readings and activities will emphasize ethical, legal, moral and spiritual issues and principles for practice within the context of communicating in inter-professional teams.

IPE 440. International Health and Human Services in Malta. 4 credits. Offered May. This May session, study abroad course examines health issues in Malta and provides a team oriented project experience. Project participation, tours and arranged meetings with local experts are used to illustrate health related problems that apply globally and which are compared and contrasted with those in the United States.

IPE/NSG 480. Healthcare Informatics. 2 credits. This course focuses on the nature and functions of present and future application of health care informatics. Emphasis is on preparing current and future health care professionals to plan, design, collaborate with other health care disciplines, and utilize healthcare informatics for effective health care delivery, health organizational management and improved client outcomes. Prerequisite: Minimum of sophomore standing.

IPE 490. Special Topics in Health and Human Services. 0-4 credits. Offered fall and spring.
This course involves topics of special interest in the area of health and human services but is open to all students. The focus of specific courses is identified for specific offerings. Courses are offered based on faculty and student interests.

**Interscience Research**

Departments of Biology, Chemistry and Biochemistry, Geographic Science, Mathematics, Physics and Astronomy, and Computer Science

ISO 450 A, B, C. Interscience Research 1-4 credits, repeatable to 6 credits.

An investigative experience spanning more than one field of science which may require supervision by multiple faculty members from different disciplines. Students must get prior approval for this course from each of the supervising faculty members and the department head of their program. Prerequisites: Junior status and permission of the instructors.

**Italian**

**Department of Foreign Languages, Literatures and Cultures**

ITAL 101. Elementary Italian I. 4 credits. Offered fall and spring.

The fundamentals of Italian through listening, speaking, reading and writing. Practice in pronunciation and development of comprehension. One hour's work a week in the language laboratory. If student has had two or more years of the language in high school he/she will not receive credit for the course.

ITAL 102. Elementary Italian II. 4 credits. Offered fall and spring.

The fundamentals of Italian through listening, speaking, reading and writing. Practice in pronunciation and development of comprehension. One hour's work a week in the language laboratory. If student has had two or more years of the language in high school he/she will not receive credit for the course. Prerequisite: ITAL 101.

ITAL 102F. Elementary Italian-Florence II. 4 credits. Offered spring.

The fundamentals of Italian through listening, speaking, reading and writing. Practice in pronunciation and development of comprehension. If student has had two or more years of the language in high school he/she will not get credit for the course. Prerequisite: ITAL 101.

ITAL 111. Intensive Italian I. 6 credits. Offered May or June.

The fundamentals of Italian through intensive listening, speaking, reading and writing. This four-week course is the equivalent of ITAL 101-102.

ITAL 212. Intensive Italian II. 6 credits. Offered May or June.

The fundamentals of Italian through intensive listening, speaking, reading and writing at the intermediate level. This four-week course is the equivalent of ITAL 213-232. Prerequisite: ITAL 102 or ITAL 111.

ITAL 231. Intermediate Italian I. 3 credits. Offered fall and spring.

A thorough review of grammar, vocabulary building, conversation, composition and reading. Prerequisite: ITAL 102.

ITAL 231F. Intermediate Italian-Florence I. 3 credits. Offered fall.

A thorough review of grammar, vocabulary building, conversation, composition and reading. Prerequisite: ITAL 102.

ITAL 232. Intermediate Italian II. 3 credits. Offered fall and spring.

A thorough review of grammar, vocabulary building, conversation, composition and reading. Prerequisite: ITAL 231.

ITAL 232F. Intermediate Italian-Florence II. 3 credits. Offered spring.

A thorough review of grammar, vocabulary building, conversation, composition and reading. Prerequisite: ITAL 231.

ITAL 300. Italian Grammar and Communication. 3 credits. Offered fall and spring.

Intensive training in grammatical structures and their application to oral and written communication. Instruction is in Italian. Fulfills the College of Arts and Letters writing-intensive requirement for the major. Prerequisite: ITAL 232.

ITAL 307. Italian Civilization. 3 credits. Offered fall.

A study of Italian society, economics, politics and the arts from the Roman Republic to 1814. Instruction is in Italian. Prerequisite: ITAL 300.

ITAL/HIST 308. Contemporary Italian Civilization. 3 credits. Offered spring.

A study of Italian society, economics, politics and the arts from 1814 to the present. Instruction in English. (Research papers for Italian majors/minors in the language.)

ITAL 315. Italian Phonetics. 3 credits. Offered fall.

Intensive drill in Italian sounds and intonation patterns. Instruction is in Italian. Prerequisite: ITAL 232 or equivalent.

ITAL 317. Strategies for Italian Oral Communication. 3 credits. Offered spring.

In this course students will develop linguistic competencies and learn basic tools to improve their oral communication skills. Prerequisite: ITAL 232.

ITAL 320. Italian Oral and Written Communication. 3 credits. Offered fall and spring.

Intensive training in the use of modern, everyday Italian with emphasis on conversation and composition. Readings in Italian will provide a context for discussion and writing. Prerequisite: ITAL 300.

ITAL 330. Business Italian. 3 credits. Offered fall or spring.

A study of commercial and technical vocabulary and trade customs in conjunction with practice in the art of commercial communication, including interviews, letter writing and simultaneous interpretation. Instruction is in Italian. Prerequisite: ITAL 300.

ITAL 335. Introduction to Italian Literature. 3 credits. Offered spring.

A survey of Italian literature from its beginning to the present. Textual analysis of sample writings representative of the most important literary movements. Instruction is in Italian. Prerequisite: ITAL 300.

ITAL 351. Italian-English Technical/Commercial Translation. 3 credits. Offered fall.

Italian-English translation applied in several commercial (i.e. marketing, finance) and technical (i.e., electricity and electronics, software, hardware) fields. Focus will be on the acquisition of specialized knowledge (both linguistic and extralinguistic) and the delivery of professional documents in real-market conditions. Prerequisite: ITAL 300.

ITAL 375. Business and Society in Italy. 3 credits. Offered fall.

This course studies Italian business, economy, politics and the influence the Italian society has on them. Prerequisite: ITAL 300.

ITAL 397. Creative Writing in Italian. 3 credits. Offered fall or spring.

This course will develop strategies both for writing well and for writing creatively. Prerequisite: ITAL 300.

ITAL 400. Advanced Conversation. 3 credits. Offered fall or spring.

Discussions deal with topics of current interest. Prerequisite: ITAL 320.

ITAL 410. Italian Through Media. 3 credits. Offered fall or spring.

This course is designed to improve fluency and accuracy in speaking, reading and understanding. Prerequisite: ITAL 300.

ITAL 425. Modern Italian Literature. 3 credits. Offered fall or spring.

A study of the works of major Italian writers of the 20th century. Instruction is in Italian. Prerequisite: Three years of college Italian or equivalent.

ITAL/ENG 437. Studies in Italian Literature. 3 credits. Offered fall or spring.

A study of selected works of Italian literature. Instruction is in English. May be repeated for credit when course content changes. (Research papers for Italian majors/minors in the language.)

ITAL 446. Special Topics in Italian Literature. 3 credits. Offered fall or spring.

Study of a particular topic in Italian literature. It may cover one or specific Italian literature genres. Prerequisite: ITAL 300.

ITAL 447. Special Topics in Italian Civilization and Culture. 3 credits. Offered fall or spring.

Students will study a particular topic in the civilization and/or culture of Italy. Course may be repeated. Prerequisite: ITAL 300.

ITAL 448. Special Topics in Italian Linguistics. 3 credits. Offered fall or spring.

Students will study a particular topic of Italian linguistics. Topics could include an introduction to Italian sociolinguistics and psycholinguistics. Course may be repeated. Prerequisite: ITAL 300.

ITAL 465. Italian Cinema. 3 credits. Offered fall or spring.

A study of the evolution of Italian cinema. Emphasis given to the following directors: Rossellini, Visconti, De Sica, Fellini, Antonioni, Bertolucci, Wertmuller, Scola, Taviani, Salvalatore. Instruction is in Italian. Prerequisite: ITAL 300 or permission of the instructor.

**Japanese**

**Department of Foreign Languages, Literatures and Cultures**


The fundamentals of Japanese through listening, speaking, reading and writing. Practice in pronunciation and development of comprehension. One-hour's work a week in the language laboratory. If the student has had two or more years of the language in high school, he/she will not receive credit for the course.

JAPN 212. Intensive Japanese I. 6 credits. Offered fall.

The fundamentals of Japanese through intensive listening, speaking, reading and writing. This four-week course is the equivalent of JAPN 101-102.

JAPN 231. Intermediate Japanese I. 3 credits. Offered fall and spring.

A thorough review of grammar, vocabulary building, conversation, composition and reading. Prerequisite: JAPN 102.

JAPN 231F. Intermediate Japanese-Fukuoka I. 3 credits. Offered fall.

A thorough review of grammar, vocabulary building, conversation, composition and reading. Prerequisite: JAPN 102.

JAPN 232. Intermediate Japanese II. 3 credits. Offered fall and spring.

A thorough review of grammar, vocabulary building, conversation, composition and reading. Prerequisite: JAPN 231.

JAPN 232F. Intermediate Japanese-Fukuoka II. 3 credits. Offered spring.

A thorough review of grammar, vocabulary building, conversation, composition and reading. Prerequisite: JAPN 231.

JAPN 300. Japanese Grammar and Communication. 3 credits. Offered fall and spring.

Intensive training in grammatical structures and their application to oral and written communication. Instruction is in Japanese. Fulfills the College of Arts and Letters writing-intensive requirement for the major. Prerequisite: JAPN 232.

JAPN 307. Japanese Civilization. 3 credits. Offered fall.

A study of Japanese society, economics, politics and the arts from the late Tokugawa period to 1945. Instruction is in Japanese. Prerequisite: JAPN 300.

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