

# INTEGRATED SCI, BUS & TECH (ISBT)

## ISBT 101 Living Systems I

This course will provide students with an introduction to biology, chemistry, environmental science, and geology with an emphasis on practical applications. Included in this course will be the fundamentals of computer use, including training on how to use the computer to prepare laboratory reports. The course will be laboratory-intensive with hands-on group learning experiences. Students will be expected to master basic laboratory skills and gain a degree of comfort in working in the laboratory.

## ISBT 102 Living Sys Technologies

Students (working in teams) will be required to select 2 to 3 technologies that are derived from the sciences they were introduced to in ISBT 101. Students will analyze the technology from its inception to its current status. The analysis will include business considerations, an understanding of the basic science, moral, social, and ethical issues related to the technology, and a summary suggesting a future for the technology. Each team will be required to prepare both written and oral presentations.

## ISBT 103 Scientific Discovery: Phage Hunting I

This course is designed to teach students how to do scientific research. It is the first semester of a year-long research-based project lab course in which students will participate in a nation-wide program in collaboration with undergraduates at other colleges. Students will isolate and characterize novel bacteriophages (viruses that infect bacteria) from the environment using modern molecular biology techniques.

## ISBT 104 Scientific Discovery: Phage Hunting II

This is the second semester ("Phage 2") of a year-long research-based project lab course in which students will participate in a nationwide program in collaboration with undergraduates at other colleges. Students will describe the basic genome structure. This will involve mastering the strategies and computer programs required to predict where genes are located in the genome and annotating the function of those genes. These results will be presented for peer-review and will likely result in a scientific publication for the student.

## ISBT 111 Technology and Systems Analysis

This course will introduce students to the field of systems analysis and to the broad spectrum of technologies that are integrated into the design, construction, and operation of a high-tech electronic commercial product. The product will be disassembled into its simplest parts followed by an analysis of the form, function, and fundamental physical-science basis of each component. Using laboratory computers, equipment, and software tools, students will assemble the components into a working prototype of the commercial product.

## ISBT 112 Technology Foundations I: Processes

This course will examine the fundamental physical processes utilized by a wide range of technologies. Topics include kinematics, force, work, energy, momentum, and thermodynamics. The mathematical concepts used to describe these topics will be introduced along with their applications. The course will be laboratory-intensive with hands-on group learning experiences. Upon completion of this course, students will be comfortable in a physical science laboratory.

## ISBT 170 Special Topics

## ISBT 171 Special Topics

## ISBT 201 Living Systems II

This course will examine specific concepts and practices underlying biology, chemistry, and environmental science, with forensics providing an over-arching theme. Students will spend most of their time in the laboratory learning the skills and procedures that are essential in the technological practice of these sciences. Students will work in teams and practice hands-on problem solving. Prerequisite(s): ISBT 103

## ISBT 202 Technology and Business Analysis

This course will continue the student's exploration of existing technologies and the process of commercialization. Students, working in teams, will create companies and analyze three different technologies as if their companies were creating and developing those technologies. Specifically, the students will need to demonstrate the science of the technology in the laboratory, define the need, analyze the sales and marketing plan, understand the moral and ethical implication, and calculate costs and profitability. The students will assess the business-state of the technology and recommend directions in which the technology should expand. Each team will be required to prepare both written and oral presentations. Teams will be required to select a technology from each of the ISBT areas of concentration, i.e., (biotechnology, energy and natural resources, and information and knowledge management.) Analysis of a technology from each of the areas will prepare students to choose their area of concentration. Prerequisite(s): ISBT 111 and BUS 100

## ISBT 211 Instrumentation and Measurement

This course will examine the acquisition of data through an analysis of measurement transducers, instrument design, and computer data-acquisition and interfacing. The descriptive statistics and data-visualization techniques required to transform raw data into useful information will be investigated in a laboratory setting. The incorporation of multiple measurements into process-level monitoring and control systems will be studied with respect to the various commercially available intelligent instruments, industrial network architectures, and information control systems. Prerequisite(s): ISBT 111 and ISBT 112

## ISBT 212 Technology Foundations II: Materials

This course will examine the materials utilized in machines, devices, and consumer products. The study of metals, polymers, ceramics, adhesives, coatings, fuels, and lubricants is combined with the exploration of mechanical and nondestructive materials testing in a hands-on laboratory environment. In addition the sources of raw materials, production methods, markets, costs, and waste products of each type of material are evaluated.

## ISBT 241 Product Dev & Validation

## ISBT 270 Special Topics

## ISBT 272 Special Topics

## ISBT 301 Methods in Biotechnology

This course will provide a hands-on introduction to biotechnology. Throughout the semester the student will learn many of the techniques routinely used in molecular biology and biotechnology. The majority of the time will be spent in the laboratory. Upon completion of the course, the student should have sufficient fundamental knowledge of molecular biology and biotechnology to be able to function in a biotechnology laboratory. Prerequisite(s): ISBT 201

**ISBT 302 Tissue Culture**

This course will provide the student with a hands-on introduction to cell culture. Throughout the semester, the student will learn techniques for handling, storing, growing, and manipulating cells in culture. The majority of the time will be spent in the laboratory practicing these techniques. Upon completion of the course, the student should have sufficient fundamental knowledge of cell culture to be able to function in a cell culture laboratory. Prerequisite(s): ISBT 201

**ISBT 311 Bioinformatics**

This course examines current biological problems and explore and develop bioinformatic solutions to these issues. Each topic includes a definition of the problem, a review of the basic biological concepts involved, an introduction to the computational techniques used to address the problem along with a utilization of existing web-based tools and software solutions often employed by professionals in the field of bioinformatics. Biological topics include those such as antibiotic resistance, genetic disease, and genome sequencing.

**ISBT 312 Collaborative Software Development**

This course will introduce students to the tenets of collaborative software development. As commercial and professional applications are developed by a group of software engineers rather than individuals, this course will examine various methods of project management and specifically utilize Agile project management. Working applications will be developed throughout the course. Prerequisite(s): ISBT 111

**ISBT 321 Fundamentals of Energy and Natural Resources**

This course will cover the fundamental concepts from chemistry, physics, and engineering within the context of energy applications. This includes the principles governing energy transformations, transport, and conversion, including the laws of thermodynamics, the study of heat, and chemical and nuclear reactions. We look at the way we use our natural resources to obtain energy. In addition to basic principles, we also use current events, policy making, and the media's treatment of issues surrounding our use of natural resources to put these principles in context. Prerequisite(s): ISBT 212

**ISBT 322 Role of Energy and Natural Resources in Modern Society**

This course will provide a fairly comprehensive overview of available energy resources both domestically and internationally. This course will be taught by a professional in the field and will draw upon the instructor's own experiences.

**ISBT 330 Life Science Innovation**

This course is open to students interested in learning how to commercialize new technologies. Teams of science and business students will work with inventor-scientists at the Wistar Institute—as well as with external partners such as venture capitalists, intellectual property lawyers, and biotechnology entrepreneurs—to develop proposals on the scientific merit and commercial feasibility of life science research projects. Students should have either a scientific or business background to enroll in this course. (Cross-listed as MGT 330 and BIO 330)

**ISBT 331 Project Management****ISBT 333 Entrepreneurship and High-Tech Business I**

This course will direct the student through the many steps required to take a concept from business start-up, through invention and development to commercialization. The students will learn through two pathways, studying cases and through their own creative efforts. Time will be spent tracing the history of high tech start-ups, both those that have survived and those that did not. In parallel, the students will be required to simulate their own companies. Prerequisite(s): BUS 100

**ISBT 334 Entrepreneurship and High-Tech Business II**

This course is an optional follow on to ISBT 333. It is aimed at students that have a business idea that they are ready to take to the next level. In this course, students will take the business plan they wrote for ISBT 333 and find and include the detail needed to start the business. Students will design and participate in feasibility studies, technology demonstrations, market surveys, solicitation of funds, and due diligence. Prerequisite(s): ISBT 333

**ISBT 350 Cooperative Education I, II**

This experience involves full-time, paid assignment in a cooperating firm, and involves job-related learning under faculty and on-site supervision. Students will meet regularly with a faculty member and will be encouraged to reflect on the relationship between course work and their co-op experience. Position is arranged through the director. Restriction(s): Junior or Senior Standing, Minimum G.P.A. of 3.0, and approval of Chair

**ISBT 360 ISBT Internship I, II**

This experience is normally part-time or summer employment in a cooperating site to provide practical experience. Working under professional supervision, students will learn how to apply their education to everyday demands of the world of work. Students will meet regularly with a faculty member and will be encouraged to reflect on the relationship between course work and their internship experience. Restriction(s): Junior or Senior Status, Minimum G.P.A. of 3.0, and Approval of Chair

**ISBT 371 Special Topics****ISBT 372 Special Topics****ISBT 373 Special Topics****ISBT 374 Special Topics****ISBT 379 Project Management****ISBT 380 ISBT Internship****ISBT 401 Bioprocessing**

This course will provide the student with a hands-on introduction to bioprocessing. Throughout the semester, the student will learn how to set up, maintain, and operate bioreactors. Along with the operation of the equipment, she will need to learn and understand the growth requirements for the organisms she chooses to grow and the specific requirements for the product she wishes the organisms to generate. The majority of the time will be spent in the laboratory practicing these techniques. Upon completion of the course, the student should have sufficient fundamental knowledge to be able to run a small-scale bioreactor. Prerequisite(s): ISBT 201

**ISBT 402 Special Topics****ISBT 403 Bioinformatics****ISBT 411 Intelligent Systems**

This course presents a systematic introduction to the fundamentals of computational intelligence, including in-depth examination of artificial neural networks, evolutionary computing, swarm intelligence, and fuzzy systems. Computational intelligence is the study of adaptive mechanisms to enable or facilitate intelligent behavior in complex and changing environments. Specific environments examined will include Laboratory Automation, Automated Process Control, Robotics, and Business Decision Support.

**ISBT 412 Knowledge Discovery**

This course will introduce students to the Knowledge Discovery process with special concentration on the various concepts and algorithms of Data Mining. Specific topics include an examination of Online Analytical Processing (OLAP), data warehousing, information retrieval, and machine learning. The core concepts of classification, clustering, association rules, prediction, regression, and pattern matching are followed by a discussion of advanced topics such as mining temporal data, spatial data, and Web mining. This course will incorporate the algorithms examined in ISBT 411–Intelligent Systems—and will emphasize the importance of Knowledge Discovery and Data Mining in research, product development, and production facilities. Prerequisite(s): ISBT 411

**ISBT 421 Natural Resource Management**

This course will cover natural resource use, conservation, and management. We begin by discussing renewable energy sources, contrasting their use with the use of non-renewable sources. We then discuss some of our other natural resources, such as water, forests, minerals, and the atmosphere. In addition to basic principles, we also use current events, policy making, and the media's treatment of issues surrounding our use of natural resources to put these principles in context.

**ISBT 422 Sustainable Energy Development**

This course covers the topic of sustainability as it relates to our use of our natural resources. We discuss the philosophy, economics, implementation, public and government involvement in this area, the reality and the future of sustainability. We also use current events, policy making, and the media's treatment of issues surrounding our use of natural resources to put these principles in context.

**ISBT 431 Regulatory Affairs**

In this course, we discuss the history, issues, roles, and future trends of the U.S. agencies such as the FDA, EPA, and OSHA that are responsible for administering the major laws and regulations pertaining to the life cycle of products in commerce. Emphasis is on understanding the impacts of environmental, health, safety (EHS), and product laws and regulations with which most businesses have to comply. All of the major EHS Acts are presented and case studies, practical exercises, and team group work are used to discover the business impact. Restriction(s): ISBT Junior Standing

**ISBT 444 Research in ISBT I**

This course provides the student with an opportunity to do research with a faculty member. The student and the faculty member agree on the research project before the student registers for the course.

**ISBT 445 Research in ISBT II**

This course is a continuation of the 444 research course. It provides the student with an opportunity to continue to conduct research with a faculty member.

**ISBT 450 Cooperative Education I, II**

This experience involves full-time, paid assignment in a cooperating firm, and involves job-related learning under faculty and on-site supervision. Students will meet regularly with a faculty member and will be encouraged to reflect on the relationship between course work and their co-op experience. Position is arranged through the director. Restriction(s): Junior or Senior Standing, Minimum G.P.A. of 3.0, and approval of Chair

**ISBT 451 Co-op Education II****ISBT 460 ISBT Internship I, II**

This experience is normally part-time or summer employment in a cooperating site to provide practical experience. Working under professional supervision, students will learn how to apply their education to everyday demands of the world of work. Students will meet regularly with a faculty member and will be encouraged to reflect on the relationship between course work and their internship experience. Restriction(s): Junior or Senior Status, Minimum G.P.A. of 3.0, and Approval of Chair

**ISBT 461 ISBT Internship III****ISBT 470 Special Topics****ISBT 471 Special Topics****ISBT 472 Special Topics****ISBT 473 Biotech of Pharmaceuticals****ISBT 474 Special Topics****ISBT 475 Special Topics****ISBT 477 Special Topics****ISBT 478 Biotech/Pharmaceutical Indust****ISBT 479 Special Topics****ISBT 480 ISBT Internship****ISBT 481 Capstone Experience I, II**

As an extension of a student's concentration, individual students or teams of students will work on a real-world problem designed by the student or team. The project will culminate in the student's formal presentation of results and conclusions both orally and in written form.

**ISBT 482 Capstone Experience I, II**

As an extension of a student's concentration, individual students or teams of students will work on a real-world problem designed by the student or team. The project will culminate in the student's formal presentation of results and conclusions both orally and in written form.

**ISBT 483 Capstone III**