

# SCHOOL OF HEALTH, SCIENCE & TECHNOLOGY

## On-Campus Majors

- Biology (BA) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/biology-ba/>)
- Computer Science (BS) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/computer-science-bs/>)
- Engineering with a Data Science Concentration (BSE) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/data-science-concentration-bse/>)
- Engineering with a Design and Innovation Concentration (BSE) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/design-innovation-concentration-bse/>)
- Engineering with a Engineering Management Concentration (BSE) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/engineering-management-concentration-bse/>)
- Engineering with a Environmental Engineering Concentration (BSE) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/environmental-engineering-concentration-bse/>)
- Engineering with a Mechanical Engineering Concentration (BSE) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/mechanical-engineering-concentration-bse/>)
- Environmental Biology (BS) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/environmental-biology-bs/>)
- Environmental Biology with a Water Resources Concentration (BS) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/environmental-biology-water-resources-concentration-bs/>)
- Environmental Biology with a Wildlife Biology Concentration (BS) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/environmental-biology-wildlife-biology-concentration-bs/>)
- Exercise Science (BS) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/exercise-science-bs/>)
- Exercise Science with a Cardiac Rehabilitation Concentration (BS) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/exercise-science-cardiac-rehabilitation-concentration-bs/>)
- Exercise Science with a Pre-Occupational Therapy Concentration (BS) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/exercise-science-pre-occupational-therapy-concentration-bs/>)
- Exercise Science with a Pre-Physical Therapy Concentration (BS) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/exercise-science-pre-physical-therapy-concentration-bs/>)
- Health Services (AS) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/health-service-as/>)
- Mathematics (BA) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/mathematics-ba/>)
- Nursing (BSN) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/nursing-bsn/>)
- Pre-Dental (BS) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/pre-dental-bs/>)
- Pre-Medical (BS) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/pre-medical-bs/>)
- Pre-Pharmacy (BS) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/pre-pharmacy-bs/>)

- Pre-Physician's Assistant (BS) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/pre-physicians-assistant-bs/>)
- Pre-Veterinary (BS) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/pre-veterinary-bs/>)

## On-Campus Minors

- Biology (Minor) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/biology-minor/>)
- Chemistry (Minor) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/chemistry-minor/>)
- Coaching (Minor) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/coaching-minor/>)
- Computer Science (Minor) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/computer-science-minor/>)
- Environmental Sustainability (Minor) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/environmental-sustainability-minor/>)
- General Science (Minor) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/general-science-minor/>)
- Mathematics (Minor) (<https://catalog.cornerstone.edu/undergraduate/health-science-technology/mathematics-minor/>)

## Biology (BIO)

### BIO-111 INTRO TO BIOLOGICAL SCIENCE (4 Credits)

An introductory course in Biology in which plants and animals are used to illustrate basic biological principles. The course will examine the relationships among living organisms, including man, and their environment. It is designed to increase student awareness and appreciation of organisms in nature as well as the natural history of selected plants and animals. The laboratory includes the identification of common organisms living in West Michigan during field trips. This course is for non-science majors and minors and satisfies the core requirement for Lab Science. Course fee applied.

*Prerequisite:* None

### BIO-121 BIOSTATISTICS (3 Credits)

This course teaches the statistical methods and principles of biostatistics. Students will learn to use the statistical program R to understand, interpret, and analyze data used in the biological sciences.

*Prerequisite:* Complete math core

### BIO-151 GENERAL BIOLOGY (4 Credits)

This course is designed to provide a natural science foundation for all science majors and minors. Foundational concepts in cell biology/chemistry, genetics (classical and molecular) and microbiology will be stressed in both lecture and lab. This course satisfies the core requirement for Lab Science. Course fee applied.

*Prerequisite:* None

### BIO-161 HUMAN BIOLOGY (4 Credits)

This course includes examination of the structure and function of the human body with special emphasis on disease process as it relates to dysfunction along with practical applications for a lifestyle of healthful living. Emphasis is placed upon cell biology, tissues and various systems of the body including integumentary, skeletal, muscular, nervous, endocrine, circulatory, lymphatic, respiratory, digestive, urinary, endocrine and reproductive systems. This general survey course fulfills the science core requirements for a lab science and is open to students desiring basic knowledge of human anatomy and physiology. Course fee applied.

*Prerequisite:* None

**BIO-171 INTRODUCTION TO MICROBIOLOGY (4 Credits)**

This course will provide students with an introduction to the microbial world. The lectures cover topics including microbial growth and metabolism, microbial diversity, ecology, and a survey of common diseases and control mechanisms. The laboratory sessions introduce proper culture and identification, microscopy, aseptic transfer, and medical tests involving microorganism. Lecture and lab. Course fee applied.

*Prerequisite:* None

**BIO-225 BOTANY (4 Credits)**

Studies basic plant science, including the structure, reproduction, and ecological relationships among plants. Lecture and lab. This course satisfies the core requirement for Lab Science. Course fee applied.

*Prerequisite:* BIO-111 or BIO-151

**BIO-233 ZOOLOGY (4 Credits)**

Introduction to the basic principles of zoology, including development, distinguishing characteristics and interactions of the major animal kinds, with special emphasis on the invertebrates. Lecture and lab. This course satisfies the core requirement for Lab Science. Course fee applied.

*Prerequisite:* BIO-111 or BIO-151

**BIO-241 ANATOMY AND PHYSIOLOGY I (4 Credits)**

A systems approach to the structure and function of the human body with special emphasis on disease process as it relates to dysfunction along with practical applications for a life-style of healthful living. Includes integumentary, skeletal, muscular, nervous, and endocrine systems. Laboratory experiences will use microscopic and lab animal investigation. Stresses the homeostatic function and intricacy of the body and its analogies to the Body of Christ, the Church. Lecture and lab. This course satisfies the core requirement for Lab Science. Course fee applied.

*Prerequisite:* None

**BIO-242 ANATOMY & PHYSIOLOGY II (4 Credits)**

A systems approach to the structure and function of the human body with special emphasis on disease process as it relates to dysfunction, along with practical applications for a life-style of healthful living. Includes cardiovascular, digestive, respiratory, lymphatic, urinary, and reproductive systems. Laboratory experiences will use microscopic and lab animal investigation. Stresses the homeostatic function and intricacy of the body and its analogies to the Body of Christ, the Church. Lecture and lab. This course satisfies the core requirement for Lab Science. Lab fee applied.

*Prerequisite:* BIO-241, C- or higher

**BIO-331 ORNITHOLOGY (4 Credits)**

Study of bird anatomy, behavior, life cycles, migration, distribution, and economic relations. Field work is concerned with identification by sight and song and observing the habitat requirements of each species. Lecture and lab. This course satisfies the core requirement for Lab Science. Course fee applied.

*Prerequisite:* None

**BIO-347 INTRO TO NUTRITION (3 Credits)**

This course is designed to study foods and their effects upon health, development, and performance of the human body. Students will develop an understanding of healthful and performance nutrition as it relates to optimal health and physical performance. Also, students will study energy pathways in the body and the six basic nutrients related to performance. Additionally, students will investigate body composition and weight control.

*Prerequisite:* None

**BIO-351 GENETICS (4 Credits)**

A study of classical Mendelian genetics, molecular genetics, genomes and developmental genetics, as well as the current molecular basis of gene expression. Lab investigations include inherited traits studied with fruit flies and corn. Lab experience includes modern techniques in molecular genetic analysis, PCR, gel electrophoresis, transformation and cloning. Ethical issues will also be considered. Course fee applied.

*Prerequisite:* BIO-151

**BIO-352 MICROBIOLOGY (4 Credits)**

A survey study of the structure and function of micro-organisms, with an emphasis on bacteria. Lab included basic techniques in the isolation, identification and culture of micro-organisms. Lecture and lab. Course fee applied.

*Prerequisite:* BIO-233 or BIO-151

**BIO-353 PATHOPHYSIOLOGY (3 Credits)**

The Pathophysiology course is designed to promote the understanding and application of fundamental concepts of disease processes. General concepts of disease (e.g. cell injury, inflammation, necrosis, wound healing, immune response, infectious disease, and neoplasia) are discussed. These concepts are then applied in a systems-oriented approach, including the pathogenesis, clinical manifestations, diagnosis and treatment of the various disease processes.

*Prerequisite:* BIO-241, BIO-242

**BIO-400 CAPSTONE SEMINAR: BIOETHICS & ARGUMENT (3 Credits)**

This course is a senior capstone course for Biology and Pre-Professional Majors, and investigates the ethical and theological issues confronting one choosing a biology-related career. Emphasis will be placed upon constructing a personal, Christian philosophical framework. Students will address these concepts as they investigate and evaluate relevant biological issues.

*Prerequisite:* None

**BIO-431 VERTEBRATE ZOOLOGY (4 Credits)**

Introduction to the characteristics of the seven classes of vertebrate animals, their structure and life history. Lecture and lab. Course fee applied.

*Prerequisite:* BIO-233

**BIO-451 MOLECULAR CELL BIOLOGY (4 Credits)**

Examines the structure, function, differentiation and reproduction of cells at all levels of organization with special emphasis on current research in oncology, immunology, neurology and embryology. Lab experience includes modern techniques in sterile tissue culture and cell growth as well as some computer graphics. Lecture and lab. Course fee applied.

*Prerequisite:* BIO-351

**BIO-480 SPECIAL TOPICS BIOLOGY (1-3 Credits)**

*Prerequisite:* None

## Chemistry (CHM)

**CHM-110 GEN/ORGANIS/BIO CHEM FOR HEALTH SERVICE (3 Credits)**

This non-lab introductory chemistry course surveys general chemistry, basic organic chemistry nomenclature, functional groups and typical reactions, as well as introducing organic compounds of biological importance. Applications of the chemical concepts will focus on situations encountered by healthcare professionals - especially nurses. This course is required for all students in the Associate of Science - Health Services Program. It serves as an elective course for any other student.

*Prerequisite:* Take MAT-108 or MAT-121

**CHM-111 PRIN GENERAL CHEMISTRY (4 Credits)**

Investigates properties of substances and the changes they can undergo. Special emphasis on laws of chemical combination, theories of atomic structure, periodic trends, kinetic theory, and chemical and physical equilibria as well as activities to communicate the centrality of chemistry to historical development, modern civilization, and life itself. Explores proper biblical stewardship in chemical manufacturing, disposal, and use. Lecture and lab. This course satisfies the core requirement for Lab Science. Course fee applied.

*Prerequisite:* None

**CHM-121 GENERAL CHEMISTRY I (4 Credits)**

Investigation of the composition and properties of substances and the changes they can undergo. Special emphasis on laws of chemical combination, theories of atomic structure, periodic trends, gas properties and thermodynamics, as well as activities to communicate the centrality of chemistry to historical development, modern civilization, and life itself. Explores proper biblical stewardship in chemical manufacturing, disposal, and use. Lecture and lab. This course satisfies the core requirement for Lab Science. Course fee applied.

*Prerequisite:* None

**CHM-122 GENERAL CHEMISTRY II (4 Credits)**

A continuation of CHM-121 with emphasis on reaction types and rates, electrochemistry, equilibria, group properties, nuclear chemistry and qualitative analysis. Addresses environmental concerns and safe handling and disposal of chemicals. Applications of chemical concepts to daily life are emphasized throughout the course. Lecture and lab. Course fee applied.

*Prerequisite:* CHM-121, minimum grade C-

**CHM-212 PRINCIPLES OF ORGANIC & BIOCHEM (4 Credits)**

Study of the structure, properties, reactions, and interactions of the compounds of carbon and the molecules of life. Special emphasis upon the relationship of macromolecular structure and function to their components. Explores and utilizes chemical theory in the understanding of simple and complex molecular behavior. Laboratory exercises concentrate on synthesis, identification and investigation of both natural and man-made products. Lecture and lab. Course fee applied.

*Prerequisite:* CHM-111 or CHM-121, minimum grade C-

**CHM-230 ORGANIC CHEMISTRY LAB I (2 Credits)**

This course develops laboratory principles, methods and techniques for synthesis and analysis of organic molecules. Course fee applied.

*Prerequisite:* CHM-231

**CHM-231 ORGANIC CHEMISTRY I (3 Credits)**

A study of carbon compounds including nomenclature, structures, bonding, reactions, mechanisms, and spectroscopic characterization.

*Prerequisite:* CHM-122, minimum grade C-

**CHM-232 ORGANIC CHEMISTRY II (3 Credits)**

A continuation of CHM-231 with special emphasis on polyfunctional compounds and molecules with biological significance. Natural product synthesis and polymer chemistry will also be addressed.

*Prerequisite:* CHM-231, minimum grade C-

**CHM-233 ORGANIC CHEMISTRY II LAB (2 Credits)**

Continuation of Organic Chemistry Lab I. This course develops laboratory principles, methods and techniques for synthesis and analysis of organic molecules. Course fee applied.

*Prerequisite:* CHM-232

**CHM-280 ADVANCED TOPICS (1-4 Credits)**

*Prerequisite:* None

**CHM-411 PERSPECTIVES IN CHEMISTRY (2 Credits)**

Investigation in the history, philosophy, curricular structure, methodology, key ideas and concepts of chemistry. Emphasis will be given to the central role in technology and society as well as stewardship issues of production, utilization, and disposal.

*Prerequisite:* Three CHM courses, Junior or Senior status required

**CHM-470 READINGS IN CHEMISTRY (1-3 Credits)**

*Prerequisite:* None

**CHM-472 BIOCHEMISTRY (4 Credits)**

Investigation of biologically important molecules including proteins, lipids, carbohydrates, and nucleic acids. Enzyme kinetics, metabolic pathways, and the relationship of problems in these pathways to disease states are emphasized. Lecture and lab.

*Prerequisite:* CHM-232

**CHM-480 ADVANCED TOPICS IN CHEMISTRY (3 Credits)**

Formal class dependent upon student demand and interest of the professor.

*Prerequisite:* None

**CHM-490 INDEPENDENT STUDY (1-3 Credits)**

*Prerequisite:* None

## Computer Science (CSC)

**CSC-131 PROGRAMMING FUNDAMENTALS (3 Credits)**

An introduction to the field of computer science and software engineering. Topics include problem solving, algorithms, structured program design, data types, program control structures, program testing, and debugging. Programming assignments are written in a high-level general-purpose programming language. Satisfies the core requirement for a science elective.

*Prerequisite:* Take MAT-121 (C or higher) May be taken concurrently.

**CSC-132 INTERMEDIATE PROGRAMMING (4 Credits)**

A continuation of Programming Fundamentals. Further development of problem solving and programming skills. Topics include object oriented programming, elementary data structures, indirection, dynamic memory allocation, inheritance, polymorphism, and templates. Introduction to software engineering practices for version control, coding conventions, and automated testing. Programming assignments are written in high-level programming languages. Students may not receive credit for both EGR-112 and CSC-132.

*Prerequisite:* CSC-131 (C or higher)

**CSC-216 DATABASE MGT SYSTEMS (3 Credits)**

An introduction to the analysis, design, and implementation of database management systems with an emphasis on the relational model. Topics include data modeling, entity-relationship models, normal forms, query languages, database security and integrity.

*Prerequisite:* CSC-132 (C or higher)

**CSC-225 PROGRAMMING LANGUAGE CONCEPTS (3 Credits)**

A study of programming language concepts. Topics include language definition, lexical analysis, parsing, translation of high level languages to assembly language, optimization, alternative programming paradigms, and the history and evolution of programming languages. Several languages are introduced and examined.

*Prerequisite:* CSC-132 (C or higher), EGR-226 (C or higher), EGR-227 (C or higher)

**CSC-231 DATA STRUCTURES (3 Credits)**

A study of classical data structures and their implementations. Topics include abstract data types, stacks, queues, sequences, iterators, hashes, heaps, trees, and graphs. Introduction to the analysis of algorithms and further development of advanced programming concepts including memory management and security issues. Programming assignments are written in a high-level object-oriented programming language.

*Prerequisite:* CSC-132 (C or higher)

**CSC-322 OPERATING SYSTEMS (3 Credits)**

An introduction to the principles of operating system design and implementation. Topics include processes, threads, and parallelism, inter-process communication and synchronization, deadlock, memory management and shared memory, processor scheduling, file systems, input/output devices, client-server systems, distributed systems, protection and security.

*Prerequisite:* CSC-231 (C or higher), EGR-226 (C or higher), EGR-227 (C or higher)

**CSC-325 WEB APPLICATION DEV (3 Credits)**

An introduction to full-stack development of dynamic web applications. Topics include both front-end and back-end programming and development technologies.

*Prerequisite:* CSC-216 (C or higher), CSC-132 (C or higher)

**CSC-343 DESIGN & ANALYSIS OF ALGORITHMS (3 Credits)**

A study of the principles and techniques for designing and analyzing algorithms. Topics include divide-and-conquer, recursion and dynamic programming, greedy methods, graph algorithms, analysis of time and space requirements, and computational complexity.

*Prerequisite:* CSC-225 (C or higher)

**CSC-350 SOFTWARE ENGINEERING (3 Credits)**

A study of software engineering concepts, methodologies, and tools. Topics include: system analysis and design, requirements management, system lifecycle management, software project management, waterfall vs agile, software quality assurance, testing, maintenance, continuous integration and delivery, legal and ethical principles as they pertain to software engineering projects.

*Prerequisite:* CSC-325 (C or higher), CSC-343 (C or higher)

**CSC-380 INTERNSHIP (1-6 Credits)**

This course provides students with the opportunity for practical work experience in a supervised setting. The experience must include the application of concepts and skills the student has learned in the Computer Science program.

*Prerequisite:* Junior or Senior status required

**CSC-422 DATA COMMUNICATION SYSTEMS (3 Credits)**

An introduction to the concepts of data communication and networks. Topics include physical media, modulation, multiplexing, error detection and correction, the layered network architecture of the Internet, the services and protocols at each level, addressing, reliable data transfer, routing, naming, and network security.

*Prerequisite:* CSC-322 (C or higher)

**CSC-452 SOFTWARE ENGINEERING CAPSTONE PROJECT (4 Credits)**

This course is the capstone design experience for computer science majors. Students integrate and apply the knowledge, skills, and experience that they have gained throughout the program to complete a significant computing project. Students consider the legal and ethical principles that pertain to computing systems as well as their impacts on society.

*Prerequisite:* CSC-350 (C or higher)

## Ecology (ECO)

**ECO-241 ENVIRONMENTAL SCIENCE (4 Credits)**

Studies how ecological principles, philosophy, economics, sociology and politics interact with identifying and solving environmental issues. Topics include: air quality, water quantity and quality, population dynamics, energy sources, types of waste, sustainability, environmental policy and legislation, and pertinent government agencies. Lecture and lab. Course fee applied. This course satisfies the core requirement for lab science.

*Prerequisite:* None

**ECO-242 GEOGRAPHIC INFORMATION SYSTEMS (3 Credits)**

This course introduces students to the theory and application of Geographic Information Systems (GIS), and the fundamentals of spatial data management. Students gain practical experience using ArcGIS software for mapping, modelling, and spatial analysis. *Prerequisite:* BIO-151 or BIO-233.

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**ECO-243 NATURAL RESOURCES MGT (3 Credits)**

An exploration of the role of natural resource agencies in developing, sustaining and protecting natural resources. Emphasis is placed on the history of natural resource management in Michigan, management philosophies, politics that impact natural resources, species and ecology management, sustainability and carrying capacity.

*Prerequisite:* None

**ECO-301 LAND & WATER RESOURCES - AUSAABLE (4 Credits)**

Systems-level perspective on land forms and ecosystems. Includes analysis and interpretation of on-site data recorded in the field, remote-sensing data derived from satellite and low-altitude aerial imagery and geographic information systems (GIS). Field trips to and analysis of forests, bogs, marshes, dunes, and rivers. Includes application to policy and land use planning.

*Prerequisite:* None

**ECO-302 LAKE ECOLOGY & MGMT - AUSAABLE (4 Credits)**

Field study of lakes and streams with applications to planning and management. Includes an introduction to limnology and investigation of representative lakes and streams of the region.

*Prerequisite:* None

**ECO-303 ECOLOGICAL AGRICULTURE - AUSAABLE (4 Credits)**

Environmental analysis and natural resources in relation to people and policy. The focus is on ethnobotany, ecological agriculture, and land stewardship. It employs a discussion format both in classroom and field settings. Its emphasis is grappling with difficult practical and ethical problems and issues that require deep and persistent thought.

*Prerequisite:* None

**ECO-304 INTERNL DEVELOP & ENVIRON SUS - AUSAABLE (4 Credits)**

Global Development and Ecological Stewardship: Environmental analysis and natural resources in relation to society and development issues. The focus is on ecological sustainability and sustainable society in the context of the various factors that are bringing environmental degradation and impoverishment of people and cultures. It deals with topics of tropical agriculture, hunger, poverty, international debt, appropriate technology, relief programs, missionary earthkeeping, conservation of wild nature, land tenure, and land stewardship. It employs a discussion format both in classroom and field settings. Its emphasis is grappling with difficult practical and ethical problems and issues that require deep and persistent thought.

*Prerequisite:* None



**ECO-305 AGROECOLOGIA (4 Credits)**

Study a wide variety of current food production systems through visits with practicing farmers. Evaluate agrosystems in terms of soil quality, energy flow and nutrient cycling, pesticide fate, functional plant, animal, and genetic biodiversity, water use efficiency, energy flow, and population ecology. Learn to recognize, design, and implement sustainable agrosystems. Engage current social and economic food production systems and norms in the context of Christian faith, to steward the natural resources God has entrusted with us more effectively, improving both global environmental health and food security.

*Prerequisite:* None

**ECO-308 ENVIRONMENTAL HEALTH (3 Credits)**

Study of the interconnection between the health of people, animals, and their shared environment. This course includes topics such as toxicology, epidemiology, community health, radiation, and environmental justice. These topics are applied at the local, regional, and global scale.

*Prerequisite:* None

**ECO-310 ENVIRONMENTAL LAW & POLICY - AUSABLE (4 Credits)**

Analysis of the policy-making process at a local, national, and international scales with examination of environmental policy challenges, including climate change, resource management, and energy development. Students will interact with regional policy-making and land managers in the field to consider linkages between policy and science and ways for science to inform the policy-making process. Environmental ethics, environmental justice, and environmental advocacy will also be considered.

*Prerequisite:* None

**ECO-311 FIELD BOTANY - AUSABLE (4 Credits)**

Field identification and ecology of vascular plants as components of natural communities in Michigan. Emphasis is placed upon on-site examination of plants in communities such as bog, dune, forest, marsh, meadow, and swamp. Plants difficult to study under field conditions are brought to the laboratory for microscopic examination and identification. Ecological features such as community stratification and plant zonation along ecological gradients are examined.

*Prerequisite:* None

**ECO-314 ENVIRONMENTAL JUSTICE (3 Credits)**

Study of the treatment and involvement of all people in the development and enforcement of environmental laws, regulations, and policies. This course discusses historical, contemporary, and emerging threats to environmental justice.

*Prerequisite:* None

**ECO-318 MARINE BIOLOGY - AUSABLE (4 Credits)**

Marine Biology focuses on intertidal life and marine ecology in oceanic and geophysical contexts. Students study the biology of marine plants and animals in the field, specifically trophic dynamic relationships of eel grass communities and the intertidal zone, workings of the island systems of Puget Sound, ecological roles of sea birds and fishes, population and community structure dynamics, exploitation and oceanic microbialization and biogeochemical processes and their linkages with the biosphere. Marine stewardship and effects of human activity on the marine environment are integral to the course.

*Prerequisite:* None

**ECO-321 ANIMAL ECOLOGY - AUSABLE (4 Credits)**

Interrelationships between animals and their biotic and physical environments emphasizing behavioral aspects. A field course that centers on the ecology of northern Michigan fauna from a stewardship perspective. Included are individual student projects.

*Prerequisite:* None

**ECO-322 AQUATIC BIOLOGY - AUSABLE (4 Credits)**

Ecology, identification, systematics, culture and care of aquatic plants and animals, and adaptations to freshwater environments. Aquatic life is studied in lakes, ponds, bogs, marshes, streams, and in the laboratory. The course assesses human impact on aquatic species and ecosystems, presents procedures for the stewardship of aquatic habitats, and introduces aquatic restoration ecology. Prerequisites: One year of general biology or one semester each of general zoology and general botany.

*Prerequisite:* None

**ECO-323 STREAM ECOLOGY - AUSABLE (4 Credits)**

*Prerequisite:* None

**ECO-324 FISH ECOLOGY & MGMT-AUSABLE (4 Credits)**

Introduction to the relation of freshwater fish species and their environments in lakes and streams with concurrent examination of techniques and technologies employed to manage populations and species for conservation, recreational use, and commercial harvest. This course will provide understanding of freshwater fish taxonomy and phylogenetic relationships, habitat requirements of major fish species by life stages, stream habitat assessment, population measuring and monitoring, and strategies for management of recreational and commercial species and conservation of threatened and endangered species.

*Prerequisite:* None

**ECO-330 GEOGRAPHIC INFO SYSTEMS/AUSAB (4 Credits)**

An introduction to the theory and application of Geographic Information Systems (GIS) for applied social and ecological problem-solving. Through a series of readings, videos, and hands-on exercises covering a variety of environmental themes, issues, and scales, participants will learn the fundamentals of the types of maps, map projections, symbology, classification, analysis, and web mapping applications, and gain skills and confidence to be able to conduct their own field studies, do spatial analysis, and create their own maps and visualizations.

*Prerequisite:* None

**ECO-332 ENVIRONMENTAL CHEMISTRY - AUSABLE (4 Credits)**

Principles and analysis of chemical movement and distribution both natural and human-induced in natural environments. Sampling and analytical methods are included for water, soil, and air. Work is conducted both on site in natural habitats and the laboratory.

*Prerequisite:* None

**ECO-341 ECOLOGY (4 Credits)**

The study of the interrelationships of living organisms, plant or animal, and their environments. These are studied with a view of discovering the principles that govern relationships. A special emphasis on the different ecosystems of Michigan bogs, marshes, streams, and sand dunes, and man's impact on them, will be studied. Lecture and lab. Course fee applied. This course satisfies the core requirement for lab science.

*Prerequisite:* MAT-151 or MAT-251, EGR-100 or BIO-225 and BIO-233

**ECO-342 FIELD BIOLOGY (4 Credits)**

First two weeks: Instruction and experience in the use of the tools of the field biologist, trips to different types of ecosystems: forest, field, stream, pond, lake, marsh, and bog. Final week: Travel experience covering points of interest in the Upper Peninsula and Lower Peninsula of Michigan, or the student may elect to work on a field problem in the Grand Rapids area. Course fee applied.

*Prerequisite:* EGR-100 or BIO-225 and BIO-233

**ECO-343 TROPICAL AGRICULTURE -AUSABLE (4 Credits)**

An introduction to tropical agriculture for working with resource-poor farmers. Topics include the scientific basis behind successful low cost techniques, a survey of major tropical crops and their requirements, and on-site practical work. Selected issues in Christian missions and in community development, and some urban gardening and small animal techniques are also covered. Taught in a rural, mountainous village in Costa Rica in collaboration with a Christian organization aiding redevelopment after an earthquake, with several trips to different ecosystem regions of Costa Rica.

*Prerequisite:* None

**ECO-345 WILDLIFE ECOLOGY - AUSABLE (4 Credits)**

Ecology, conservation and stewardship of wildlife species and their habitats. Includes growth and structure of natural and managed populations, environmental and human social factors affecting wildlife communities and wildlife conservation. The course is set in the context of the historical development of the field from management, to ecology, and to the land ethic of Leopold. Includes management and stewardship of non-game and endangered species, and long-term prospects of wildlife in changing environmental, climatic and social contexts.

*Prerequisite:* None

**ECO-354 ENVIRONMENTAL JUSTICE - AUSABLE (4 Credits)**

Systems-level perspective on land forms and ecosystems. Includes analysis and interpretation of on-site data recorded in the field, remote-sensing data derived from satellite and low-altitude aerial imagery and geographic information systems (GIS). Field trips to and analysis of forests, bogs, marshes, dunes, and rivers. Includes application to policy and land use planning. *Prerequisite:* One year of introductory science.

*Prerequisite:* None

**ECO-355 WATERSHEDS IN GLOBAL DVLPT - AUSABLE (4 Credits)**

Principles of watershed ecology. Includes principles and practice of community-based water monitoring and watershed management for developing and developed countries and data access and analysis using an online relational database and data-to-action strategies. Designed for students in science and public policy, including students interested in missions and development and agencies involved in environmental assessment and community development. *Prerequisite:* One year of general biology.

*Prerequisite:* None

**ECO-358 FIELD TECHNIQUES IN WETLANDS (4 Credits)**

A comprehensive overview of wetland ecosystem processes, values, legislation and quantification. Students will learn to evaluate and quantify soils, hydrologic status and vegetation in a variety of wetland ecosystems including bogs, emergent marshes, forested wetlands and wetlands converted for agriculture, and to apply standard tools developed by the US Army Corps of Engineers and Michigan Department of Environmental Quality to assess wetland extent and habitat quality.

*Prerequisite:* None

**ECO-359 MARINE MAMMALS - AUSABLE (4 Credits)**

Biology, behavior, ecology, identification and conservation of the marine mammals of the Pacific Rim. This study area covers some major habitats in Puget Sound and the Salish Sea, with attention to the diving physiology, social behavior, and communications of whales and seals. The course aims to develop a stewardship perspective rooted in biological principles and directed at the global conservation of marine mammals and their ecosystems. Special attention is given to their use by cultures of the region in order to understand current issues.

*Prerequisite:* None

**ECO-360 APPLIED BIODIVERSITY GENETICS - AUSABLE (4 Credits)**

A field class introducing recent advances in molecular biology techniques, computation and storage for applied ecological work. The ability to utilize these techniques is becoming more and more important to scientists for addressing fundamental questions in biology. This course will expose you to a broad range of techniques and concepts in molecular biology and phylogenetics. Emphasis is placed on the strengths and limitations of each method and its application to a wide range of organisms, including plants, animals and microorganisms. It will provide a foundation for molecular applications to issues of environmental stewardship. *Prerequisites:* Two years of biology, one year of chemistry.

*Prerequisite:* None

**ECO-361 FIELD BIOLOGY IN SPRING-AUSABLE (4 Credits)**

Springtime plants and animals, their field identification, field biology, behavior and landscape context with a focus on spring flora, amphibia, and birds.

*Prerequisite:* None

**ECO-362 ENVIRONMENTAL APPS IN GIS - AUSABLE (4 Credits)**

Introduction to the theory and application of spatial analysis for environmental conservation and planning using geographic information systems (GIS) technology in the context of real world conservation problems.

*Prerequisite:* None

**ECO-365 INSECT ECOLOGY = AUSABLE (4 Credits)**

Life history, behavior, and ecology of terrestrial and aquatic insects, and their roles in pollination, herbivory, predation, agroecosystems, disease and vector epidemiology, invasion ecology, soil ecology, biodiversity, and freshwater ecology. Practical applications include study of Integrated Pest Management (IPM) approaches to reduce negative impacts of pest species in agricultural, subcultural, and medical settings while preserving biodiversity and ecosystem functionality.

*Prerequisite:* None

**ECO-367 CONSERVATION/DEVELOPMENT OF INDIAN TROP (4 Credits)**

Tropical ecology of South India, including an introduction to and comparative analysis of coastal ecosystems, the plains, and montane tropical ecosystems of the Western Ghats including altitudinal zonation. The course will be taught on-site at a variety of ecosystem preserves and national parks. If suitable arrangements can be made, a number of ecosystems will be studied on the Andaman Islands. Topics include tropical ecosystem structure and function, adaptations of flora and fauna, biodiversity surveys, past and present human interactions with the landscape, and autecology of selected plant and animal species. *Prerequisites:* Upper division standing and at least one ecology course (preferably completed at AuSable).

*Prerequisite:* None

**ECO-368 FOREST ECOLOGY (4 Credits)**

This course will focus on how plants interact with the abiotic environment and with other organisms. Field trips will provide opportunity to examine various physiological adaptations and population and community processes; and to introduce research approaches in different contexts. Quantitative skills including data collection, management, and basic analysis will be emphasized.

*Prerequisite:* None

**ECO-371 FOREST MGMT - AUSABLE (4 Credits)**

Introduction to site-level, landscape and multi-stakeholder approaches to forest management, including strategies of climate change adaptation and mitigation. Theory, application, and techniques of forest management for specified values and objectives including instrumental (economic/utilitarian and life support such as wood production, habitat and watershed protection and climate moderation) and non-instrumental values (such as aesthetic, moral/spiritual values e.g. recreation). The course will address the evolution of forest management practice and some specific practices, methods and techniques of growing trees and the development and care of forests (silviculture) as applied to natural forests managed for various objectives.

*Prerequisite:* None

**ECO-377 MARINE INVERTEBRATES - AUSABLE (4 Credits)**

*Prerequisite:* None

**ECO-385 URBAN ENVIRONMENTAL JUSTICE/AUSABLE (4 Credits)**

Introduction to environmental justice theory, practice, and history as a movement that bridges scholarship, action, science and ethics. Grounded in a case study of Chicago, students learn about how urban ecologies are formed around matters of race, class, food politics, health, industry, waste, energy, markets, and history. Through assigned readings, classroom discussion, field visits and research with activists, churches, community organizations, and city officials, students are equipped with skills and framework to conceive of the city, the environment, and justice in relation to a biblical vision of human flourishing in and with natural and built environments.

*Prerequisite:* None

**ECO-390 DIRECTED INDIV STUDY - AUSABLE (1-4 Credits)**

Field or laboratory study of a problem selected by the student in consultation with a professor, and presented as a written proposal in advance of the session in which the study is to be conducted. Normally, problems are outgrowths of previous coursework with a given professor at Au Sable. *Prerequisite:* A study proposal including goals and objectives, methods, protocols for evaluation; to be signed by the professor and program director.

*Prerequisite:* None

**ECO-400 ENVIRONMENTAL BIOLOGY CAPSTONE (3 Credits)**

This course investigates the pressing local and global environmental issues and the interdisciplinary strategies necessary to address these issues. Emphasis will be placed upon investigating environmental issues through the Christian environmental stewardship framework.

*Prerequisite:* None

**ECO-442 ADVANCED FIELD STUDIES (1-6 Credits)**

A field-oriented course in the study of the relationships of the fauna and flora of special segment of the biosphere such as Northern Ireland, Yellowstone National Park, the Florida peninsula and other locations in the USA and abroad. Students spend most of the time on location experiencing the ecology of the area. Course fee applied. Instructor permission required.

*Prerequisite:* None

**ECO-443 ADVANCED FIELD STUDIES LAB (1 Credit)**

The laboratory field-oriented experience taken in conjunction with or after ECO-442. This course is designed to immerse students in a field-oriented experience focusing on the natural history, environmental issues and culture of the region or country studied in ECO-442. Instructor permission required.

*Prerequisite:* ECO-442 (previously or concurrently)

**ECO-471 CONSERVATION BIOLOGY - AUSABLE (4 Credits)**

Principles of conservation biology with applications to sustainable human society and biospheric integrity. An integrative approach to biology and society that interrelates population biology, ecological principles, biogeochemical cycles, ecosystem functions, and human society in the context of biospheric degradation. The course develops a stewardship perspective rooted in biological principles and directed at conservation of plant and animal species, biotic communities, ecosystems, and human society. Included are topics of human development, poverty, and economic growth.

*Prerequisite:* None

**ECO-478 ALPINE ECOLOGY - AUSABLE (4 Credits)**

Ecology of the mountains of the Pacific Northwest, with particular attention to adaptation of plant and animal life to montane climates and altitudes, and analysis and interpretation of altitudinal zonation of biotic communities with applications to latitudinal biogeography. Also included are topics of physiological responses of organisms to reduced oxygen levels, low temperatures and high altitude radiation regimes. Field work includes on-site studies in the Olympic Mountains of the Olympic Peninsula.

*Prerequisite:* None

**ECO-480 ADVANCED TOPICS: ECOLOGY (1-4 Credits)**

*Prerequisite:* None

**ECO-482 RESTORATION ECOLOGY - AUSABLE (4 Credits)**

Ecological foundations and techniques for ecosystem and biotic community restoration. This course applies ecological principles and environmental ethics to redeeming and restoring degraded and damaged ecosystems and endangered species. Field studies include analysis of restoration and rehabilitation work with the Kirtland Warbler, an officially designated wild river, coastal dunes, kettlehole bogs, old growth forest, deforested lands, degraded residential and farming sites, and abandoned oil wells. A practical field laboratory is included in which techniques are applied to a specific site.

*Prerequisite:* None

## Engineering (EGR)

**EGR-100 INTRO TO ENGINEERING (1 Credit)**

An introduction to the different engineering fields and the industries that these fields support. Study techniques for students to be successful in the engineering program will be presented. Students will have the opportunity to work in groups, identify problems, brainstorm ideas, prototype solutions, and communicate their results. (lecture only)

*Prerequisite:* None

**EGR-111 INTRO TO ENGINEERING GRAPHICS (1 Credit)**

This course introduces students to the principles of drafting used by engineers through a hands-on learning environment. Topics of instruction include drawing interpretation, visualization (including pictorials and orthographic drawings), geometric construction, sectioning, working drawings, and mechanical drawings (including but not limited to sectioning and working drawings). (lab only)

*Prerequisite:* None

**EGR-112 APPLIED PROGRAMMING FOR ENGINEERS (2 Credits)**

This course provides an introduction to structured and modular programming for use in engineering applications. Numerous programming assignments develop the practical skills necessary to ensure students are capable of writing, testing, debugging, and validating programs. (lecture and lab). Students may not receive credit for both EGR-112 and CSC-132.

*Prerequisite:* Take MAT-122 or higher

**EGR-113 INTRO TO CAD/CAM (1 Credit)**

This course is to introduce computer-aided design (CAD) and computer-aided manufacturing (CAM) theory and applications. The course topics include CAD/CAM systems, geometric modeling, tool path generation, integration of CAD/CAM with the production machine, NC machining, and additive manufacturing. (lecture and discussion)

*Prerequisite:* EGR-111

**EGR-185 FIRST YEAR ENGINEERING DESIGN (2 Credits)**

A cornerstone course in the principles and practice of multi-disciplinary engineering analysis and design. Students will work as part of a team to design and construct a working physical prototype of an electro-mechanical system. Students will learn to communicate their design ideas effectively. Lab fee applied.

*Prerequisite:* EGR-112 (C or higher)

**EGR-209 MECHANICS AND MACHINES (4 Credits)**

Lecture only. Forces and momentum, equilibrium, Free Body Diagrams. Introduction of machine elements: gears, belts, chains, shafts. Stress/strain: normal and shear stresses due to bending and torsion. Design and analysis of welds, fasteners: bolts and rivets in engineering structures. Principles of mechanical design: synthesis and selection methods of basic off-the-shelf machine components.

*Prerequisite:* Take MAT-132 and PHY-211, PHY-211

**EGR-214 CIRCUIT ANALYSIS I (3 Credits)**

Topics include Ohm's Law, Kirchhoff's Laws, node voltage and mesh current analysis, Thevenin's and Norton's Theorems, superposition, basic operation of diodes, transistors, operational amplifiers and transformers, capacitance, inductance, and time-domain analysis of first order circuits.

*Prerequisite:* PHY-222 (C or higher)

**EGR-215 CIRCUITS LAB (1 Credit)**

Laboratory activities associated with linear circuit analysis. Including the use of power supplies, multimeters, function generators, oscilloscopes, and electronic circuit CAD/CAM software packages. Lab fee applied.

*Prerequisite:* PHY-222 (C or higher), Take EGR-214 concurrently

**EGR-220 MEASUREMENT & DATA ANALYSIS (1 Credit)**

Measurement and data analysis lab that complements MAT-251.

This course uses hands-on engineering tests and experiments to build understanding of applied statistical analysis. The use of various measurement and data-acquisition tools and data analysis techniques are introduced. Technical writing in the form of lab reports is introduced and emphasized. Lab fee applied.

*Prerequisite:* Take MAT-251 concurrently, MAT-131, ENG-212

**EGR-226 INTRODUCTION TO DIGITAL SYSTEMS (3 Credits)**

An introduction to the analysis and design of digital systems. Topics include boolean algebra, combinational and sequential logic circuits, models of hardware and software at various levels of abstraction, computer organization and architecture, machine language, and microcontroller architecture, programming, and interfaces.

*Prerequisite:* Take EGR-112 or CSC-132 (C or higher)

**EGR-227 DIGITAL SYSTEMS LAB (1 Credit)**

Laboratory activities to design, build, and test various digital systems. Projects include combinational and sequential logic circuits, finite state machines, programming of microcontrollers, and microcontroller interfaces. Lab fee applied.

*Prerequisite:* Take EGR-226 concurrently

**EGR-250 MATERIALS SCIENCE & ENGINEERING (3 Credits)**

An introduction to the field of Materials Engineering will begin with an investigation of the contributions of atomic and crystalline structures on the physical properties of materials. A thorough review of metals, polymers, ceramics and composites will then be conducted. Key concepts will be explored and highlighted through a series of weekly lab exercises. The successful completion of this course shall provide Engineers with the necessary understanding of materials to select the most appropriate material for specific design applications. The final area of study shall assess the economic and environmental impacts of material selection in a complex world.

*Prerequisite:* Take CHM-111, PHY-222

**EGR-251 MATERIALS LAB (1 Credit)**

The laboratory sessions will acquaint students with modern experimental techniques and devices used in: (i) the characterization of the microstructures and properties of engineering materials, and (ii) laboratory simulation of industrial manufacturing processes. Application of the scientific method and technical report writing will be emphasized. Lab fee applied.

*Prerequisite:* Take CHM-111 and PHY-222 (C or higher), Take EGR-250 concurrently

**EGR-301 ANALYTICAL TOOLS FOR PRODUCT DESIGN (4 Credits)**

Analytic methods in product design are integrated into a coherent design process that includes: gathering customer requirements, establishing specifications, generating alternative concepts, estimating feasibility, concept selection, embodiment design, design refinement, prototyping, and project planning.

*Prerequisite:* EGR-250

**EGR-309 MACHINE DESIGN I (3 Credits)**

Topics include shear and bending stresses in beams, beam deflections, statically indeterminate beams, planar combined loading, triaxial stress and strain transformations, static failure theories, fatigue failure theories, surface failures, belt and chain drives, clutches and brakes, finite element analysis for planar loading, and introduction to strain gauges and rosettes.

*Prerequisite:* Take EGR-209

**EGR-310 MACHINE DESIGN I LAB (1 Credit)**

Introduction to finite element analysis for planar loading, strain gauges and rosettes, and experimental determination of state of stress in a body. Lab fee applied.

*Prerequisite:* Take EGR-209 (C or higher), Take EGR-309 concurrently

**EGR-312 DYNAMICS (3 Credits)**

Study of motion and the relationship between force, mass, and acceleration for particles and rigid bodies. Work-energy and impulse-momentum concepts.

*Prerequisite:* EGR-209 (C or higher), MAT-235 (C or higher)

**EGR-336 PROJECT MANAGEMENT (3 Credits)**

This course will examine key factors related to successful completion of both large and small projects. Topics will include project selection, chartering, scope, resources, scheduling, budgeting, controlling, termination and team leadership. Students will approach learning through a semester-long project planning activity.

*Prerequisite:* EGR-100 or MGT-231 or CSC-133



**EGR-345 DYNAMIC SYSTEM MODELING & CONTROL (4 Credits)**

An introduction to mathematical modeling of mechanical, thermal, fluid, and electrical systems. Topics include equation formulation, Laplace transform methods, transfer functions, system response and stability, Fourier methods, frequency response, feedback control, control actions, block diagrams, state variable formulation, and computer simulation. Emphasis on mechanical systems.

*Prerequisite:* EGR-214, MAT-235

**EGR-350 VIBRATION (3 Credits)**

Study of mechanical vibration of structures and engineering components. Free and forced vibration of single, two, and multi-degree of freedom systems. Modal analysis and mode summation. Elements of analytical dynamics. Approximate numerical methods. Random vibration. Vibration measurement, isolation, and control.

*Prerequisite:* Take MAT-235 (C or higher), PHY-222 (C or higher)

**EGR-360 THERMODYNAMICS (4 Credits)**

Lecture only. Basic concepts of thermodynamics and an introduction to heat transfer. Properties of pure substances, equation of state, work, heat, first and second laws of thermodynamics, closed systems and control volume analysis, irreversibility and availability, refrigeration and power cycles, thermodynamic relations, introduction to conduction, convection, radiation, heat transfer, and heat exchange design.

*Prerequisite:* PHY-222 (C or higher), MAT-235 (C or higher)

**EGR-362 THERMAL & FLUID SYSTEMS (4 Credits)**

Thermal system engineering is primarily a study of energy: its forms, transformations, the transfer of it, and efficiencies related to its transfer and use. This course includes the thermodynamic, fluid mechanics, and heat transfer principles required to understand the design of thermal systems found in product designs and manufacturing.

*Prerequisite:* PHY-222 (C or higher), MAT-235 (C or higher)

**EGR-365 FLUIDS (3 Credits)**

This course provides students with a foundation in fluids, specifically, fluid statics, control volume analysis, continuity, momentum, energy, Bernoulli equation, dimensional analysis and similitude, laminar and turbulent flows, boundary layers, differential analysis, external flow, lift and drag, internal flow, pump selection, introduction to turbomachinery, and open channel flow.

*Prerequisite:* EGR-360

**EGR-367 MANUFACTURING PROCESSES (3 Credits)**

The fundamentals of manufacturing processes and the machinery of production. The forming of metals, plastics, ceramics, and composites with an emphasis on the economics of engineering designs and designs that can be practically manufactured. Computer aided manufacturing and quality control processes.

*Prerequisite:* EGR-250

**EGR-368 MANUFACTURING PROCESSES LAB (1 Credit)**

The laboratory experiments and exercises will involve careful investigation of the effects of the interactions between design, processing conditions, and materials on the quality and performance of fabricated products. Application of the scientific method in investigations, the principles of design of experiments (DOE), and statistics are reinforced. Lab fee applied.

*Prerequisite:* Take EGR-367 concurrently

**EGR-380 INTERNSHIP (1-6 Credits)**

This course provides an opportunity to work in a supervised engineering setting. The experience must include opportunities to apply the theories and concepts learned in the discipline of engineering.

*Prerequisite:* Take EGR-100, Junior or Senior status required

**EGR-409 MACHINE DESIGN 2 (3 Credits)**

The study of mechanical design. Topics include design of screws, clutches, brakes, belts, gears, journal bearings, roller bearings, and planetary gear trains.

*Prerequisite:* EGR-309

**EGR-437 ENVIRONMENTAL ENGINEERING (4 Credits)**

An analysis of the impact of human development (industrial, commercial and residential) on air, land, and water resources. Special emphasis is placed on environmental engineering practices related to environmental laws and regulations. Additional topics include the development of environmental engineering plans and designs. Lab fees applied.

*Prerequisite:* ECO-241, EGR-360 or EGR-362

**EGR-440 PRODUCTION MODELS (3 Credits)**

An introduction to analytic and simulation models, as well as their application to current production strategies, particularly lean manufacturing. Emphasis on workstations, inventories, flow lines, Kanban and CONWIP, and cellular manufacturing. Computer-based solution techniques, case studies, and case problems are employed.

*Prerequisite:* EGR-113 (C or higher)

**EGR-468 HEAT TRANSFER (3 Credits)**

This course provides students with an in-depth study of heat transfer.

The mechanisms by which heat is transferred in different media: conduction, convection, and radiation. One- and two-dimensional steady state conduction, transient conduction, finite differences, methods in conduction, forced and free convections, heat exchangers, radiation processing and properties, radiation exchange between surfaces.

*Prerequisite:* EGR-360 or EGR-362 (previously or concurrently)

**EGR-485 CAPSTONE PROJ & ETHICS I (1 Credit)**

An independent investigation of theoretical or experimental design problems in engineering. The nature and scope of the project are determined by the student in consultation with the instructor and depend upon the facilities available. Normally this project is carried out during the entire senior year, with one-hour of credit during the first semester and two hours of credit during the second semester. A written technical report is required. All seniors meet together each week to discuss their projects with each other and their supervisor. Laboratory. Lab fee applied.

*Prerequisite:* Senior status required

**EGR-486 CAPSTONE PROJ & ETHICS II (2 Credits)**

Continuation of student's work in EGR 485. Both an oral report and a final written technical report are required. Lab fee applied.

*Prerequisite:* EGR-485, Senior status required

**EGR-490 INDEPENDENT STUDY (1-3 Credits)**

*Prerequisite:* None

## Kinesiology (KIN)

**KIN-100 TOTAL FITNESS & WELLNESS (2 Credits)**

This course focuses on whole person wellness in the context of Biblical principles. Emotional, mental, intellectual, physical, social, and spiritual wellness areas are addressed. Students are taught and encouraged to transition from the mindset of high school attitudes and habits to a collegiate level of thinking and decision making with regards to nutrition, personal wellness, social attitudes and actions as responsibilities of Biblical stewardship.

*Prerequisite:* Take activity course concurrently

**KIN-102 PERSONAL WELLNESS (3 Credits)**

This course focuses on whole person wellness in the context of Biblical principles. Emotional, mental, intellectual, physical, social, and spiritual wellness areas are addressed. Students are taught and encouraged to transition from the mindset of high school attitudes and habits to a collegiate level of thinking and decision making with regards to nutrition, personal wellness, social attitudes, and actions as responsibilities of Biblical stewardship.

*Prerequisite:* None

**KIN-111 BADMINTON (1 Credit)**

The study and practice of basic techniques in the game of badminton. This course includes topics such as ready position, grip, strokes, serve, rules of the game, and strategy. Opportunities are given to test skills against other class members through tournament play.

*Prerequisite:* None

**KIN-113 GOLF (1 Credit)**

An introduction for the beginner to golf encompassing basic techniques of the stance, grip, swing, rules of the game and etiquette. This course is designed to offer opportunity to test and improve skills on a regulation eighteen-hole golf course. It is desired that this activity leads to the appreciation of golf and becomes a lifelong enjoyment for the Christian steward. Course fee applied.

*Prerequisite:* None

**KIN-114 COED BASKETBALL (1 Credit)**

Students will learn the basic skills of dribbling, passing, rebounding and shooting, along with various offensive concepts like screen and roll and give and go. Students will also learn defensive concepts such as help and recover, hedging on screens and defending the post. Various strategies of the game will be incorporated into the class.

*Prerequisite:* None

**KIN-116 RACQUETBALL (1 Credit)**

An introduction for the beginner to racquetball encompassing rules, basic skills, terminology, strategy and safety. This course is designed to offer game play with class members and is desired that this activity leads to the appreciation of racquetball and becomes a lifelong enjoyment for the Christian steward.

*Prerequisite:* None

**KIN-118 AEROBIC DANCE & STRETCH (1 Credit)**

This class will include basic steps of aerobic moves with intervals of muscular strength and endurance exercises to burn calories with cardio-training to strengthen the heart for overall well-being. It will also introduce the student to various techniques of stretch and relaxation. Music and movement will be a regular part of the course as the students take a holistic approach to their overall wellness.

*Prerequisite:* None

**KIN-121 OUTDOOR SKILLS (1 Credit)**

Instruction in the basic skills and equipment needed for participation in outdoor activities. This course includes opportunity to develop skills and problem solving skills. Activities will be determined based on season and weather, but may include snowshoeing, map & compass, hiking, backpacking, adventure racing, and canoeing.

*Prerequisite:* None

**KIN-124 PICKLEBALL (1 Credit)**

The study and practice of basic techniques in the game of Pickleball (the newest and fastest racquet sport). The course includes topics such as ready position, grip, strokes, serve, rules of game, and strategy. Opportunities are given to test skills against other class members through tournament play.

*Prerequisite:* None

**KIN-129 BEGINNING DANCE (1 Credit)**

An introduction for the beginner dancer, including basic rhythm and terminology necessary for individual and partner dancing. Line, Ballroom, Swing, and other popular forms of dance will be explored throughout the course.

*Prerequisite:* None

**KIN-132 COED SOCCER (1 Credit)**

The study and practice of rules, basic fundamentals, strategy, team play, and game etiquette. Opportunities will be given to the student to test skills against other players through tournament play.

*Prerequisite:* None

**KIN-133 VOLLEYBALL (1 Credit)**

The study and practice of the basic techniques in the game of volleyball. The course includes topics such as ready position, serve, set, forearm pass, rules of the game, and strategy. Opportunities are given to test skills against other class members through tournament play.

*Prerequisite:* None

**KIN-143 JOGGING (1 Credit)**

To provide students with a thorough understanding of aerobic activity and its application to physical conditioning. The content of this course also includes general Biomechanics of jogging, flexibility, nutrition, a proper Christian viewpoint of jogging as a lifetime fitness activity.

*Prerequisite:* None

**KIN-144 LADIES WEIGHT TRAINING & FITNESS CLASS (1 Credit)**

This class will be an introduction of weight training and fitness opportunities for the college female. It will emphasize proper technique and safety precautions for weight lifting while promoting the importance of a healthy and personal physical fitness conditioning program. This course will also educate female students in the importance of the injury prevention through building muscle strength and teaching proper fitness components.

*Prerequisite:* None

**KIN-146 PHYSICAL CONDITIONING (1 Credit)**

For the student who is unable to meet the core requirement of a traditional physical activity course due to physical limitations or disability, this course offers an individualized program of fitness activities set up by both the supervising professor and the student, in consultation with staff from Student Disability Services. Objectives and requirements are set forth in an initial meeting and must be completed by the end of the enrolled semester. The student must have applied for disability accommodations through the Accommodations Review Committee and been approved in order to register for this course.

*Prerequisite:* None

**KIN-148 WEIGHT TRAINING (1 Credit)**

An introduction for the beginner to basic techniques and instruction in weight training for both muscular strength and endurance. This course is designed for the development of a personalized weight training program and is desired that this activity leads to lifelong enjoyment for the Christian steward.

*Prerequisite:* None

**KIN-161 VARSITY BASEBALL (1 Credit)**

A maximum of two credits will be awarded for participation in two different varsity sports. Students must register for credit at the beginning of the semester their sport is in season. These credits will count as elective credit only, and do not apply toward core physical education requirements or the Physical Education major or minor.

*Prerequisite:* None

**KIN-162 VARSITY SOFTBALL (1 Credit)**

A maximum of two credits will be awarded for participation in two different varsity sports. Students must register for credit at the beginning of the semester their sport is in season. These credits will count as elective credit only, and do not apply toward core physical education requirements or the Physical Education major or minor.

*Prerequisite:* None

**KIN-163 VARSITY BASKETBALL (1 Credit)**

A maximum of two credits will be awarded for participation in two different varsity sports. Students must register for credit at the beginning of the semester their sport is in season. These credits will count as elective credit only, and do not apply toward core physical education requirements or the Physical Education major or minor.

*Prerequisite:* None

**KIN-164 WOMEN'S VARSITY VOLLEYBALL (1 Credit)**

A maximum of two credits will be awarded for participation in two different varsity sports. Students must register for credit at the beginning of the semester their sport is in season. These credits will count as elective credit only, and do not apply toward core physical education requirements or the Physical Education major or minor.

*Prerequisite:* None

**KIN-165 VARSITY SOCCER (1 Credit)**

A maximum of two credits will be awarded for participation in two different varsity sports. Students must register for credit at the beginning of the semester their sport is in season. These credits will count as elective credit only, and do not apply toward core physical education requirements or the Physical Education major or minor.

*Prerequisite:* None

**KIN-166 VARSITY TENNIS (1 Credit)**

A maximum of two credits will be awarded for participation in two different varsity sports. Students must register for credit at the beginning of the semester their sport is in season. These credits will count as elective credit only, and do not apply toward core physical education requirements or the Physical Education major or minor.

*Prerequisite:* None

**KIN-167 VARSITY TRACK (1 Credit)**

A maximum of two credits will be awarded for participation in two different varsity sports. Students must register for credit at the beginning of the semester their sport is in season. These credits will count as elective credit only, and do not apply toward core physical education requirements or the Physical Education major or minor.

*Prerequisite:* None

**KIN-168 VARSITY CROSS COUNTRY (1 Credit)**

A maximum of two credits will be awarded for participation in two different varsity sports. Students must register for credit at the beginning of the semester their sport is in season. These credits will count as elective credit only, and do not apply toward core physical education requirements or the Physical Education major or minor.

*Prerequisite:* None

**KIN-169 VARSITY WRESTLING (1 Credit)**

A maximum of two credits will be awarded for participation in two different varsity sports. Students must register for credit at the beginning of the semester their sport is in season. These credits will count as elective credit only, and do not apply toward core physical education requirements or the Physical Education major or minor.

*Prerequisite:* None

**KIN-171 VARSITY GOLF (1 Credit)**

A maximum of two credits will be awarded for participation in two different varsity sports. Students must register for credit at the beginning of the semester their sport is in season. These credits will count as elective credit only, and do not apply toward core physical education requirements or the Physical Education major or minor.

*Prerequisite:* None

**KIN-172 VARSITY BOWLING (1 Credit)**

A maximum of two credits will be awarded for participation in two different varsity sports. Students must register for credit at the beginning of the semester their sport is in season. These credits will count as elective credit only, and do not apply toward core physical education requirements or the Physical Education major or minor.

*Prerequisite:* None

**KIN-173 VARSITY CHEERLEADING (1 Credit)**

A maximum of two credits will be awarded for participation in two different varsity sports. Students must register for credit at the beginning of the semester their sport is in season. These credits will count as elective credit only, and do not apply toward core physical education requirements or the Physical Education major or minor.

*Prerequisite:* None

**KIN-174 MEN'S VARSITY VOLLEYBALL (1 Credit)**

A maximum of two credits will be awarded for participation in two different varsity sports. Students must register for credit at the beginning of the semester their sport is in season. These credits will count as elective credit only, and do not apply toward core physical education requirements or the Physical Education major or minor.

*Prerequisite:* None

**KIN-180 ADVANCED TOPICS (3.00 Credits)**

*Prerequisite:* None

**KIN-211 HISTORY & PRINCIPLES OF KINESIOLOGY (3 Credits)**

A study of physical education, sport, and fitness in the context of their historical development and how they have been an integral part of culture pertaining to the psychological, sociological, and philosophical factors that have affected these topics. Vocational opportunities related to the field of Kinesiology will be explored as well as preparation for these vocations. This course includes learning techniques such as tests, informational interviews, readings and presentations.

*Prerequisite:* None

**KIN-220 INTRO TO ATHLETIC TRAINING (3 Credits)**

This course introduces the profession of athletic training and the basic principles of preventative care commonly used in the profession. Topics will include athletic training facility organization and procedures, protective sports equipment, construction of protective devices and application of protective taping, braces, wrapping and protective pads. Areas to be studied include the role of the athletic trainer in sports medicine, mechanisms of athletic injuries, tissue response to injury, blood-borne pathogens, introductory techniques of assessment and evaluation of athletic injuries and emergency procedures. Each student who takes this course will have hands-on and practical exposure to what the field of athletic training encompasses so that the student is able to make an educated decision as to whether this career path will be a rewarding one for them to pursue. In this course, students are expected to apply what they learn in class by engaging with other students using a hands-on approach to learning. A biblical view of relationships will be presented as the model for client/trainer interaction.

*Prerequisite:* None

**KIN-231 PRINCIPLES OF COACHING (3 Credits)**

The study of the nature and responsibilities of the profession of coaching. Topics include philosophy of coaching, the coach and his/her personality, the athlete and his/her personality, communication, team cohesion, motivation, discipline, teaching techniques, and scouting.

*Prerequisite:* None

**KIN-251 MOTOR DEVELOPMENT AND LEARNING (3 Credits)**

A study of childhood growth and development patterns as it relates to motor learning and motor skill acquisition. This course is designed to enhance the understanding of growth and motor behavior/development of children from conception through adulthood. Principles of motor development and learning are explored along with an opportunity to apply them in a lab setting.

*Prerequisite:* None

**KIN-262 MIDWEST ACSM CONF (1 Credit)**

This course is designed to allow students to receive credit for attending the Midwest regional American College of Sports Medicine (ACSM) conference. The ACSM serves to advance and integrate scientific research as well as provide educational and practical application of exercise science and sports medicine. Small group meetings, in depth discussion and short journals will be utilized to expose students to scientific research specific to careers within the field of exercise science.

*Prerequisite:* None

**KIN-280 ADVANCED TOPICS (3.00 Credits)**

*Prerequisite:* None

**KIN-341 ANATOMICAL KINESIOLOGY (4 Credits)**

This course is designed as a functionally specific approach to the musculoskeletal system. Emphasis will be placed on the qualitative analysis and description of human movement. The course will also serve as an introduction to the biomechanical basis of human motion. Students will then learn how to apply the basic concepts of human motion to exercise and sport. Course fee applied.

*Prerequisite:* BIO-241, BIO-242

**KIN-342 EXERCISE PHYS I (3 Credits)**

A study of the physiological responses of the healthy human body to exercise. This course includes topics such as energy systems, nutrition, conditioning, exercise testing, and exercise prescriptions. Lecture and lab. Course fee applied.

*Prerequisite:* BIO-241, BIO-242 & KIN-346

**KIN-344 ADAPTED PHYSICAL EDUCATION (2 Credits)**

This course is an orientation to the theoretical and practical aspects of teaching physical education for K-12 students with physical and mental disabilities. The focus is on the history and scope of adapted physical education, key techniques required for effective and safe instruction, general needs of special populations, legal issues, development of Individualized Education Programs and accommodation of activities, equipment and instructional materials for special populations. These topics will be studied within the context of our Christian worldview, with special attentions given to issues of equity and individual worth.

*Prerequisite:* KIN-243

**KIN-345 MEASUREMENT & EVALUATION (3 Credits)**

A study of methods for evaluating cognitive, affective, and psychomotor domains of learning in physical education. The course provides opportunity for practical experience in test construction and administration as well as evaluation of the results. Topics such as statistics, fitness testing, grading procedures, and affective checklists will be covered.

*Prerequisite:* Complete math core requirement

**KIN-346 EXERCISE TESTING & PRESCRIPTION (3 Credits)**

This course will explore theory and practices related to exercise testing and prescription. It will include practical experience in body composition techniques, electrocardiography, muscle strength and endurance testing, flexibility testing and cardiovascular endurance testing. The results of the testing will be used to form appropriate exercise prescriptions according to the American College of Sports Medicine guideline. Course fee applied.

*Prerequisite:* Take BIO-242

**KIN-357 PHYS ED IN PRESCHOOL/ELEM (3 Credits)**

This course is designed specifically to provide in-depth methods of instruction for teaching preschool and elementary children in physical education programs. The course includes motor development and basic movement education emphasizing movement patterns, fundamental motor skills, manipulative skills, locomotor activities, physical fitness testing, and introduction to sports related skills. Introduction to teaching scope and sequences will be utilized. Lesson planning and peer teaching will provide the practical experience needed for professional growth.

*Prerequisite:* KIN-243 and KIN-251

**KIN-361 ECG (ELECTROCARDIOGRAPHY) (2 Credits)**

Anatomy and physiology of the heart will be reviewed, including the conduction system and circulatory system, as well as layout of the ECG, essentials of the 12-lead ECG, and lead placement and interpretation. Discussion on how the pathophysiology of the acute MI process affects the normal 12-lead ECGs and the average times in which such effects are evidenced. Students will learn to identify normal 12-lead ECG's ST segments, isoelectric lines, J points, and R-Wave progression.

*Prerequisite:* BIO-242

**KIN-362 FIRST AID, INJURY PREVENTION, TREATMENT (3 Credits)**

Basic principles of injury prevention and care, first aid principles of prevention, injury evaluation and current rehabilitation methods are taught. The student will have active participation in caring for various injuries. The student will receive American Red Cross certifications in First Aid, Cardiopulmonary Resuscitation and Automated Defibrillation as well as Blood Borne Pathogen Training and Concussion Training. Course fee applied.

*Prerequisite:* BIO-241, BIO-242

**KIN-364 CARDIOVASCULAR DISEASE RISK/MANAGEMENT (3 Credits)**

Health risk factors associated with cardiovascular and other chronic diseases will be identified and studied. Management and risk to morbidity and mortality will be emphasized. Course fee applied.

*Prerequisite:* BIO-241, BIO-242, KIN-342 and KIN-346

**KIN-370 PRACTICUM IN COACHING (1 Credit)**

*Prerequisite:* None

**KIN-380 INTERNSHIP (1-6 Credits)**

An opportunity to gain practical experience in settings appropriate for exercise science and coaching.

*Prerequisite:* Junior or Senior status required

**KIN-381 INTERNSHIP - CARDIC REHAB (12 Credits)**

An opportunity to gain practical experience in a clinical cardiac rehabilitation setting appropriate for exercise science majors in preparation for the American College of Sports Medicine (ACSM) Certified Exercise Physiology certification. Cardiac Rehab majors must take 12 credits of internship for a total experience of no less than 480 hours.

*Prerequisite:* None



**KIN-402 PROFESSIONAL CAPSTONE SEMINAR (1 Credit)**

The first course in a two-course seminar experience will examine a Christian worldview and the ethical and professional issues associated with the major. The seminar will devote time to Christian worldview reflection in regard to a senior's prior academic preparation and future vocational opportunities. Students will also develop a working hypothesis for a novel research question in the field of exercise science, complete a literature review on the topic and formulate a research proposal for the Institutional Review Board. Course fee applied.

*Prerequisite:* KIN-346, Junior or Senior status required

**KIN-403 PROF CAPSTONE RESEARCH PROJ (1 Credit)**

The second course in a two-course seminar experience will continue to examine a Christian worldview and the ethical and professional issues associated with the major. The seminar will include a final portfolio and completion of the senior research project for kinesiology. Students will collect, process, interpret and present data from their novel research investigation. Course fee applied.

*Prerequisite:* MAT-151, KIN-345, KIN-402, Senior status required

**KIN-441 ORGANIZATION & ADMINISTRATION (3 Credits)**

The study of organization, administration, planning, implementation, interscholastic activities, and sports/fitness clinics. The students will gain a closer look at the administrative roles at these various settings. Topics will include budget creation and control, program development, leadership techniques, and program evaluation.

*Prerequisite:* None

**KIN-444 EXERCISE PHYSIOLOGY II (3 Credits)**

This course is designed to focus on integrative physiological mechanisms and responses to exercise. The course will use novel research findings to enhance student understanding of human physiology during rest and exercise. Students will be provided with the necessary tools to assess the integrative nature of human physiology during rest and exercise. Such assessment will be important for understanding how all of the pieces of the human body work together as one, flawlessly in God's image. Course fee applied.

*Prerequisite:* KIN-342

**KIN-461 SKILL/PERFORMANCE COMPETENCIES (1 Credit)**

This course involves a series of experiences to help students understand the many roles of the physical educator. The specific experiences will be planned jointly by the student and the professor as soon as a physical education major or minor is declared. The work will begin towards meeting the competencies in the areas required over the next three years. The goal of this course is to improve the students' personal and professional expertise through participation, observation and coaching opportunities.

*Prerequisite:* None

**KIN-462 SKILLS, COMP, PROF ETHICS IN PE (3 Credits)**

This course involves documenting and/or completing a series of experiences to help students understand the many roles of the physical educator. The specific experiences will be planned jointly by the student and the professor as soon as a physical education major/minor is declared. The goal of these experiences is to improve the student's personal and professional expertise through participation, observation and coaching opportunities. In addition, this course will examine the ethical and professional issues associated with physical education. The student will devote time to reflection on prior academic preparation and future vocational opportunities for the physical educator. The course will include significant evaluation instruments including a portfolio, a physical education philosophy paper, and a created curriculum with daily lesson plans. The physical education major/minor will work closely with the supervising professor to review all completed assignments.

*Prerequisite:* KIN-359

**KIN-470 READINGS IN PHY EDUCATION (1-3 Credits)**

Guided readings and periodic reports in areas of student's interest and need.

*Prerequisite:* None

**KIN-480 ADVANCED TOPICS (2-3 Credits)**

*Prerequisite:* None

**KIN-490 INDEPENDENT STUDY (1-4 Credits)**

With faculty supervision, the student will research and write on a specific topic or area. Outside involvement in topic is normally required.

*Prerequisite:* None

## Mathematics (MAT)

**MAT-096 PRE-ALGEBRA (3 Credits)**

An individualized review of applied arithmetic and pre-algebra. Patterns leading to operations with fractions, decimals, percents and proportions. Review of multiplication facts 0-15. This course does not count toward a major or a minor in mathematics. This course does not fulfill the core mathematics requirement. This course has a no-calculator policy.

*Prerequisite:* None

**MAT-107 ALGEBRA (3 Credits)**

A study of number properties, variation, graphs and equations involving linear, quadratic and exponential functions. This course introduces the use of calculators and/or spreadsheets for the study of functions and data. It does not count toward a major or minor in mathematics. MAT-107 is designed to review the necessary foundations in algebra for MAT-110. Prerequisite: Qualifying score on math placement test; this course does not fulfill the core mathematics requirement.

*Prerequisite:* Requires qualifying placement score or MAT-096. C or higher

**MAT-108 MATH FOR NURSING (3 Credits)**

This class examines the structure of mathematical expressions, equations and functions, along with their connection to practical applications. Topics include the evaluation and manipulation of expressions, equations and functions, as well as the structure and applications of linear, quadratic, rational and exponential functions.

*Prerequisite:* Qualifying placement score or MAT-096, C or higher

**MAT-109 MATH FOR ELEM TEACHERS (4 Credits)**

This course is intended for teacher candidates. Its purpose is to give candidates broad exposure to a variety of applications of mathematics in the real world as well as enhance their basic math skills to help prepare them for teaching math in the classroom. Topics include problem solving, fraction/decimals/percents, numeration systems, equations, geometry, functions, finance, probability, and statistics. This course satisfies the core requirement in Mathematics for elementary students.

*Prerequisite:* Take MAT-096 (C or higher) or qualifying placement score.

**MAT-110 COLLEGE MATHEMATICS (3 Credits)**

College Mathematics is intended for students majoring in liberal arts or other fields that do not have a specific mathematics requirement. Its purpose is to give students a broad exposure to a variety of applications of mathematics in the real world and to understand related spiritual foundations. Topics include reasoning, voting methods, apportionment, mathematics of finance, logic, shapes and patterns in geometry, networks and directed graphs, probability and statistics. Computational skill, spatial reasoning, calculator usage, and logical analysis abilities are developed. This course satisfies the core requirement in mathematics.

*Prerequisite:* Qualifying score on SAT or CU Math Placement Exam or MAT-107 or MAT-096, C or higher. \*Warning: Math, Science, Engineering & Exercise Science Majors check with your advisor for the correct math course.

*Prerequisite:* Take MAT-096 (C or higher), or qualifying placement score

**MAT-120 CONTEMPORARY MATH FOR BUSINESS (3 Credits)**

by permission only

*Prerequisite:* None

**MAT-121 COLLEGE ALGEBRA (3 Credits)**

College Algebra introduces the study of polynomial, rational, exponential, and logarithmic functions, in addition to the quadratic formula, geometric series, binomial series, systems of equations and probability. A graphing calculator is required (TI-83/84 recommended). This course satisfies the core requirement in mathematics.

*Prerequisite:* Take MAT-107 or qualifying placement score

**MAT-122 PRE-CALCULUS (4 Credits)**

This course serves as a collection of topics relevant to calculus based courses. Focus will be given on exponential and logarithmic functions in addition to properties, graphs and applications of the sine, cosine and tangent functions, along with their reciprocals and inverse functions. Connections are made with right and oblique triangles, polar coordinates and equations concerning polar coordinates and conic sections. This course satisfies the core requirement in mathematics.

*Prerequisite:* Take MAT-121 or qualifying placement score

**MAT-131 CALCULUS I (5 Credits)**

The study of rates of change for polynomial, exponential, logarithmic, and trigonometric functions, tangent lines, graphs, maximum values, and areas. Applications of calculus will be modeled with graphing calculators. Computer software and/or graphing calculator (TI-84 recommended) is a required tool for this course. This course satisfies the core requirement in mathematics.

*Prerequisite:* Take MAT-122 or qualifying placement score

**MAT-132 CALCULUS II (5 Credits)**

Applications of differentiation and integration will include techniques of integration, transcendental functions, infinite series and sequences, parametric equations, polar forms and vectors. Graphing calculator (TI-84 recommended) required. This course satisfies the core requirement in Mathematics.

*Prerequisite:* MAT-131

**MAT-151 STATISTICS (3 Credits)**

Descriptive statistics including measures of central tendency and standard deviation, statistical inference with emphasis upon testing of hypotheses and measures of association, and application of these techniques to decision-making and planning. Computer software and/or graphing calculator is required (TI-83/84 preferred).

*Prerequisite:* Complete math core

**MAT-209 TEACHING MATH I & CLINICAL EXP (4 Credits)**

This course is designed to merge mathematical content knowledge and pedagogical knowledge to design mathematical pedagogical knowledge that focuses on the whole learner with specific attention to PK-3 students' needs (cognitive, physical, behavioral, social, and emotional). Teacher candidates will be introduced to reflective thinking to understand how their own biases, content knowledge, and past experiences will impact their instruction. Topics include counting and cardinality; operations (addition, subtraction, and foundational ideas for multiplication); initial place value and regrouping concepts; measurement and data (time, money, relative positions, lengths in metric and standard); and geometry (naming shapes, shape composition, shapes in the real world, composition/decompositions of shapes, 2D and 3D shapes). This course will expose teacher candidates to various curricular resources, assessment tools, and instructional technology to promote active engagement and give direction to instruction. Clinical experience in an appropriate early education setting provides teacher candidates an opportunity to apply their developing mathematical instructional knowledge and skills.

*Prerequisite:* MAT-109, Conditional acceptance into TE division

**MAT-233 DIFFERENTIAL EQUATIONS (3 Credits)**

The study of equations involving derivatives by methods of analytic algebra or numeric solutions. Priority is given to first-order differential equations and their applications as well as linear higher-order equations and Laplace transformations. Maple software required.

*Prerequisite:* MAT-132

**MAT-234 MULTIVARIATE CALCULUS (3 Credits)**

This course explores differentiation and integration of functions of several variables, limits, differentials, optimization, volumes and surface area. Students will also study change of variables and methods of multivariate integration. Maple software required.

*Prerequisite:* MAT-132

**MAT-235 DIFFER EQUAT & LINEAR ALG - ENGINEERS (3 Credits)**

Introduction to the theory of first and higher order differential equations by analytical and numerical methods as well as computer-based approaches. This course also introduces concepts in linear algebra such as systems of equations, determinants, vector spaces and eigenvectors. Maple software required.

*Prerequisite:* MAT-234

**MAT-241 APPLIED LINEAR ALGEBRA (3 Credits)**

The algebra of matrices, determinants, vectors, inverting matrices, diagonalizing matrices, eigenvalues and their applications. Maple software and graphing calculator (TI-89/92/200) required for calculations and applications to dynamic systems.

*Prerequisite:* None

**MAT-243 DISCRETE MATHEMATICS (3 Credits)**

A basic study of fundamental principles of discrete mathematics. Topics include combinatorics, probability and algorithms.

*Prerequisite:* MAT-121 or MAT-131

**MAT-244 METHODS OF MATHEMATICAL RESEARCH (3 Credits)**

Students in this course will be introduced to the typesetting language of L<sup>A</sup>T<sub>E</sub>X, solving mathematical problems with Maple, understanding mathematical articles, locating and researching mathematical topics, and preparing mathematical presentations. Maple software required.

*Prerequisite:* ENG-212, MAT-245

**MAT-245 MATHEMATICAL PROOFS (4 Credits)**

A course in reading and constructing mathematical proofs. How to start proofs (direct proofs, proofs by cases, proofs by contrapositive, proofs by contradiction); proofs about sets, functions, numbers, inequalities, and equivalence relations; proofs by mathematical induction; understanding the theorems of calculus and linear algebra; and preparing to do proofs in Modern Algebra and Real Analysis.

*Prerequisite:* ENG-212

**MAT-251 PROBABILITY & STATISTICS (3 Credits)**

This is a Calculus-based course in probability and statistics which includes discrete and continuous random variable probability models.

Topics include the central limit theorem, sampling distributions, estimation, confidence intervals, hypotheses testing, analysis of variance, and regression analysis. Emphasis will be placed on statistical software to create probability models and run statistical procedures, specific to applications in economics and science.

*Prerequisite:* MAT-131, MAT-132

**MAT-312 ELEM MATH METHODS & FIELD EXPERIENCE (4 Credits)**

This course is designed to merge mathematical content knowledge and pedagogical knowledge to design mathematical pedagogical knowledge that focuses on the whole learner with specific attention to the 3rd through 6th grade students' needs (cognitive, physical, behavioral, social, and emotional). Teacher candidates will be introduced to reflective thinking to understand how their own biases, content knowledge, and past experiences will impact their instruction. Topics include place value (multi-digit operations, base 10, and other bases); multiplication and division (factors, multiples, area model, distributive property, commutative property, order of operations, and inverse operations); fractions (unit fractions, equivalent fractions, relationship to perimeter, volume, angle measure, shapes, and attributes); and arithmetic patterns (setting up for algebraic thinking). This course will also expose students to various curricular resources, assessment tools, and instructional technology to promote age-appropriate active engagement and give direction to instruction. Clinical experience in an appropriate upper elementary setting provides teacher candidates an opportunity to apply their developing mathematical instructional knowledge and skills.

*Prerequisite:* Professional Status and MAT 209

*Prerequisite:* Complete math core and have full acceptance into teacher ed program

**MAT-315 TEACHING MATHEMATICS II (4 Credits)**

This course is designed to merge mathematical content knowledge and pedagogical knowledge to design mathematical pedagogical knowledge that focuses on the whole learner with specific attention to the 3rd through 6th grade students' needs (cognitive, physical, behavioral, social, and emotional). Teacher candidates will be introduced to reflective thinking to understand how their own biases, content knowledge, and past experiences will impact their instruction. Topics include place value (multi-digit operations, base 10, and other bases); multiplication and division (factors, multiples, area model, distributive property, commutative property, order of operations, and inverse operations); fractions (unit fractions, equivalent fractions, relationship to perimeter, volume, angle measure, shapes, and attributes); and arithmetic patterns (setting up for algebraic thinking). This course will also expose students to various curricular resources, assessment tools, and instructional technology to promote age-appropriate active engagement and give direction to instruction. Clinical experience in an appropriate upper elementary setting provides teacher candidates an opportunity to apply their developing mathematical instructional knowledge and skills.

*Prerequisite:* MAT-209, Full acceptance into TE program

**MAT-333 REAL ANALYSIS (3 Credits)**

A first course in the theory of the calculus of a single real variable.

Students will study the real number system as a complete ordered field, convergence of sequences and series, continuity and differentiability of functions of a real variable, theory of the Riemann integral and integrable functions.

*Prerequisite:* MAT-132, 241, 233 or 234 and MAT-245

**MAT-341 MODERN ALGEBRA (3 Credits)**

A first course in group theory with a focus on binary operations, isomorphisms, cyclic groups, permutations, abelian groups, orbits of equivalence relations, cosets, normal subgroups, homomorphisms and related theorems, factor groups, group actions and Sylow's Theorems.

*Prerequisite:* MAT-245, MAT-241

**MAT-380 INTERNSHIP (1-3 Credits)**

An individualized assignment arranged with an agency, business or other organization to provide guided practical experience in a mathematical sciences related career/ministry activity.

*Prerequisite:* Junior or Senior status required

**MAT-400 CAPSTONE SEM: GEOM & HIST/MATH SCIENCES (3 Credits)**

For Math Education majors, this course studies the history of mathematical ideas, notation and processes from ancient Egypt and Mesopotamia through the modern era. Students will study individual mathematicians as well as cultural and abstract ideas. Attention will be given to geometrical concepts, including constructions and geometrical proofs.

*Prerequisite:* MAT-241 and 245

**MAT-401 CAPSTONE SEMINAR FOR MATHEMATICS (3 Credits)**

Students will research and present an important topic in mathematics using both library research and personal preparation.

*Prerequisite:* Fifteen credits of upper level MAT courses

**MAT-402 MATHEMATICAL SCIENCE SEMINAR I (3 Credits)**

Exploration of selected advanced topics in mathematical modeling, set theory, number theory; topology, complex variables; differential geometry, set theory, number theory; topology, complex variables; differential geometry, modern geometries; abstract linear algebra, advanced matrix algebra, vector analysis, numerical analysis, graph theory, combinatorics, computer programming. Advanced project topics in physics may be selected from Fourier series, transform calculus, partial differential equations, boundary value problems, complex variables, and vector calculus. Designed for mathematical sciences majors' current needs and for students planning graduate study in the physical sciences or applied mathematics.

*Prerequisite:* None

**MAT-403 MATHEMATICAL SCIENCE SEMINAR II (3 Credits)**

Exploration of selected advanced topics in mathematical modeling, set theory, number theory; topology, complex variables; differential geometry, set theory, number theory; topology, complex variables; differential geometry, modern geometries; abstract linear algebra, advanced matrix algebra, vector analysis, numerical analysis, graph theory, combinatorics, computer programming. Advanced project topics in physics may be selected from Fourier series, transform calculus, partial differential equations, boundary value problems, complex variables, and vector calculus. Designed for mathematical sciences majors' current needs and for students planning graduate study in the physical sciences or applied mathematics.

*Prerequisite:* Take MAT-402

**MAT-470 READINGS IN MATHEMATICAL SCIENCES (1-3 Credits)**

Readings in specific mathematical sciences or mathematics education topics in areas of student need and interest. Required periodic reports with related discussions, labs, or creative/classroom activities. May be repeated.

*Prerequisite:* None

**MAT-471 SECONDARY MATH METHODS (3 Credits)**

Prospective teachers implement a secondary mathematics curriculum that models NCTM and State of Michigan standards. They will examine educational philosophy and history, learning theory and curriculum development. They will also plan, implement and evaluate unit and lesson plans in developmental math, algebra, geometry, probability and statistics and pre-calculus. Exploration with use manipulatives, computers, multimedia technologies, activity projects and construction tools. Computer and TI-84 graphing calculator required.

*Prerequisite:* MAT-132, MAT-151 or MAT-251 and acceptance into teacher ed program

**MAT-480 ADVANCED TOPICS (1-3 Credits)**

Selected topics in mathematical modeling, set theory, number theory; topology, complex variables; differential geometry, set theory, number theory; topology, complex variables; differential geometry, modern geometries; abstract linear algebra, advanced matrix algebra, vector analysis, numerical analysis, graph theory, combinatorics, computer programming. Advanced project topics in physics may be selected from Fourier series, transform calculus, partial differential equations, boundary value problems, complex variables, and vector calculus. Designed for mathematical sciences majors' current needs and for students planning graduate study in the physical sciences or applied mathematics. May be repeated. *Prerequisite:* Permission of instructor.

*Prerequisite:* None

**MAT-490 INDEPENDENT STUDY (1-3 Credits)**

An opportunity to perform independent study/research/creative activity in the various branches of mathematical sciences and allied fields of application. Submission and approval of a research proposal must precede registration. May be repeated.

*Prerequisite:* None

## Nursing (NUR)

**NUR-201 FOUNDATIONS OF NURSING (3 Credits)**

This didactic course will introduce students to the vocational and professional aspects of nursing care and provide a basis of understanding of topics including professional writing, dosage calculation, medical terminology and nursing study and testing strategies.

*Prerequisite:* None

**NUR-221 HEALTH ASSESSMENT LAB (2 Credits)**

This lab course focuses on health assessment skills that include obtaining a history, vital signs, documentation, and a head to toe assessment. Must be in the BSN program.

*Prerequisite:* Take MAT-108, BIO-241, BIO-242, ENG-212, COM-112, and BIO-151

**NUR-231 PATHOPHYSIOLOGY (3 Credits)**

This didactic course relates disease manifestation and risk factors regarding the underlying illness or injury as it relates to nursing interventions. Must be in the BSN program.

*Prerequisite:* Take MAT-108, ENG-212, COM-112, BIO-151, BIO-241 and BIO-242 Must be accepted into the BSN program

**NUR-241 COMMUNITY HEALTH NURSING (3 Credits)**

This didactic course emphasizes holistic care, which is respectful, compassionate, and coordinated. Topics include recognizing differences, preferences, values, needs and resources of the person or designee as the source of control and full partner in healthcare. Person-centered care is informed by evidence and supports the achievement of positive health outcomes within the community context. Must be in the BSN program.

*Prerequisite:* Take MAT-108, BIO-241 BIO-242, ENG-212, COM-112, and BIO-151, Take NUR-242 concurrently

**NUR-242 COM HEALTH NURSING CLINICAL (1 Credit)**

This clinical course focuses on the application of concepts from lecture and lab. Under the guidance of a registered nurse, students will have hands on application experience in simulation and the community. Must be in the BSN program. Pass/Fail

*Prerequisite:* Take MAT-108, BIO-241, BIO-242, ENG-212, COM-112 and BIO-151

**NUR-243 NURSING SKILLS LAB (2 Credits)**

This lab course focuses on establishing emerging principles of safety and quality in nursing and health care as an essential component of skill obtainment and practice.

*Prerequisite:* Take NUR-221, 241 and NUR-242

**NUR-245 FUNDAMENTALS OF NURSING (3 Credits)**

This didactic course engages students in health care partnerships to learn how to support and improve equitable, population health outcomes.

*Prerequisite:* Take NUR-221, 241 and 242

**NUR-246 FUNDAMENTALS CLINICAL (1 Credit)**

This clinical course focuses on the application of concepts from Fundamentals of Nursing and Skills lab. Under the guidance of a registered nurse, students will have hands-on experiences in simulation and long-term care environments. Pass/Fail

*Prerequisite:* None



**NUR-251 MENTAL HEALTH NURSING (3 Credits)**

This didactic course explores evidence-based practice and historically relevant mental health concepts. Students have the opportunity to explore therapeutic communication and interviewing strategies.

*Prerequisite:* Take NUR-252 concurrently

**NUR-252 MENTAL HEALTH NURSING CLINICAL (1 Credit)**

This clinical course focuses on the application of concepts from lecture. Under the guidance of a registered nurse, students will have application experience in simulation and mental healthcare settings. Pass/Fail

*Prerequisite:* Take NUR-251 concurrently

**NUR-341 ADULT HEALTH NURSING I (3 Credits)**

This didactic course discusses teamwork across professions and with care team members, patients, families, and communities to optimize care, enhance the experience, improve outcomes, and reduce costs.

*Prerequisite:* Take PSY-235 and successfully complete all previous NUR courses, Take NUR-342 concurrently

**NUR-342 ADULT HEALTH NURSING I CLINICAL (3 Credits)**

This clinical course focuses on the application of concepts from lecture and lab. Under the guidance of a registered nurse, students will have hands on application experiences in simulation and in adult healthcare environments. Pass/Fail

*Prerequisite:* Take PSY-235 and all previous NUR courses, Take NUR-341 concurrently

**NUR-346 PHARMACOLOGY I (3 Credits)**

This didactic course focuses on the basic drug classification, concepts and principles of pharmacology with special consideration for the nurse's role.

*Prerequisite:* Take CHM-110, BIO-352 and all previous NUR courses

**NUR-347 PHARMACOLOGY II (3 Credits)**

This didactic course focuses on the advanced drug classification, concepts and principles of pharmacology with special consideration for the nurse's role.

*Prerequisite:* Successfully complete all previous NUR courses

**NUR-351 ADULT HEALTH NURSING II (3 Credits)**

This didactic course expands the response to adult health needs and concepts of leading within complex systems of health care.

*Prerequisite:* Successfully complete all previous NUR courses, Take NUR-352 concurrently

**NUR-352 ADULT HEALTH NURSING II CLINICAL (3 Credits)**

This clinical focuses on the application of advanced concepts from lecture and lab. Under the guidance of a registered nurse, students will have hands on application experiences in simulation and in adult healthcare environments by working up the ability to care for half a typical patient assignment. Pass/Fail

*Prerequisite:* Complete all previous NUR courses, Take NUR-351 concurrently

**NUR-357 NURSING ETHICS (2 Credits)**

This didactic course allows formation and cultivation of a sustainable professional nursing identity, accountability, perspective, collaborative disposition and comportment that reflects nursing's characteristics, norms and values.

*Prerequisite:* Complete all previous NUR courses

**NUR-380 INTERNSHIP (1-6 Credits)**

This course provides an opportunity to work in a supervised biological setting (e.g., DNR, nature center, public health agency). The experience must include opportunities to apply the theories and concepts learned in the discipline or to enhance biological science research skills.

*Prerequisite:* Complete all 200-level NUR courses

**NUR-429 RESEARCH IN NURSING PRACTICE (3 Credits)**

The didactic course covers topics such as generation, synthesis, translation, application, and dissemination of knowledge to improve health and transform health care.

*Prerequisite:* Take BUS-211 or MAT-151 and all previous nursing courses

**NUR-431 HEALTH & AGING (3 Credits)**

This didactic course focuses on the role of the nurse in relation to the needs of aging patients in an adapting healthcare delivery system. Topics include providing holistic nursing care for the aging population addressed through discussions of social and cultural considerations, wellness, management of chronic disease, and navigation of end-of-life care.

*Prerequisite:* NUR-351 and NUR-347

**NUR-441 MATERNAL/PED HEALTH NURSING (4 Credits)**

This didactic course focuses on the health care needs of the pediatric population.

*Prerequisite:* Complete all previous NUR courses, Take NUR-442 concurrently

**NUR-442 PEDIATRIC/MATERNAL HEALTH NURS CLINICAL (2 Credits)**

This clinical course focuses on the application of concepts from lecture and lab. Under the guidance of a registered nurse, students will have hands on experiences in simulation within pediatric and maternal healthcare environments. Pass/Fail

*Prerequisite:* Complete all previous NUR courses, Take NUR-441 concurrently

**NUR-451 NURSING CAPSTONE (3 Credits)**

This didactic course offers participation in activities and self-reflection that foster personal health, resilience, and wellbeing, lifelong learning, and support the acquisition of nursing expertise and assertion of leadership.

*Prerequisite:* Complete all previous nursing courses, Take NUR-452 concurrently

**NUR-452 NURSING CAPSTONE CLINICAL (3 Credits)**

This clinical course focuses on the application of concepts from lecture and lab. Under the guidance of a registered nurse, students will have hands on application experiences in simulation and in healthcare environments to pull together all the clinical skills and care for a full patient assignment.

*Prerequisite:* Complete all previous nursing courses, Junior or Senior status required

## Physics (PHY)

**PHY-211 GENERAL PHYSICS I (4 Credits)**

An introductory survey of the basic concepts of mechanics, heat, sound, and wave motion. Appropriate for students in life sciences. Lecture and lab. This course satisfies the core requirement for Lab Science. Course fee applied.

*Prerequisite:* Take MAT-121, 122, 131 or 132

**PHY-212 GENERAL PHYSICS II (4 Credits)**

An introductory survey of the basic concepts of electricity, magnetism, light and modern physics. Appropriate for students in life sciences. Lecture and lab. Course fee applied.

*Prerequisite:* PHY-211; minimum grade C-

**PHY-221 PHYSICS FOR SCI & ENGINEERS I (5 Credits)**

An introductory survey of the basic concepts of mechanics, heat, sound and wave motion. Appropriate for students in the mathematical sciences and engineering. Lecture and Lab. Course fee applied. This course satisfies the core requirement for lab science.

*Prerequisite:* Take MAT-131 concurrently

**PHY-222 PHYSICS FOR SCI & ENGINEERS II (5 Credits)**

An introductory survey of the electricity, magnetism, light and modern physics. Appropriate for students in the mathematical sciences and engineering. Lecture and Lab. Course fee applied. Mastering Physics software required.

*Prerequisite:* PHY-221; minimum grade C-

## Science (SCI)

**SCI-119 CONTEMP ISSUES IN SCIENCE & TECH (3 Credits)**

An exploration of current issues in physics, science, biology, health and medicine. The course provides an understanding of the scientific method and how to critically evaluate current issues from a scientific perspective.

*Prerequisite:* None

**SCI-201 INTEGRATED SCIENCE ELEM EDU (3 Credits)**

A college-level study and application of science concepts contained in the Michigan Grade Level Content Expectations for pre-service elementary teachers. Focus of the course will be on Science Process Skills, Physical Science, Life Science and Earth/Space Science, centering on the integration of these disciplines using inquiry-based learning, labs and field trips. Course fee applied.

*Prerequisite:* EDU-230

**SCI-202 FOUND OF INTEGRATED SCIENCE I (3 Credits)**

Teacher candidates will investigate and apply the principles of 3-dimensional science pedagogy to a select subset of science principles focused on PK-3. Using the Michigan Science Standards/NGSS as a foundation for developing skills in science and engineering practices, disciplinary core ideas and crosscutting concepts, students will engage these ideas to figure out how phenomena in the real world integrate in culturally-relevant ways to enable students to build their understanding of how science works and applies to their cultural context. Pedagogical methods will focus on the use of play, observation, and a subset of science and engineering practices to engage students in phenomenological inquiry.

*Prerequisite:* EDU-220

**SCI-212 FOUND OF INTEGRATED SCIENCE II (3 Credits)**

Building on the principles of Foundations of Integrated Science (PK-3) teaching candidates will investigate and apply the principles of 3-dimensional science pedagogy using the Michigan Science Standards/NGSS as a foundation for developing skills in science and engineering practices, disciplinary core ideas and crosscutting concepts. Students will engage these ideas to figure out how phenomena in the real world integrate in culturally-relevant ways to enable students to build their understanding of how science works and applies to their cultural context. Pedagogical methods will focus on the use of inquiry-based instruction to engage students in phenomenological inquiry.

*Prerequisite:* Conditional Status with TE division, SCI-202

**SCI-242 MEDICAL TERMINOLOGY (2 Credits)**

This course equips members of the health care professions with a working knowledge of medical vocabulary. Emphasis is placed on definitions, spelling, and pronunciation as it relates to the body. The course is designed for students desiring to pursue health-related careers.

*Prerequisite:* None

**SCI-261 ASTRONOMY (4 Credits)**

A study of the distinctive qualities of the planets, their moons, the stars, and galaxies through laboratory exercises in observations and calculations. Lecture and lab. This course satisfies the core requirement for Lab Science. Course fee applied.

*Prerequisite:* Math core requirement

**SCI-262 GEOLOGY (4 Credits)**

A study of the materials and processes of the earth, leading to a responsible Christian appreciation for it and its use. Explores basic principles through a survey of the history of the ideas about the earth. Applies basic insights of chemistry, biology, physics, and mathematics to the solution of problems such as earthquakes, volcanic eruptions, floods, marine erosion, the nature and distribution of fossil fuels, metals, ground water, and other mineral resources. Studies man-imposed and natural boundaries to characterize geographic regions. Lecture and lab. This course satisfies the core requirement for Lab Science. Course fee applied.

*Prerequisite:* None

**SCI-263 ATMOSPHERE AND WEATHER (2 Credits)**

This primarily on-line course is adapted from the American Meteorological Society Online Weather Studies. Students are led through the major aspects of atmospheric composition, weather production and parameters and forecasting models. Does not satisfy lab core requirement.

*Prerequisite:* None

**SCI-311 SCIENCE IN CULTURE (3 Credits)**

This course is a rigorous examination (based on a Christian philosophical worldview) of the nature of science and some of the major scientific ideas and issues affecting our culture.

*Prerequisite:* Lab science (music ed students take SCI-211 - elem ed students take SCI-201), Junior or Senior status required, PHI-211

**SCI-345 GLOBAL HEALTH & EPIDEMIOLOGY (3 Credits)**

This course explores the complex determinants of health and is designed to help students use their understanding of these determinants to develop strategies to improve the health of communities and populations. The course introduces students to the history, philosophy and ethics of epidemiology, and emphasizes the application of epidemiology (description, association and causality) to community health policy and practice. The student will analyze how policies and programs impact health outcomes within the current urban and global health care settings.

*Prerequisite:* None

**SCI-346 PHARMACOLOGY (3 Credits)**

This course is designed to teach the student principles of pharmacology, including mathematics and calculations, rules and regulations governing medications, medication administration and safety issues. Medications specific to various diseases and disorders will be studied, emphasizing desired effects, side effects, and contraindications.

*Prerequisite:* BIO-151, 241 & 242

**SCI-361 EVOLUTION & ORIGINS (3 Credits)**

A scientific investigation of the feasibility of various origin theories with special emphasis on the creation vs. evolution debate. Explores the difference between origins science and operation science and analyzes the conflict in the Christian scientific community as well as the population at large.

*Prerequisite:* BIO-111 or 4 credits from SCI, BIO, CHM, PHY

**SCI-380 INTERNSHIP (1-6 Credits)**

This course provides an opportunity to work in a supervised biological setting (e.g., DNR, nature center, public health agency). The experience must include opportunities to apply the theories and concepts learned in the discipline or to enhance biological science research skills.

*Prerequisite:* Junior or Senior status required

**SCI-400 CAPSTONE SEMINAR: INTEGRATED SCIENCE (2 Credits)**

This course is designed to serve as the culminating course of science content for the integrated science major and minor, just prior to the directed teaching semester. Using the major themes motif, each subject will be explored for the common and varied approaches to understanding its physical, biological and earth/space science content and interconnections. Philosophical underpinnings and ethical considerations will be stressed for each theme along with its outworking. Students will be responsible for developing their own set of alternative solutions for each problem encountered, discovering strategies for communicating integrated content in their classroom and devising techniques to stimulate their students to join the quest.

*Prerequisite:* Junior or Senior status required

**SCI-423 NEUROSCIENCE (3 Credits)**

A special topics course which introduces workings of the brain and aspects of personality dealing with these at the level of the nerve cells and brain structures. Learned topics include: Perception, cognition, intelligence, the basis of emotional states, personality disorders and questions of guilt; progressive and degenerate diseases of the mind; nerve impulses and the synapses to understanding drug abuse and addictions; neural pathologies like speech disorders, attention deficit hyperactive disorder and the epilepsies; sensations, reflexes and movement control; brain waves, sleeping and arousal, awareness, consciousness and the soul, along with investigating the neural brain of gender differences.

*Prerequisite:* BIO-151, BIO-241 or PSY-441

**SCI-465 SECONDARY SCIENCE METHODS (3 Credits)**

This course focuses on specific knowledge, skills, and attitudes that are demonstrated by effective science teachers in secondary schools. Students will learn to design, organize, present, and evaluate the learning of science subject matter utilizing various instructional models and methods of teaching science.

*Prerequisite:* Acceptance into teacher ed program

**SCI-470 READINGS IN SCIENCE (1-3 Credits)**

*Prerequisite:* None

**SCI-480 ADVANCED TOPICS (1-4 Credits)**

*Prerequisite:* None

**SCI-490 INDEPENDENT STUDY (1-3 Credits)**

*Prerequisite:* None

**SCI-495 SENIOR RESEARCH PROJECT (1 Credit)**

The senior research project is independently conducted research under the guidance of a science faculty mentor and is taken as a summer credit before taking the senior research seminar (SCI-496) or in the spring after the senior research seminar.

*Prerequisite:* Senior status required

**SCI-496 SENIOR RESEARCH SEMINAR (1 Credit)**

The senior research seminar is designed to help students develop the skills necessary to complete their senior research project (SCI-495). Seminars will focus on literature review, scientific writing, use of statistics in writing, creating tables and figures, review-editing of manuscripts and posters and presentations. Course fee applied.

*Prerequisite:* None

**Barnard, Marvin**, Assistant Professor of Chemistry and Engineering

**Burdine, Justin**, Assistant Professor of Biology

**Crompton, Nigel**, Professor of Biology

**Curtis, Morgan** (<https://www.cornerstone.edu/faculty/morgan-curtis/>), Assistant Professor of Nursing

**Emmons, Misty** (<https://www.cornerstone.edu/faculty/misty-emmons/>), (Dean) Assistant Professor of Nursing, Chief Nursing Administrator

**Ensink, Robert**, Assistant Professor of Engineering

**Greene, Michael**, Associate Professor of Engineering

**Hoffman, Robert**, Assistant Professor of Mathematics

**Keller, Ned** (<https://www.cornerstone.edu/faculty/ned-keller/>), Professor of Science

**Keys, Robert**, Professor of Environmental Biology and Science Education

**Korhorn, Kimberly** (<https://www.cornerstone.edu/faculty/kim-korhorn/>), Assistant Professor of Nursing

**Reynhout, Tim**, Assistant Professor of Mathematics

**Rocafort, Andréa**, Assistant Professor of Nursing

**Sackett, James**, Associate Professor of Kinesiology

**Wideman, Charles** (<https://www.cornerstone.edu/faculty/charles-wideman/>), Instructor of Science

**Zainea, Kimberly** (<https://www.cornerstone.edu/faculty/kimberly-zainea/>), Associate Professor of Kinesiology