Course Designators
In conjunction with course numbers, departments and programs are identified by a 2-, 3-, or 4-letter designator prefix (e.g., CE for Civil Engineering, POL for Political Science, ECON for Economics). When no designator precedes the number of a course listed as a prerequisite, that prerequisite course is in the same department as the course being described.

Course Numbers
- **0xxx** ......Courses that do not carry credit toward any University degree.
- **1xxx** ......Courses primarily for undergraduate students in their first year of study.
- **2xxx** ......Courses primarily for undergraduate students in their second year of study.
- **3xxx** ......Courses primarily for undergraduate students in their third year of study.
- **4xxx** ......Courses primarily for undergraduate students in their fourth year of study; graduate students may enroll in such courses for degree credit. 4xxx courses can be counted for a Graduate School degree if the course is taught by a member of the graduate faculty or an individual appointed to Limited Teaching Status (LTS).
- **5xxx** ......Courses primarily for graduate students; undergraduate students in their third or fourth year may enroll in such courses.

Course Symbols
The following symbols are used throughout the course prerequisites of most University catalogs to denote common and recurring items of information.

- **=** Credit will not be granted if credit has been received for the course listed after this symbol.
- **&** Concurrent registration is required (or allowed) in the course listed after this symbol.
- **#** Approval of the instructor is required for registration.
- **%** Approval of the department offering the course is required for registration.
- **@** Approval of the college offering the course is required for registration.
- **,** In prerequisite listings, comma means “and.”

1-4 cr [max 6]. The course can be taken for 1 to 4 credits and may be repeated for up to 6 credits.

Abbreviations
The following abbreviations are used throughout the course prerequisites of most University catalogs to denote common and recurring items of information.

- **Prereq** Course prerequisites.
- **cr** Credit.
- **div** Division.
- **DUS** Director of undergraduate studies.
- **equiv** Equivalent.
- **fr, soph, jr, sr** Freshman, sophomore, junior, senior.
- **H** Honors. Courses with an H following the course number satisfy honors requirements.
- **V** Honors and Writing Intensive. Courses with a V following the course number satisfy both honors and liberal education writing intensive requirements.
- **W** Writing Intensive. Courses with a W following the course number satisfy the writing intensive requirement for liberal education.
- **A-F only** A-F grade basis only; course may not be audited or take pass/fail.
- **A-F or Aud** A-F grade basis, or course may be audited for no grade.
- **S-N only** S-N grade basis only (pass/fail), course may not be audited or taken A-F.
- **S-N or Aud** S-N grade basis (pass/fail), or course may be audited for no grade.
- **No Grade** No grade will be given for the course; typically used for laboratory components of courses.
- **OPT No Aud** Student selects the grading option; course may not be audited.
- **Stdnt Opt** Student selects the grading option; course may be audited.

Course Listing Sample

**Xology (Xolo)**

**Xology and Diometrics**

**College of Liberal Education**

**Xolo 5101. Methods in Xology.** (3-4 cr [max 8 cr]; A-F only. Prereq-3578 or #)

Historical, numerical, sociological, and Freudian methods of research in xology with applications to contemporary problems.
### Biochemistry (BIOC)

**BIOL 1393. Directed Study in Biochemistry.** (1-3 cr. [max 6 cr.]; Student Option; Every Fall & Spring)
Individual study on selected topics or problems. prereq: instr consent, dept consent

**BIOL 3321. Biochemistry.** (3 cr.; A-F or Audit; Every Fall)
In this course students gain an appreciation for the breadth and depth of current knowledge in biochemistry through an active learning, student-centered approach. Students examine the structure of macromolecules essential to life (including proteins, lipids, and carbohydrates). This analysis gives special consideration to the manner in which molecular structure dictates function. Additionally, students examine the enzymatic pathways responsible for synthesis and degradation of macromolecules, the regulation of enzymes that catalyze these reactions, and the energy expended or produced during these processes. Such pathways include carbohydrate metabolism (glycolysis, gluconeogenesis, citric acid cycle), lipid metabolism (beta-oxidation, lipid synthesis), and oxidative phosphorylation. Students apply these concepts to problem solving within the field, while also gaining confidence in his/her communication of biochemical principles through collaborative, team-based activities. prereq: BIOL 2311, CHEM 2231, and CHEM 2333; or instr consent

**BIOL 3393. Directed Study or Research in Biochemistry.** (1-6 cr. [max 24 cr.]; Student Option; Every Fall & Spring)
Individual study or research on selected topics or problems. prereq: instr consent, dept consent

**BIOL 4721. Special Topics in Biochemistry.** (1-4 cr. [max 8 cr.]; A-F or Audit; Periodic Fall & Spring)
In-depth study of special topics in Biochemistry. prereq: instr consent; repeated enrollment allowed only if topics are different

### Biology (BIOL)

**BIOL 1393. Directed Study in Biology.** (1-3 cr. [max 6 cr.]; Student Option; Every Fall & Spring)
Individual study on selected topics or problems. prereq: instr consent, dept consent

**BIOL 2310. Integrated Studies in Biology and Writing.** (1 cr.; A-F or Audit; Every Fall)
This one-credit directed study experience is intended for students who will be enrolling in WRIT 1512 without enrolling in the co-requisite course BIOL 2311. In this course, students will complete reading and writing assignments relevant to the biological and health sciences. Co-requisite: WRIT 1512.

**BIOL 2311. Introduction to Biology.** (BIOL,TS; 4 cr.; A-F or Audit; Every Spring)
Writing-integrated, transdisciplinary design of introductory biology course with lab for health sciences major. Emphasis on scientific literacy, mastery of core biological concepts, the relationship of biology to health sciences and other major disciplines, lifelong learning and citizenship. Taught utilizing student-centered, active learning and writing-integrated approaches. coreq: WRIT 1512

**BIOL 2331. Anatomy and Physiology I.** (BIOL; 4 cr.; A-F or Audit; Every Fall)
This course examines the shape, structure, and function of human body and its parts including basic anatomy, structure, and function of body systems and special senses. Specific attention is spent differentiating the anatomy and physiological workings of the integument, Skeletal, Muscular, Nervous including the special senses, Cardiovascular, Respiratory, Digestive and Urinary systems. Case studies and laboratory activities are used within a reduced-lecture delivery method to provide a student-centered, active-learning environment. prereq: 2311

**BIOL 3311. Genetics.** (BIOL,TS; 3 cr.; A-F or Audit; Every Fall)
Advanced introduction to genetic information, including molecular aspects of inheritance and disease; gene expression and regulation in cells/organisms; population genetics; mutation and molecular evolution; genome organization; gene databases; and pedigree analysis. Incorporates ethical, social and legal perspectives relevant to advances in genetic technology and increasing availability of human genetic information. Taught utilizing student-centered, active learning and writing-integrated approaches. prereq: 2311, CHEM 1231, CHEM 2331

**BIOL 3332. Anatomy and Physiology II.** (4 cr.; A-F or Audit; Every Spring)
This course reviews and elaborates on the basic anatomy, structure, and function of body systems and special senses, concepts/principles of body organization, histology, and hematopoietic topics covered in BIOL 2331.
Attention is given to understanding how these systems and concepts are related to higher order physiological phenomena such as: 1) Our ability to sense stimuli and respond (nervous system, endocrine system, lymphatic system and immune response); 2) The complex mechanisms/requirements for homeostatic regulation (relationship between nutrition and metabolism and water and ion balance in the human body); 3) Reproduction and fertility & #8230; 4) & #8230; shape, structure, and function of human body and its parts. Case studies and laboratory activities incorporate problem solving and applications to health sciences within a student-centered, active-learning environment. Strong emphasis on experimental design and execution. Prereq: Grade of at least C- in 2331 or placement test

**BIOL 3344. Microbiology.** (ENV; 4 cr.; A-F or Audit; Every Fall & Spring)
Microbiology examines the evolution, structure, physiology, metabolism and genetics of microorganisms with an emphasis on bacteria and viruses. Students also examine the dynamic impact of microbes on humans and the role of microbes in the environment. This course is taught using student-centered, active learning and writing integrated approaches. Students apply these concepts to problem solving within the field, while also gaining confidence in his/her communication of microbiology through collaborative, team-based assignments. In the accompanying laboratory, students gain exposure to and develop a variety of current microbiology techniques. prereq: grade of at least C- in 2331 or equiv. [CHEM 1231 or equiv.], [MATH 1110 or equiv]

**BIOL 3393. Directed Study or Research in Biology.** (1-6 cr. [max 24 cr.]; Student Option; Every Fall & Spring)
Individual study or research on selected topics or problems. prereq: instr consent, dept consent

**BIOL 4312. Advanced Topics in Molecular and Cellular Biology and Genetics.** (4 cr.; A-F or Audit; Periodic Fall)

**BIOL 4342. Neuroscience.** (3 cr.; A-F or Audit; Every Fall)
Investigation into principles of brain function from neurons to behaviors within the context of current physiological advances in studies of the brain and nervous system. prereq: 2331; [2332 or 3311 or BIOC 3321]; or instr consent

**BIOL 4364. Immunology.** (3 cr.; A-F or Audit; Every Spring)
The immune system is a complex amalgamation of cells and processes that are constantly interacting with the outside world to keep you safe from infection. Specific attention will be spent examining the general properties of the human immune system including: the structure, function and origin of participating tissues and cells, the general mechanism of the innate and adaptive immune immune systems and the development and deployment of self vs non-self. A multidisciplinary lens will be used to examine the social, ethical and historical perspectives of the immune system through specific cases of disease relevant to the health sciences and prevention of disease through vaccination. prereq: 2332 or 3344 or BIOL 3321 or instr consent

**BIOL 4721. Special Topics in the Life Sciences.** (1-4 cr. [max 8 cr.]; A-F or Audit; Periodic Fall & Spring)
In-depth study of special topics in the life sciences. prereq: instr consent; repeated enrollment allowed only if topics are different

### Biomed Inform & Comput Biology (BICB)

**BICB 5620. Topics in Biomedical Informatics and Computational Biology.** (0.5-4 cr. [max 24 cr.]; Student Option; Every Fall, Spring & Summer)
Each section corresponds to a Mayo 5XXX and 6XXX course. prereq: BICB grad student, permission of DGS

**BICB 8333. FTE: Master?**s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
TBD prereq: Master’s student, adviser consent, DGS consent

BICB 8401. Ethics in Bioinformatics and Computational Biology. (1 cr.; Student Option; Every Fall) 
Ethics of scientific investigation. Ethical conduct related to the scientific enterprise. Discussions on ethical topics related to bioinformatics data.

BICB 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) 
TBD prereq: Master’s student, adviser consent, DGS consent

BICB 8510. Computation and Biology. (2 cr. [max 4 cr.]; A-F only; Every Fall & Spring) 
Course taught in modular form. Overview of topics in, for instance, molecular biology and genetics, mathematics, statistics and biostatistics; programming in FORTRAN and C/C++; programming in Perl; data management; data mining. prereq: BICB grad student or instructor consent

BICB 8620. Topics in Biomedical Informatics and Computational Biology. (0.5-4 cr. [max 24 cr.]; Student Option; Every Fall, Spring & Summer) 
Each section corresponds to a Mayo 8XXX course; prereq: BICB grad student, permission of DGS

BICB 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) 
Doctoral Pre-Thesis Credits prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to 60 combined cr.

BICB 8670. Topics in Management of Technology. (0.5-4 cr. [max 24 cr.]; Student Option; Every Fall, Spring & Summer) 
Each section of this course corresponds to one of the MOT courses. prereq: BICB grad student, DGS consent

BICB 8777. Thesis Credits: Master’s. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) 
TBD

BICB 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) 
TBD

BICB 8920. BICB Colloquium. (1 cr. [max 2 cr.]; S-N only; Every Fall & Spring) 
Weekly colloquium. Features research talks. prereq: BICB grad student

BICB 8930. BICB Journal Club. (1 cr. [max 4 cr.]; S-N only; Every Fall & Spring) 
Weekly seminar. Journal articles presented by participants. prereq: BICB grad student or instructor consent

BICB 8932. Proposal Writing Seminar. (1 cr.; S-N only; Every Spring) 
Process of developing/writing research proposal that serves as basis for preliminary written exam in BICB graduate program. prereq: BICB PhD student or instructor consent

BICB 8940. Education and Pedagogy Seminar. (1 cr. [max 4 cr.]; S-N only; Every Fall & Spring) 
Offered jointly with Center for Learning Innovation (under development at UMR). Pedagogical approaches based on cognitive science research. Current/past literature on how our understanding of learning has shaped classroom teaching. prereq: BICB grad student or instructor consent

BICB 8960. Internship. (1-6 cr. [max 12 cr.]; S-N only; Every Fall & Spring) 
tbd prereq: BICB Ph.D. student

BICB 8970. Entrepreneurship and Leadership Seminar. (1 cr.; S-N only; Every Spring) 
Students will be introduced to aspects of entrepreneurship and leadership primarily in the context of clinical and translational research, such as data confidentiality, policies, challenges to bring research to the market, or federal funding trends. The seminar includes guest speakers. prereq: BICB graduate student or instructor permission

BICB 8990. Seminar on Current Topics. (1 cr. [max 4 cr.]; Student Option; Periodic Fall, Spring & Summer) 
Current topics in biomedical informatics and computational biology. prereq: BICB grad student or instructor consent

BICB 8991. Independent Study. (1-2 cr. [max 4 cr.]; S-N only; Every Fall, Spring & Summer) 
Individual reading on specialized topics. prereq: BICB grad major

BICB 8994. Directed Research. (1-3 cr. [max 6 cr.]; S-N only; Every Fall, Spring & Summer) 
Course used to develop a research project prior to enrolling in thesis credits. Project may lead to thesis research. prereq: BICB grad student or instructor consent

Center for Learning Innovation (CLI)

CLI 1196. National Student Exchange: Plan A. (0 cr.; S-N only; Every Fall, Spring & Summer) 
National Student Exchange enrollment: off-campus study.

CLI 1296. National Student Exchange: Plan B. (0-20 cr. [max 40 cr.]; S-N only; Every Fall, Spring & Summer) 
National Student Exchange enrollment: off-campus study.

CLI 1711. University Experience I. (1 cr.; S-N or Audit; Every Fall) 
Orientation to University environment and skills required to be successful in the transition to college. Students will explore themes of personal responsibility, diversity, and self-awareness. Students will develop skills in time management; financial management; academic strategies; physical, mental, and sexual health; and conflict resolution. prereq: Admitted to Bachelor of Science in Health Sciences (BSHS)

CLI 1712. University Experience II. (1 cr.; S-N or Audit; Every Spring) 
Exploration of strengths and values in understanding self. Students will take a strengths-based approach to academics, teams and relationships, and an introduction to a wide array of health careers. Students will also explore themes of self-awareness in relation to diversity and difference, beliefs, and making meaning of the college experience. prereq: 1711 or instructor consent

CLI 2522. Community Collaboratory. (3 cr.; A-F only; Every Fall & Spring) 
The academic goal of this course is to extend the student learning experience into the local community. Responding to needs identified by local public, private, and nonprofit organizations, students will confront the challenges present in complex human systems and contribute to projects aimed at improving the quality of life in Southeastern Minnesota. In doing so, students participate in sustainable and meaningful partnerships between the University of Minnesota Rochester and the surrounding community. Students will also have the opportunity to build relationships with people of different backgrounds and life experiences, to broaden their worldview, to critically and creatively examine community concerns, and to discover their own capacity to affect change in the world around them.

CLI 2713. Career Exploration in the Health Sciences. (1 cr.; S-N or Audit; Every Fall & Spring) 
This course will introduce students to career development theories and the Career Decision Making Cycle as they explore diverse health career fields. Students will build upon their assessment of values and strengths completed in CLI 1712 and engage in self-reflection to increase self-awareness. Students will be asked to apply their interests, skills, values and strengths to intentional career decision making. Students will develop the skills to write effective resumes and cover letters, as well as networking and interviewing skills. Prereq: 1712 or instructor consent

CLI 3496. Internship: Professional Experience. (1-6 cr. [max 24 cr.]; S-N only; Every Fall, Spring & Summer) 
Matches student’s academic/career goals with opportunities in industry, nonprofit organizations, and government agencies. prereq: instructor consent, dept consent, acceptance of internship proposal

CLI 3711. Career Preparation. (1 cr. [max 4 cr.]; S-N or Audit; Every Fall & Spring) 

CLI 3712. Capstone Proposal Writing. (1 cr.; S-N or Audit; Every Fall & Spring) 
This course focuses on all aspects of writing and submitting the Capstone Proposal for the BSHS degree. Students will propose a set of learning experiences which connect to a holistic theme. Capstone Proposals are reviewed by the CLI Faculty and must be approved before Capstone experiences can begin.

CLI 3715. Learning Away Orientation. (1 cr.; S-N only; Periodic Fall & Spring) 
Provides an introduction to the various challenges related to learning away. Students
will learn about cultural theories and stumbling blocks to intercultural communication, and acquire new knowledge and attitudes to successfully complete a learning away experience. In addition, the course will provide important information on financial management while away, how to remain healthy and safe, preparing for reentry into the United States and campus community, and how to market an experience away on a resume and cover letter.

Online, seven week course. prereq: instructor consent

CLI 3716. Living on Purpose. (1 cr.; S-N only; Periodic Fall)

Living on Purpose allows students to explore the roles personal purpose and intentional living play in our lives (e.g., goal setting and career planning). Students will explore their core values via a combination of discussion and activities that will allow students to further clarify their personal and professional values.

CLI 3950. Special Topics. (; 3 cr. ; max 6 cr.; ; A-F only; Periodic Fall, Spring & Summer)

In-depth study of special topic related to health sciences.

CLI 4000. Off-Campus Study. (0-36 cr. ; max 72 cr.; ; A-F only; Periodic Fall, Spring & Summer)

Not printed in catalog. A registration mechanism for students pursuing a unique off-campus study experience through either other educational institutions or through private non-credit granting agencies. Limited to students whose study is approved by University of Minnesota Rochester faculty who certify likely departmental credit for successfully completed study as specified by agreement forms signed by both student and faculty. prereq: inst consent

CLI 4094. Off-Campus Directed Research. (1-6 cr. ; max 12 cr.; ; S-N only; Periodic Fall, Spring & Summer)

Off-campus research experiences are different from any other type, since they combine elements of directed research with an internship, since typically the research is supervised by a non-faculty member who assigns a grade based on a combination of supervisor feedback and reflective writing. prereq: inst consent, dept consent

CLI 4711. Capstone Reflections I. (1 cr.; ; S-N only; Periodic Fall, Spring & Summer)

Student will complete this course during the first semester of their UMR capstone experience. This course intentionally integrates student life, the curriculum, and career exploration to facilitate student growth and professional development. The purpose of this course is to participate in, observe, analyze and interpret student’s capstone experience. To illustrate growth, students will present their capstone portfolio in a public presentation.

CLI 4713. Capstone Reflections I and II. ( ; 2 cr.; ; S-N only; Every Fall & Spring)

Student will complete this course in their final semester of their UMR capstone experience. This course intentionally integrates student life, the curriculum, and career exploration to facilitate student growth and professional development. The purpose of this course is to participate in, observe, analyze and interpret student’s capstone experience. To illustrate growth, students will record their observations and analysis throughout the semester and present their capstone portfolio in a public presentation.

CLI 4896. Capstone Certificate in Health Professions. (1-20 cr. ; max 60 cr.; ; Student Option; Every Fall, Spring & Summer)

Enrollment in certificate program courses in a health profession. prereq: concurrent registration is required (or allowed) in 4711 or concurrent registration is required (or allowed) in 4712, acceptance of capstone proposal, full-time enrollment in certificate program

Chemistry (CHEM)

CHEM 1231. Organic Chemistry I. (PHYS; 4 cr.; ; A-F or Audit; Every Fall)


CHEM 1393. Directed Study in Chemistry. (1-3 cr. ; max 6 cr.; ; Student Option; Every Fall & Spring)

Individual study on selected topics or problems. prereq: instr consent, dept consent

CHEM 2231. Organic Chemistry II. (4 cr.; ; A-F or Audit; Every Spring)

Study of organic reactions (addition/removal; elimination reactions, chemistry of carbonyl compounds, aromatic electrophilic substitution, rearrangements, oxidations and reductions); Biological examples. Introduction to the use of spectroscopic tools in structure elucidation (nuclear magnetic resonance, mass spectroscopy, Infrared and electronic absorption spectroscopy); Organic polymers and biologically important classes of organic compounds such as lipids, carbohydrates, amino acids, peptides, proteins, and nucleic acids; Lab. prereq: Grade of at least C- in 1231, concurrent registration is required (or allowed) in BIOL 2311

CHEM 2331. General Chemistry I. (PHYS; 4 cr.; ; A-F or Audit; Every Fall)


CHEM 2333. General Chemistry II. (4 cr.; ; A-F or Audit; Every Spring)


CHEM 3393. Directed Study or Research in Chemistry. (1-6 cr. ; max 24 cr.; ; Student Option; Every Fall & Spring)

Individual study or research on selected topics or problems. prereq: instr consent, dept consent

CHEM 4331. Chemical Biology/Bioorganic Chemistry. (3 cr.; ; A-F or Audit; Every Spring)

Topics include: Chemical control of signal transduction; Polyketide biosynthesis; Non-natural amino acid insertion into proteins (in vivo nonsense suppression); Non-ribosomal peptides; Organic chemistry of polymerase chain reaction; Protein backbone modification - secondary structure stabilization; Chemical biology of fluorescent proteins. DNA backbone modification; RNA; Cell surface engineering through oligosaccharide biosynthesis. prereq: C- or better in 2231; Recommended BIOC 3321

CHEM 4333. Physical Chemistry. (3 cr.; ; A-F or Audit; Every Spring)

Statistical mechanics to understand macroscopic description of chemical phenomena: molecular energy levels, Boltzmann factor and partition functions. Chemical thermodynamics, phase equilibria, liquid-liquid solutions and chemical equilibria. Introduction to molecular spectroscopy. Principles of nuclear magnetic resonance spectroscopy. prereq: concurrent registration is required (or allowed) in MATH 2171, [Grade of at least C- in [2333], [PHYS 2251], [MATH 1171]]

CHEM 4721. Special Topics in Chemistry. ( ; 1-4 cr. ; max 8 cr.; ; A-F or Audit; Periodic Fall & Spring)

In-depth study of special topics in chemistry. prereq: instr consent; repeated enrollment allowed only if topics are different

Communication Studies (COMM)

COMM 1393. Directed Study in Communication. (1-3 cr. ; max 6 cr.; ; Student Option; Every Fall & Spring)

Individual study on selected topics or problems. prereq: instr consent, dept consent

COMM 2711. Communication in Professional Contexts. (3 cr.; ; A-F only; Periodic Fall & Spring)
Course focuses on the role of communication skills for professionals in a health care context. Students will develop public speaking skills including the use of presentation software. Students will also learn principles of communication and how to effectively communicate through both verbal and nonverbal channels. Students will explore the role of interpersonal, group, and organizational communication in health care settings.

COMM 2715. Public Discourse and Health: Communication and Advocacy. (3 cr.; A-F only; Periodic Fall & Spring) Course focuses on the role of communication in shaping public discourses and individual’s understanding of health issues. Students will learn and apply communication theory to explore and analyze the way people use verbal and nonverbal communication to create meaning, engage and shape public discourses, and influence other people’s understanding of health issues. Students will examine how individuals, institutions, and technology impact public discourses on health. Students will also apply their knowledge to research and to advocate for ethical, science-based perspectives on a health discourse of their choosing and to improve their written, spoken, and visual communication skills.

COMM 3393. Directed Study or Research in Communication. (1-6 cr.; max 24 cr.; Student Option; Every Fall & Spring) Individual study or research on selected topics or problems. prereq: instr consent, dept consent

COMM 4721. Special Topics in Communication. (1-4 cr.; max 8 cr.; A-F only; Periodic Fall & Spring) In-depth study of special topics in communication.

Cytotechnology Mayo (CYTM)

CYTM 4001. General Principles of Cytology and Pathology. (2 cr.; A-F only; Periodic Fall, Spring & Summer) This course consists of a series of lectures, demonstrations, and laboratory sessions designed to orient you to the lab and teach you introductory principles of cytology. This includes basic microscopy, cell structures, and cellular biology including cell division and growth as well as several mechanisms of pathologic changes. A comprehensive case study project involving concepts of pathology and cytology will also be included in this course.

CYTM 4002. Gynecology Cytology. (4 cr.; A-F only; Periodic Fall, Spring & Summer) This course involves a study of the normal and abnormal anatomy, physiology, histology, and cytology of the female genital tract. Lectures, demonstrations, and laboratory sessions will be provided. Normal and abnormal cytology is emphasized. Non-neoplastic findings such as hormonal abnormalities, inflammatory conditions, and infections are also discussed.

CYTM 4003. Advanced Gynecologic Cytology. (3 cr.; A-F only; Every Fall) This course is a continuation of Gynecologic Cytology to include benign and malignant conditions of the endocervix, endometrium, ovary, fallopian tube and vagina. Lectures will also be given on special topics including atypical glandular cells as well as cytology of pregnancy and treatment.

CYTM 4004. Pulmonary Cytology. (3 cr.; A-F only; Periodic Fall, Spring & Summer) This course consists of a series of lectures, demonstrations and laboratory sessions of the gross and microscopic anatomy, physiology, pathology and cytology of the respiratory tract. Particular areas covered include benign and infections conditions, malignancies and alterations due to therapy. Fine needle aspiration of the lung is also discussed.

CYTM 4005. Urinary Cytology. (2 cr.; A-F only; Periodic Fall, Spring & Summer) This course consists of a series of lectures, demonstrations, and laboratory sessions of the gross, microscopic anatomy, physiology, pathology and cytology of the urinary tract. Areas covered include benign conditions, inflammatory disorders, malignancies, and therapeutic effects.

CYTM 4006. Gastrointestinal Cytology. (1 cr.; A-F only; Periodic Fall, Spring & Summer) This course consists of a series of lectures, demonstrations, and laboratory sessions of the gross and microscopic anatomy, pathology, and cytology of various areas of the gastrointestinal tract sampled using brushing, washing, and fine needle aspiration techniques.

CYTM 4007. Effusion Cytology. (2 cr.; A-F only; Periodic Fall, Spring & Summer) This course consists of a series of lectures, demonstrations, and laboratory sessions of the gross and microscopic anatomy, physiology, pathology and cytology of the body cavity fluids (pleural, peritoneal, and pericardial) and the cerebrospinal fluid.

CYTM 4008. Fine Needle Aspiration Cytology. (6 cr.; A-F only; Periodic Fall, Spring & Summer) This course consists of a series of lectures, demonstrations, and laboratory sessions of the gross and microscopic anatomy, pathology, and cytology of various areas sampled using fine needle aspiration including the breast, thyroid, salivary gland, lymph node, head and neck, liver, pancreas, kidney, adrenal gland, soft tissue, and bone.

CYTM 4009. Laboratory Operations and Preparation. (2 cr.; A-F only; Periodic Fall, Spring & Summer) Lectures, demonstrations and laboratory sessions will be given in the various procedures connected to or carried out in the cytology laboratory. Collection and preparatory techniques are described throughout the course series. Assignments in laboratory techniques continue through the year, with one full week in the preparation lab during the second semester. Also included in this course are management topics including quality assurance, quality control, test validation, performance management, others, etc. The students will also perform a mock laboratory inspection.

CYTM 4010. Professional Development. (2 cr.; A-F only; Periodic Fall, Spring & Summer) During this course students explore various aspects of professionalism. In addition, they are expected to give a cytology related presentation, create a professional resume, participate in a mock interview, and create a hypothetical research proposal.

CYTM 4011. Clinical Cytology. (5 cr.; A-F only; Periodic Fall, Spring & Summer) This course in the second semester includes approximately 4 months of clinical experience where the students screen both nongynecologic and gynecologic laboratory cases Monday through Thursday each week. In additional, students, paired with cytotecnologist, provide assistance at endoscopic fine needle aspiration procedures on a rotating basis. Additional rotations in the preparatory lab as well as the molecular cytology, virology and histology areas are also planned.

Echocardiography (ECHO)

ECHO 3011. Foundations of Echocardiography. (TS; 2 cr.; A-F only; Every Fall) This course is designed to provide students with a fundamental understanding of echocardiographic techniques. The course will provide students with patient care skills required for cardiac sonographers and will identify proper imaging techniques to prevent injury. The course will include recognition of cardiac anatomy on an echocardiogram, provide an understanding of machine instrumentation and basic ultrasound physics, indentify proper 2-D, M-mode, and Doppler techniques, and echocardiographic assessment of systolic and diastolic function.

ECHO 3101. Cardiovascular Anatomy & Physiology. (3 cr.; A-F only; Every Fall) The course is designed to provide the student with an in-depth understanding of gross and cross-sectional cardiac anatomy and an understanding of normal cardiac physiology. The concepts of cardiovascular physiology will include circulation blood flow, the cardiac cycle, electrical and mechanical properties of the heart, and blood flow hemodynamics of the arterial and venous system. This course will provide the foundation for advanced physiologic concepts and Doppler hemodynamic assessment in subsequent courses.

ECH 3002. Adult Echocardiography. (6 cr.; A-F only; Every Spring) The intent of this course is to provide the student with the necessary knowledge of cardiomyopathies, coronary artery disease, and cardiac diseases due to systemic illness, pericardial diseases, systemic and pulmonary hypertension, cardiac tumors and masses, diseases of the great vessels and echocardiographic assessment of valvular heart disease by utilizing 2-D, M-mode, and Doppler techniques.

ECHO 3301. Clinical Practicum I. (8 cr.; A-F only; Every Fall) The intent of this course is to provide the student with an opportunity to perform portions of an echo exam, review position, transducer placement, and terminology in the clinical setting. Two-dimensional (2-D) and Doppler skills learned in Foundations of
Echocardiography will be applied in the clinical setting. Clinical Practicum I will provide the student with the opportunity to observe the clinical environment, understand the clinical application of echocardiography, and interact with clinical staff.

**ECHO 3302. Clinical Practicum II.** (7 cr.; A-F only; Every Spring)
The intent of this course is to continue to provide the student with the necessary skills and knowledge to integrate academic and clinical learning. Course content will include review of how to perform a routine two-dimensional, Color Flow, and Doppler echocardiography examination and the development of skills necessary to do a complete hemodynamic and Doppler assessment. Course will use hands-on experience to help develop the skills required to do a hemodynamic assessment.

**ECHO 3403. Echocardiographic Application.** (3 cr.; A-F only; Every Summer)
The intent of this course is to integrate knowledge from previous courses. This course will focus on case reviews and the integration of all 2-D and Doppler data. Students will be able to demonstrate application of echocardiographic data and recognize discrepancies to identify key findings, ability to create a preliminary report, and effectively communicate the echo findings to the reviewer.

**ECHO 3503. Stress Echocardiography.** (2 cr.; A-F only; Every Summer)
This course will provide the student with the necessary knowledge regarding common lab values, ECG, and basis cardiac pharmacology along with a thorough understanding of the different types of stress tests performed in an echocardiographic laboratory and the technical aspects of the digitizing equipment. The role of the sonographer for each procedure will be identified. Students will develop an in-depth understanding of exercise echocardiography and the use of Dobutamine and contrast during a stress echo.

**ECHO 4111. Ultrasound Physics I.** (2 cr.; A-F only; Every Fall)
This course is designed to introduce the student to basic physics principles and instrumentation used in diagnostic ultrasound. The course will describe basic ultrasound physics principles, formulae and calculations as well as describe ultrasound itself. Key areas to be covered include: the properties of sound waves, principles of reflection, transmission, scattering and refraction; principles of attenuation and components of sound energy loss; transducer construction and function; sound beam a??anatomya??; spatial resolution; transducer array technology; sound beam steering and focusing. The course goal is to help the student understand the process by which an image is created, and ultimately identify ways to produce an optimal echo image.

**ECHO 4112. Ultrasound Physics II.** (2 cr.; A-F only; Every Spring)
The course is designed to expand the information learned in Ultrasound Physics I and provide new information regarding theory and operation of diagnostic ultrasound equipment. The course will describe 2-dimensional imaging principles and instrumentation, image storage and display, the Doppler effect, pulsed and continuous wave Doppler generation, spectral analysis and display, color flow imaging, image features and artifacts, quality assurance, bioeffects and safety, and will introduce students to newer technologies including contrast and tissue harmonics, Doppler tissue imaging, and power Doppler. The course goal is to help the student understand the process by which an image is created, Doppler information is generated and displayed, and identify ways to produce high quality, diagnostic echocardiographic information.

**ECHO 4211. Congenital Heart Disease I.** (3 cr.; A-F only; Every Fall)
The intent of this course is to provide the student with advanced knowledge of anatomy of congenital cardiac abnormalities, adult congenital heart disease (CHD), and follow-up of these patients. Surgical repair and interventional catheterization or methods of treatment will be discussed as well as postoperative complications. The student will also be provided the opportunity to perform a systematic 2-D, spectral and Color Flow Doppler examination on a patient with CHD.

**ECHO 4303. Clinical Practicum III.** (6 cr.; A-F only; Every Summer)
Clinical Practicum III will primarily focus on development of students clinical skills for 2-Dimensional and Doppler echocardiography. Clinical Practicum III is devoted to clinical training, allowing students an opportunity to apply didactic classroom instruction and develop their clinical skills. Students will begin to integrate the clinical and echo findings and identify final impressions related to the echo exam. Observational rotations will include intraoperative TEE, Outreach echocardiography, Stress Echocardiography, TEE and contrast echocardiography. 3D and strain rate echocardiography and the role of the sonographer for each procedure will also be included in this course. Lab sessions will allow students the opportunity to demonstrate the required skills for 3D and strain rate imaging.

**ECHO 4401. Clinical Practicum IV.** (8 cr.; A-F only; Every Fall)
Clinical Practicum IV will continue to develop the student???s clinical skills to complete an optimal echocardiographic hemodynamic assessment. The focus of the term will be the ability to integrate 2-D and echo data in an accurate patient report. Clinical Practicum IV will introduce students to congenital echocardiography, to the field of stress echocardiography, and to echocardiographic research.

**ECHO 4402. Clinical Practicum V.** (9 cr.; A-F only; Every Spring)
During Clinical Practicum V, the students will apply previous didactic and clinical training to complete a quality echocardiographic examination. Students will be responsible for integrating echo data, preparing preliminary echo findings and delivering the report.

**ECHO 4460. Special Procedures.** (2 cr.; A-F only; Every Summer)
Focus on the special procedures performed involving echocardiography and the sonographer's role. Includes anatomy and clinical indications of TEE, intro-operative procedures, pericardiocentesis, cardiac catheterization procedures, and echo assessment of left ventricular assist devices. Introduction to other imaging modalities including Nuclear, CT, and MRI, and the information they can provide about the heart. Also includes 3D and strain echocardiography and the role of the sonographer for each procedure.

**ECHO 4501. Research Project and Publication I.** (1 cr.; A-F only; Every Spring)
Students will be responsible for devising, developing and undertaking a research project which would be suitable for submission either to a scientific meeting or for publication. This will include developing a research question, devising and submitting a research protocol, reviewing related literature, and reporting the findings in abstract, paper, and/or a short oral presentation. Research mentors will be assigned to allow guided independent study.

**ECHO 4540. Professional Growth and Development.** (1 cr.; A-F only; Every Spring)
Provides students with the skills and knowledge for future professional growth. Discussion of the scope of practice and career advancement for sonographers, medical ethics. Includes registry exam preparation.

**English: Literature (ENGL)**

**ENGL 1393. Directed Study in English.** (1-3 cr. [max 6 cr.]; Student Option; Every Fall & Spring)
Individual study on selected topics or problems. Prereq: instr consent, dept consent

**ENGL 1433. Introduction to Literature.** (LITR; 3 cr. [max 6 cr.]; A-F or Audit; Every Fall & Spring)
Basic techniques for analyzing/understanding literature and developing critical thinking skills. Readings of novels, short stories, poems, plays.

**ENGL 3393. Directed Study or Research in English.** (1-6 cr. [max 24 cr.]; Student Option; Every Fall & Spring)
Individual study or research on selected topics or problems

**ENGL 3481. Technology and Society.** (DSJ; 3 cr.; A-F only; Every Spring)
This course is explores a variety of theories of gender and sexuality and explores the literary and media representations of gender and sexuality (both contemporary and historical). Students will be asked to think about the embodiment, performance and construction of gender and sexual identities; they will be asked to consider the ethical, social, and political dimensions of gender- and heteronormativity and the role of power in theories and manifestations of gender and sexuality. Prereq: 1433 or PHIL 1431 or HIST 1435 or instructor consent

**ENGL 3481. Technology and Society.** (TS; 3 cr.: A-F only; Every Fall)
Historical/contemporary analysis of technology. The course explores ways in which technology influences, and is influenced by, cultures and
their values and how technology figures in modes of truth production. The course could explore perspectives that may include, but are not limited to the cultural, the psychological, the historical and the literary. Course is discussion-based and project-centered. Prereq: 1433 or PHIL 1431 or HIST 1435 or instr consent.

ENGL 4721. Special Topics in English. (1-4 cr. [max 8 cr.]; A-F or Audit; Periodic Fall & Spring) In-depth study of special topics in English. Prereq: instr consent; repeated enrollment allowed only if topics are different.

Health Professions (HP)

HP 3021. Patient Care Techniques. (1 cr.; A-F only; Every Fall & Summer) This multidisciplinary course uses a blended format to introduce students to the fundamental practice, attitudes, and competencies needed by all health care providers. Professionalism, communication skills, infection control, vital signs, ergonomics, patient safety, medical emergencies, management, and medical decision-making are reviewed. Students will practice general patient care procedures and skills and demonstrate competent performance.

HP 4802. Health Economics and Finance. (DSJ; 3 cr. [max 6 cr.]; A-F only; Every Spring) Students will learn micro- and macroeconomic theory applied within the healthcare sector. A flow of funds approach explores finances in healthcare transactions and incentives. Historical development of third party reimbursement, healthcare financial structures and mechanisms, individual health and public health factors affecting the delivery system, payment system, and supply/demand system is followed by a wider macroeconomic review to explore factors of change within the healthcare system. National health spending and the role of government and regulators in public and private health will be applied by case study and contemporary readings. The health of individuals and the health of groups will be studied in terms of cost, economic, ethical, and socioeconomic disparities, and in non-Western countries. The course aims to make the language of healthcare finance and economics understandable and relevant for students in healthcare professions.

Humanities (HUM)

HUM 4721. Special Topics in Humanities. (1-4 cr. [max 8 cr.]; A-F or Audit; Periodic Fall & Spring) In-depth study of special topics in humanities. Prereq: instr consent; repeated enrollment allowed only if topics are different.

Mathematics (MATH)

MATH 1100. College Algebra with Physical Concepts. (MATH; 3 cr.; A-F or Audit; Every Spring) The goals of this course are to strengthen fundamental quantitative reasoning skills and gain exposure to fundamental physical concepts by exploring topics including unit conversion; number sense; polynomial, rational, and exponential/logarithmic equations and expressions; introductory graphing; systems of equations and variation. Quantitative reasoning skills will be motivated by exposure to fundamental physical concepts. Students learn to simplify expressions and solve equations using mathematical and logical symbols and quantitative techniques, to communicate results clearly, and the importance of these skills to physical sciences. This course goes beyond the usual coverage in three-year high school mathematics curriculum. Prereq: three yrs high school math.

MATH 1111. Precalculus with Physical Concepts. (MATH; 3 cr.; A-F or Audit; Every Fall & Spring) The goal of this course is to make students proficient in quantitative reasoning skills relevant to fundamental algebra concepts, in depth treatment of functions and graphs, polynomial functions, rational functions, exponential/logarithmic functions, trigonometric functions, vectors, matrices and systems of equations with a focus on the use of physical sciences contexts. Students learn to model real world situations, graph, simplify expressions and solve equations using mathematical and logical symbols and quantitative techniques and communicate results clearly. This course goes beyond the usual coverage in three-year high school mathematics curriculum. Prereq: Grade of at least C-in [MATH 1110 or equiv] or placement exam.

MATH 1161. Statistics and Discrete Mathematics. (MATH; 3 cr.; A-F or Audit; Every Fall) Exploration of statistical analysis in a health sciences context, using technology and active/peer learning. Build statistical inferences from scientific methods. Gather, sort, describe, arrange and construct visual representations of data sets and generate basic predictive models. Introduction to probability and data distributions, leading to inferential statistics. Prereq: three years of high school math.

MATH 1171. Calculus, Modeling, and Data I. (MATH; 4 cr.; A-F or Audit; Every Fall & Spring) Differential/integral calculus of a single variable. Optimization, numerical methods. Differential equations, graphing. Functions of several variables and Introduction to partial derivatives. Applications emphasize biology, health sciences, and integration of mathematical models. Prereq: Grade of at least C-in 1111 or placement exam or instr consent.

MATH 1393. Directed Study in Mathematics. (1-3 cr. [max 6 cr.]; Student Option; Every Fall & Spring) Individual study on selected topics or problems. Prereq: instr consent, dept consent.

MATH 2161. Biostatistics. (MATH; 3 cr.; A-F or Audit; Every Fall) Using real data, students will develop their conceptual understanding of statistical hypothesis testing and think critically about sampling techniques and experimental design. Students will choose appropriate hypothesis tests for research questions and correctly complete ANOVA tests, non-parametric tests, log/odds ratio tests, logistic regression and survival analysis. Students will use Microsoft Excel and make extensive use of SAS to perform the computational parts of hypothesis testing and produce meaningful graphical representations. Students will develop their ability and confidence to discuss statistics in groups, present findings and communicate results. Prereq: Grade of at least C-in 1161

MATH 2163. Multivariable Calculus. (MATH; 4 cr.; A-F or Audit; Periodic Spring) Multivariable Calculus takes the concepts and techniques from Calculus I and II and...
Nuclear Medicine (NUCM)

NUCM 4001. Management & Methods of Patient Care. (1 cr.; A-F only; Every Spring) A survey of hospital administrative procedures including medical terminology, medical ethics, medical research, career development and quality improvement.

NUCM 4002. Anatomy, Physiology and Pathology. (2-3 cr.; A-F only; Every Fall) The clinical application of anatomy, physiology and pathology of the human organ systems treated in the application of nuclear medicine.

NUCM 4003. Radiation Protection. (4 cr.; A-F only; Every Spring) Properties of alpha, beta and gamma radiations, their effects upon human beings and methods for protecting patients and staff from unnecessary exposure and possible injury.

NUCM 4007. Clinical Nuclear Practicum I. (6 cr.; A-F only; Every Fall) A comprehensive exploration of nuclear medicine imaging of patients for diagnostic purposes through theory, observation, supervised use and reflection of clinical application.

NUCM 4008. Clinical Nuclear Practicum II. (8 cr.; A-F only; Every Spring) The supervised use of radionuclides in imaging and scanning of patients for diagnostic purposes.

NUCM 4009. Application of Radionuclides to Medicine. (2 cr.; A-F only; Every Fall) Review of radionuclides and the compounds into which they are formed that are useful in medical research, diagnosis and therapy.

NUCM 4010. Nuclear Radiation Physics and Instrumentation. (5 cr.; A-F only; Every Fall) Properties of alpha, beta and gamma radiations; their origins and interactions with matter; their control and shielding; and the statistics of counting.

NUCM 4013. Nuclear Medicine Chemistry and Pharmacology. (4 cr.; A-F only; Every Fall) A study of the radiopharmacology and chemistry of radionuclides used in the clinical nuclear medicine technology laboratory.

NUCM 4015. Multi-Modality Imaging. (4 cr.; A-F only; Every Spring) This course will provide a study of hybrid imaging in radiology including the integration of CT and MRI to SPECT and PET imaging. Emphasis will be placed on the fundamentals specific to each modality such as physics and instrumentation, patient and technologist safety, image production and quality as well as cross-sectional anatomy.

Philosophy (PHIL)

PHIL 1393. Directed Study in Philosophy. (1-3 cr.; max 6 cr.; Student Option; Every Fall & Spring) Individual study on selected topics or problems. prereq: instr consent, dept consent

PHIL 1431. Introduction to Philosophy. (AH; 3 cr.; A-F or Audit; Every Fall) This course examines historical and contemporary philosophical problems and introduces students to the standards for evaluating philosophical arguments. Some of the problems that may be examined include: the existence of god, the nature of knowledge, the relationship between the mind and the body, the nature of personal identity, and the problem of free will. Students will gain an understanding of the nature and historical origin of these problems and learn to critically evaluate possible solutions to these problems. The course also includes an integrated project with Writing.

PHIL 1441. Introduction to Ethics. (PHIL; CIV; 3 cr.; A-F or Audit; Every Spring) This course introduces students to basic ethical theories and examines several contemporary ethical problems. Some of the problems that may be examined include: income inequality, immigration, the right to die, the right to health care, civil disobedience, just war theory, paternalism, animal rights, and capital punishment. Students will gain an understanding of the nature and historical origin of these problems and learn to critically evaluate possible solutions to these problems. The course also includes an integrated project with Writing, Biology, and Sociology. prereq: 1431 or instr consent

PHIL 3393. Directed Study or Research in Philosophy. (1-6 cr.; max 24 cr.; Student Option; Every Fall & Spring) Individual study or research on selected topics or problems. prereq: instr consent, dept consent

PHIL 3437. History and Philosophy of Science. (PHIL; HIS; 3 cr.; A-F or Audit; Every Spring) This course examines several historical and contemporary philosophical problems that arise within the context of scientific practice. Some of the problems that may be examined include: the nature of scientific explanation, the problem of induction, the problem of demarcation, the role of laws and models in scientific theorizing, the social responsibilities of scientists, and scientific realism. Students will gain an understanding of the nature and historical origin of these problems and learn to critically evaluate possible solutions to these problems. prereq: 1431 or 1433 or 1435 or 1441 or instr consent

PHYS 1251. Physics I. (PHYS; 4 cr.; A-F or Audit; Every Fall & Spring) An activity-based introductory physics course focused on concepts of motion, force, energy, fluid dynamics, and oscillating systems. The course develops problem solving skills through a systematic decision-making framework and develops knowledge through a formal disciplinary integration and application to biomedical and other real world application. The laboratory component enhances knowledge and promotes good experimental design, techniques, and technical writing. prereq: Grade of at least C- in [MATH 1111 or equiv] or [concurrent registration is required (or allowed) in MATH 1171 or equivalent] or MATH 2161

PHYS 1393. Directed Study in Physics. (1-3 cr.; max 6 cr.; Student Option; Every Fall & Spring) Individual study on selected topics or problems. prereq: instr consent, dept consent

PHYS 2251. Physics II. (PHYS; 4 cr.; A-F or Audit; Every Fall & Spring) A course covering more fundamental concepts building on concepts of motion, force and energy. The course uses an activity-based approach to cover topics including thermodynamics, electricity and magnetism, optics, and atomic and nuclear physics and integrates these concepts with modern medical applications and technology. The course...
advances problem solving by building on a core systematic decision-making framework. A laboratory component integrates real world applications. prereq: Grade of at least C- in [2251 or equiv], Grade of at least C- in [MATH 1171 or equiv]

PHYS 3251. Physics III: Applied Physics of Matter and Interactions. (4 cr. : A-F or Audit; Periodic Spring) Overview of physical concepts of classical electromagnetism and twentieth century physics, nature of light and physical optics, atomic and atomic nucleus and special relativity. Explores the topics and focuses on applications of the physical concepts. prereq: Grade of at least C- in [2251 or equiv]

PHYS 3393. Directed Study or Research in Physics. (1-6 cr. [max 24 cr.]; Student Option; Every Fall & Spring) Individual study or research on selected topics or problems. prereq: instr consent, dept consent

Psychology (PSY)

PSY 1393. Directed Study in Psychology. (1-3 cr. [max 6 cr.]; Student Option; Every Fall & Spring) Individual study on selected topics or problems. prereq: instr consent, dept consent

PSY 1511. Introduction to Psychology. (SOC); 3 cr. : A-F or Audit; Every Fall & Spring) Scientific study of behavior and mental processes. Analysis of historical and contemporary paradigms in psychology, research methods, sequence and processes of human development, and the joint contribution of biological and environmental influences on behavior.

PSY 3393. Directed Study or Research in Psychology. (1-6 cr. [max 24 cr.]; Student Option; Every Fall & Spring) Individual study or research on selected topics or problems. prereq: instr consent, dept consent

PSY 3510. Human Development across the Lifespan. (3 cr. : A-F or Audit; Every Spring) This course will emphasize the diverse cultural, social, socioeconomic, and historical contexts of human development throughout the lifespan and explore how these contexts directly influence biosocial, cognitive and psychosocial aspects of human development. The course will cover the basic principles of human development including: major paradigms, research methods, the sequences and processes of development, and the joint contributions of biological and environmental influences. prereq: 1511

PSY 3512. Principles of Abnormal Psychology. (3 cr. : A-F or Audit; Every Fall) Abnormal psychology is the study of the classification, explanation and treatment of abnormal phenomena and mental disorder. In this course we will focus on the major concepts and controversies in the field. We will consider how abnormality is defined and classified, and how the biological, psychological, and sociocultural paradigms contribute to understanding and treating individuals with mental disorder. The multicausality of mental disorder will be understood using a diathesis-stress model. Common types of mental disorders will be covered with an emphasis on the phenomenology of the disorder (i.e., what it is like to have the disorder), the biopsychosocial causes of the disorder, and the major treatment approaches. Attention will be given to appreciating the impact of abnormal mental phenomena on the sufferer and their loved ones, and examining the values and ethics that apply to working with people with mental disorder. prereq: (PSY 1511 or equiv) or instr consent

PSY 4512. Social Psychology. (3 cr. : A-F only; Every Fall) Social Psychology is the scientific study of how peoples’ thoughts, feelings, and actions can influence and/or be influenced by others. This course covers topics that include, but are not limited to: research methods, ethics, and classic as well as contemporary research on topics including social influence and social cognition, self and person perception, attitude formation and change, prejudice and stereotypes, aggression and conflict, helping and prosocial behavior. pre-requ: 1511;

PSY 4721. Special Topics in Psychology. (1-6 cr. [max 6 cr.]; A-F or Audit; Periodic Fall & Spring) In-depth study of special topics in psychology.

Public Health (PUBH)

PUBH 1393. Directed Study in Public Health. (1-3 cr. [max 6 cr.]; Student Option; Every Fall & Spring) Individual study on selected topics or problems. prereq: instr consent, dept consent

PUBH 2561. Public Health: A Global Perspective. (GP; 3 cr. : A-F or Audit; Every Spring) Introductory overview of public health; history and contemporary principles, core disciplines, systems, problems/challenges, applications, career opportunities, etc. Discussion of the complementary roles of public health and healthcare systems in developed and developing countries. Application of public health principles to case studies from around the globe.

PUBH 3331. Social Determinants of Health: How Inequality Makes Us Sick. (3 cr. : A-F or Audit; Fall Odd Year) The goal of this course is to promote student exploration of how and why various social factors shape disparities in health outcomes. Through an in-depth exploration of the literature we will examine the ways by which social inequalities shape differences in overall health statuses, access to health care, cancer outcomes, and other diseases. The course will focus on health disparities as historically marginalized groups including communities of color, recent immigrants, and low-income populations in the United States experience them. prereq: 2561 or instr consent

PUBH 3393. Directed Study or Research in Public Health. (1-6 cr. [max 24 cr.]; Student Option; Every Fall & Spring) Individual study or research on selected topics or problems. prereq: instr consent, dept consent

PUBH 3531. Health Policy in a Global Context. (GP,SOCS; 3 cr. : A-F or Audit; Fall Even Year) In this course, students will begin to explore the ways in which policy shapes: the lives and health of individuals, and population health. By comparing the varying health issues faced by populations around the world, as well as the ways different countries seek to meet the health needs of their citizens, students will begin to place health policy in the United States within a global context. Specific topics may include: environmental and social determinants of health; globalization and its impact on health outcomes; health care providers, health care payers, and health care reform; and the effect of public policy on population health, as well as individuals’ mental and physical health.

PUBH 3561. Environmental Health and Environmental Justice. (ENV,SOCS; 3 cr. : A-F or Audit; Every Fall) This course explores how environments--both natural and built--can negatively impact human health outcomes. We will examine major environmental health issues; exposures/causes as well as possible approaches or interventions for reducing associated disease burdens in developing and developed countries. The course also provides an introduction to the concept of environmental justice or notion that all communities, regardless of socioeconomic status, should bear an equal burden of environmental hazards. prereq: 2561 or instr consent

PUBH 4561. Introduction to Epidemiology: Research and Data Exploration. (3 cr. : A-F or Audit; Every Spring) Introductory overview of epidemiology--the basic science of public health. Topics covered to include history of the discipline, common epidemiologic measures, epidemiologic research designs, and basic statistics. The course also covers sources of public health data, public health surveillance, and outbreak investigation. Case studies and examples will explore epidemiologic topics/investigations in both developing and developed countries. prereq: (2561, MATH 1161) or instr consent

PUBH 4721. Special Topics in Public Health. (1-4 cr. [max 8 cr.]; A-F only; Periodic Fall & Spring) In-depth study of special topics in public health.

Radiography (RADI)

RADI 3011. Foundations of Radiography. (TS; 2 cr. : A-F only; Every Fall) This course introduces students to the profession and provides a foundation for understanding the radiographer's role in a radiology department. The radiographer's ethical responsibility to their profession, institution and the diverse patient population is clarified through the introduction of the Radiographer's Code of Ethics and the Patients' Bill of Rights. The course will introduce exposure factors and corresponding technique chart use, interactions with patients, and methods to ensure radiation protection for patients and healthcare workers. The theoretical concepts and practical application of
RADI 3101. Radiographic Procedures I. (4 cr.; A-F only; Every Fall)
This course will introduce radiographic positioning terminology as it relates to patient anatomy. This course also provides a review of the anatomy of the upper and lower limbs. Routine radiographic anatomy as well as pathology and traumatic changes demonstrated on radiographic images will be included. Methods to modify standard positioning for trauma and pediatric patients are presented. Specialized projections of the upper and lower limbs will also be presented in this course. Positioning considerations and evaluating radiographs will be emphasized.

RADI 3102. Radiographic Procedures II. (7 cr.; A-F only; Every Spring)
This course provides a review of the anatomy of the axial skeletal system, skull, gastrointestinal system, and urinary system. Radiographic positioning instruction used to demonstrate the anatomy of the systems listed above is provided in this course. Routine radiographic anatomy and traumatic changes demonstrated on radiographic images will be included. This course also covers pathology specific to the bone, respiratory system, cardiovascular system, digestive system, urinary system, hematopoietic system, endocrine system, and reproductive system. Methods to modify standard positioning for trauma, pathology and pediatric patients are presented. Positioning considerations and evaluating radiographs will be emphasized. pre-req: 3101; 3301

RADI 3111. Radiation Physics. (2 cr.; A-F only; Every Fall)
Radiation physics presents the students with a history of people and events which lead to the discovery and use of ionizing radiation in medical imaging, with a review of introductory physics concepts and their application to x-radiation production. Electricity, magnification, transformers, and rectification will be discussed as components of x-ray circuitry and production of x-rays. The student will learn and understand each component of the x-ray tube, including its function and contribution to the production of x-radiation. Theoretical concepts and mathematical formulas needed to adjust exposure techniques in radiography practice will be presented. Students will solve algebraic equations to determine how to make adjustments to exposure factors when changes to mA, time, kVp, or distance are necessary; and explain how changes affect the emission spectrum. pre-req: Physics with lab component

RADI 3202. Principles of Radiographic Exposure. (2 cr.; A-F only; Every Spring)
This course presents X-ray exposure principles. X-ray interaction with matter are defined. Dose and the impact on the radiologic image are presented. The effect of scattered and secondary radiation on image quality and methods of control are included. Image receptors are discussed in terms of structure, function, types, and uses. The role of the primary variables (kVp, time mA, and SID) in radiography is presented. Variable effects on density, contrast, and visibility of detail are defined. Methods of exposure calculation for changes in the primary variables are reviewed. Principles of digital image acquisition and display including CR and DR imaging are explored in this course. pre-req: 3111;

RADI 3301. Clinical Practicum I. (5 cr.; A-F only; Every Fall)
This course consists of three components: professional development, a lab practicum and clinical rotations as assigned on the Mayo Campuses. Lab practicum encompasses: anatomy, positioning simulations and image critique of projections addressed in RADI 3101; Radiographic Procedures I course.

RADI 3302. Clinical Practicum II. (5 cr.; A-F only; Every Spring)
This course consists of three components: professional development a lab practicum and clinical rotations as assigned on the Mayo Campuses. Lab practicum encompasses: anatomy, positioning simulations and image critique of projections addressed in RADI 3101; Radiographic Procedures I and II courses. pre-req: 3101; 3301;

RADI 3303. Applied Radiography Topics. (1 cr.; A-F only; Every Summer)
The Applied Radiography Course focuses on conducting and summarizing research then presenting that information in three assignments including a persuasive paper, a written literature review and visual presentation. The assignments must adhere to the American Psychological Association, 6th Edition (APA) writing style.

RADI 4101. Radiographic Procedures III. (3 cr.; A-F only; Every Fall)
This course provides an introduction to MRI, CT, Mammography and Interventional radiology. The history, theory and required equipment for the imaging modality is presented, along with an discussion of exams performed in each modality. Emphasis is placed on anatomy visualized by each modality.

RADI 4241. Radiation Protection Advanced Imaging. (3 cr.; A-F only; Every Fall)
This course reviews the types and sources of radiation and their interactions with matter. Effects of high doses on biologic systems are described, and effects of low doses on populations are presented. Elements of radiation protection are included. Quality management concepts, measurements, interpretation, and correcting actions, and governmental regulations insuring compliance are presented. The theoretical concepts and practical application of fluoroscopy, tomography, automatic exposure control, and duplication of radiographs are discussed.

RADI 4303. Clinical Practicum III. (7 cr.; A-F only; Every Summer)
This course consists of three components: professional development a lab practicum and clinical rotations as assigned on the Mayo campuses. Lab practicum encompasses: anatomy, positioning simulations and image critique of projections addressed in RADI 3102; Radiographic Procedures II courses and factors learned in RADI 3202; Principles of Radiographic Exposure course. pre-req: 3102; 3202; 3302;

RADI 4401. Clinical Practicum IV. (7 cr.; A-F only; Every Fall)
This course consists of three components: professional development a lab practicum and clinical rotations as assigned on the Mayo Clinic campus and Mayo Health Systems campuses. Students will participate in non-regular shifts consisting of evenings and weekends. Lab practicum encompasses: anatomy, positioning simulations and image critique of projections addressed in RADI 3101; Radiographic Procedures I, RADI 3102; Radiographic Procedure II and factors learned in RADI 3202; Principles of Radiographic Exposure course. pre-req: 4303;

RADI 4402. Clinical Practicum V. (8 cr.; A-F only; Every Spring)
This course consists of three core components: 1)Professional Development 2)Curriculum Review of all sections outlined in the American Registry of Radiologic Technologists board examination content specifications and 3) Clinical Rotation practical experience as assigned on the Mayo Campus and Mayo Health System sites. Students will participate in non-regular shifts consisting of evenings, overnight and weekends. pre-req: 4401;

RESP 3011. Foundations of Respiratory Care. (TS; 2 cr.; A-F only; Every Fall)
This course reviews the clinical roles/ responsibilities and career options within the fields of respiratory care. In addition, this course provides students with a solid foundation in professional attributes, cardiopulmonary science, chemical and physics relationships, and mathematical skills to promote success as they begin the clinical-based curriculum. Students explore respiratory care subspecialties and role differences in various clinical settings. Class includes laboratory sessions, discussion, simulation and role-playing.

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RESP 3201. Cardiopulmonary Patient Assessment. (4 cr.; A-F only; Every Fall)
Patient assessment skills are developed to allow students to both gather and interpret a wide range of patient data. This would include the medical record, patient interview, physical examination, medical laboratory tests, pulmonary function reports (including blood gas analysis), hemodynamic record and radiographic imaging. Cardiopulmonary diseases are introduced with emphasis on pathophysiological manifestations that can be assessed. The laboratory provides a setting for role playing, mock exams and practice of assessment skills. A weekly bedside teaching case review is designed to integrate coursework, examination skills as well as the human aspect of patient care. The Mayo Multidisciplinary Simulation Center allows practice and debriefing of assessment skills in a safe environment.

RESP 3202. Advanced Cardiopulmonary Physiology and Pathophysiology. (3 cr.; A-F only; Every Spring)
The first half of the course will provide students with a detailed review of the physiology of cardiovascular and pulmonary systems. The second section involves a review of adult, pediatric and perinatal cardiopulmonary disorders. Emphasis will be placed on integrating assessment, laboratory evaluation, major pathology, pathophysiologic manifestations and treatment options with focus on respiratory care. A bi-weekly bedside patient case review allows interaction with patients and application of coursework on cardiopulmonary disorders. The Mayo Multidisciplinary Simulation Center allows students to apply skills, knowledge and develop as reflective practitioners using simulated patients in a safe environment. Prereq: 3201

RESP 3203. Clinical Practicum I. (3 cr.; S-N only; Every Fall)
Students begin a series of rotations including 18 different clinical areas at the Mayo Medical Center. Each rotation requires completion of specific competencies. Those areas include 9 intensive care units, the operating room, emergency room, general floor care areas, pulmonary function labs, sleep disorders center, smoking cessation clinic, pulmonary rehabilitation program, home care and an outpatient clinic. Learners will practice and master skills using simulation-based medical education. Students will expand their competencies in adult as well as perinatal & pediatric critical respiratory care. Prereq: 3301

RESP 3401. Seminar in Respiratory Care I. (1 cr.; A-F only; Every Fall)
Students will attend weekly conferences and seminars in which issues and cases of clinical importance in respiratory care will be discussed. Students will, with faculty guidance, prepare a presentation on a topic and lead discussion on the topic presented. The emphasis will be on a critical review of the medical literature. Effective presentation skills will be covered. (1 hour-either Pulmonary & Critical Care Medicine Case Conference or Combined Critical Care Conference) and 1 hour seminar weekly.

RESP 3402. Seminar in Respiratory Care II. (1 cr.; A-F only; Every Spring)
Students will attend weekly conferences and seminars in which cases and issues of clinical importance in respiratory care will be discussed. Students will prepare and present a case presentation and lead discussion on the case and issues raised by the case. The relevant medical literature will be critically reviewed. In the second part of the course students will gain familiarity with the common forms of medical literature and be introduced to the critical appraisal of published articles in a seminar format. Prereq: 3401

RESP 3502. Clinical Research: Literature, Methodology, and Application. (3 cr.; A-F only; Every Spring)
Students will become readers and writers of research literature, especially that literature which pertains to health care. Students will learn the methodologies of scientific investigation. Students will learn to become constructive critics of scientific investigation. The course provides study content in scientific writing, statistics, research study design including problem statement development and protocol development, research questions or hypothesis development, feasibility analysis, sampling methods and instruments, data management, data analysis and interpretation, and dissemination of research. Prereq: Statistics course, 3401

RESP 4300. Clinical Practicum Summer - Adult Critical Care. (2 cr.; A-F only; Every Summer)
Students will focus on topics relevant to providing respiratory care to critically ill adults. There will be an emphasis on reviewing case examples of cardiopulmonary problems and therapeutic procedures. However, a multi-organ system-wide patient approach will be maintained. Advanced competencies in ventilator management and critical care monitoring, diagnostics and therapeutic procedures will be assured by laboratory experiences. Prereq: 3302

RESP 4311. Advanced Perinatal and Pediatric Respiratory Care. (3 cr.; A-F only; Every Fall)
The didactic course combined with its clinical counterpart will allow students to assume the role of the perinatal/pediatrics specialist as defined by the National Board for Respiratory Care (NBRC). A thorough review of the literature on mechanical ventilation, monitoring applied with emphasis on an evidence-based care, will be provided. Current strategies for extended mechanical ventilation or other forms of long-term support will be reviewed using case study examples. Prereq: 3202

RESP 4321. Advanced Cardiopulmonary Diagnostics. (2 cr.; A-F only; Every Fall)
Students will review the rationale and methods used in cardiopulmonary diagnostics. This course along with its clinical counterpart will allow students to assume the role of the advanced pulmonary function technologist and complete the NBRC's CPFT specialty board exams. Procedures in which participants would become competent include inert gas and body plethysmographic measurement of lung capacity, diffusion studies, bronchial provocation, and heart & lung function during maximal exercise. Interpretation of results and quality control in the laboratory will be facilitated by case reviews and laboratory experiences. Prereq: 3202

RESP 4331. Cardiopulmonary Rehabilitation, Disease Prevention and Case Management. (1 cr.; A-F only; Every Fall)
Students will review the delivery of care to chronically ill patients with lung and heart disorders with emphasis on respiratory care. The rehabilitation process will be applied to hospital-based program, extended care facilities and in the home. Topics include clinical testing, exercise prescriptions, and practice guidelines for management. Patient care reviews as part of the laboratory will underscore the multidisciplinary approach to case management and responsibilities unique to the respiratory therapist. This course along with its clinical counterpart will allow students to perform the responsibilities attributed to this subspecialty in respiratory care. Students will become certified asthma educators. Prereq: 3202

RESP 4341. Clinical Practicum III: Advanced Respiratory Care. (3 cr.; S-N only; Every Fall)
Students will complete competencies focused in the areas of adult and pediatric respiratory care including clinical subspecialties and related areas important to the respiratory care practitioner desiring greater scope of practice. Learners will practice and master skills using simulation-based medical education. Advanced Perinatal and Pediatric Respiratory Care: Clinical experiences in high-risk delivery, perinatal & pediatric intensive, inter-hospital transport and chronic care. Advanced Cardiopulmonary Diagnostics: Clinical experiences in pulmonary function testing including lung volume measurement, diffusion studies, exercise testing, sleep diagnostics, ventilation control, indirect calorimetry, provocation testing, oxygen titration and laboratory quality control. Cardiopulmonary Rehabilitation, disease prevention and
case management: Clinical experiences in cardiopulmonary rehabilitation including cardiopulmonary disease assessment, disease prevention, patient family education, evaluation of impairment/disability, exercise training and social and psychological considerations. prereq: 3302

RESP 4342. Clinical Practicum V: Advanced Respiratory Care. (3 cr.; S-N only; Every Spring)

Students will complete competencies focused in the areas of advanced-level respiratory care including clinical sub-specialties and related areas important to the respiratory care practitioner desiring greater scope of practice. Learners will practice and master skills using simulation-based medical education. Advanced Perinatal and Pediatric Respiratory Care: Clinical experiences in high-risk delivery, perinatal & pediatric intensive, inter-hospital transport and chronic care. Advanced Cardiopulmonary Diagnostics: Clinical experiences in pulmonary function testing including lung volume measurement, diffusion studies, exercise testing, sleep diagnostics, ventilation control, indirect calorimetry, provocation testing, oxygen titration and laboratory quality control. Cardiopulmonary Rehabilitation, disease prevention and case management: Clinical experiences in cardiopulmonary rehabilitation including cardiopulmonary disease assessment, disease prevention, patient family education, evaluation of impairment/disability, exercise training and social and psychological considerations. prereq: 4341

RESP 4400. Advanced Adult Respiratory Critical Care Techniques I. (2 cr.; A-F only; Every Summer)

Students will focus on topics relevant to providing respiratory care to critically ill adults. There will be an emphasis on reviewing case examples of cardiopulmonary problems and therapeutic procedures. However, a multi-organ system-wide patient approach will be maintained. Advanced competencies in ventilator management and critical care monitoring procedures including hemodynamic monitoring will be assured by laboratory experiences. prereq: 3102

RESP 4401. Clinical Practicum IV: Advanced Adult Respiratory Critical Care. (1 cr.; A-F only; Every Fall)

Clinical experiences in intensive care of patients including post-operative general-surgical, neurology/neurologic surgery ICU, trauma care, medical ICU, thoracic surgical ICU, inter-hospital transport and hemodynamic monitoring. prereq: 3302

RESP 4402. Clinical Practicum VI: Advanced Adult Respiratory Critical Care. (2 cr.; A-F only; Every Spring)

Clinical experiences in intensive care of patients including post-operative general-surgical, neurology/neurologic surgery ICU, trauma care, medical ICU, thoracic surgical ICU, inter-hospital transport and hemodynamic monitoring. prereq: 4401

RESP 4500. Advanced Adult Respiratory Critical Care Techniques II. (1 cr.; A-F only; Every Fall)

Students will focus on advanced topics relevant to providing respiratory care to critically ill adults. There will be an emphasis on reviewing complete case examples of cardiopulmonary problems and therapeutic procedures. However, a multi-organ system-wide patient approach will be maintained. Advanced competencies in ventilator management and critical care monitoring, diagnostics and therapeutic procedures will be assured by laboratory experiences. prereq: 3502

RESP 4501. Research Project I. (1 cr.; A-F only; Every Fall)

Students in small groups will be responsible for devising, developing and undertaking a research project which would be suitable for submission either to a scientific meeting or for publication. This will include developing research question, devising and submitting a research protocol, carrying out the research and reporting the findings in abstract and a short oral presentation. Research mentors will be assigned to allow guided independent study.

RESP 4502. Research Project II. (1 cr.; A-F only; Every Spring)

Students in small groups will continue work on their chosen research project from RESP 4501. This project will be suitable for submission to either a scientific meeting or for publication. This will include developing a research question, devising and submitting a research protocol, carrying out the research and reporting the findings in abstract and a short oral presentation. Research mentors will be assigned to allow guided independent study. prereq: 4501

RESP 4602. Grand Rounds. (2 cr.; A-F only; Every Spring)

This capstone course reviews allied health clinical and professional issues over a broad spectrum and also allows reflection on caregiver roles. Presentations cover a wide range of topics that impact allied health practitioners and include global views of national health policy, economics, multicultural/diversity, ethical and legal problems, and challenging clinical cases. Group discussion sessions provide a forum for multidisciplinary review of cases in order to bring larger issues down to individual patient and family experiences. A key element of the course will be the opportunity to both experience and apply course topics through service learning activities.

RESP 4802. Health Care Delivery Systems and Finance. (3 cr.; A-F only; Every Spring)

Students explore health care delivery systems including a review of health economics, third party and public reimbursement, and contemporary trends in health care organization, management and administration. Regulations, standards, quality assurance, accreditation and ethical issues are considered in the context of contemporary healthcare practice. Future implications for health care providers and professionals, patients and families, communities, and international health are included. This course will also provide an understanding of finance in the health care industry through a discussion of how the health care industry???s financial information is interpreted and used. The course aims to make the language of health care finance understandable and relevant for students in health care professions.

RESP 4902. Leadership and Management in Health Professions. (2 cr.; A-F only; Every Spring)

Students acquire background and skills in the business and administrative aspects of health care. Applications of business theory are applied to medical settings including organization models, reimbursement methodologies, information systems, staff scheduling, employee evaluation, accreditation agencies, productivity management, budget planning and group leadership.

Sociology (SOC)

SOC 1393. Directed Study in Sociology. (1-3 cr.; max 6 cr.; Student Option; Every Fall & Spring)

Individual study on selected topics or problems. prereq: instr consent, dept consent

SOC 1571. Introduction to Sociology. (DSJ, SOCS; 3 cr.; A-F or Audit; Every Fall)

Introduction to foundational ideas and research techniques in sociology. Includes a critical engagement with core concepts, including the sociological imagination, socialization, culture, the interplay between individuals and institutions, and social stratification. prereq: concurrent registration is required (or allowed) in MATH 1161

SOC 1641. Social Justice and Ethical Decision Making. (CIV; 3 cr.; A-F or Audit; Every Spring)

Utilizes foundational sociological concepts to systematically explore the role of policies, regulations, values, norms, and social structures in reinforcing or undermining inequality. Students will exercise decision-making in the context of ethical dilemmas regarding inequality, stratification, research ethics, and biomedical ethics. Students will use reasoned arguments and evidence to support a position on an ethical issue.

SOC 3393. Directed Study or Research in Sociology. (1-6 cr. ; max 24 cr.; Student Option; Every Fall & Spring)

Individual study or research on selected topics or problems. prereq: instr consent, dept consent

SOC 3531. Health Policy in a Global Context. (GP, SOCS; 3 cr.; A-F or Audit; Fall Even Year)

In this course, students will begin to explore the ways in which policy shapes: the lives and health of individuals, and population health. By comparing the varying health issues faced by populations around the world, as well as the ways different countries seek to meet the health needs of their citizens, students will begin to place health policy in the United States within a global context. Specific topics may include: environmental and social determinants of health; globalization and its impact on health outcomes; health care providers, health care payers, and health care reform; and the effect of public policy on population health, as well as individuals??? mental and physical health.
SOC 3571. Drugs and Society. (DSJ, SOCS; 3 cr.; A-F or Audit; Spring Odd Year)
This course will investigate a variety of causal factors for drug use, including environmental and biological, and situate these within their social, historical, and cultural contexts. Topics include drug use across cultures; social responses to drug use; drug use and race/class conflict; drug policy, legislation, and enforcement; drug treatment; mass media images of drug use and related activities.
prereq: [1571 or 1641] or instr consent

SOC 3581. Medical Sociology and Technology. (SOCS, TS; 3 cr.; A-F or Audit; Spring Even Year)
This course will explore the complicated interplay among health, illness, disease, health care systems, technology, biomedical science, and society. This course utilizes the sociological perspective to investigate the personal, social, cultural, and organizational, and technological issues that influence the health of people in the United States and globally. Topics include the role that society plays in the development of medical technologies, as well as the impact of those technological developments on population health, individual health, and the field of medicine.
prereq: [1571 or 1641] or instr consent

SOC 4721. Special Topics in Sociology. (; 1-4 cr. [max 8 cr.]; A-F or Audit; Periodic Fall & Spring)
In-depth study of special topics in sociology.
prereq: instr consent; repeated enrollment allowed only if topics are different

Sonography (SONO)

SONO 3011. Foundations of Sonography. (TS; 3 cr.; A-F only; Every Fall)
This introductory course will provide the skills and knowledge necessary to begin a clinical rotation in an ultrasound department. Students will receive lectures and participate in lab exercises to help them understand basic anatomy, physics, instrumentation, ultrasound terminology, scanning techniques, image orientation, film labeling, and scanner controls.

SONO 3111. Abdomen I Sonography. (; 2 cr.; A-F only; Every Fall)
This course will present the anatomy, physiology, laboratory values, pathology, and sonographic appearances of the prevertebral vessels, kidneys, and spleen. There will be a review of scanning protocols and scanning practice in a controlled environment which will integrate course material with clinical applications.

SONO 3112. Abdomen II Sonography. (; 3 cr.; A-F only; Every Spring)
This course will use lectures and scanning labs to help students learn the anatomy, physiology, laboratory values, pathology, and sonographic appearances and scanning techniques for the liver, biliary tree and pancreas.

SONO 3113. Abdomen III Sonography. (; 2 cr.; A-F only; Every Fall)
This predominantly Blackboard course will present the anatomy, pathophysiology, laboratory values, and sonographic appearances of the GI tract, retroperitoneum, peritoneum, chest cavity, abdominal wall, as well as emergency sonography, transplant sonography and interventional applications. Emphasis and practical application will be placed on topics most commonly encountered in a typical sonography department such as appendix, FAST Scan, hypertrophic pyloric stenosis, renal-pancreas, and liver transplant and ultrasound guided sterile procedures.

SONO 3121. Cross-Sectional Abdominal Anatomy. (; 1 cr.; A-F only; Every Fall)
This predominantly online course will assist students in identifying abdominal and pelvic anatomical structures in cross-sectional imaging studies. After reviewing anatomical structures using standard anatomy illustrations, the corresponding Ultrasound, CT and MRI planar images will be demonstrated with a focus on location and spatial relationships to each other.

SONO 3201. Gynecologic Sonography. (; 2 cr.; A-F only; Every Fall)
GYN Sonography is the first course of the obstetrics and gynecology (OB/GYN) curriculum. This course covers gynecologic anatomy, pathophysiology, and GYN ultrasound information. The curriculum includes the following topics: female pelvic anatomy and physiology, uterine, ovarian, and tubal pathology, infertility, and pelvic sonographic scanning techniques.

SONO 3301. Clinical Practicum I. (; 3 cr.; A-F only; Every Fall)
This course is a 13-week clinical rotation in the following ultrasound areas: General, Vascular, and Obstetrics. Students will learn through observation, scanning, and application of knowledge obtained during didactic coursework and scanning labs. Students will be directly supervised.

SONO 3302. Clinical Practicum II. (; 5 cr.; A-F only; Every Spring)
This course is a 16-week clinical rotation in the following ultrasound areas: General, Vascular, and Obstetrics. Students will learn through observation, scanning, and application of knowledge obtained during didactic coursework and scanning labs. Students will be directly supervised.

SONO 3311. Vascular Technology. (; 2 cr.; A-F only; Every Fall)
Vascular I is the first course of the Vascular curriculum. This course provides the student with basic knowledge of the physics of duplex ultrasound imaging, Doppler concepts and machine instrumentation to prepare the student to perform carotid duplex exams and transcranial Doppler exams and identify normal and abnormal anatomy and physiology of the carotid system.

SONO 3312. Vascular Technology II. (; 3 cr.; A-F only; Every Spring)
This course provides the student with the basic knowledge and skills necessary to perform duplex imaging of the abdominal arteries, lower extremity arteries and veins, and nonimaging testing of the peripheral vessels. Lectures and scanning labs include anatomy, pathophysiology, treatment, and testing techniques (including nonimaging vascular testing) for upper and lower extremity and arteries.

SONO 3313. Vascular Technology III. (; 1 cr.; A-F only; Every Summer)
This course covers anatomy, pathology, treatment, indications, and scanning techniques necessary to perform duplex imaging exams of upper extremity arteries and veins, dialysis grafts and mapping, lower extremity venous insufficiency and perforator veins, and upper and lower extremity venous mapping. Test validation and QA statistics will also be explored.

SONO 3401. OB Sonography. (; 2 cr.; A-F only; Every Spring)
This course provides the student with the necessary information to perform and aid in interpreting normal and abnormal obstetrical sonograms. The following topics will be presented: embryoembryology, first trimester sonography, normal fetal anatomy, amniotic fluid, invasive procedures, assessment of fetal age and growth restriction, placenta, cord, membranes, high-risk pregnancy, indications and safety.

SONO 3403. Concepts Review and Case Studies. (; 2 cr.; S-N only; Every Summer)
This course provides the student opportunities to review concepts taught throughout the curriculum by completing computerized review exams and case studies.

SONO 3503. Superficial Sonography. (; 2 cr.; A-F only; Every Summer)
This course will present anatomy, physiology, laboratory values, pathology and sonographic appearance of the breast, neck, prostate and scrotum. Musculoskeletal ultrasound will also be introduced. There will be review of scanning protocols and practices.

SONO 4111. Ultrasound Physics I. (; 2 cr.; A-F only; Every Fall)
This course provides the student with a general overview of diagnostic pulse-echo ultrasound imaging devices, basic mathematical concepts, and knowledge of the basic physics of ultrasound and its interaction with tissue.

SONO 4112. Ultrasound Physics II. (2 cr.; A-F only; Every Spring)
This course provides the student with a detailed description of the physics and technology of diagnostic pulse-echo B-mode ultrasound imaging devices.

SONO 4201. Pediatric Sonography. (; 1 cr.; A-F only; Every Fall)
This course provides the student with necessary information about the anatomy of the neonatal brain and pathologies of intracranial hemorrhage. Other pediatric pathophysiologies are also presented including pediatric renal/urinary tract disease, pediatric abdominal masses and neonatal hips and spines.

SONO 4301. Fetal Anomalies. (; 2 cr.; A-F only; Every Summer)
The Fetal Anomalies course prepares students to define fetal pathologies and identify classic sonographic findings associated with cranial, thoracic, neck, GI, GU, skeletal, cardiac, and chromosomal fetal anomalies.

SONO 4303. Clinical Practicum III. (; 6 cr.; A-F only; Every Summer)
This course is a 14-week clinical rotation in the following ultrasound areas: General, Vascular,
Obstetrics, Vascular Testing Lab, and affiliate rotations. Students will learn through observation, scanning, and application of knowledge obtained during didactic coursework and scanning labs. Students will be indirectly supervised at the discretion of the Clinical Instructor.

**SONO 4401. Clinical Practicum IV.** (7 cr.; A-F only; Every Fall)
This course is a 16-week clinical rotation in the following clinical areas: General, Vascular, Obstetrics, Vascular Testing Lab, and Breast Imaging. Students will learn through observation, scanning, and application of knowledge obtained during didactic coursework and scanning labs. Students will be indirectly supervised at the discretion of the Clinical Instructor.

**SONO 4402. Clinical Practicum V.** (8 cr.; A-F only; Every Spring)
This course is a 17-week clinical rotation in the following clinical sites: General, Vascular, Obstetrics, Vascular Testing Lab, and selected specialty areas. Students will learn through observation, scanning, and application of knowledge obtained during didactic coursework and scanning labs. Students will be indirectly supervised at the discretion of the Clinical Instructor.

**SONO 4501. Research Project & Publication.** (1 cr.; A-F only; Every Fall)
This course provides the student with the opportunity to explore emerging technologies and advanced concepts in sonography through the completion of a research paper.

**SONO 4502. Research Project and Publication II.** (1 cr.; A-F only; Every Spring)
This course provides the student with the opportunity to explore emerging technologies and advanced concepts in sonography through the completion of a poster to be submitted for competition at the Minnesota Society of Diagnostic Ultrasound (MSDU) Annual Spring Seminar, or the national SDMS meeting.

**SONO 4602. Professional Growth and Development.** (1 cr.; A-F only; Every Spring)
This course provides the student with the opportunity to explore the many aspects of professionalism including: professional interactions, professional responsibilities, sonographer scope of practice, clinical practice standards, ARDMS credentialing requirements, legal issues, sonography lab expenses, interviewing and resume skills, and current sonographer issues.

**SONO 4603. Mock Exams.** (1 cr.; S-N only; Every Spring)
Through a series of course reviews, mock registry examinations and information sessions, students are able to prepare for ARDMS examinations. Information on credentialing examinations, effective test-taking strategies, and ARDMS examination content are also provided. Students will be required to apply for and take the ARDMS Physics and Instrumentation board examination during the last part of Semester 5.

**SPAN 1521. Spanish I.** (3 cr.; A-F or Audit; Every Fall)
A communicative approach for beginners to grammar and vocabulary within the context of daily life in both personal and professional interactions. Focus on listening, speaking, reading and writing skills in culturally and situationally appropriate ways. Includes an initial exploration of Spanish within the healthcare environment. Students should expect to build their knowledge bank with a large amount of vocabulary necessary to form meaningful conversations. Lecture is limited; class time is spent primarily in small group practice. Taught utilizing student-centered, active learning and writing-integrated approaches. Students who have previously studied Spanish are expected to take the placement exam before enrolling in a course.

**SPAN 1522. Spanish II.** (3 cr.; A-F or Audit; Every Spring)
A communicative approach to grammar and vocabulary within the context of daily life and the healthcare environment in both personal and professional interactions. Focus on listening, speaking, reading and writing skills in culturally and situationally appropriate ways. Students should expect to continue building their vocabulary knowledge bank and deepen their understanding of grammar structures. Lecture is limited; class time is spent primarily in small group practice. Taught utilizing student-centered, active learning and writing-integrated approaches. Students must have received at least a C- in Spanish 1521 or have placed into 1522 through the placement exam.

**SPAN 1524. Conversational Spanish.** (1 cr.; A-F or Audit; Every Fall & Spring)
Conversation class that puts into practice vocabulary and grammatical concepts present in 1522 course. preq: concurrent registration is required (or allowed) in 1522.

**SPAN 2521. Spanish III.** (3 cr.; A-F or Audit; Every Fall)
A communicative approach to grammar and vocabulary at the intermediate level within the context of the healthcare environment in both personal and professional interactions. Focus on listening, speaking, reading and writing skills in culturally and situationally appropriate ways. Students should expect to review and deepen previously covered grammar structures and learn in-depth medical Spanish vocabulary. Lecture is limited; class time is spent primarily in small group practice. Taught utilizing student-centered, active learning and writing-integrated approaches. Students must have received at least a C- in Spanish 2522 or have placed into 2521 through the placement exam.

**SPAN 2524. Spanish IV.** (3 cr.; A-F or Audit; Every Spring)
This course will teach students Spanish grammar and vocabulary as it applies to the health sciences such as bones, body parts, physical examinations, intake questionnaires, emergencies, common diseases within the Latino population, and medical specializations. By familiarizing students with conversational Spanish within the medical field, this course will enable students to apply their learning to real-world situations, to assist in communications, and ultimately to gain communicative competency. Taught utilizing student-centered, active learning and writing-integrated approaches. Students must have received at least a C- in Spanish 2521.

**SPAN 3393. Directed Study or Research in Spanish.** (1-6 cr.; max 24 cr.; A-F or Audit; Every Fall & Spring)
Individual study or research on selected topics or problems. preq: instr consent, dept consent.

**SPAN 4721. Special Topics in Spanish.** (1-4 cr.; A-F or Audit; Periodic Fall & Spring)
In-depth study of special topics in Spanish. preq: instr consent; repeated enrollment allowed only if topics are different

**Writing Studies (WRIT)**

**WRIT 1511. Writing Studio I.** (1 cr.; A-F or Audit; Every Spring)
Introduction to and practice of writing. Integrated into freshman academic coursework. Formal/informal writing assignments. Critical reading skills. Principles of audience, purpose, and argumentative strategies. preq: Only Rochester-admitted students will be able to enroll in this course.

**WRIT 1512. Writing Studio II.** (2 cr.; A-F or Audit; Every Spring)

**WRIT 1513. Professional Reflective Writing.** (1 cr.; A-F only; Periodic Fall)
Focuses on recognizing the importance of reflective writing in professional environments, especially in the health sciences, through an appreciation of the power of stories and narratives. Students will hone critical reading and analysis skills through reading and responding to professional writing, exercise mindfulness of experiences and activities, utilize the writing process (prewriting, drafting, proofreading, & editing), and practice revision and proofreading techniques through peer review and compiling a final portfolio.

**WRIT 3393. Directed Study or Research in Writing.** (1-6 cr.; max 24 cr.; A-F or Audit; Every Fall & Spring)
Individual study or research on selected topics or problems. preq: instr consent, dept consent.

**WRIT 4721. Special Topics in Writing.** (3 cr.; max 6 cr.; A-F or Audit; Periodic Fall & Spring)
In-depth study of special topics in writing. preq: instr consent; repeated enrollment allowed only if topics are different