

Medical Laboratory Sciences Program

Director: *J. Lynne Williams*

Professor: *J. Lynne Williams*

Assistant professors: *Sumit Dinda, Wanda Reygaert*

Clinical professors: *Larry Kestin, Joan C. Mattson, Frank A. Vicini, Dafang Wu*

Clinical associate professors: *Barbara Anderson, Mujtaba Husain, Raymond Karcher, Harland Verrill.*

Clinical assistant professors: *Ursula Bedrossian, Douglas Ferry, Martha Higgins, Carol A. Holland, Barbara O'Malley, Barbara Robinson-Dunn*

Clinical instructors: *Michele M. Beauvais, Laura Bergsman, Lisa Burgess, Janice Campbell, Vivian Churchill, Cheryl Culver-Schultz, Jeff Forget, M. Patricia Harvey, Leonard Kim, Nancy Lamers, JoAnne Logue-O'Malley, Larry D. Meakem, Muriel Morrison, Paul M. Nuechterlein, Laura L. Ochs, Sbruti Patel, Mary L. Premo, Nancy E. Ramirez, Joseph Roszka, Joyce A. Salancy, Dawn Taylor, Laura Tyburski, Peggy A. Wenk, Mary A. Zamboldi, Anita Zuzga*

Adjunct instructors: *Janet Castillo, Jean Garza*

The medical laboratory sciences program is designed to prepare students for professional opportunities in a variety of settings. Graduates may find employment in hospital or commercial clinical laboratories, research laboratories or public health facilities. Positions within biomedical corporations, including research and development, quality assurance and sales or service may also be prospective sources for employment. Furthermore, because it meets basic academic requirements, the medical laboratory sciences curriculum provides excellent preparation for entry into post-baccalaureate professional programs including physician assistant, medicine, dentistry and osteopathy.

Medical laboratory sciences is a very diversified field. In response to new technologies, many areas of specialization have evolved within the profession to ensure the expertise of individuals performing the required tasks. The medical laboratory sciences program at Oakland University addresses several specializations including clinical laboratory science (formerly medical technology), cytotechnology, histotechnology, nuclear medicine technology, radiation therapy and radiologic technology. As health care professionals, medical laboratory scientists play an integral part in patient care. Some are involved in detection and diagnosis of disease. Others provide therapy to patients. In general, cytotechnologists and histotechnologists are involved in the diagnosis of disease based on alterations in cells or tissues. Clinical laboratory scientists (formally medical technologists) perform a wide range of diagnostic tests, including chemical, microscopic, bacteriological and immunological procedures used in the diagnosis and study of disease. Nuclear medicine technologists use small amounts of radioactive materials for diagnostic evaluation of the anatomic or physiologic conditions of the body and to provide therapy with radioactive sources. Radiation therapists use ionizing radiation in the treatment of cancer. Radiologic technologists utilize ionizing radiation to image internal structures of the body (x-ray).

Generally, employment in a hospital or community clinical laboratory requires certification in a specialization field. Students are eligible to sit for national certification examinations in their specialization upon completion of the appropriate internship at an accredited institution. Professional certification is obtained by successfully passing the examination.

Students may be admitted as pre-medical laboratory science majors directly from high school or by transfer from other colleges or universities. As described below (*Admission to clinical specialization internship*), with the exception of clinical laboratory science, students have the option of earning the medical laboratory sciences degree by completing a hospital based clinical specialization internship program. **Acceptance into the internship programs is competitive and is based on grade point average, personal interview and letters of recommendation.** The application process for each of the specializations is unique. Students are advised to read carefully about their chosen specialization. In some

cases it is the policy of the affiliate institution that a criminal background check at the students expense is required for acceptance into a clinical program.

All students should declare their choice of specialization by the end of sophomore year. They must complete a departmental program application at this time. The declaration of and acceptance into a student's chosen specialization shall define specialization standing for course prerequisites and professional course requirements. The junior and senior year curricula will vary depending upon the specialization.

Students not wishing to pursue professional certification or not accepted by a clinical internship program may complete the medical laboratory sciences degree by following the academic program for the specialization of their choice and substituting adviser approved electives for the clinical year (internship) course work. Such students will be eligible to apply for clinical internship opportunities either before or after graduation, if desired. However, only those students accepted into the radiation therapy internship program or radiologic technology internship program will be allowed to enter the respective junior year curriculum (hospital based program).

Requirements for the B.S. degree with a major in medical laboratory sciences

Students pursuing specializations in cytotechnology, histotechnology, nuclear medicine technology, radiation therapy or radiologic technology must complete a minimum of 136 credits, including the following requirements. Students pursuing the specialization in clinical laboratory science must complete a minimum of 128 credits, including the following requirements.

Pre-professional program

1. Meet the university general education requirements (see *Undergraduate degree requirements*). Note that several courses under point #3 below satisfy general education requirements and Medical Laboratory Science degree requirements. See courses marked with “*”.
2. Complete the university U.S. diversity requirement.
3. Complete the medical laboratory sciences core curriculum.

Professional program

4. Complete the professional course requirements specified under one of the six medical laboratory sciences specializations (clinical laboratory science, cytotechnology, histotechnology, nuclear medicine technology, radiation therapy or radiologic technology).
5. Complete all medical laboratory sciences major program course work with a cumulative GPA of 2.50 or higher.

Medical Laboratory Sciences Core Curriculum courses

BIO 111*, 205, 206 or 322, 207* preferred (or 321) (BIO 206 is required for RT specialization.)

CHM 157*-158

MTH 141

STA 225* or 226

PHY 101*-102* (For CT and HT specializations PHY 101 and/or PHY 102 can be replaced by equivalent credits from BIO 341 and/or BIO 409.)

MLS 201, 205, 210, 226, 450 (MLS 205 and MLS 226 are not required for RAD or RT specializations.)

Admission to clinical specialization internship

To be accepted in a clinical specialization internship, students must submit a formal application for each program for which they seek consideration. Applications for the cytotechnology, histotechnology, and radiation therapy internship programs are processed in the winter semester of the sophomore year (or following completion of the medical laboratory sciences core curriculum). Applications for nuclear

medicine internships are processed during the winter semester of the junior year and applications for the CLS/MT internships are processed during the summer prior to the senior year. It is recommended that students have a 3.00 overall GPA. Students with lower grade point averages may be admitted provisionally pending satisfactory completion of appropriate fall semester, junior-year course work. The Beaumont Hospital Radiologic Technology program accepts two classes each year. Admission to the July class is typically in February, and admission for the January class is in August (approximately 5 months prior to the start of each class).

Grade point policy

Students must maintain a cumulative GPA of 2.50 in all course work applied to the medical laboratory sciences major. Students in a specialization will be placed on probation if they earn a grade less than 2.0 in any course or if their cumulative grade point average in major course work falls below 2.50. Students who earn a second grade less than 2.0 must have their programs reviewed by the faculty to determine remediation or termination from the program.

In order to remove probationary status, students must raise their major grade point average to 2.50 or higher.

Specialization in clinical laboratory science (medical technology)

Clinical laboratory scientists perform diagnostic tests that afford important information to determine the presence, extent or absence of disease and provide data to evaluate the effectiveness of treatment. They work with all types of body tissues and fluids, from blood and urine to cell samples. Major areas of specialization within the laboratory are hematology, clinical chemistry, microbiology, serology, urinalysis and immunohematology (blood bank).

Students may apply for specialization standing in CLS after completing the preprofessional program, generally at the end of the sophomore year. The junior and senior years consist of the prescribed professional course requirements at Oakland University. A clinical internship is required for national certification as a clinical laboratory scientist (certification required for most hospital and private laboratory employment positions). Application to clinical internship (if desired) is made during the summer semester prior to the senior year. Internships are between six to 10 months (depending on the clinical site), and are done post-graduate. Oakland University is affiliated with the following accredited CLS clinical programs: Detroit Medical Center University Laboratories, Detroit; St. John Hospital, Detroit; William Beaumont Hospital, Royal Oak; and the Wayne State University/Oakland University clinical consortium. Acceptance into the internship program is competitive and based on grade point average, personal interview, and letters of recommendation.

Clinical laboratory science specialization professional course requirements

Students in the clinical laboratory science specialization must complete the following courses: CHM 234; MLS 313, 314, 327, 328, 335, 336, 400, 401, 402, 416, 417, 423, 425, 430, 431 and 440.

Specialization in cytotechnology

Cytotechnologists are trained medical laboratory scientists who detect disease by light microscopic examination of cell samples from all areas of the human body. They are responsible for the collection, preparation and staining of specimens consisting of cells that have been shed, abraded or aspirated from body tissues. Cytotechnologists are able to detect abnormal cells and provide preliminary diagnostic information.

Students may apply for specialization standing in cytotechnology after completing the preprofessional program. Application to the hospital-based internship is made during the winter semester of the sophomore year. Students will be informed of acceptance in June and begin the internship in August of

the next calendar year. Application for specialization standing and internship usually coincide for cytotechnology.

The junior year consists of the prescribed professional course requirements at Oakland University. The senior year consists of a 12-month internship at an approved hospital school of cytotechnology. The internship includes an integrated presentation of didactic material, microscopic study, specimen preparation, clinical observation, cytogenetics, laboratory management and a research project.

The Detroit Medical Center University Laboratories offer a cytotechnology internship in affiliation with Oakland University. Acceptance into the internship program is competitive and based on grade point average, personal interview, and letters of recommendation.

Cytotechnology specialization professional course requirements

Students in the cytotechnology specialization must complete the following courses: BIO 305, 306, HS 401; MLS 312, 335, 336, 400, 401, 423, 425, 430; and CT 401 and 402.

Specialization in histotechnology

Histotechnologists perform a variety of diagnostic and research procedures in the anatomic sciences. During the clinical internship, students will learn histological techniques that involve processing, sectioning and staining of tissue specimens that have been removed from humans or animals by biopsy, surgical procedures or autopsy. Advanced techniques include muscle enzyme histochemistry, electron microscopy, immunofluorescence and immunoenzyme procedures, molecular pathology techniques including in situ hybridization and image analysis, and medical photography. Techniques in education methodology, management, research, technical writing and presentation of scientific information are also included in the curriculum.

Students may apply for specialization standing in histotechnology after completing the preprofessional program. Application to the hospital-based internship is made during the winter semester of the sophomore year. Students will be informed of acceptance in June and begin the internship in August of the next calendar year. Application for specialization standing and internship usually coincide for histotechnology.

The junior year consists of the prescribed professional course requirements at Oakland University. The senior year consists of a 12-month internship at The William Beaumont Hospital School of Histotechnology. Acceptance into the internship program is competitive and is based on grade point average, personal interview and letters of recommendation.

Histotechnology specialization professional course requirements

Students in the histotechnology specialization must complete the following courses: BIO 305, 306; HS 401; MLS 312, 335, 336, 400, 401; 423, 425, 430; HT 401, 402, 403 and 404.

Specialization in nuclear medicine technology

Nuclear medicine technologists utilize small amounts of radioactive materials for diagnosis, therapy and research. Diagnosis can involve organ imaging using gamma counters to detect radioactive material administered to the patient or analysis of biologic specimens to detect levels of various substances. Therapeutic doses of radioactive materials are also given to patients to treat specific diseases.

Students may apply for specialization standing in nuclear medicine technology after completion of the pre-professional program. Application for specialization standing occurs at the end of the sophomore year. Application for the clinical internship is made during the junior year as the student approaches completion of the prescribed professional course requirements. The senior year consists of a 12-14 month affiliation at an approved school of nuclear medicine technology. Currently Oakland University MLS students may apply to the following accredited Schools of Nuclear Medicine Technology: William

Beaumont Hospital, Royal Oak, MI, and the Nuclear Medicine Institute, Findlay, OH. The application process for each school is different and students should consult their adviser. Acceptance into the internship program is competitive and based on grade point average, personal interview and letters of recommendation.

Nuclear medicine technology specialization professional course requirements

Students in the nuclear medicine technology specialization must complete the following courses: HS 401; MLS 312, 400, 401, 423, 425; PHY 158; NMT 401 and 402. (In addition to the NMT specialization requirements, the Nuclear Medicine Institute, Findlay, OH program requires CSE 110 and a speech/oral communications class).

Specialization in radiation therapy

Radiation therapy uses ionizing radiation to treat disease, especially cancer. Radiation therapists have the technical skills to plan, deliver and record a prescribed course of radiation. Their primary responsibility is to implement treatment programs prescribed by a radiation oncologist. Practice of this profession requires good judgment and compassion to provide appropriate therapy.

Students may apply for specialization standing in radiation therapy after completion of the pre-professional program. Students applying to the radiation therapy program must take the Allied Health Professions Admissions Test. Application is made during the winter semester of sophomore year. Students will be informed of acceptance in June and begin the two-year clinical program in August. Additional requirements for admission into William Beaumont Hospital's School of Radiation Therapy include a minimum 2.7 grade in all of the hospital's pre-requisite courses, a minimum of 100 volunteer hours, and a two hour site visit at both William Beaumont Hospital - Troy and William Beaumont Hospital - Royal Oak. See the school's web page: (<http://www.beaumont-hospitals.com/alliedhealth>). Acceptance into the internship program is competitive and based on grade point average, personal interview, and letters of recommendation. The junior and senior years consist of didactic work and the supervised clinical experience in the Radiation Therapy Department at William Beaumont Hospital.

Radiation therapy specialization professional course requirements

Students in the radiation therapy specialization must complete the following courses: CSE 110; PHY 158; RT 301, 311, 315, 321, 323, 331, 333, 334, 335, 341, 342, 343, 344, 401, 402, 403, 404, 405 and 406.

Specialization in radiologic technology

A radiologic (X-ray) technologist is a professional responsible for the administration of ionizing radiation for diagnostic or research purposes. The radiologic technologist must integrate complex knowledge and advanced technical skills in the imaging of internal structures. Radiologic technologists apply knowledge of anatomy, physiology, positioning and radiographic technique in the performance of their duties.

Individuals interested in a radiography career must be able to communicate effectively with patients and other health care professionals. The radiologic technologist must display compassion, competence and concern in order to meet the special needs of the patient. Direct contact is required when maneuvering the patient into position for various procedures. Radiography is a rewarding career that combines patient care with modern medical technology.

Students may apply for specialization standing in Radiologic Technology after completing the pre-professional program. The first two years consist of the MLS core curriculum. Application to the hospital-based internship is made during the sophomore year (typically February 28 deadline for the July program and August 28 for the January program). **Acceptance into the internship program is competitive and is based on grade point average, personal interview and letters of**

recommendation. Patient contact experience, volunteering with patients and advanced course work are considered favorably in the admissions process. The junior and senior years consist of didactic work and the supervised clinical experience in the Radiologic Technology Department at William Beaumont Hospital (<http://www.beaumont-hospitals.com/alliedhealth>). This program is accredited by the Joint Review Committee on Education in Radiologic Technology (JRCERT).

Radiologic technology specialization professional course requirements

Students in the radiologic technology specialization must complete the following courses: PHY 158; RAD 306, 311, 331, 333, 341, 344, 345, 401, 404, 407, 411, 433, 435, 441, 445, 450, 451, 452, 453, 454, 455, 456.

Pre-professional studies in medicine, dentistry, optometry, veterinary medicine and physician assistant

The Bachelor of Science degree in Medical Laboratory Science, with a concentration in clinical laboratory science, provides excellent preparation for admission to professional schools. Different professional programs may require additional courses. Students should consult with the MLS adviser. The other specializations in MLS (HT, CT, NMT and RT) can also be used as a prerequisite for professional schools with appropriate course supplementation.

Course Offerings

The program offers selected courses from this catalog as warranted by student needs and availability of faculty. Specific offerings for each term may be found in the *Schedule of Classes*.

CYTOTECHNOLOGY

CT 401 Clinical Internship (12)

Microscopic study of cellular alterations indicative of cancer and precancerous lesions, infections and benign conditions in the female genital tract, introduction to cytopreparatory techniques.
Prerequisite: program permission.

CT 402 Clinical Internship (12)

Continuation of CT 401; microscopic study of non-gynecologic samples and fine needle aspirations; laboratory rotations; research project.
Prerequisite: program permission.

HISTOTECHNOLOGY

HT 401 Basic Histotechnique and Histochemical Staining Methods (12)

Didactic and practicum experience in preparing histologic sections for light microscopy, including the study of over 50 different histologic and enzyme histochemical staining methods and their specific applications.
Prerequisite: program permission.

HT 402 Basic Electron Microscopy (6)

Didactic and practicum experience in basic biological electron microscopy. Electron microscopic histochemistry and special techniques are also covered. Emphasis is on the electron microscope as a medical diagnostic tool.
Prerequisite: program permission.

HT 403 Immunohisto-Cytochemistry (3)

Didactic and practicum experience in basic and advanced procedures of fluorescent and enzymelabeled antibody techniques. Includes the preparation of tissues, staining with labeled antibodies and the use of the fluorescence microscope in clinical medicine and research.

Prerequisite: program permission.

HT 404 Special Techniques (3)

Didactic and practicum experience in molecular pathology (in situ hybridization and DNA analysis), management, education methodology, technical writing and research techniques.

Prerequisite: program permission.

MEDICAL LABORATORY SCIENCES**MLS 201 Careers in Medical Laboratory Sciences (1)**

An introductory seminar in medical laboratory sciences, including career opportunities in clinical settings (clinical laboratory science, histotechnology, cytotechnology, nuclear medicine technology, radiation therapy, industrial sales and/or research and development, basic medical research and education). Offered fall semester.

MLS 205 Contemporary Issues in Health Care Organizations and Practice (2)

An understanding of laboratory and health care organizations and issues to prepare students as professional practitioners to function effectively in a rapidly changing environment. Offered fall and summer semesters.

MLS 210 Medical Terminology (1)

This course is designed as an independent study using a programmed text. Initial emphasis is on learning Greek and Latin word parts and rules for combining them, with cumulative study directed to the analysis and definition of medical terms. Offered fall, winter, and summer semesters.

MLS 226 Introduction to Laboratory Theory and Techniques (2)

Basic concepts and principles in the practice of clinical laboratory science. Integration of principles of phlebotomy, microscopy, laboratory mathematics, spectrophotometry, and laboratory safety. Offered fall, winter semesters.

Prerequisite: CHM 158.

MLS 312 Hematology/Cellular Pathophysiology (3)

Topics include current concepts of hematopoiesis, including selected topics in red blood cell, white blood cell and platelet morphogenesis, physiology and pathophysiology; an introduction to the basic principles involved in cellular disease mechanisms. Offered fall semester.

Prerequisite: BIO 207 or BIO 321; permission of instructor.

MLS 313 Immunohematology (4)

Discussion of the immunologic and genetic basis for the study of red cell antigen/antibody systems, including physiologic and pathophysiologic consequences of foreign antigen exposure. Laboratory included. Offered fall semester.

Prerequisite: BIO 207 or BIO 321; MLS 226, MLS 423; permission of instructor.

MLS 314 Hemostasis (3)

In depth study of the basic physiology and pathophysiology of the human hemostatic system, including the role of the vasculature, platelets and plasma proteins. Laboratory included. Offered fall semester.

Prerequisite: BIO 207 or BIO 321 and MLS 226; permission of instructor.

MLS 327 Clinical Chemistry (4)

A theoretical introduction to the fundamentals of clinical chemistry, with emphasis on pathophysiology and clinical correlations. To include an introduction to theoretical and practical aspects of relevant instrumentation and methods of clinical analysis. Offered fall semester.

Prerequisite: MLS 425.

MLS 328 Clinical Chemistry Laboratory (1)

Provides practical experience in the application of clinical instrumentation and current clinical methodologies to the performance of clinical chemistry assays. Offered fall semester.

Prerequisite: MLS 226. Corequisite: MLS 327.

MLS 335 Clinical Parasitology/Mycology/Virology (3)

Introduction to clinical parasitology, mycology and virology. Included are: morphology, life cycles, reproduction, classification and diseases in humans. Offered winter semester.

Prerequisite: BIO 111 and MLS 226.

MLS 336 Clinical Parasitology/Mycology/Virology Laboratory (1)

Laboratory to accompany MLS 335. Includes basic parasitology and mycology isolation and identification procedures such as staining, and macroscopic and microscopic observations. Also includes very basic rapid virology diagnostic techniques. Offered winter semester.

Prerequisite: BIO 111 and MLS 226. Corequisite: MLS 335.

MLS 400 Introduction to Molecular Genetics (2)

An introduction to the molecular nature of genes and their roles in controlling the function, development and inheritance of organisms. Basic gene structure and function, molecular anatomy of the gene, DNA replication, functional genomics and current methods will be covered. Emphasis on human/medical genetics. Offered fall semester.

Prerequisite: BIO 207 or 321. MLS 425 as prerequisite or corequisite.

MLS 401 Molecular Pathology (3)

Introduces the cause and diagnosis of disease on a molecular level. Illustrates the use of molecular pathology as used in recent diagnostic methodology. Offered winter semester.

Prerequisite: BIO 207 or 321; MLS 400, 425.

MLS 402 Molecular Diagnostics (2)

Discussion of current molecular diagnostic techniques and procedures, including correlation with clinical conditions. Laboratory included. Offered winter semester.

Prerequisite: MLS 226, 401.

MLS 405 Special Topics (1, 2, 3 or 4)

May be repeated for additional credit. Prerequisite: permission of instructor.

MLS 416 Medical Hematology (4)

Theory and techniques in hematology, including red blood cell, white blood cell and platelet morphogenesis, physiology and pathophysiology. Offered winter semester.

Prerequisite: BIO 207 or BIO 321.

MLS 417 Hematology Laboratory (1)

To accompany MLS 416. Offered winter semester.

Prerequisite: MLS 226.

MLS 423 Clinical Immunology (3)

An introduction to the principles and practices of clinical immunology with emphasis on cellular and molecular interactions, using an experimental approach. The course will include the normal immune

responses and clinical conditions, including autoimmunity, immunodeficiency, hypersensitivity disorders and transplant rejection. Offered winter semester.

Prerequisite: BIO 207 or 321 and MLS 425.

MLS 425 Medical Biochemistry (4)

An integrated approach to human biochemistry stressing metabolic interrelationships. Topics covered include: structure and function of proteins, carbohydrates and lipids; enzyme mechanisms and regulation; metabolic pathways and control; nucleic acid structure, function and processing; regulation of gene expression; intracellular and extra cellular signal transduction. Offered fall and summer semesters.

Prerequisite: BIO 207; CHM 158.

MLS 430 Clinical Microbiology (3)

Provide a background in basic clinical microbiology, including the morphology, cultivation, identification and control of microorganisms. Offered summer and fall semesters.

Prerequisite: BIO 111 and 207 or BIO 321.

MLS 431 Clinical Microbiology Laboratory (1)

Laboratory to accompany MLS 430. Includes basic microbiological procedures such as aseptic technique, isolation, cultivating, biochemical characteristics and staining of selected microbes, with regard to their importance in the diagnosis of human diseases. Offered summer and fall semesters.

Prerequisite: MLS 226. Corequisite: MLS 430.

MLS 432 Medical Microbiology Laboratory (1)

Laboratory for non-CLS majors to accompany MLS 430. Includes basic microbiological procedures such as aseptic technique, isolation, cultivation, biochemical characteristics, and staining of selected microbes, with regard to their importance in human diseases. Offered summer and fall semesters.

MLS 440 Clinical Correlation (3)

A problem-solving, multidisciplinary, case-study-based course which integrates material from the various clinical laboratory science disciplines. The course utilizes critical-thinking exercises to interpret data across disciplines, correlating results to disease problem-solving and quality assurances. Offered winter semester.

Prerequisite: MLS 313, 314, 327, 416 and 430.

MLS 450 Law, Values, and Health Care (4)

Examination of legal concepts, problems, institutions that shape/control professional responsibility, problems associated with maintaining and terminating life, licensure and related questions in organization and delivery of health services. *Satisfies the university general education requirement for the capstone experience. Satisfies university general education requirement for a writing intensive course in the major. Prerequisite for writing intensive: completion of the university writing foundation requirement.* Identical with AHS 450 and HS 450.

Prerequisite: junior standing.

MLS 451 Clinical Education (6)

Prerequisite: permission of instructor.

MLS 490 Individual Laboratory Work (2, 3, 4)

May be repeated for additional credit.

Prerequisite: permission of instructor.

MLS 497 Apprentice College Teaching (2)

Directed teaching of selected undergraduate courses. May be repeated for a maximum of 4 credits. Graded S/U.

Prerequisite: permission of instructor.

MLS 498 Directed Study (1-4)

Student initiated and problem-oriented directed study focusing on medical laboratory science issues. May be repeated for additional credit.

Prerequisite: program permission.

NUCLEAR MEDICINE TECHNOLOGY**NMT 401 Clinical Internship I (12)**

Didactic and clinical experience in clinical nuclear medicine including instrumentation, radio pharmacy, ligand assay, organ imaging and therapy with radionuclides.

Prerequisite: Program permission.

NMT 402 Clinical Internship II (12)

Continuation of NMT 401.

Prerequisite: program permission.

NMT 403 Clinical Internship III (8)

Continuation of NMT 402.

RADIATION THERAPY**RT 301 Introduction to Radiation Therapy (2)**

An introduction to the activities and responsibilities of the radiation therapist including orientation to school and hospital policies, career insights, overview of techniques used in radiation therapy, and essentials of procedures needed in the care of radiation oncology patients. Medical terminology specific to the field is reviewed.

Prerequisite: RT specialization standing.

RT 311 Patient Care and Management (2)

Patient care techniques with emphasis on those necessary in the care and examination of oncology patients, especially those receiving radiation therapy. Psychological considerations, management of emergencies, infection control, examination, medical-surgical asepsis and tube management will be presented.

Prerequisite: RT specialization standing.

RT 315 Seminar in Radiation Oncology (3)

Literature search of faculty approved topics related to radiation oncology with written analysis of case studies on various malignancies. Oral presentation required.

Prerequisite: RT specialization standing.

RT 321 Radiographic Imaging and Anatomy (2)

Fundamentals of radiographic exposure techniques including production of radiation, rectification, quality of radiation and film processing. Topographic and cross-sectional anatomy and identification of anatomic structures as seen by various imaging modalities will be introduced.

Prerequisite: BIO 205 and RT specialization standing.

RT 323 Radiobiology (2)

Biophysical principles of ionizing radiation and effects on living tissue with emphasis on radio sensitivity and response to radiation, including a review of cell biology. An introduction to hyperthermia as a treatment modality illustrating the cellular response to heat, methods of heating and interactions of heat and radiation.

Prerequisite: RT 331 and RT specialization standing.

RT 331 Radiation Physics (3)

Fundamental principles of atomic structure and matter, production and properties of radiation, interactions of photons, particulate radiation, measurements of radiation and measurement of absorbed dose are covered. Discussions will include different radiation therapy treatment units.

Prerequisite: PHY 102 and RT specialization standing.

RT 333 Clinical Dosimetry (3)

Basic concepts of clinical dosimetry including use of isodose charts, treatment planning, field defining apparatus and wedges. Different methods of dosimetric calculations are described. Emphasis is on conformal therapy, MLC dosimetry and three dimensional treatment planning.

Prerequisite: RT 331 and RT specialization standing.

RT 334 Brachytherapy and Radiation Protection (3)

Principles of radiation safety including need for radiation protection, detection and measurement of radiation, regulatory agencies and regulations, personnel monitoring and practical radiation protection are presented. Also includes types and storage of brachytherapy sources, use and care of applicators, leak testing and surveys and accident procedures.

Prerequisite: RT specialization standing.

RT 335 Quality Assurance (2)

Principles and applications of a comprehensive quality assurance program in radiation therapy. Topics include relevant tasks, frequency of performance and acceptable limits. Laboratory exercises included.

Prerequisite: RT specialization standing.

RT 341 Oncologic Pathology (3)

Disease concepts including: inflammatory process, neoplasia, types of growth, causative factors, behavior of tumors and staging procedures. Tumors originating from specific sites and respective pathology will be discussed.

Prerequisite: BIO 207 and RT specialization standing.

RT 342 Technical Radiation Oncology I (3)

Provides an understanding of radiation therapy equipment including techniques used in treatment delivery. Tumor localization utilizing simulators, beam directing devices and other technical considerations involved are presented. The role of the radiation therapist in disease management will be discussed.

Prerequisite: PHY 102, BIO 205 and BIO 207, RT specialization standing.

RT 343 Technical Radiation Oncology II (3)

Continuation of Technical Radiation Oncology I.

Prerequisite: RT 342 and RT specialization standing.

RT 344 Clinical Radiation Oncology (2)

An overview of radiation oncology and its role in medicine as compared with surgery and chemotherapy as treatment modalities. Discussion of tumors including locations, etiology, detection, staging and grading, and treatment. Oncologic emergencies are presented.

Prerequisite: RT 341 and RT 342 and RT specialization standing.

RT 401 Clinical Practicum (4)

Supervised experience in the practice of radiation therapy technology. The student therapist will observe and participate in simulation procedures and delivery of radiation treatment to actual patients in the Radiation Oncology Department of William Beaumont Hospital. Patient care and management will be covered.

Prerequisite: program permission.

RT 402 Clinical Practicum (4)

Continuation of RT 401.

Prerequisite: program permission.

RT 403 Clinical Practicum (4)

Continuation of RT 402.

Prerequisite: program permission.

RT 404 Clinical Practicum (4)

Continuation of RT 403.

Prerequisite: program permission.

RT 405 Clinical Practicum (4)

Continuation of RT 404.

Prerequisite: program permission.

RT 406 Clinical Practicum (4)

Continuation of RT 405.

Prerequisite: program permission.

RADIOLOGIC TECHNOLOGY**RAD 301 Introduction to Radiologic Technology (1)**

An introduction to safety, pathlore, and compliance in the Radiology Department. Also included is an orientation to radiation protection (methods to limit patient and operator exposure, such as collimation, shielding and personal monitoring devices).

Prerequisite: RAD specialization standing.

RAD 306 Human Structure and Function (4)

(Anatomy and Physiology) – this class reviews the body systems and their functions in detail. Cross-sectional anatomy is included.

Prerequisite: RAD specialization standing.

RAD 311 Methods of Patient Care I (2)

An overview of basic nursing procedures such as sterile technique, cardiopulmonary resuscitation and life-saving first aid, vital body signs, shock, fracture, etc; correct body mechanics and patient transport; routine and emergency patient care procedures; the purpose and radiographic identification of tubes/lines. CPR certification occurs in second quarter.

Prerequisite: RAD specialization standing.

RAD 331 Radiologic Physics (3)

The principles of atomic theory, x-ray production and generation, and the characteristics of x-rays. The entire x-ray circuit is covered, as well as the function of the circuits' individual components. Basic electronics, electrostatics, magnetism, the structure of matter, etc. are covered.

Prerequisite: RAD specialization standing.

RAD 333 Principles of Radiographic Exposure I (3)

This course covers the fundamentals of setting proper exposure factors; the relationship between current (milliamperage), voltage and time; the factors, which affect radiographic quality.

Prerequisite: RAD specialization standing.

RAD 341 Radiographic Procedures I (4)

An introduction to radiographic positioning, terminology and procedures. The student learns which view demonstrates a particular body part best, and the proper way to set up for various radiographic studies.

Positioning laboratory, chest, abdomen, IVU's OR procedure, GI's, extremities, spine, boney thorax, pediatric radiography and angiography are included.

Prerequisite: RAD specialization standing.

RAD 344 Radiographic Imaging (2)

An introduction to the different recording devices used in diagnostic radiology. Specialized imaging modalities are discussed including CT, MRI and Ultrasound. Devices such as fluoroscopy, cine and video recorders are reviewed in detail. Also, closed circuit TV and TV camera pick-up tubes, image processing methods, PACS, computers in radiology and digital radiography included.

Prerequisite: RAD specialization standing.

RAD 345 Radiographic Image Evaluation I (2)

An in-depth study of the radiographic images. Films are critiqued in terms of proper positioning, radiographic quality, and exposure, as well as pathology. Student presentations and discussions are major components of this course.

Prerequisite: RAD specialization standing.

RAD 401 Pathology (1)

A survey of medical diseases. The names, causes and treatments for a majority of the diseases related to radiology are covered.

Prerequisite: RAD specialization standing.

RAD 404 Quality Assurance (1)

This course covers the basics of quality control testing processes, including sensitometry.

Prerequisite: RAD specialization standing.

RAD 407 Radiation Biology (2)

The basic interactions of x-rays with matter (tissue). Genetic and somatic damage is examined in detail.

Prerequisite: RAD specialization standing.

RAD 411 Methods of Patient Care II (2)

The preparation and administration of all contrast agents is discussed. Each agent is described in terms of usage, viscosity, atomic number, chemical composition, etc. Both ionic and non-ionic materials are included. An introduction to EKG and pharmacology unit covering action and use of select drugs and routes of administration are included.

Prerequisite: RAD specialization standing.

RAD 433 Principles of Radiographic Exposure II (2)

Exploration into tube heat, fluoroscopy, technique chart formulation and review. The Developmental Tests are completed during this class.

Prerequisite: RAD specialization standing.

RAD 435 Radiation Protection (1)

This course investigates the interaction of radiation with matter and the means to measure and protect from radiation exposure.

Prerequisite: RAD specialization standing.

RAD 441 Radiographic Procedures II (3)

Topics include all skull/head studies as in Radiographic Procedures I. Specialty projections and trauma head work are included.

Prerequisite: RAD specialization standing.

RAD 445 Radiographic Image Evaluation II (1)

Students present routine radiographic studies, evaluating quality aspects of each radiograph.
Prerequisite: RAD specialization standing.

RAD 450 Senior Seminar (1)

This course addresses various topics including test taking skills, health-care career pathways, current trends in health-care, professional development, and employment application/interview skills.
Prerequisite: RAD specialization standing.

RAD 451 Clinical Practicum I (3)

Supervised experience in the practice of radiologic technology. The student will observe and participate in simulation procedures and delivery of radiologic procedure to actual patients in the Radiography Department of William Beaumont Hospital.
Prerequisite: program permission.

RAD 452 Clinical Practicum II (3)

Continuation of RAD 451
Prerequisite: program permission.

RAD 453 Clinical Practicum III (4)

Continuation of RAD 452
Prerequisite: program permission.

RAD 454 Clinical Practicum IV (4)

Continuation of RAD 453
Prerequisite: program permission.

RAD 455 Clinical Practicum V (4)

Continuation of RAD 454
Prerequisite: program permission.

RAD 456 Clinical Practicum VI (5)

Continuation of RAD 455
Prerequisite: program permission.

Nutrition and Health Minor

A minor in Nutrition and Health is available to students in any degree program. A minimum GPA of 2.00 is required in each course for the minor. A total number of 22 credits are required for the minor including: NH 300, Organic and Biochemistry for Nutrition Sciences; NH 301, Human Nutrition and Health; NH 311, Contemporary Topics in Nutrition; NH 330, Introduction to Food Science; NH 331, Introduction to Food Science Lab; NH 340, Nutrition and Lifecycles; also required are four hours of the following electives: NH 401, Sports Nutrition; NH 402, Community Nutrition; NH 403, Herbs, Supplements & Nutrition; NH 404, Nutrition and Culture; NH 405, Eating Disorders; NH 446, Food Toxicology.

Nutrition and Health

NH 300 Organic and Biochemistry for Nutrition Sciences (4)

This course integrates concepts in general, organic and biochemistry as a platform for understanding the relationship between chemical compounds, human physiology and nutrition. Topics will include, but are not limited to, identification, structure and physical properties of organic compounds, carbohydrate, lipid, and protein metabolism, enzymes and protein synthesis.