Medical Diagnostic & Translational Sciences

Web Site: http://www.odu.edu/mdts

Harold Riehman, Chair

The School of Medical Diagnostic and Translational Sciences offers a coordinated program of courses and clinical experiences leading to degrees of Bachelor of Science in Medical Laboratory Science (formerly medical technology) and Bachelor of Science in Nuclear Medicine Technology and a post-baccalaureate certificate in cytotechnology. Students may also pursue a concentration in cytotechnology through the Bachelor of Science in Health Sciences degree program. In addition, the school offers a minor in medical laboratory science (formerly medical technology) and a degree completion program for certified medical laboratory technicians (MLT) pursuing a baccalaureate degree. For those seeking a graduate certificate in molecular diagnostics, please refer to the ODU Graduate Catalog.

Bachelor of Science in Medical Laboratory Science (formerly Medical Technology)

http://www.odu.edu/mdts/medical-technology

Program Director:
Barbara Kraj, PhD, MLS(ASCP)\textsuperscript{CM,MB}\textsuperscript{CM}
College of Health Sciences
4608 Hampton Blvd, Rm 2122
Phone: 757-683-6039
E-mail: bkraj@odu.edu (bkraj@odu.edu757-683-6039)

The medical laboratory scientist/medical technologist plays a vital role in the diagnosis and treatment of disease by performing clinical laboratory tests on patients' blood, body fluids, and other specimens. This includes clinical tests within the areas of chemistry, microbiology, hematology, immunology/serology, urinalysis, immunohematology (blood banking), and molecular pathology.

The program has been continually accredited by the National Accrediting Agency for Clinical Laboratory Sciences, 5600 N River Road, Suite 720, Rosemont, IL 60018, 773 714-8880. Due to accreditation, upon successful completion of the program graduates are eligible to take the national certification exam for Medical Laboratory Scientist, administered by the American Society for Clinical Pathology, MLS(ASCP).

Admission

Admission to the University does not constitute admission to the medical laboratory science/medical technology program. Students are admitted to the program after completion of two years of college study, which includes all program prerequisite courses. All program prerequisite courses must be completed with a grade of C (2.00) or better. The students then enter two years of a combined didactic and clinical phase congruent with the 2 + 2 concept. A grade of C (2.00) or better is required in all medical laboratory science/medical technology course work for continuance in the program.

The program does not offer just the final clinical phase to transfer applicants from 3 + 1 programs. Applications to the program, including all materials, must be submitted no later than February 1 for consideration for admission the following fall. Exemptions may be appealed only through the program director. Prospective students who fail to meet the February 1 deadline for formal admission may be allowed to take on-campus medical laboratory science/medical technology courses on a space-available basis. Permission must be first granted by the program director in advance of registration.

Requirements

Lower-Division General Education

| Skills | Written Communication (grade of C or better required in both courses) | 6 |

| Oral Communication (satisfied through major course requirements) |
| Mathematics | 6 |
| STAT 130M | Elementary Statistics |
| MATH 102M | College Algebra (Required for The Nature of Science courses) |
| or MATH 103M | College Algebra with Supplemental Instruction |
| Language and Culture | 0-6 |
| Information Literacy and Research | 3 |
| Ways of Knowing | 3 |
| Human Creativity | 3 |
| Interpreting the Past | 3 |
| Literature | 3 |
| Philosophy and Ethics | 3 |
| PHIL 345E | Bioethics (preferred) |
| The Nature of Science | 12 |
| BIOL 121N & BIOL 122N | General Biology I and General Biology I Lab |
| CHEM 121N & CHEM 122N | Foundations of Chemistry I Lecture and Foundations of Chemistry I Laboratory |
| CHEM 123N & CHEM 124N | Foundations of Chemistry II Lecture and Foundations of Chemistry II Laboratory |
| Human Behavior | 3 |
| Impact of Technology (any upper-division T course outside the College of Health Sciences) | 3 |

Total Hours 45-51

Departmental Requirements

| BIOL 250 & BIOL 251 | Human Anatomy and Physiology I and Human Anatomy and Physiology II |
| CHEM 211 & CHEM 212 | Organic Chemistry Lecture and Organic Chemistry Laboratory |

Students must complete the following courses prior to entering the Medical Laboratory Science/Medical Technology program: BIOL 121N and BIOL 122N, BIOL 250 and BIOL 251, CHEM 121N and CHEM 122N, CHEM 123N and CHEM 124N, CHEM 211 and CHEM 212 and STAT 130M.

Total Hours 13

Major Requirements

<p>| Third Year |</p>
<table>
<thead>
<tr>
<th>First Term</th>
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<th>Second Term</th>
<th>Hours</th>
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<td>MLS 351</td>
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17 | 18 | 7
### Upper-Division General Education

- **Option A.** Approved Disciplinary Minor, 12 hours minimum; also second degree or second major.
- **Option B.** Interdisciplinary Minor (specifically 12 hours, 3 of which may be in the major)
- **Option C.** International Business and Regional Courses or an approved Certification Program such as teaching licensure
- **Option D.** Two Upper-Division Courses from outside the College of Health Sciences and not required by the major (6 hours)

### Requirements for Graduation

Requirements for graduation include a minimum cumulative grade point average of 2.00 overall and in the major, a minimum of 121 credit hours, which must include both a minimum of 30 credit hours overall and 12 credit hours in upper-level courses in the major program from Old Dominion University, completion of ENGL 110C, ENGL 211C or ENGL 221C or ENGL 231C, and the writing intensive (W) course in the major with a grade of C or better, and completion of Senior Assessment.

### Bachelor of Science in Medical Laboratory Science/Medical Technology—Degree Completion Program

The Bachelor of Science in Medical Laboratory Science degree completion program (previously medical technology) is available for graduates of accredited associate degree university and hospital-based or military Medical Laboratory Technician (MLT) programs. MLT certification is required for admission. The curriculum is designed to meet the needs of local and distant practitioners. Program courses are delivered online to accommodate the schedules of working students. Distance learning enrollment coordinators for health sciences programs may be reached at healthsciencesonline@odu.edu.

For consultation and evaluation of eligibility for the degree completion program contact:

Ellie Luethy, MHS, MT(ASCP)
Education Coordinator
eeluethy@odu.edu
(757) 683-3016

### Lower-Division General Education

#### Skills

- Written Communication (grade of C or better required in both courses) 6
- Oral Communication (satisfied through major course requirements)

#### Mathematics

- STAT 130M Elementary Statistics 6
- MATH 102M College Algebra (Required for the Nature of Science courses) or MATH 103M College Algebra with Supplemental Instruction

#### Language and Culture

<table>
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<th>Language &amp; Culture</th>
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</table>

#### Information Literacy and Research

3

#### Ways of Knowing

### Medical Bacteriology

- BIOL 121N and BIOL 122N, BIOL 250 and BIOL 251, CHEM 121N and CHEM 122N, CHEM 123N and CHEM 124N, CHEM 211 and CHEM 212 and STAT 130M.

### Total Hours

45-51

### Departmental Requirements

<table>
<thead>
<tr>
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### Total Hours

13

### Major Requirements

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<tr>
<td>Literature</td>
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<tr>
<td>Philosophy and Ethics</td>
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</tbody>
</table>

- **PHIL 345E** Bioethics (preferred)
- **The Nature of Science** 12
- **GENERAL BIOLOGY I** 8
- **Human Anatomy and Physiology I** 5
- **Organic Chemistry Lecture**
- **Medical Parasitology, Mycology, and Virology** 1
- **Urinalysis** 1
- **Clinical Biochemistry** 3
- **Management in the Clinical Setting** 3
- **Statistical Applications and Data Analysis in the Clinical Laboratory** 3
- **Clinical Hematology Competencies** 1
- **Medical Microbiology Competencies** 1
- **Clinical Chemistry Competencies** 1
- **Clinical Blood Bank Competencies** 1
- **Advanced Clinical Practicum** 3
- **Medical Laboratory Science Seminar** 1

### Total Hours

51-57

### Upper-Division General Education

- **Option A.** Approved Disciplinary Minor, 12 hours minimum; also second degree or second major.
- **Option B.** Interdisciplinary Minor (specifically 12 hours, 3 of which may be in the major)
- **Option C.** International Business and Regional Courses or an approved Certification Program such as teaching licensure
- **Option D.** Two Upper-Division Courses from outside the College of Health Sciences and not required by the major (6 hours)
Requirements for Graduation

Requirements for graduation include a minimum cumulative grade point average of 2.00 overall and in the major, minimum 120 credit hours, which must include both a minimum of 30 credit hours overall and 12 credit hours in upper-level courses in the major program from Old Dominion University, completion of ENGL 110C, ENGL 211C or ENGL 221C or ENGL 231C, and the writing intensive (W) course in the major with a grade of C or better, and completion of Senior Assessment.

Minor in Medical Laboratory Science (formerly Medical Technology)

A minor in medical laboratory science/medical technology requires a minimum of 12 semester hours of 300/400-level MLS courses. Students may choose courses from a specific laboratory science discipline (hematology, microbiology, clinical chemistry, and immunohematology) or from several disciplines. All prerequisite courses must be completed. Selection of a plan or program of study must be done in consultation with the program director. For completion of the minor, students must have a minimum overall cumulative grade point average of 2.00 in all courses required for the minor exclusive of prerequisite courses and a minimum of six hours in upper-level courses in the minor requirement must be taken through courses offered by Old Dominion University. Substitutes of non-MLS courses require the permission of the program director. Completion of the minor does not confer eligibility to write national certification examinations.

Bachelor of Science in Nuclear Medicine Technology

http://www.odu.edu/mdts/nuclear-medicine
Scott R. Sechrist, Program Director

Nuclear medicine technology is the medical specialty that utilizes sealed and unsealed radioactive materials in the diagnosis and treatment of disease. The nuclear medicine technology program at Old Dominion University is designed to prepare individuals as entry-level nuclear medicine technologists. Upon successful completion of the program, graduates are eligible to sit for a national exam for certification as a nuclear medicine technologist.

Nuclear medicine technologists are allied health professionals certified in nuclear medicine technology who, under the direction of an authorized physician user, are committed to applying the art and skill of diagnostic and therapeutic nuclear medicine procedures through the safe and effective use of radionuclides. Responsibilities include but are not limited to: direct patient contact, the preparation and administration of radiopharmaceuticals, patient imaging procedures including computer processing, laboratory testing, patient preparation, quality control and radiation safety. Nuclear medicine technologists can be employed in hospitals and imaging centers. The program is accredited by the Joint Review Committee on Educational Programs in Nuclear Medicine Technology.

A grade of C (2.00) or better in all nuclear medicine course work is required to continue in the program.

Admission

All admission materials must be received by October 15. Interviews are then scheduled for early November.

Requirements

Lower-Division General Education

Skills

Written Communication (grade of C or better required in both courses) 6
Oral Communication 3
Mathematics 6

| STAT 130M | Elementary Statistics |
| MATH 102M | College Algebra |

Ways of Knowing

Human Creativity 3
Interpreting the Past 3
Literature 3
Philosophy and Ethics 3

PHIL 345E Bioethics

The Nature of Science

| CHEM 105N & CHEM 106N | Introductory Chemistry and Introductory Chemistry Laboratory |
| CHEM 107N & CHEM 108N | Introductory Organic and Biochemistry and Introductory Organic and Biochemistry Laboratory |
| PHYS 101N & PHYS 102N | Conceptual Physics and Conceptual Physics |

Human Behavior 3
Impact of Technology 3

HIST 304T History of Medicine, Disease, and Health Technology (or upper-division T course outside the College of Health Sciences)

Total Hours 52-58

Departmental Requirements

| BIOL 240 Fundamentals of Anatomy and Physiology I | 4 |
| BIOL 241 Fundamentals of Anatomy and Physiology II | 4 |
| or BIOL 250 Human Anatomy and Physiology I |
| or BIOL 251 Human Anatomy and Physiology II |

Students must complete the following courses (or equivalent) prior to entering the nuclear medicine technology Program: BIOL 240 or BIOL 250 and BIOL 241 or BIOL 251, CHEM 105N, CHEM 106N, CHEM 107N and CHEM 108N, PHYS 101N and PHYS 102N, and MATH 102M and STAT 130M.

Total Hours 8

Major Course Requirements

Third Year

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<th>First Term</th>
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Fourth Year

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<th>Second Term</th>
<th>Hours</th>
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<td>NMED 402</td>
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<td>NMED 410</td>
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<td>NMED 403</td>
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Total credit hours: 57

Elective credit may be needed to meet the minimum requirement of 120 credit hours.

Upper-Division General Education

• Option A. Approved Disciplinary Minor, 12 hours minimum; also second degree or second major.

Requirements for graduation include a minimum cumulative grade point average of 2.00 overall and in the major, minimum 120 credit hours, which must include both a minimum of 30 credit hours overall and 12 credit hours in upper-level courses in the major program from Old Dominion University, completion of ENGL 110C, ENGL 211C or ENGL 221C or ENGL 231C, and the writing intensive (W) course in the major with a grade of C or better, and completion of Senior Assessment.
• Option B. Interdisciplinary Minor (specifically 12 hours, 3 of which may be in the major)
• Option C. International Business and Regional Courses or an approved Certification Program such as teaching licensure
• Option D. Two Upper-Division Courses from outside the College of Health Sciences and not required by the major (6 hours)

Requirements for Graduation
A variety of clinical facilities in the Hampton Roads area are utilized for clinical education experiences. Students are responsible for providing their own transportation to these sites. Students must meet established programmatic technical standards.

Requirements for graduation include a minimum cumulative grade point average of 2.00 overall and in the major, a minimum of 120 credit hours, which must include both a minimum of 30 credit hours overall and 12 credit hours in upper-level courses in the major program from Old Dominion University, completion of ENGL 110C, ENGL 211C or ENGL 221C or ENGL 231C, and the writing intensive (W) course in the major with a grade of C or better, and completion of Senior Assessment.

Cytotechnology Concentration—Bachelor of Science in Health Sciences

http://www.odu.edu/mdts/cytotechnology

Deborah Krzyzaniak, Program Director

The School of Medical Diagnostic and Translational Sciences offers a program in cytotechnology through the Bachelor of Science in Health Sciences.

Cytotechnologists are specially trained medical laboratory professionals who work with pathologists in detecting changes in cell samples from numerous body sites which allows the early diagnosis of cancer. This is done primarily with the use of the microscope to evaluate slide preparation of cell samples for abnormalities in structure, indicating cancer, precancerous lesions, benign tumors, infectious agents and inflammatory processes. They are also trained in specimen preparatory techniques.

The program of study is accredited by the Commission on Accreditation of Allied Health Education Programs (CAAHEP), 1361 Park Street, Clearwater, FL 33756; phone: 727-210-2350; e-mail: mail@caahep.org; website: www.caahep.org (http://www.caahep.org), in association with the American Society of Cytopathology.

Theory is reinforced through an integrated clinical phase which allows the student direct experience in a hospital or lab setting providing additional training in screening techniques and diagnostic procedures. Graduates are eligible to sit for national certifying ASCP exams. Application to the cytotechnology program must be submitted by February 1 for the fall semester.

Requirements

Lower-Division General Education

Skills

<table>
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<th>Written Communication</th>
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<td>ENGL 110C</td>
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<td>ENGL 211C</td>
<td>English Composition (grade of C or better required)</td>
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<td>Oral Communication</td>
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<td>Mathematics</td>
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<td>MATH 102M</td>
<td>College Algebra</td>
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<tr>
<td>or MATH 103M</td>
<td>College Algebra with Supplemental Instruction</td>
</tr>
</tbody>
</table>

Language and Culture | 0-6 |

Information Literacy and Research | 3 |

| HLTH 120G            | Information Literacy for Health Professions (preferred) |

Ways of Knowing

| Human Creativity     | 3 |
| Interpreting the Past| 3 |
| Literature           | 3 |
| Philosophy and Ethics| 3 |

PHIL 345E Bioethics (recommended)

The Nature of Science | 16 |

<table>
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<tr>
<th>BIOL 121N &amp; BIOL 122N</th>
<th>General Biology I and General Biology I Lab</th>
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<td>General Biology II and General Biology II Lab</td>
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<tr>
<td>CHEM 105N &amp; CHEM 106N</td>
<td>Introductory Chemistry and Introductory Chemistry Laboratory</td>
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<tr>
<td>CHEM 107N &amp; CHEM 108N</td>
<td>Introductory Organic and Biochemistry and Introductory Organic and Biochemistry Laboratory</td>
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Human Behavior | 3 |

Impact of Technology | 3 |

HIST 304T History of Medicine, Disease, and Health Technology (preferred but any upper-division T course outside the College of Health Sciences accepted) |

Total Hours | 46-52 |

* Met in the major with CYTO 424 and CYTO 497.

Departmental Requirements

<table>
<thead>
<tr>
<th>BIOL 240 or BIOL 250</th>
<th>Fundamentals of Anatomy and Physiology I and Human Anatomy and Physiology I</th>
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<tbody>
<tr>
<td>BIOL 241 or BIOL 251</td>
<td>Fundamentals of Anatomy and Physiology II and Human Anatomy and Physiology II</td>
</tr>
<tr>
<td>BIOL 103</td>
<td>Basic Bacteriology</td>
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</table>

Students must complete the following courses prior to entering the cytotechnology program: BIOL 121N and BIOL 122N, BIOL 123N and BIOL 124N, BIOL 240 or BIOL 250 and BIOL 241 or BIOL 251, BIOL 103, CHEM 105N and CHEM 106N, CHEM 107N and CHEM 108N and the nine hours from the health sciences core courses.

Total Hours | 12 |

Major Course Requirements

First Semester:

| CYTO 404 | General Pathology | 3 |
| CYTO 428W| Cytopreparatory Techniques and Procedures | 3 |
| MDT 400  | Principles of Molecular Pathology and Clinical Diagnostics | 3 |
| MDT 401  | Molecular Diagnostics Laboratory | 3 |
| CHP 450  | Public and Community Health Administration | 3 |

Second Semester:

| CYTO 407 | Clinical Histology (Strongly Recommended) | 3 |
| CYTO 403 | Gynecological Screening Laboratory | 3 |
| CYTO 405 | Normal Gynecological Cytology | 3 |
| CYTO 415 | Abnormal Gynecological Cytology | 4 |
| CYTO 442 | Gastro-Intestinal Cytology | 2 |
| CYTO 458 | Cytology Internship I | 3 |

Third Semester:

| CYTO 424 | Respiratory Cytology | 3 |
| CYTO 444 | Genitourinary Cytology | 2 |
| CYTO 445 | Breast Cytology | 2 |
| CYTO 446 | Body Fluids Cytology | 3 |

Medical Diagnostic & Translational Sciences | 4
Fourth Semester:

<table>
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<td>CYTO 478</td>
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<td>CYTO 497</td>
<td>Cytology Senior Seminar</td>
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Upper-Division General Education

- Option A. Approved Disciplinary Minor, 12 hours minimum; also second degree or second major.
- Option B. Interdisciplinary Minor (specifically 12 hours, 3 of which may be in the major)
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Certificate Option/Second Degree

A certificate in cytotechnology or second degree in health sciences is available to students who have a Bachelor of Science degree, with a minimum of 20 credit hours in biology and eight credit hours in chemistry.

CYTOTECHNOLOGY Courses

**CYTO 403. Gynecological Screening Laboratory. 3 Credits.**
Laboratory experience in the screening of gynecological smears. Prerequisites: Acceptance into the Cytotechnology Program and/or permission of the cytotechnology program director. Pre- or corequisite: CYTO 405 and CYTO 415.

**CYTO 404. General Pathology. 3 Credits.**
This course is an overview of general disease processes and causes in the human. All body systems will be covered including respiratory, gastrointestinal, circulatory, nervous, reproductive, and urinary. Aging, dietary, and stress factors will be discussed in the disease process. Bacteria, fungi, and viruses will be discussed in general and for each body system. Neoplasms will be covered for each body site. This course will be of benefit to anyone interested in diseases of the human body or entering the medical field. (cross listed with MLS 401) Prerequisites: junior standing. Pre- or corequisite: BIOL 250 and BIOL 251 or equivalent.

**CYTO 405. Normal Gynecological Cytology. 3 Credits.**
Introduction to histological and cytological features of the normal female genital tract with emphasis on normal and non-neoplastic abnormalities. Principles of cytological diagnostic techniques will be discussed. Prerequisites: Acceptance into the Cytotechnology Program or permission of program director. Pre- or corequisite: CYTO 403.

**CYTO 407. Clinical Histology. 3 Credits.**
This course consists of the systematic study of cellular components as well as the grouping/organization of tissues into major ‘organ’ systems. Microscopic and virtual identification and morphology of cells, tissues, and organ substructures will be emphasized. This course will be of benefit to anyone interested in diseases of the human body or entering the medical field. Prerequisites: permission of the instructor.

**CYTO 415. Abnormal Gynecological Cytology. 4 Credits.**
Introduction to diagnostic cytological techniques and pathology of the female reproductive tract with emphasis on premalignant and malignant changes. Pre- or corequisite: CYTO 403 and CYTO 405.

**CYTO 424. Respiratory Cytology. 3 Credits.**
Principles of diagnostic cytology and pathology of the respiratory tract, including benign conditions, inflammatory and infectious diseases, premalignant conditions and primary and metastatic malignancies. Pre- or corequisite: CYTO 405 and CYTO 415.

**CYTO 428W. Cytopreparatory Techniques and Procedures. 3 Credits.**
Introduction to collection, processing and preparation of cytologic specimens from all body sites and general laboratory procedures and regulations. A portion of this course consists of practical experience acquired in the laboratory. Practical experience will be performed during clinical site rotations throughout the Cytotechnology Program. Students will learn how to properly write lab reports and papers related to health science fields. This is a writing intensive course. Prerequisites: Pre-admission to the Cytotechnology Program or Program Director permission; completion of ENGL 110C and ENGL 211C or ENGL 221C or ENGL 231C with a grade of C or higher.

**CYTO 442. Gastro-Intestinal Cytology. 2 Credits.**
Study of the pathology and cytology of the gastro-intestinal tract, including the oral cavity, esophagus, stomach, colon, and rectum. Emphasis on normal conditions, benign inflammatory, infections, parasitic conditions, gastric ulcers, premalignant and malignant lesions. Pre- or corequisite: CYTO 405 and CYTO 415.

**CYTO 444. Genitourinary Cytology. 2 Credits.**
Study of the pathology and cytology of the genitourinary tract, with emphasis in normal conditions, benign inflammatory and infectious conditions, crystals, premalignant and malignant lesions. Pre- or corequisite: CYTO 405 and CYTO 415.

**CYTO 445. Breast Cytology. 2 Credits.**
Study of pathology and cytology of the breast, with emphasis on benign, inflammatory conditions, premalignant and malignant disease in both breast smears and fine needle aspirations. Prerequisite: CYTO 407. Pre- or corequisite: CYTO 405 and CYTO 415.

**CYTO 446. Body Fluids Cytology. 3 Credits.**
Study of the pleural, peritoneal and pericardial cavity fluids, synovial and cerebral spinal fluids, with emphasis on benign, inflammatory conditions, and primary and metastatic malignancies. Prerequisite: CYTO 407. Pre- or corequisite: CYTO 405 and CYTO 415.

**CYTO 448. Non-Epithelial Cytology. 2 Credits.**
Study of the pathology and cytology of non-epithelial lesions with emphasis on benign, inflammatory, and malignant conditions. Pre- or corequisite: CYTO 405, CYTO 415, CYTO 424, CYTO 444, CYTO 445, and CYTO 446.

**CYTO 455. Fine Needle Aspiration. 6 Credits.**
Study of specialized collection techniques, processing and diagnosis of fine needle aspirations from various body sites, including, but not limited to, thyroid, liver, lymph nodes, pancreas, lung, kidney, etc. Emphasis will be on benign, inflammatory, primary, and metastatic malignancies of all sites. Clinical practical application of these principles will be continued at the clinical sites. Prerequisite: CYTO 403. Pre- or corequisite: CYTO 405, CYTO 415, CYTO 424, CYTO 444, CYTO 445, and CYTO 446.

**CYTO 458. Cytology Internship I. 3 Credits.**
Directly supervised experience in a clinical setting: includes evaluation of gynecologic smears and study set assignments. Students will be exposed to cytopreparatory techniques. Pre- or corequisite: CYTO 405 and CYTO 415.

**CYTO 468. Cytology Internship II. 4 Credits.**
Directly supervised experience in a clinical setting. Includes evaluation of gynecologic and non-gynecologic specimen slides and study set assignments. Students will pre-screen gynecologic and non-gynecologic smears and study set assignments. Students will be exposed to cytopreparatory techniques. Pre- or corequisite: CYTO 405, CYTO 415, CYTO 424, CYTO 444, CYTO 445, and CYTO 446.
CYTO 478. Cytology Internship III. 8 Credits.
Directly supervised experience in a clinical setting. Includes evaluation of
gynecologic and non-gynecologic smears and study set assignments.
Students will be exposed to cytopreparatory techniques. Pre- or corequisite:
CYTO 405, CYTO 415, CYTO 424, CYTO 444, CYTO 445, CYTO 446, and
CYTO 455.

CYTO 495. Topics in Cytology. 1-3 Credits.
Independent study of selected topics in clinical cytology. Review of
cytologic specimens from various body sites Prerequisites: permission of the
program director.

CYTO 497. Cytology Senior Seminar. 1 Credit.
Supervised experience consists of clinical cases and seminar presentations
into current advances within the specialty of clinical cytology. A student
research project and oral presentation of current journal articles and the
research paper are required. Prerequisites: permission of the program
director.

CYTO 498. Topics. 1-3 Credits.

MEDICAL LABORATORY SCIENCE Courses

MLS 210. Orientation to Medical Laboratory Science. 1 Credit.
An introduction to the profession of medical laboratory science (previously
called medical technology). Professional, ethical and operational issues will
be discussed.

MLS 307. Clinical Methods in Microbiology. 2 Credits.
Laboratory techniques in the diagnosis of clinically relevant
microorganisms. Prerequisite: admission to the major or minor in medical
laboratory science. Pre- or corequisite: MLS 308.

MLS 308. Clinical Microbiology. 3 Credits.
A fundamental course in microbiology that includes bacterial growth,
synthesis, differentiation, microbial nutrition and metabolism. Prerequisites:
BIOL 121N, BIOL 122N, BIOL 123N, and BIOL 124N; CHEM 211 is
recommended or permission of the instructor.

MLS 309. Medical Bacteriology. 3 Credits.
A comprehensive survey of bacteria, including colonial morphology, cultural
characteristics, biochemical identification, pathogenicity, epidemiology, and
treatment. Prerequisites: MLS 307 and MLS 308.

MLS 310. Urinalysis and Body Fluids. 1 Credit.
A study of the chemical, physical and microscopic analysis of human urine
and other body fluids, with abnormal results interpreted and correlated to
disease processes and cancer cytology of the urinary tract. Prerequisites:
BIOL 250 and BIOL 251 or permission of the instructor.

MLS 311. Hematology. 3 Credits.
The study of the principles of the formation and development of blood,
including the interpretation of normal and abnormal blood morphology
and diagnostic procedures in the investigation of hematological disorders.
Prerequisites: BIOL 250 and BIOL 251 or permission of the instructor. Pre-
or corequisite: MLS 312.

MLS 312. Hematology Laboratory. 1 Credit.
Laboratory methods utilizing microscopy and other analytical procedures
in the diagnosis and investigation of hematological disorders. Prerequisite:
BSOL 250 and BSOL 251 or equivalent. Pre- or corequisite: MLS 316.

MLS 313. Diagnostic Methods in Urinalysis. 1 Credit.
Laboratory experience in the chemical, physical, and microscopic
examination of the urine and body fluids with emphasis on quality control,
osmometry, and disease correlates. Prerequisite: BSOL 250 or equivalent.
Pre- or corequisite: MLS 310.

MLS 315. Clinical Laboratory Diagnosis. 3 Credits.
An introduction to clinical diagnostic principles utilized in immunology,
sérology, and hemostasis. Prerequisite: students must be certified graduates
of a medical laboratory associate-level training program (MLT).

MLS 319. Medical Bacteriology Methods. 2 Credits.
Laboratory methods emphasizing isolation, identification and media
requirements for pathogenic microorganisms. Prerequisite: admission to the
major or minor in medical laboratory science. Pre- or corequisite: MLS 309.

MLS 320. Blood Collection Techniques. 2 Credits.
Laboratory methods in the procurement of blood by capillary, venipuncture
and arterial draws, analytical variables, special phlebotomy tests, isolation
techniques, safety, forensic, molecular, legal and ethical implications,
pediatric, geriatric, and compromised patient concerns. All students must
submit to venipuncture by fellow students. Prerequisite: BIOL 250 or
equivalent or permission of the instructor.

MLS 322. Phlebotomy Internship. 2 Credits.
A 120-hour clinical internship for those desiring to qualify for the ASCP
certification exam in phlebotomy. Prerequisite: MLS 320.

MLS 324. Clinical Instrumentation and Electronics. 3 Credits.
A course covering the theory, operation, selection, maintenance and
quality control of instruments in the clinical laboratory. Instruments
discussed include spectrophotometers, flame photometry, atomic
absorption, fluorometry, gas and liquid chromatography, mass spectroscopy,
chemiluminescence, immunochemical and nephelometric methods,
electrophoresis, radiation detection and dosimetry, osmometry,
electrochemistry and applications to molecular diagnostic and forensic
testing, and basic electronic applications. Statistical applications to data
analysis of both instrument and method comparisons, trouble shooting and
quality control in the clinical lab. Prerequisites: CHEM 211 or CHEM 321,
MATH 102M or permission of the instructor. Pre- or corequisite: MLS 325.

MLS 325. Clinical Instrumentation Methods. 1 Credit.
A laboratory course designed for students entering the clinical laboratory
field. The course includes the instrumental and data processing techniques
required for the clinical analysis of body fluids as well as applied statistical
techniques to the interpretation of laboratory data, and statistical comparison
methods. Lab to include lab sessions in molecular diagnostic testing,
comparison studies, quality control, calibration, maintenance, and trouble
shooting of clinical chemistry analytics. Prerequisites: MATH 102M,
CHEM 121N, CHEM 122N, CHEM 123N, CHEM 124N, and CHEM 211.

MLS 326. Immunohematology. 3 Credits.
The study of the identification of blood group antigens and antibodies,
standard testing procedures, decision criteria for component selection, and
regulations of blood banks and transfusion services. Prerequisites: MLS 311,
MLS 312, MLS 330, MLS 331, BIOL 250, and BIOL 251 or permission of
the instructor. Pre- or corequisite: MLS 336.

MLS 327. Hemostasis. 1 Credit.
The study of the fundamentals of hemostasis, emphasizing principles,
evaluation techniques, and diagnostic applications. Class meets the
first seven weeks of the semester. Prerequisites: MLS 311, MLS 312 or
permission of the instructor.

MLS 330. Clinical Immunology/Serology. 2 Credits.
The study of the body's immune response, its cellular and non-cellular
components, in-vitro manifestations, diagnostic techniques and
interpretations related to the investigation and diagnosis of infectious
and non-infectious disease states. Prerequisite: BSOL 251N, BSOL 122N,
BSOL 250 and BSOL 251 or permission of the instructor. Pre- or corequisite: MLS 331.

MLS 331. Clinical Immunology/Serology Laboratory. 1 Credit.
Laboratory methods emphasizing in-vitro antigen and antibody reactions
used to aid in the diagnosis of infectious and non-infectious disorders.
Prerequisites: admission to the major or minor in medical laboratory science.
Pre- or corequisite: MLS 330.

MLS 336. Immunohematology Laboratory. 1 Credit.
Laboratory methods emphasizing procedures that lead to the identification
of blood group antigens and antibodies and the selection of therapeutic
components necessary for making transfusion-related decisions. Prerequisite:
admission to the major or minor in medical laboratory science. Pre- or
corequisite: MLS 326.

MLS 337. Advanced Hematology. 1 Credit.
The microscopic study of blood cells in blood and body fluids, emphasizing
morphologic identification and correlation of laboratory data in order to
identify specific disease states. Class meets the second seven weeks of
the semester. Prerequisites: MLS 311 and MLS 312 or permission of the
instructor.
MLS 339. Medical Parasitology and Mycology Laboratory. 1 Credit. Laboratory methods emphasizing the identification of medically relevant parasites and fungi. Prerequisite: admission to the major or minor in medical laboratory science. Pre- or corequisite: MLS 340.

MLS 340. Medical Parasitology, Mycology, and Virology. 1 Credit. A study of the medically important parasites, fungi, and viruses, and their medical significance. Prerequisite: MLS 307, MLS 308 or permission of the instructor.

MLS 350. Urinalysis. 1 Credit. A study of the chemical, physical and microscopic analysis of human urine and body fluids, anatomy and physiology, and path physiology, with abnormal results interpreted and correlated to disease processes. Restricted to distance education students. Prerequisites: BIOL 250 and BIOL 251 or permission of the instructor.

MLS 351. Clinical Biochemistry. 3 Credits. An introduction to the applications of biochemistry and clinical testing in the diagnosis of human disease. Practice given in the interpretation of laboratory data in the areas of carbohydrate, protein, lipid, genetic disorders, liver, renal, pancreatic, G.I., enzymatic, and cardiac testing. Also enzyme kinetics, electrolytes, acid base physiology, tumor markers, endocrinology, pharmacokinetics, therapeutic drug monitoring, and molecular diagnostics. Special emphasis on specimen collecting, pre- and post-analytical variables, and case studies. Prerequisites: BIOL 250, BIOL 251, CHEM 211, and CHEM 212, or permission of the instructor.

MLS 401. General Pathology. 3 Credits. This course is an overview of general disease processes and causes in the human. All body systems will be covered including respiratory, gastrointestinal, circulatory, nervous, reproductive, and urinary. Aging, dietary, and stress factors will be discussed in the disease process. Bacteria, fungi, and viruses will be discussed in general and for each body system. Neoplasms will be covered for each body site. This course will be of benefit to anyone interested in diseases of the human body or entering the medical field. (cross listed with CYTO 404) Prerequisite: junior standing. Pre- or corequisites: BIOL 250 and BIOL 251 or equivalent.

MLS 403W/503. Management in the Clinical Setting. 3 Credits. A course concerned with organization and management in the clinical setting including personnel supervision, planning, equipment justification, quality assurance, data processing, budgeting, fiscal techniques, marketing, regulatory agencies, educational methodologies, current issues, as well as legal and ethical considerations. This is a writing intensive course. Prerequisites: junior standing and a grade of C or better in ENGL 110C and ENGL 211C or ENGL 221C or ENGL 231C.

MLS 404. Clinical Hematology Practicum. 4 Credits. Direct clinical experience offered in automated and manual hematology procedures used in distinguishing blood dyscrasias and coagulation abnormalities. (qualifies as a CAP experience) Prerequisites: MLS 311, MLS 312, MLS 327, MLS 337, and permission of the program director.

MLS 406. Clinical Microbiology Practicum. 5 Credits. Direct clinical experience offered in isolating and identifying human pathogens such as bacteria, fungi, and parasites from various clinical specimens. Prerequisites: MLS 307, MLS 308, MLS 309, MLS 319 and permission of the program director.

MLS 440. Statistical Applications and Data Analysis in the Clinical Laboratory. 3 Credits. Topics include review of basic statistics used in the laboratory; use of statistics for quality control, reference range determination, method comparisons, test utility assessment, techniques for searching the literature and assessing quality and applicability of published studies; and data organization and retrieval via queries. Students will perform projects, preferably using actual laboratory data, that relate to lecture topics. Prerequisites: STAT 130M and permission of the instructor.

MLS 441. Clinical Hematology Competencies. 1 Credit. Demonstration of stated clinical laboratory competencies within the discipline of hematology. Prerequisites: MLS 311 and MLS 315.

MLS 442. Clinical Microbiology Competencies. 1 Credit. Demonstration of stated clinical laboratory competencies within the discipline of clinical microbiology. Prerequisite: MLS 309.

MLS 443. Clinical Chemistry Competencies. 1 Credit. Demonstration of stated clinical laboratory competencies within the discipline of clinical chemistry. Prerequisites: MLS 324 and MLS 351.

MLS 444. Clinical Blood Bank Competencies. 1 Credit. Demonstration of stated clinical laboratory competencies in the discipline of blood banking. Prerequisites: MLS 315 and MLS 326.

MLS 445. Advanced Clinical Practicum. 3 Credits. A project-based advanced clinical experience for laboratory practitioners emphasizing enhancement of basic procedures and techniques and development of management, research, computer and educational skills, resulting in a written paper and oral presentation. (qualifies as a CAP experience) Prerequisite: MLS 440 or approved research methods course; or permission of instructor.

MLS 452. Clinical Biochemistry Practicum. 5 Credits. Direct clinical experience offered in automated and manual clinical chemistry determinations with emphasis on the principles, instrumentation, interpretation, and diagnostic significance. Prerequisites: MLS 324, MLS 325, MLS 351, and permission of the program director.

MLS 454. Clinical Blood Bank Practicum. 4 Credits. Direct clinical experience offered in the theories and principles of blood banking with emphasis on the instruction of technical procedures used in an AABB approved blood bank. Prerequisites: MLS 311, MLS 312, MLS 326, MLS 336, and permission of the program director.

MLS 457. Medical Laboratory Science Seminar. 1 Credit. In-depth review for Medical Laboratory Scientist (MLS) certification exam. Prerequisite: permission of the program director.

MLS 458. Clinical Elective Practicum. 1 Credit. Directed internship in any clinical area of interest approved by the clinical instructor and program director. Prerequisite: permission of the program director.

MLS 495. Special Topics in Medical Laboratory Science. 1-3 Credits. The advanced study of selected topics within the medical field. Prerequisite: permission of the program director.

MLS 497. Directed Study in Medical Laboratory Science. 1-3 Credits. Supervised experience in medical laboratory science specialties, allowing students to pursue areas of interest under faculty direction. Prerequisite: permission of the program director.

MLS 498. Clinical Research Methods. 3 Credits. An introduction to clinical research methods to include sampling techniques, data collection and analysis, inferential statistics, multivariate analysis, hypothesis testing and research design. The student will be expected to develop a research proposal based upon a critical review of the literature. Prerequisite: STAT 130M or permission of the instructor.

NUCLEAR MEDICINE TECHNOLOGY Courses

NMED 300. Medical Terminology. 3 Credits. A course designed to cover the terminology and abbreviations used in the clinical sciences. Prerequisites: ENGL 110C or equivalent.

NMED 331. Fundamental Concepts in Nuclear Medicine Technology. 4 Credits. A course designed to cover the physical principles related to nuclear medicine technology. The methods and mathematics of radioactive decay, types of radiation, radiation interactions, origins of radionuclides, including SPECT and PET/CT radionuclides also presented. Prerequisites: PHYS 101N and PHYS 102N or equivalent.

NMED 332. Nuclear Instrumentation. 4 Credits. This course is designed to familiarize the student with the theory, operation and quality assurance associated with the instrumentation found in a typical nuclear medicine department. Prerequisites: NMED 331 or permission of program director.
NMED 335. Radiation Health. 3 Credits.
Discussions of radiation effects on cellular systems as well as guidelines for radiation protection and safe handling of radioactive materials in the nuclear medicine clinical setting. Prerequisites: NMED 331 or permission of the instructor.

NMED 401. Nuclear Medicine Technology I. 4 Credits.
A course designed to cover the nuclear medicine procedures and protocols of the gastrointestinal, genitourinary, central nervous, skeletal systems. Other current or emerging clinical nuclear medicine procedures are also covered. Prerequisites: BIOL 240 or BIOL 250 and BIOL 241 or BIOL 251 and NMED 331 or permission of the program director.

NMED 402. Nuclear Medicine Technology II. 4 Credits.
A course designed to cover the nuclear medicine procedures of the respiratory, cardiovascular and endocrine systems. Other current and emerging clinical nuclear medicine procedures and protocols are also presented. Prerequisites: NMED 401 or permission of the program director.

NMED 403. Radiopharmacy. 3 Credits.
This course is designed to cover the concepts and techniques related to the field of radiopharmacy for nuclear medicine technology practice. The production, preparation, uses and quality assurance of radiopharmaceuticals are presented. Prerequisites: NMED 331, CHEM 105N-CHEM 106N and CHEM 107N-CHEM 108N or equivalent or permission of the program director.

NMED 410. Nuclear Medicine and Molecular Imaging. 3 Credits.
This course covers the concepts, instrumentation and procedures pertaining to molecular imaging as related to nuclear medicine. Topics include: Positron Emission Tomography (PET), Computed Tomography (CT), PET/CT, Magnetic Resonance Imaging (MRI), and other emerging technologies. Cross-sectional anatomy and radionuclide therapy, including monoclonal antibodies are also discussed. Prerequisites: NMED 401 and NMED 402.

NMED 440. Clinical Nuclear Medicine Technology I. 8 Credits.
Clinical instruction in patient care, radiation safety, radiopharmaceutical administration, imaging and nonimaging techniques and quality assurance procedures. Prerequisites: admission to the program and permission of the program director.

NMED 450. Clinical Nuclear Medicine Technology II. 8 Credits.
Continued clinical instruction in diagnostic and therapeutic nuclear medicine procedures, including PET/CT. The correlation of nuclear medicine procedures is also presented. Prerequisites: NMED 440 and permission of the program director.

NMED 460. Clinical Nuclear Medicine Technology III. 8 Credits.
Advanced clinical instruction in diagnostic and therapeutic nuclear medicine procedures, including PET/CT. The correlation of nuclear medicine procedures is also presented. Prerequisites: NMED 450 and permission of the program director.

NMED 475W. Administration and Management in Nuclear Medicine Technology. 3 Credits.
This writing intensive course is designed to provide a review of the administration, management, policies, and practices relevant to nuclear medicine technology. The leadership, legal, ethical and planning aspects of operating a nuclear medicine department are covered. Prerequisites: Admission to the NMED program and a grade of C or better in ENGL 110C and ENGL 211C or ENGL 221C or ENGL 231C.

NMED 495. Special Topics in Nuclear Medicine Technology. 1-3 Credits.
A study of selected current topics in nuclear medicine technology. Prerequisites: permission of the program director.

NMED 497. Directed Study in Nuclear Medicine Technology. 1-3 Credits.
Directed study in a topic relevant to nuclear medicine technology. Prerequisites: Permission of the program director.