Medical Laboratory Science

DEGREE OFFERED

• Bachelor of Science in Medical Laboratory Science

The Degree Program

The B.S. in medical laboratory science has two tracks: Clinical laboratory science (http://medicine.hsc.wvu.edu/medical-laboratory-science) and Histotechnology (http://medicine.hsc.wvu.edu/Histotech). Clinical laboratory scientists are healthcare professionals educated in all aspects of clinical laboratory analysis, including test development, performance, and evaluation. Clinical laboratory scientists may work in many areas, including clinical chemistry, hematology, immunohematology, immunology, clinical microbiology, and molecular diagnostics.

Histotechnologists are healthcare professionals who are qualified through academic and applied science education and training to provide service, research, and management in histotechnology and areas related to anatomic pathology. Histotechnologists are integral to the success of the anatomic pathology department by performing routine and complex procedures to preserve and process tissue specimens for examination and diagnosis by a pathologist.

Practice settings for both clinical laboratory scientists and histotechnologists include hospital, clinic, public health, or private clinical laboratories; research, cytogenetic, pharmaceutical, or in-vitro fertilization laboratories; technical or sales representatives for medical manufacturers and suppliers; biotechnology, food, and cosmetic industries; and state or federal forensics laboratories.

Nature of Program

Students are admitted into either the clinical laboratory science or the histotechnology track within the medical laboratory science major after completing the pre-requisite courses at an accredited college or university. As students complete the pre-requisite courses, they may apply to the medical laboratory science major, typically during the sophomore year.

Within both tracks, the junior year (the first year of the professional curriculum) includes core and area-specific courses to introduce the student to the medical sciences and to prepare for the senior year curriculum. During the senior year (the second year of the professional curriculum), the student receives both didactic instruction and practical experience. Students receive practical experience at one or more of the affiliated hospital laboratories including:

• Ruby Memorial Hospital, Morgantown, WV
• Monongalia County General Hospital, Morgantown, WV
• West Penn Allegheny Health System, Pittsburgh, PA
• WVU Eastern Division which includes City Hospital, Martinsburg, WV and Jefferson Memorial Hospital, Ranson, WV
• Veterans Affairs Medical Center, Martinsburg, WV
• Excela Health which includes Westmoreland Hospital in Greensburg, PA and Latrobe Hospital in Latrobe, PA
• Charleston Area Medical Center, Charleston, WV
• United Hospital Center, Clarksburg, WV
• St. Clair Hospital, Pittsburgh, PA

Students must provide their own transportation and housing during the clinical rotations. Students assigned to the Eastern Division will participate in the rural rotation activities at this site.

The WVU medical laboratory science tracks in clinical laboratory science and histotechnology are accredited by the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS), 5600 N. River Road, Suite 720, Rosemont, IL 60018, and (773) 714-8880. Graduates of the clinical laboratory science program and the histotechnology program are eligible for certification by the Board of Certification of the American Society for Clinical Pathology (ASCP).

FACULTY

DIRECTOR OF MEDICAL LABORATORY SCIENCE AND CLINICAL LABORATORY SCIENCE PROGRAM DIRECTOR

• Beverly Kirby - Ed.D. (West Virginia University)

HISTOTECHNOLOGY PROGRAM DIRECTOR

• Kimberly Feaster - B.S. (University of Findlay)
ASSOCIATE PROFESSOR AND CLS MEDICAL DIRECTOR
- Peter L. Perrotta - M.D. (Pennsylvania State University)

CLINICAL ASSISTANT PROFESSOR AND HTL MEDICAL DIRECTOR
- Olukemi Esan - M.D. (West Virginia University)

ASSOCIATE PROFESSOR
- Kerry Harbert - M.A. (West Virginia University)

INSTRUCTOR
- Jane Wade - B.A. (West Virginia University)

ASSISTANT PROFESSOR
- Marianne T. Downes - PhD (The Catholic University of America)
- Abra L. Elkins - M.A. (West Virginia University)
- Jason V. Evans - PhD (West Virginia University)

ASSOCIATE PROFESSOR EMERITUS
- Barbara J. Gutman
- Mary Ellen Koenn
- Karen S. Long

ADJUNCT INSTRUCTOR
- Sharon Hall

Admission to the Pre-Medical Laboratory Science Major
Students in the pre-medical laboratory science major and direct admit students must meet the admission criteria of WVU. Pre-medical laboratory science students are advised by the Center for Learning, Advising, and Student Success. Medical laboratory science faculty advise direct admit students. Prospective students are advised to take mathematics, chemistry, and biology in high school.

Qualified applicants may enter the pre-medical laboratory science major at the beginning of any semester, however the professional curriculum begins the fall semester after the student is admitted to either the clinical laboratory science or histotechnology track. Admission to the pre-medical laboratory science major does not ensure admission to the medical laboratory science tracks in clinical laboratory science or histotechnology.

Pre-medical laboratory science students apply for admission into the junior year (first year in the medical laboratory science professional curriculum) before the second semester of the sophomore year in college. Fulfillment of the pre-requisites does not ensure admittance into either the clinical laboratory science or the histotechnology track.

PRE-REQUISITES

<table>
<thead>
<tr>
<th>English</th>
<th>3-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 101 &amp; ENGL 102 or ENGL 103</td>
<td>Introduction to Composition and Rhetoric and Composition, Rhetoric, and Research Accelerated Academic Writing</td>
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<table>
<thead>
<tr>
<th>Biology</th>
<th>8</th>
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<tbody>
<tr>
<td>BIOL 101 &amp; BIOL 103 or BIOL 115</td>
<td>General Biology and General Biology Laboratory Principles of Biology</td>
</tr>
<tr>
<td>BIOL 102 &amp; BIOL 104 or BIOL 117</td>
<td>General Biology and General Biology Laboratory Introductory Physiology</td>
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</table>

<table>
<thead>
<tr>
<th>Chemistry</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 115</td>
<td>Fundamentals of Chemistry 4</td>
</tr>
<tr>
<td>CHEM 116</td>
<td>Fundamentals of Chemistry 4</td>
</tr>
<tr>
<td>CHEM 233</td>
<td>Organic Chemistry 4</td>
</tr>
<tr>
<td>&amp; CHEM 235 or CHEM 231</td>
<td>and Organic Chemistry Laboratory Organic Chemistry: Brief Course 4</td>
</tr>
</tbody>
</table>
CHEM 234 & CHEM 236
or CHEM 231

Organic Chemistry
and Organic Chemistry Laboratory
Organic Chemistry: Brief Course

Mathematics (One of the following):

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>MATH 126A</td>
<td>College Algebra 5-Day</td>
</tr>
<tr>
<td>MATH 126B</td>
<td>College Algebra 4-Day</td>
</tr>
<tr>
<td>MATH 126C</td>
<td>College Algebra 3-Day</td>
</tr>
<tr>
<td>MATH 129</td>
<td>Pre-Calculus Mathematics</td>
</tr>
<tr>
<td>MATH 155</td>
<td>Calculus 1</td>
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Statistics

<table>
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<tr>
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<th>Title</th>
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</thead>
<tbody>
<tr>
<td>STAT 211</td>
<td>Elementary Statistical Inference</td>
</tr>
<tr>
<td>or ECON 225</td>
<td>Elementary Business and Economics Statistics</td>
</tr>
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</table>

GEF

Credits to satisfy foundations 4-7.

Total Hours 56-59

* CHEM 231 Organic Chemistry: Brief Course may be substituted for CHEM 233/235 and CHEM 234/236, however two semesters of organic chemistry are strongly recommended to better prepare for the professional curriculum.

Although not required for admission to the medical laboratory science tracks in clinical laboratory science and histotechnology, eight credits of organic chemistry, eight credits of physics, cell biology, and six credits of social sciences are suggested electives for those students interested in applying to medical, dental, or other graduate programs. In addition, a foreign language is recommended for students who plan to do graduate work.

Admission decisions are based upon the applicant’s grade point average, recommendations, interview, and documented ability to successfully complete full-time academic work. Applicants should have a minimum grade point average of 2.5 (cumulative and science). Applicants may be admitted on probation if their GPA (cumulative or science) is less than 2.5. Applicants with less than a 2.0 GPA, either cumulative or science, will not be admitted. A GPA of 2.5 or above does not ensure admission. Two letters of recommendation are required; at least one must be from a college science professor. A personal interview with the Medical Laboratory Science Admissions Committee is required. Admission of international students is in compliance with WVU regulations.

APPLICATION PROCEDURE

Each year the medical laboratory science division selects a limited number of applicants from the applications received for admission into the clinical laboratory science and histotechnology track. The application is available online after December 1.

There is an application fee for residents and non-residents. The application deadline is March 15 if the applicant expects to enter the program the following fall semester. If the class is not filled by those applications, the deadline may be extended until August.

Click the link below to view the corresponding track requirements and Suggested Plans of Study.

- Clinical Laboratory Science (p. 6)
- Histotechnology (p. 6)

GENERAL EDUCATION FOUNDATIONS

Please use this link to view a list of courses that meet each GEF requirement. (http://registrar.wvu.edu/gef)

NOTE: Some major requirements will fulfill specific GEF requirements. Please see the curriculum requirements listed below for details on which GEFs you will need to select.

General Education Foundations

<table>
<thead>
<tr>
<th>F1 - Composition &amp; Rhetoric</th>
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<tbody>
<tr>
<td>ENGL 101</td>
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<tr>
<td>&amp; ENGL 102</td>
</tr>
<tr>
<td>or ENGL 103</td>
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<tr>
<td>Introduction to Composition and Rhetoric and Composition, Rhetoric, and Research Accelerated Academic Writing</td>
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</table>

<table>
<thead>
<tr>
<th>F2A/F2B - Science &amp; Technology</th>
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</thead>
<tbody>
<tr>
<td>F3 - Math &amp; Quantitative Skills</td>
</tr>
<tr>
<td>F4 - Society &amp; Connections</td>
</tr>
<tr>
<td>F5 - Human Inquiry &amp; the Past</td>
</tr>
<tr>
<td>F6 - The Arts &amp; Creativity</td>
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</table>
Degree Requirements

Medical Laboratory Science Pre-Requisites

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 101 &amp; ENGL 102</td>
<td>Introduction to Composition and Rhetoric and Composition, Rhetoric, and Research</td>
<td>6</td>
</tr>
<tr>
<td>or ENGL 103</td>
<td>Accelerated Academic Writing</td>
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</tr>
<tr>
<td>BIOL 101 &amp; BIOL 103</td>
<td>General Biology and General Biology Laboratory</td>
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</tr>
<tr>
<td>or BIOL 115</td>
<td>Principles of Biology</td>
<td></td>
</tr>
<tr>
<td>BIOL 102 &amp; BIOL 104</td>
<td>General Biology and General Biology Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>or BIOL 117</td>
<td>Introductory Physiology</td>
<td></td>
</tr>
<tr>
<td>CHEM 115</td>
<td>Fundamentals of Chemistry</td>
<td></td>
</tr>
<tr>
<td>CHEM 116</td>
<td>Fundamentals of Chemistry</td>
<td></td>
</tr>
<tr>
<td>CHEM 233 &amp; CHEM 235</td>
<td>Organic Chemistry and Organic Chemistry Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>or CHEM 231</td>
<td>Organic Chemistry: Brief Course</td>
<td></td>
</tr>
<tr>
<td>CHEM 234 &amp; CHEM 236</td>
<td>Organic Chemistry and Organic Chemistry Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>or CHEM 231</td>
<td>Organic Chemistry: Brief Course</td>
<td></td>
</tr>
<tr>
<td>MATH 126A</td>
<td>College Algebra 5-Day</td>
<td>3</td>
</tr>
<tr>
<td>MATH 126B</td>
<td>College Algebra 4-Day</td>
<td></td>
</tr>
<tr>
<td>MATH 126C</td>
<td>College Algebra 3-Day</td>
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<td>MATH 129</td>
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<td>MATH 155</td>
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<td>or ECON 225</td>
<td>Elementary Business and Economics Statistics</td>
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GEF Requirements 4, 5, 6, & 7 12

First Year Studies Requirement

WVUE 191 First Year Seminar 1

Medical Laboratory Science Core Curriculum

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>MICB 323</td>
<td>Medical Microbiology/Lab</td>
<td>5</td>
</tr>
<tr>
<td>or MICB 200 &amp; PATH 323</td>
<td>Medical Microbiology and Medical Microbiology Lab</td>
<td></td>
</tr>
<tr>
<td>PATH 300</td>
<td>Introduction to Pathology</td>
<td>3</td>
</tr>
<tr>
<td>PATH 303</td>
<td>Clinical Lab Applications</td>
<td>2</td>
</tr>
<tr>
<td>PATH 320</td>
<td>Basic Clinical Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>PATH 380</td>
<td>Introduction to Immunology</td>
<td>1</td>
</tr>
<tr>
<td>PATH 381</td>
<td>Research and Educational Methodology</td>
<td>2</td>
</tr>
<tr>
<td>PATH 403</td>
<td>Community Service Practicum</td>
<td>1</td>
</tr>
<tr>
<td>PATH 465</td>
<td>Medical Laboratory Management</td>
<td>2</td>
</tr>
<tr>
<td>PATH 475</td>
<td>Medical Relevance (fulfills the Capstone requirement)</td>
<td>3</td>
</tr>
<tr>
<td>PSIO 441</td>
<td>Mechanisms of Body Function</td>
<td>4</td>
</tr>
</tbody>
</table>

There are two Tracks: Histotechnology or Clinical Laboratory Science 36

Histotechnology (43 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>NBAN 205</td>
<td>Introduction to Human Anatomy</td>
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</table>
PATH 200  Medical Terminology  
PATH 304  Histotechnology Microanatomy  
PATH 305  Staining Techniques 1  
PATH 306  Histotechnique 1  
PATH 405  Staining Techniques 2  
PATH 406  Histotechnique 2  
PATH 407  Histology Laboratory  
PATH 408  Histotechnologist Practicum  
PATH 409  Molecular Pathology for Laboratory Professionals  

### Clinical Laboratory Science (36 credits)  
PATH 310  Clinical Laboratory Mycology  
PATH 329  Clinical Chemistry 1  
PATH 340  Introduction to Hematology  
PATH 401  Phlebotomy  
PATH 420  Immunology and Blood Banking  
PATH 421  Immunohematology and Blood Banking Laboratory  
PATH 430  Clinical Chemistry 2  
PATH 431  Clinical Chemistry Laboratory  
PATH 440  Clinical Hematology  
PATH 441  Clinical Hematology Laboratory  
PATH 450  Clinical Microbiology  
PATH 451  Clinical Microbiology Laboratory  
PATH 470  Clinical Microscopy  
PATH 472  Urinalysis and Body Fluids Laboratory  
PATH 480  Clinical Immunology  
PATH 481  Clinical Immunology Laboratory  

**Electives**  

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Total Hours</strong></td>
<td><strong>120</strong></td>
</tr>
</tbody>
</table>

* CHEM 231 may be substituted for CHEM 233/235 and CHEM 234/236, however two semesters of organic chemistry are strongly recommended to prepare for the professional curriculum.

** PATH 100, PATH 101, PATH 200, and PATH 201 are required for Direct Admit students and highly recommended for Pre-Medical Laboratory Science students.

A minimum of 120 hours are required for graduation. However, students may have to take additional hours.

### Graduation Requirements  

#### JUNIOR YEAR  
Students must maintain a minimum grade point average of 2.5 throughout the program. Failure to maintain at least a 2.5 GPA (cumulative and science) may result in disciplinary sanctions. The Academic and Professional Standards Committee must recommend any student for advancement to the senior year. A satisfactory GPA does not ensure advancement.

#### SENIOR YEAR  
Students receive didactic and clinical instruction during the senior year which includes summer, fall, and spring semesters. Students must maintain a minimum grade point average of 2.5 (cumulative and science) for each semester of the senior year.

Graduation requires satisfactory completion of all academic work and the recommendation of the faculty of the School of Medicine. All first degree students are required to complete a total of 120 semester hours for the BS in Medical Laboratory Science degree. Any competencies not completed must be made up by the end of the school year (mid-May) or graduation may be delayed. Graduation is not dependent upon passing a national certification examination.
# Suggested Plan of Study for Histotechnology

## First Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 115 (GEF 8)</td>
<td>4 CHEM 116</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Select one of the following (GEF 3):</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>MATH 126A</td>
<td>Select one of the following (GEF 8):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 126B</td>
<td>BIOL 102 &amp; BIOL 104</td>
<td></td>
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</tr>
<tr>
<td>MATH 126C</td>
<td>BIOL 117</td>
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</tr>
<tr>
<td>Select one of the following (GEF 2):</td>
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</tr>
<tr>
<td>BIOL 101 &amp; BIOL 103</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>BIOL 115</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEF 4, 5, 6, or 7</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>WVUE 191</td>
<td></td>
<td>1</td>
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<tr>
<td></td>
<td><strong>15</strong></td>
<td><strong>14</strong></td>
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## Second Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 102 (GEF 1)</td>
<td>3 CHEM 234 &amp; CHEM 236</td>
<td>4</td>
<td></td>
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<tr>
<td>STAT 211 or ECON 225 (GEF 8)</td>
<td>3 GEF 4, 5, 6, or 7</td>
<td>3</td>
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<tr>
<td>CHEM 233 &amp; CHEM 235</td>
<td>4 Elective</td>
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<td>GEF 4, 5, 6, or 7</td>
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<tr>
<td></td>
<td><strong>13</strong></td>
<td><strong>9</strong></td>
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## Third Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
<th>Summer</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>PATH 300</td>
<td>3 MICB 323</td>
<td>5 PATH 305</td>
<td>4</td>
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<tr>
<td>PATH 320</td>
<td>3 NBAN 205</td>
<td>3 PATH 406</td>
<td>3</td>
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<tr>
<td>PSIO 441</td>
<td>4 PATH 381</td>
<td></td>
<td>2</td>
<td></td>
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<tr>
<td>PATH 380</td>
<td>1 PATH 304</td>
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<td>3</td>
<td></td>
<td></td>
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<tr>
<td>PATH 303</td>
<td>2 PATH 306</td>
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<td>3</td>
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<td>PATH 200</td>
<td>3</td>
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<td><strong>16</strong></td>
<td><strong>16</strong></td>
<td></td>
<td><strong>7</strong></td>
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## Fourth Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
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<tbody>
<tr>
<td>PATH 465</td>
<td>2 PATH 403</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>PATH 405</td>
<td>4 PATH 475</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>PATH 407</td>
<td>8 PATH 408</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>PATH 409</td>
<td>2</td>
<td></td>
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<tr>
<td></td>
<td><strong>16</strong></td>
<td><strong>14</strong></td>
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</table>

Total credit hours: 120

# Suggested Plan of Study for Clinical Laboratory Science

## First Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CHEM 115 (GEF 8)</td>
<td>4 CHEM 116</td>
<td>4</td>
<td></td>
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<tr>
<td>Select one of the following (GEF 3):</td>
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<td></td>
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<tr>
<td></td>
<td>3 ENGL 101 (GEF 1)</td>
<td>3</td>
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</tr>
</tbody>
</table>
MATH 126A
Select one of the following (GEF 8):

MATH 126B
BIOL 102
& BIOL 104

MATH 126C
BIOL 117

Select one of the following (GEF 2):
BIOL 101
& BIOL 103
BIOL 115

GEF 4, 5, 6, or 7
3

WVUE 191
1

15
14

Second Year

Fall | Hours | Spring | Hours
--- | --- | --- | ---
ENGL 102 (GEF 1) | 3 CHEM 234 & CHEM 236 | 4
STAT 211 or ECON 225 (GEF 8) | 3 GEF 4, 5, 6, or 7 | 3
CHEM 233 & CHEM 235 | 4 Electives | 6
GEF 4, 5, 6, or 7 | 3
Elective | 1

14
13

Third Year

Fall | Hours | Spring | Hours | Summer | Hours
--- | --- | --- | --- | --- | ---
PATH 300 | 3 PATH 340 | 3 PATH 440 | 3
PATH 320 | 3 MICB 323 | 5
PSIO 441 | 4 PATH 310 | 1
PATH 380 | 1 PATH 329 | 2
PATH 303 | 2 PATH 381 | 2
Electives | 2 PATH 472 | 1
PATH 470 | 1

15
15
3

Fourth Year

Fall | Hours | Spring | Hours
--- | --- | --- | ---
PATH 450 | 3 PATH 403 | 1
PATH 420 | 3 PATH 475 | 3
PATH 430 | 3 PATH 421 | 3
PATH 480 | 2 PATH 451 | 3
PATH 465 | 2 PATH 431 | 3
PATH 481 | 1 PATH 441 | 3
PATH 401 | 1

14
17

Total credit hours: 120

Major Learning Goals

MEDICAL LABORATORY SCIENCE

The mission of the medical laboratory science major at West Virginia University is to provide a high-quality education culminating in a Bachelor of Science degree that prepares laboratory professionals for their roles as members of the healthcare team in an environment of rapidly changing technology.

The goals of the program are to provide:
• a program in medical laboratory science which meets the academic standards of the University;
• Clinical Laboratory Scientists and Histotechnologists for medical (both urban and rural) laboratories, public health laboratories, research laboratories, and industry;
• an educational background which enables graduates to assume teaching and supervisory positions;
• an education background acceptable for graduate work in the sciences.

PATH 100. Medical Laboratory Science. 1 Hour.
Introduction to the profession of medical laboratory science and medical laboratory specialties. (Pass/Fail grading only).

PATH 101. Medical Laboratory Science 2. 1 Hour.
Continuation of PATH 100. (Pass/Fail grading only).

PATH 200. Medical Terminology. 3 Hours.
General medical terminology with emphasis on clinical and anatomic pathology terminology.

PATH 201. Basic Medical Laboratory Science. 1 Hour.
Basic techniques for the medical science laboratory and current issues related to the medical laboratory science profession. (Pass/Fail grading only).

PATH 300. Introduction to Pathology. 3 Hours.
A study of principles and processes of pathology from cellular to system, including etiology, pathogenesis, and clinical features of representative or commonly occurring disorders and diseases.

PATH 301. Basic Pathology. 2 Hours.
PR: Enrollment in dental hygiene or physical therapy, or consent. A study of the basic pathologic processes in man.

PATH 302. Oral Pathology. 3 Hours.
PR: PATH 301, and dental hygiene major, or consent. Application of fundamental knowledge of general pathology to pathological conditions that occur in the oral cavity.

PATH 303. Clinical Lab Applications. 2 Hours.
Lectures and laboratory experience on laboratory safety, measurement, use and maintenance of laboratory equipment, preparation, and storage of reagents and solutions, and basic laboratory techniques.

PATH 304. Histotechnology Microanatomy. 3 Hours.
Microscopic identification of the morphology of human cells, tissues and organ systems with relationship to structure and function.

PATH 305. Staining Techniques 1. 4 Hours.
A lecture and laboratory course focusing on the theory and methodology of routine and special staining and the basic principles, components and use of instruments in the histopathology laboratory.

PATH 306. Histotechnique 1. 3 Hours.
A lecture and laboratory course focusing on the principles and theories of routine histologic techniques and the basic principles, components and use of instruments in the histopathology laboratory.

PATH 310. Clinical Laboratory Mycology. 1 Hour.
How to isolate and identify the more commonly encountered pathogenic fungi as well as those fungi frequently seen as laboratory contaminants. The course will include basic taxonomy, isolation procedures, and identifying characteristics.

PATH 320. Basic Clinical Biochemistry. 3 Hours.
Introduction to basic biochemistry and human metabolism of amino acids, proteins, enzymes, carbohydrates, liquids, and nucleotides. Molecular biology and applications to the clinical laboratory are included.

PATH 323. Medical Microbiology Lab. 2 Hours.
PR: MICB 200. (For medical laboratory science students; other students with consent.) Emphasis is on clinical laboratory techniques and laboratory identification of pathogenic microorganisms.

PATH 329. Clinical Chemistry 1. 2 Hours.
Lectures in clinical chemistry analysis, clinical significance, clinical instrumentation, and implications of diagnosis.

PATH 340. Introduction to Hematology. 3 Hours.
Lectures and laboratory sessions to cover structure, morphology, and function of the cells of the blood, bone marrow and body fluids, with an overview of hematologic abnormalities.

PATH 380. Introduction to Immunology. 1 Hour.
Lectures in basic immunology, with emphasis on its structure and function. antigens, antibodies, and complement will be discussed and related to immune disorders and simple immunological tests.

PATH 381. Research and Educational Methodology. 2 Hours.
Lectures in ethics, techniques of research, and techniques of educational methodology for medical laboratory science students.

PATH 401. Phlebotomy. 1 Hour.
PR: PATH 303. Clinical laboratory practice, including venipuncture, finger sticks, and heel sticks; isolation, universal precautions and other safety techniques are included.
PATH 403. Community Service Practicum. 1 Hour.
PR: Senior year in medical laboratory science. Students will participate in approved community service activities. (Grading will be pass /fail.).

PATH 405. Staining Techniques 2. 4 Hours.
PR: PATH 305. A lecture and laboratory course focusing on the theory and methodology of immunohistochemistry.

PATH 406. Histotechnique 2. 3 Hours.
PR: PATH 306. A lecture and laboratory course focusing on the principles and theories of routine and advanced histologic techniques and the basic principles, components and use of instruments in the histopathology laboratory.

PATH 407. Histology Laboratory. 8 Hours.
This course consists of rotations in clinical and research histopathology.

PATH 408. Histotechnologist Practicum. 10 Hours.
Students will utilize their knowledge in routine and advanced histological techniques in a clinical setting.

PATH 409. Molecular Pathology for Laboratory Professionals. 2 Hours.
This course will provide students with an overview of the principles and applications of molecular techniques in pathology. A review of molecular and cancer biology will be included, and molecular pathways and biomarkers will be discussed with correlation to cancer types.

PATH 420. Immunology and Blood Banking. 3 Hours.
Lectures on immunohematology and blood banking theory and practice.

PATH 421. Immunohematology and Blood Banking Laboratory. 3 Hours.
Clinical laboratory practice in blood banking procedures. Emphasis on procedures required for collection and preparation of blood and blood components for transfusion, special techniques, antibody studies, and problem solving.

PATH 430. Clinical Chemistry 2. 3 Hours.
PR: MTEC 329 or PATH 329. Continuation of PATH 329, includes laboratory practice in methods of measurement.

PATH 431. Clinical Chemistry Laboratory. 3 Hours.
PR: PATH 329 and PATH 420. Application of clinical chemistry principles to laboratory medicine, to include routine and specialized procedures, specimen and result evaluation, and problem solving.

PATH 440. Clinical Hematology. 3 Hours.
Lectures in hematologic theory and practice, including coagulation and body fluids laboratory.

PATH 441. Clinical Hematology Laboratory. 3 Hours.
Application of hematological principles to laboratory medicine, including coagulation, urinalysis, and body fluids. Emphasis on routine and specialized procedures, evaluations, and problem solving.

PATH 450. Clinical Microbiology. 3 Hours.
Presentation and discussion of methodologies employed in the processing of clinical microbiology specimens, isolation, and identification of clinically significant microorganisms, and determination of antimicrobial susceptibilities with laboratory.

PATH 451. Clinical Microbiology Laboratory. 3 Hours.
Practice in the clinical microbiology laboratory to include isolation and identification of microorganisms, processing of specimens and antibiograms.

PATH 465. Medical Laboratory Management. 2 Hours.
Laboratory organization and principles of laboratory management.

PATH 470. Clinical Microscopy. 1 Hour.
The analysis of body fluids (urine, fluids, etc.) for abnormalities.

PATH 472. Urinalysis and Body Fluids Laboratory. 1 Hour.
PR OR CONC: PATH 470 or Consent. Clinical Laboratory principles and procedures used in analysis of urine and body fluids.

PATH 475. Medical Relevance. 3 Hours.
Case studies of pathologic entities encountered in the medical laboratory and a review of medical laboratory science. Student will complete and give an oral presentation of the Capstone experience and pass a comprehensive examination.

PATH 480. Clinical Immunology. 2 Hours.
PR: Open only to MLS majors. Lectures in principles of immunological and serological procedures, immunological diseases, and significance of laboratory methods for diagnosis.

PATH 481. Clinical Immunology Laboratory. 1 Hour.
Clinical laboratory practice in immunological procedures. Emphasis on basic serological techniques, protein analysis, molecular methods, and tissue typing.

PATH 490. Teaching Practicum. 1-3 Hours.
PR: Consent. Teaching practice as a tutor or assistant.

PATH 491. Professional Field Experience. 1-18 Hours.
PR: Consent. (May be repeated up to a maximum of 18 hours.) Prearranged experiential learning program, to be planned, supervised, and evaluated for credit by faculty and field supervisors. Involves temporary placement with public or private enterprise for professional competence development.
PATH 493. Special Topics. 1-6 Hours.
PR: Consent. Investigation of topics not covered in regularly scheduled courses.

PATH 494. Seminar. 1-3 Hours.
PR: Consent. Presentation and discussion of topics of mutual concern to students and faculty.

PATH 495. Independent Study. 1-6 Hours.
Faculty supervised study of topics not available through regular course offerings.

PATH 496. Senior Thesis. 1-3 Hours.
PR: Consent.

PATH 498. Honors. 1-3 Hours.
PR: Students in the Honors Program and consent by the honors director. Independent reading, study, or research.