BIOMEDICAL SCIENCE MAJOR: MEDICAL LABORATORY SCIENCES OPTION (B.S.)

https://colsa.unh.edu/molecular-cellular-biomedical-sciences/program/bs/biomedical-science-major-medical-laboratory

Description

The Biomedical Science: Medical Laboratory Science (BMS:MLS) program provides you with the medical knowledge and understanding of diagnostic testing needed for a fulfilling career in the biomedical sciences, including as an American College of Clinical Pathology-certified Medical Laboratory Scientist.

As a Biomedical Science: Medical Laboratory Science major, you will:

- learn to determine the presence, extent, or absence of human disease through understanding the diagnostic testing that medical professionals use to make these determinations (70% of physician decisions are based on diagnostic testing results)
- obtain hands-on experience by performing immunological, biochemical, molecular, and microbiological procedures that aid in the diagnosis, treatment, and prevention of disease

Unique features of the MLS option include:

- the only 4-year degree program in NH that includes a path for students to become certified as Medical Laboratory Scientists (MLS) by the American Society of Clinical Pathology (ASCP) and that is accredited by the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS)
- Certified Medical Laboratory Scientists are in high demand and easily find employment in hospitals and medical centers throughout the country
- the MLS program is affiliated with Dartmouth Hitchcock Medical Center and NorDx/Maine Medical Center

Careers or post-baccalaureate education of previous Medical Laboratory Science graduates include:

- certified medical laboratory scientists (ASCP) in diagnostic testing laboratories in hospitals and industry
- research scientists/laboratory technicians
  - biotechnology and pharmaceutical companies
  - biomedical research facilities
  - forensic laboratories
  - hospital reference laboratories
  - government public health laboratories
- secondary school educators (with additional coursework in education)
- diagnostic product development
- sales and marketing
- state and federal government agencies (e.g., U.S. Food and Drug Administration).

Requirements

Degree Requirements

Minimum Credit Requirement: 128 credits

Minimum Residency Requirement: 32 credits must be taken at UNH

Minimum GPA: 2.0 required for conferral*

Core GPA: 2.0 required for conferral*

Core Curriculum Required: Discovery & Writing Program Requirements

Foreign Language Requirement: No

All Major, Option and Elective Requirements as indicated.

*Major GPA requirements as indicated.

Major Requirements

The Medical Laboratory Sciences (MLS) program is NAACLS accredited and follows accreditation requirements. Students in this option take four Foundation courses, five Bioscience Core courses, six BMS:MLS core courses, and five Major Elective courses. One capstone experience, supervised and approved within the major, is required of all seniors. The capstone explores areas of interest based on the integration of prior learning. In addition, all other University academic requirements must be completed, including those for Discovery Program and the University Writing Requirement.

A grade of C-minus or above is required in BMS:MLS Core Courses.

Foundation Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CHEM 403</td>
<td>General Chemistry I ¹</td>
<td>4</td>
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<tr>
<td>CHEM 404</td>
<td>General Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 545</td>
<td>Organic Chemistry ²</td>
<td>5</td>
</tr>
<tr>
<td>&amp; CHEM 546</td>
<td>General Biochemistry and Organic Chemistry Laboratory ²</td>
<td></td>
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<tr>
<td>Select one of the following statistics courses: ³</td>
<td></td>
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<tr>
<td>BIOL 528</td>
<td>Applied Biostatistics I</td>
<td>4</td>
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<tr>
<td>or PSYC 402</td>
<td>Statistics in Psychology</td>
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<tr>
<td>or SOC 402</td>
<td>Statistics</td>
<td></td>
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<tr>
<td>or MATH 439</td>
<td>Statistical Discovery for Everyone</td>
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Bioscience Core Courses

<table>
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<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>BMS 508</td>
<td>Human Anatomy and Physiology II</td>
<td>4</td>
</tr>
<tr>
<td>GEN 604</td>
<td>Principles of Genetics</td>
<td>4</td>
</tr>
<tr>
<td>BMCB 658</td>
<td>General Biochemistry</td>
<td>5</td>
</tr>
<tr>
<td>&amp; BMCB 659</td>
<td>General Biochemistry Lab</td>
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Select one of the following:
BMS 503 General Microbiology 
& BMS 504 and General Microbiology Laboratory 
or BMS 501 Microbes in Human Disease 

Select one of the following:

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<tr>
<td>BMS 507</td>
<td>Human Anatomy and Physiology I</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 411</td>
<td>Introductory Biology: Molecular and Cellular</td>
<td>2, 4</td>
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1. CHEM 403 fulfills the Physical Science Discovery requirement.
2. Students applying to health profession schools need a full year of Organic Chemistry, a full year of introductory Biology, and a full year of English. CHEM 651/CHEM 653 and CHEM 652/CHEM 654 should be taken in place of CHEM 545/CHEM 546; ENGL 502 or ENGL 503 is suggested in addition to ENGL 401. See Pre-Professional Health Program Advising.
3. Statistics fulfills the Quantitative Reasoning Discovery requirement.
4. BIOL 411 fulfills the Biological Science Discovery requirement, Discovery Laboratory requirement, and the Discovery Inquiry requirement.

**BMS-MLS Core Courses**

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<tr>
<td>BMS 401</td>
<td>Professional Perspectives in Biomedical Sciences</td>
<td>1</td>
</tr>
</tbody>
</table>
| BMS 560  | Body Fluids 
& BMS 561 
and Body Fluids Laboratory | 4       |
| BMS 602  | Pathogenic Microbiology 
& BMS 603 
and Pathogenic Microbiology Laboratory | 5       |
| BMS 642  | Clinical Immunology and Serology 
& BMS 643 
and Clinical Serology Laboratory | 4       |
| BMS 650  | Molecular Microbiology | 4       |
| BMS 720  | Mycology, Parasitology, and Virology | 5       |

5. If BMS 721 is taken concurrently with BMS 720, it may count as one of the two required Laboratory Electives. However, BMS 721 is not a Major Elective course, so five Major Electives must still be completed, at least one of which includes a lab component, plus four additional Major Electives with or without lab.

**BMS-MLS Major Electives**

A total of five unique Major Electives is required. Two courses must have a laboratory component.

**Approved BMS:MLS Capstone Courses**

The capstone explores areas of interest based on the integration of prior learning. The capstone requirement may be satisfied through a course, created work or product, or some form of experiential learning (e.g., honors thesis, mentored research project, or other special student activity). Students may take more than one capstone course. Capstone completion is never displayed on Degree Works; your advisor will certify capstone completion at the time of graduation. Students must have 90 credits or more when completing their capstone requirement. Please see your advisor for information.
BMS 751  Advanced Clinical Microbiology Internship  5
BMS 752  Advanced Hematology Internship  5
BMS 753  Advanced Immunohematology Internship  5
BMS 754  Advanced Clinical Chemistry Internship  5
BMS 761  Clinical Microbiology Internship  20
BMS 790  Undergraduate Teaching Experience (2 semesters, including lab presentation or instruction)  1-4
BMS 795  Investigations in Biomedical Science  1-8
BMS 795W  Investigations in Biomedical Science  1-8
BMS 799  Senior Thesis (4 credit minimum)  1-4
BMS 799H  Senior Honors Thesis (4 credit minimum)  1-4
INCB 753  Cell Culture  5
INGO 790  Advanced Research Experience (4 credit minimum)  1-4

Other Internships  7

For a Capstone experience not listed above, such as an internship, submit a Capstone Experience Approval form prior to beginning the experience.

Degree Plan

SAMPLE Course Sequence for Medical Laboratory Science

First Year
Fall
BMS 401  Professional Perspectives in Biomedical Sciences  1
ENGL 401  First-Year Writing  4
BMS 507 or BIOL 411  Human Anatomy and Physiology I or Introductory Biology: Molecular and Cellular  4
CHEM 403  General Chemistry I  4
Discovery Course  4
Credits  17

Spring
BMS 508  Human Anatomy and Physiology II  4
CHEM 404  General Chemistry II  4
Statistics  4
Discovery Course  4
Credits  16

Second Year
Fall
BMS 503 & BMS 504  General Microbiology and General Microbiology Laboratory  5
GEN 604  Principles of Genetics  4
Discovery Course  4
Discovery Course  4
Credits  17

Spring
BMS 602 & BMS 603  Pathogenic Microbiology and Pathogenic Microbiology Laboratory  5
BMS 560 & BMS 561  Body Fluids and Body Fluids Laboratory  4
CHEM 545 & CHEM 546  Organic Chemistry and Organic Chemistry Laboratory  5
Major Elective  4
Credits  18

Third Year
Fall
Major Elective with lab  4-6
BMCB 658  General Biochemistry  5
& BMCB 659  and General Biochemistry Lab
BMS 650  Molecular Diagnostics  4
Credits  13-15

Spring
BMS 642  Clinical Immunology and Serology  4
& BMS 643  and Clinical Serology Laboratory
BMS 720  Mycology, Parasitology, and Virology  3
Major Elective with lab  4-5
Elective (any course)  4
Credits  15-16

Fourth Year
Fall
Major Elective (WI)  4
Major Elective (Capstone)  4
Discovery Course  4
Elective (any course)  4
Credits  16

Spring
Four Electives (any courses) or BMS 751, BMS 752, BMS 753, and BMS 754  16-20
Credits  16-20

Total Credits  128-135

Student Learning Outcomes

Core Knowledge

• Students will demonstrate an understanding of core knowledge in biochemistry, molecular biology, cell biology, genetics and biomedical sciences.

Biomedical Science: Medical Laboratory Sciences option

• Students will be able to correlate patient history, symptoms and laboratory test results with the diagnosis and treatment of clinical disease state
• Students will be able to interpret, analyze, and identify clinical laboratory results.
• Students will be able to define the mechanisms that give rise to human diseases and/or organ system dysfunction, including hypersensitivity, renal disease, acid-base disorders, etc.
• Students will be able to recognize risk factors for the development of disease
• Students will be able to identify and explain the underlying principle(s) of appropriate testing methodologies and assays for diagnosis of clinical diseases and organ system dysfunction.

Quantitative Literacy, Inquiry & Analysis

• Students will be able to apply the scientific method to examine experimental evidence and draw informed conclusions.
• Students will be able to use graphs to represent scientific data.
• Students will be able to apply statistical methods to interpret scientific data.

Critical Thinking & Problem Solving

• Students will be able to use data to troubleshoot an unexpected outcome.
• Students will be able to apply core knowledge to critically interpret scientific data.

Written Communication

• Students will demonstrate written skills to communicate scientific knowledge and experimental data.

Oral Communication

• Students will be able to demonstrate oral presentation skills to communicate scientific knowledge and experimental data.