

Proposal for a MS Program (Non-Thesis)
in
Medical Laboratory Science
Program Policy Statement

Presented to the Faculty Senate
University of Delaware Newark, DE 19716
By Esther E. Biswas-Fiss, Ph.D., MB(ASCP) Professor and
Chair
Department of Medical and Molecular Sciences

October 27, 2018

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This proposal requests approval for a non-thesis MS in Medical Laboratory Science (MLS). This degree will be offered through the Department of Medical and Molecular Sciences.

I. Program History and Description

A. Statement of purpose and expectation of graduate study in the program

The MS-MLS for science graduates program is an 66-credit blended (having both online, hybrid and face-to-face instruction) master's degree for individuals holding a **Bachelor of Science in biology, chemistry, or a related major and who are not certified medical technologists or medical laboratory scientists** but who desire a career in the clinical laboratory sciences. Upon completion, these individuals will be eligible to take a national examination for certification as a medical laboratory scientist. Through this degree, students will gain specialized, in-depth professional hands-on skills and leadership competencies preparing them to succeed within the increasingly clinical laboratory sciences sector. The MS in MLS will allow students to gain defined "bench-focused" technical competency, in addition to training in regulatory and fiscal affairs that impact laboratory management. Completion of this program, accredited by the National Accrediting Agency for Clinical Laboratory Science (NAACLS), will prepare students to perform clinical laboratory testing and to complete the national certification examination in Medical Laboratory Science, MLS(ASCP). Following graduation students can apply their knowledge to meet specific career goals whether it be clinical laboratory practice or management.

Benefits of pursuing MS in MLS include:

- Gaining a workforce ready, well-rounded and marketable technical skills geared for future employment
- Exposure to regulatory, fiscal and management aspects of laboratory practice
- Rapid and fixed time frame of degree completion (18 months)
- Internships integrated into the curriculum offer a leg up in the job market upon graduation
- Preparation to sit for the medical laboratory scientist board of certification exam

offered through the American Society of Clinical Pathology, MLS(ASCP)

Overarching goals of this program are to provide a highly-skilled cadre of leaders in the laboratory based professions. The new program aligns with the vision of the University of Delaware as a center for graduate level professional education and training.

Outcomes for the MS-MLS include the expectation that students will be able to:

- Apply the advanced knowledge and technical skills needed to serve as active contributors and/or leaders in the laboratory science professions;
- Critically review, appraise and synthesize the biomedical sciences literature;
- Identify and systematically investigate research questions pertinent to laboratory practice;
- Synthesize new concepts, models and theories through the appropriate application of empirical knowledge and the scientific method to help resolve clinical laboratory and health sciences issues or problems;
- Apply current knowledge to evaluate or design more effective ways to deliver clinical laboratory and health-related services;
- Use a variety of information technologies to address both theoretical and practical problems, enhance communication, and disseminate knowledge to applicable audiences and interest groups;
- Demonstrate proficiency in both oral and written communication, using both scholarly and technical formats;
- Work collaboratively with others to advance the scientific bases of knowledge in laboratory science via ongoing scholarship;
- Integrate basic principles of ethics and cultural sensitivity within all interpersonal and professional activities.

The proposed new program is compatible with the academic priorities of the University by supporting the initiative of creating a diverse and stimulating graduate academic environment. This new initiative aligns with the UD Path to Prominence *One Health Initiative* where the University desires to expand its graduate level health and medical education programs.

B. Current Status

This proposal requests approval for a non-thesis MS degree in Medical Laboratory Science that would launch in Spring of 2020.

C. Degrees Offered

MS degree in Medical Laboratory Science

II. Admission

Admission to the graduate program is competitive. Those who meet stated minimum requirements are not guaranteed admission, nor are those who fail to meet all of those requirements necessarily precluded from admission if they offer appropriate strengths.

The MS in Medical Laboratory Science program is not intended for those who are already certified medical technologists or medical laboratory scientists or who have completed a bachelor's degree in MLS. Such individuals should consider enrolling in the MS in Medical Sciences offered through the Department of Medical and Molecular Sciences, which is intended for those who have already completed a BS degree in a clinical laboratory based discipline. Questions regarding which MS degree program is appropriate should be directed to the Program Director for the MS in MLS.

Admission Requirements

Expected Minimum Requirements for Admission into the MS in Medical Laboratory Science - Admissions decisions are made by the Department of Medical and Molecular Sciences' Master's Program Committee. Students will be admitted to the program based on enrollment availability and their ability to meet the following minimum recommended entrance requirements:

- Successful completion of a Bachelor's degree, from an accredited academic institution, in a biomedical sciences based discipline, including, but not limited to: Biology, Chemistry, Biochemistry, Nutrition or Exercise Science.
- Students not having completed a BS in a science based discipline may be considered for admission provided they have completed the following science and math prerequisite course work: 16 credits of Biological Sciences including one

semester of Microbiology (a course in Immunology is strongly recommended); 12 credits of chemistry including one semester of organic chemistry; and 3 credits of college level math or statistics.

- Application is competitive and a minimum cumulative GPA of 3.0 is recommended.
- The GRE is not required.
- Completion of the TOEFL requirements are described in detail below for international applicants
- Written statement of goals and objectives (the personal statement) that clearly identifies the applicant's research and curriculum interests and explains how admission to the program will facilitate his/her professional objectives.
- Current résumé and two academic or professional letters of recommendation.

All students will be expected to be sufficiently conversant in English and knowledgeable in the written word to convey clear, logical and complex written expressions.

Specific Admission Procedures - Applicants must submit all of the following items directly to the University Office of Graduate Studies using the online admission process before admission can be considered. Admission applications are available at: <https://grad-admission.udel.edu/apply/>:

1. A nonrefundable application fee must be submitted with the application. Credit card payment is accepted with the online application. Checks must be payable to the University of Delaware. Applications received without the application fee will not be processed. International students paying by check must use a check drawn on a US bank or an International Postal Money Order.
2. Applicants must submit responses to specific questions asked on the application; a resume; and a statement of professional goals and objectives.
3. Applicants must submit at least two letters of recommendation. All letters of recommendation should be mailed directly to the Office of Graduate Studies.
4. One official transcript of all US colleges and universities attended must be sent directly

from the institution to the Office of Graduate Studies or be provided in a sealed envelope with the application packet. Students who have attended the University of Delaware need not supply a transcript from Delaware.

5. One official transcript of all non-US based college and university records is required. The transcript must list all classes taken and grades earned. If the transcript does not state that the degree has been awarded, send a degree certificate that states that the degree has been awarded. If the degree has not been awarded or the degree certificate has not been issued, evidence of the awarded degree must be provided prior to the first day of classes in the term of admission. For institutions that issue documents only in English, send the English original. For institutions that issue documents both in English and a foreign language, send both the English language original and the foreign language original. For institutions that issue documents only in a foreign language, send the foreign language original and a certified translation in English. The translation must be certified by an official of the issuing institution, a state- or court-appointed translator, or the Embassy of the issuing country in the United States.

If it is necessary to send non-original documents: a. The documents must be original “attested copies”, officially attested to by the issuing institution or the Embassy of the using country in the United States, and b. Certified translations must be originals, no copies will be accepted.

6. International student applicants must demonstrate a satisfactory level of proficiency in the English language if English is not the first language. The Test of English as a Foreign Language (TOEFL) is offered by the ETS in test centers throughout the world. The University requires an official paper-based TOEFL score of at least 550 or at least 79 on the Internet-based TOEFL for an applicant to be considered for admission. TOEFL scores more than two years old cannot be validated or considered official.

7. International students must be offered admission to the University and provide evidence of adequate financial resources before a student visa will be issued. The University has been authorized under federal law to enroll non-immigrant alien students. International students are required to purchase the University-sponsored insurance plan or its equivalent.

9. All first-time international students are required to attend the Orientation Day for new international students, which takes place before classes begin.

10. It is a Delaware State Board of Health regulation and a University of Delaware mandate that all graduate students with a birth date after January 1, 1957, be immunized for measles, mumps and rubella (MMR). Also, students may be required to provide evidence of PPD (Mantoux) Tuberculosis Screening Test within 6 months prior to beginning classes. Students who are admitted beginning January 2002 are required to show proof of vaccination against meningococcal disease unless granted a waiver. Students should refer to and complete the Student Health Service Immunization Documentation form upon admission.

Admission Application Processing - Applications will be processed as they are submitted. The admission process is completed as follows: First, completed applications consisting of the application form, academic transcripts, letters of recommendations, resume, and written statement of goals and objectives are reviewed by the Medical and Molecular Sciences' Master's Program Committee.

The Program Committee arrives at an admission decision after reviewing the completed application. Students are notified in writing of the admissions decision within two weeks of the decision. It should be noted, admission to the MS in Medical Laboratory Science does not confer admission to the Ph.D. in Medical Sciences, which is a distinct graduate program offered through the College of Health Sciences.

Application Deadlines

Applications will be taken on a rolling basis to allow for admittance in the Spring semester (only). Note: International applicant deadlines precede Domestic, US citizen applicants, due to additional timing requirements for obtaining an appropriate student VISA.

December 15 (International applicants)

January 15 (Domestic applicants, US citizens)

III. Academic

A. Degree Requirements

Table 1 - Degree Requirements	
Category	Semester Credit Hours
Core MLS Curriculum	43
Core MS Courses	9
Other (Specify, e.g., internships, clinical practica)	12
TOTAL	66

Medical Laboratory Science Core

Table 1 presents an overview of the sectors which make up the MS in MLS curriculum.

1. 43crs. of subjects specific to clinical laboratory science will be completed by students without a degree in medical laboratory science as part of the curriculum. This is necessary both for the student to be sufficiently knowledgeable about the profession to practice in a clinical laboratory setting, be eligible to sit for the ASCP Board of Certification Exam and to select a Capstone Project.
2. These courses are predominately laboratory courses. Competency in the various laboratory techniques is necessary to function within the clinical science laboratory. This requires that the student be able to attend courses at the UD campus.

Additional Required Courses

Students are required to complete 9 crs. of graduate level coursework which includes courses in research design, regulatory and fiscal issues in laboratory management and completion of a capstone project.

Masters Capstone (Contemporary Topics Research MEDT 815)

The student will complete a rigorous capstone project that 1) constructs a focused investigation of a clinical laboratory science problem in real-world setting, 2) applies problem solving methodologies for development and execution of solutions, 3) investigates and applies theory through practical implementation of a project, and 4) evaluates and reports this research project in a clear, professional manner using the guidelines set forth in the course syllabus.

Clinical Practica

1. Supervised clinical practice will include: clinical chemistry, hematology, microbiology, & immunohematology.
2. Supervised clinical practice (preceptorship) will involve 40 hours/week for 3 weeks per specialty area specified above for a total of 480 hours.

**Table 2 – Curriculum Sequence
(MLS Core, Masters Core Courses & Clinical Practica)**

Prefix and Number	Required Courses	SCH
Spring - Semester 1		
MEDT 607/617	Clinical Phys Chem I with lab	5
MEDT623/624	Hematology I with lab	3
MEDT628/629	Medical Micro with lab	5
MEDT609/619	Immunoheme I with lab	3
	Total Credits	16
Summer - Semester 2		
MEDT690	Clinical and Molecular Cell Biology (online)	3
MEDT 603	Research Design (online)	3
	Total Credits	6
Fall - Semester 3		
MEDT636	Clinical Physiological Chem II	3
MEDT637	Clinical Instrumentation	2
MEDT633/634	Hematology II with lab	4
MEDT620/621	Immunoheme II with lab	3
MEDT638/639	Diagnostic Bacteriology & Medical Mycology with lab	4
MEDT602/622	Body Fluid Analysis with lab	2
	Total Credits	18
Spring - Semester 4		
MEDT605	Regulatory and Fiscal Issues in Laboratory Management	3
MEDT627	Flow Cytometry	2
MEDT815	Contemporary Topics Research I	3
MEDT691	Human Molecular Genetics	3

MEDT692	Application of Molecular Diagnostic Techniques	3
	Total Credits	14
Summer - Semester 5		
MEDT673	Advanced Clinical Chemistry/UA Practicum	3
MEDT675	Advanced Clinical Hematology Practicum	3
MEDT677	Advance Clinical Microbiology Practicum	3
MEDT679	Advanced Immunohem Practicum	3
	Total Credits	12
	Credits For Degree	66

2. Residency Requirement. At least 5 semesters of graduate work are required for the MS degree. This residency requirement, by design will be for the MS degree be fulfilled using a spring, summer, fall, spring, summer semester combination.

3. Course Substitutions. Courses in the core curriculum may not be substituted. Transfer graduate coursework cannot count towards the degree.

4. Required Background Check. Clinical practical rotation/fieldwork sites that require a criminal background check, child abuse clearance and/or fingerprinting may deny a student's participation in the clinical experience, rotation because of a felony or misdemeanor conviction or a record of child abuse. Clinical sites may also deny participation in clinical experiences for other reasons, including but not limited to failure of a required drug test, or inability to produce an appropriate health clearance. As participation in clinical experiences is a required part of the curriculum and a requirement for graduation, denial of participation by a clinical site may result in delay of graduation or the inability to graduate from the program. Regardless of whether or not a student graduates from the University of Delaware, individuals who have been convicted of a felony or misdemeanor may be denied employment, certification or licensure as a health professional. Information regarding individual eligibility may be obtained from the appropriate credentialing bodies or health care facility.

B. Committees for exams, thesis or dissertations

N/A - the MS in MLS is a non-thesis MS degree.

C. Time Limit for Completing the Degree & Definition of Satisfactory

Academic Progress

1. Timetable. The time limit for completion of degree requirements begins with the date of matriculation and is specifically detailed in the student's letter of admission. Students entering the program are given 5 consecutive semesters, in the specific sequence outlined in the curriculum sequence (**Table 2**), to complete the program requirements. An extension of time limit may be granted for circumstances beyond the student's control. Requests for time extensions must be made in writing and approved by the director of the MS in Medical Laboratory Sciences Program Director. The director will forward the request to the Office of Graduate studies.

2. Submission of Required University Forms. To initiate the process for degree conferral, candidates must submit an "Application for Advanced Degree" to the Office of Graduate Studies. The application deadlines is May 15 for Summer candidates. The application must be signed by the program director and department chair. There is an application fee of for master's degree candidates that is published by the university. Payment is required when the application is submitted. Upon completion of the audit, the Office of Graduate Studies notifies students in writing when they have met all degree requirements.

3. Grade Requirements for Satisfactory Progress. Failure to satisfactorily progress in the program will be based on the University Graduate Policy as noted below: The Office of Graduate Studies monitors the academic progress of all graduate students and notifies students in writing of all academic deficiencies. The cumulative GPA after each 9-hour increment determines academic standing. The University's Academic Probation Policy is expressed in the following chart.

If student is on:

If a student is on	Earns a GPA of	The status becomes
Any status	3.0 or above	Clear
Clear	2.99-2.5	Warning
Clear	2.49-2.	Probation
Probation	Below 3.0	Dismissal
Warning	Below 3.0	Probation
Any status	Below 2.0	Dismissal

4. Reasons for Dismissal/Termination from the Program. The Office of Graduate Studies notifies students when they are dismissed from graduate programs without completing a degree. Dismissals usually take place at the end of a term. Students may be dismissed for the following reasons:

- Upon the expiration of the 18 month time limit required for students to complete their degree.
- Upon the failure to meet the grade point average requirements as stated in the policy on Academic Deficiency and Probation.
- University of Delaware policies for appeal of dismissal can be found at <https://grad.udel.edu/policies/graduate-academic-policies/>

5. Thesis/dissertation progress timetable guidelines – N/A (non-thesis)

6. Thesis/dissertation defense guidelines – N/A (non thesis)

IV. Assessment Plan and Program Evaluation

Faculty who will be affiliated with the program plan to work with the UD Center for Educational Effectiveness in spring 2019 to fully develop the program's assessment plan. This work will entail the development of a curriculum map to align selected courses with the intended learning outcomes of the program.

Direct Measures. Four Learning Outcomes have been identified for the program. Upon completion of the program, all students will:

1. Employ research methods to assess a problem in the field of medical science in an ethical manner. Course Assessed: MEDT 603 *Research Design*

2. Communicate research findings in an effective manner. Course Assessed: MED815

Contemporary Topics Research

3. Demonstrate the ability to quantitatively analyze data using several different statistical procedures. Courses Assessed: MEDT 603 *Research Design* and MEDT 815 *Contemporary Topics Research*

4. Evaluate and assess regulatory and fiscal situations encountered in laboratory settings and make best-practice, evidence based recommendations. Course Assessed: MEDT 605 *Regulatory and Fiscal Issue in Laboratory Practice*

Indirect Measures.

Alumni Surveys: One-Year, Three-Year and Five-Year Post-Graduation Surveys of graduates will be conducted one-year and five-year post-graduation. The surveys will focus on two major areas: program/education effectiveness and demographic information pertaining to employment status and/or graduate/professional school enrollment.

Field Experience Supervisor Surveys

Upon completion of the field experience(s), the field experience supervisor will complete a rubric designed to assess the affective & technical skills demonstrated by the student.

V. Financial Aid

This is a tuition generating graduate program and tuition remission and/or stipends are not offered. Graduate students in this program would be eligible to apply for financial aid as applicable.

VI. Departmental Operations

This program will start in the fall of 2019. We initially anticipate approximately 5-10 students following this course of study each year. Within the Department of Medical & Molecular Sciences a core of faculty currently exist, with expertise in medical laboratory science and the graduate core curriculum, to deliver this program. In addition, in MMSC department, a tenure-track faculty search is underway (2018) which will add an additional faculty member with expertise in the biomedical sciences. These faculty will have primary teaching responsibility for the delivery of this program (**Table 3**).

Table 3 - Current Faculty Affiliated with the Program

Name	Degree	Rank	Specialty
Frank Newton	Ed.D.	Senior Assoc. Dean	Administration
Esther Biswas-Fiss	MS, Ph.D.	Professor & Chair	Molecular Diagnostics & Biotechnology
Leslie Allshouse	M.Ed., M.B.A.	Senior Instructor	Immunohematology
Mona Batish	Ph.D.	Assistant Professor	Applied Molecular Biology
Subhasis Biswas	Ph.D.	Professor	Applied Molecular Biology
Karen Brinker	M.Ed.	Senior Instructor	Clinical Chemistry
Virginia Hughes	Ph.D.	Associate Professor	Hematology, Public Policy & Research Design
Donald Lehman	Ed.D.	Associate Professor	Medical Microbiology
Huey-Jen Lin	Ph.D.	Associate Professor	Molecular Diagnostics
Denene Lofland	Ph.D.	Associate Professor	Microbiology, Biotechnology/BioPharm
Vijay Parashar	Ph.D.	Assistant Professor	Applied Molecular Biology
Marie Wood	Ed.D.	Assistant Professor	Clinical Chemistry & Educational Best Practice

Graduate Coordinator. The MMS department chair will appoint a graduate coordinator for the Medical Laboratory Science Master's Program from among the department faculty. The term of service for the graduate coordinator is three years, with no limit on the number of consecutive terms that may be served. The graduate coordinator serves as the program representative and point person and is responsible for the following:

- Corresponding with prospective students
- Maintaining program records
- Holding elections for members of the Program Committee
- Chairing Program Committee meetings
- Admitting students to the program following approval of the Program Committee
- Chairing meetings of the MS-MLS faculty as necessary for review/revision of program policies and curriculum

- Final approval of degree granting

Program Committee. The Medical and Molecular Sciences Graduate Program Committee will consist of an affiliated faculty members from the department, serving in staggered, three-year terms. The graduate program coordinator will serve as chair of the Program Committee. Responsibilities of the Program Committee shall include:

- Admission of students into the program
- Approval of changes to the graduate curriculum
- Oversight of student progress in the program, including dismissal of students who fail to make satisfactory progress

MS in MLS Students

- A. **Student Organization.** Students in the program will be encouraged to periodically meet as a group so that the student representative can pass on any pertinent information from program meetings and so the group can discuss any issues or concerns they might have. Concerns can be brought to the attention of the program faculty by the elected student representative.
- B. **Laboratory Safety and Research Regulations and Standards of Student Conduct.** Graduate students performing laboratory diagnostic testing and/or research and are subject to all University regulations regarding safety, human subjects, animal use, and hazardous and radioactive material use and disposal. These guidelines may be found in the University of Delaware Policies and Procedures Manual. Additional information can be obtained from the UD Research and Graduate Studies website: <http://www.udel.edu/research/>
- C. **Travel.** Students will be encouraged to attend regional scientific meetings and symposia. Funding will be sought from available University/College/departamental funds should a student attend a conference for the purpose of presenting a peer-reviewed poster or to play a leadership role in the conference.

VII. Appendix

Letters of Support from the College of Health Science Administration, the Department of Biological Sciences & the University of Delaware Library

Appendix 1 – Letters of Support



The Tower at STAR
100 Discovery Blvd. – 7th Floor
Newark, DE 19713
Phone: 302-831-8370

October 23, 2018

Esther Biswas-Fiss, PhD
Department of Medical and Molecular Sciences
305 Willard Hall Education Bldg.
Newark, DE 19716

Dear Esther,

Please consider this a letter of enthusiastic support for the two proposals creating professions-based Master's programs in Medical Laboratory Science, and Applied Molecular Biology and Biotechnology.

These creative new degrees will offer students advanced training to better prepare them for jobs in the medical laboratory science and biotechnology fields. They will also help to alleviate workforce shortages in these sectors.

The College of Health Sciences will be pleased to provide the resources necessary to support these programs.

Sincerely,

A handwritten signature in dark ink that reads 'Kathleen S. Matt'.

Kathleen S. Matt, PhD
Dean, College of Health Sciences
Professor, Department of Kinesiology & Applied Physiology
ksmatt@udel.edu

HEALTH SCIENCES

www.udel.edu/chs



University of Delaware Library
VICE PROVOST FOR LIBRARIES AND MUSEUMS
AND MAY MORRIS UNIVERSITY LIBRARIAN

181 South College Avenue
Newark, DE 19717-5267
Phone: 302-831-2231
Fax: 302-831-1046

October 19, 2018

Memorandum

To: Esther E. Biswas-Fiss
Professor and Chair
Department of Medical and Molecular Sciences

From: Trevor A. Dawes
Vice Provost for Libraries and Museums
and May Morris University Librarian

I am responding to your request to supply information about the capability of the University of Delaware Library, Museums and Press to support two proposed graduate programs in the Department of Medical and Molecular Sciences. These programs are:

- Master of Science in Applied Molecular Biology & Biotechnology (MSAMBB)
- Master of Science in Medical Laboratory Science (MSMLS)

The existing online and print collections of the University of Delaware Library, Museums and Press, which are strong in the sciences and related interdisciplinary areas, are currently able to support these programs. However, no additional funding is available for new resources. Enclosed is a description of collections, resources and services available for this purpose.

I would be pleased to respond to any questions.

/nb

Enclosure

c: Kathleen S. Matt, Professor and Dean, College of Health Sciences

University of Delaware Library, Museums and Press
Susan A. Davi, Associate Librarian and Head, Collection Management and
Licensed Electronic Content Department
M. Dina Giambi, Associate University Librarian for Budget and Collections
Sarah E. Katz, Senior Assistant Librarian, Reference and Instructional Services Department,
and UDLib/SEARCH Training Coordinator
Sabine Lanteri, Senior Assistant Librarian and Science Liaison Librarian,
Reference and Instructional Services Department
Sandra Millard, Deputy University Librarian, Associate University Librarian for
Public Services and Outreach, and Program Director, UDLib/SEARCH
Carol Rudisell, Librarian and Head, Reference and Instructional Services Department

Faculty Senate
Karren Helsel-Spry, Administrative Assistant IV



DEPARTMENT OF
BIOLOGICAL SCIENCES
OFFICE OF THE CHAIR

University of Delaware
Newark, Delaware 19716-2590
Ph: 302/831-4296
Fax: 302/831-2281

E. Fidelma Boyd, Ph.D.
Professor and Interim Chair
Department of Biological Sciences
118C Wolf Hall
Telephone (302) 831-4296
E-mail: fboyd@udel.edu

TO: Faculty Senate Academic Affairs Committee
FROM: Professor E. Fidelma Boyd, Interim Chair
RE: Medical and Molecular Sciences, Letter of Support

October 29, 2018

Dear Faculty Senate Academic Affairs Committee,

The department is happy to support the two new Masters programs in Clinical Laboratory Science and in Applied Molecular Biology and Biotechnology for the College of Health Sciences.

Sincerely,

A handwritten signature in blue ink that reads "E. Boyd".

E. Fidelma Boyd
Professor and Interim Chair



October 19, 2018

Report on Library Services and Collections in Support of
Medical and Molecular Sciences

General Description

The University of Delaware Library, Museums and Press includes the Hugh M. Morris Library, where the main collection is housed; two branch libraries located on the Newark campus, the Chemistry Library and the Physics Library; and a third branch library, the Marine Studies Library, located in Lewes, Delaware. The Library collections parallel the University's academic interests and support all disciplines

Databases, full-text electronic journals and electronic books, books, periodicals, microforms, government publications, maps, manuscripts and media provide a major academic resource for the University of Delaware, the surrounding community, the state of Delaware and the nation. Library staff members provide a wide range of services.

The University of Delaware Library, Museums and Press is a U.S. depository library and a U.S. patent depository library and contains the complete file of every patent issued by the U.S. Patent and Trademark Office (USPTO).

The online catalog, DELCAT Discovery, provides access to millions of items by author, title, subject and keyword.

Library collections number over 2,720,000 and are broadly based and comprehensive. In 2016/2017, the Library Web <library.udel.edu/> received over 3,900,000 page views.

Specific Support for Applied Molecular Biology & Biotechnology and
Medical Laboratory Sciences

The Library's collections are strong and are able to support these proposed graduate programs. For many years, the Library has supported related graduate and undergraduate programs in biotechnology, bioinformatics, biology, chemistry, biochemistry, health sciences, and medical/laboratory science. The collections in these areas are excellent and continue to grow.

An experienced librarian, Sarah E. Katz (sekatz@udel.edu), Senior Assistant Librarian, Reference and Instructional Services Department, serves as the Library liaison to the Department of Medical Laboratory Sciences.

As Library liaison, Ms. Katz works with the Department to:

- Further develop Library collections, both print and electronic to support the teaching, learning and research needs of the Department
- Provide research support for faculty and students in a consultation setting
- Provide instruction in a classroom setting
- Serve as a resource for the information needs of the Department as they relate to the Library, Scholarly Communication, Open Access and other topics

Another science librarian has considerable expertise in related subject areas and can provide additional specialized services, as needed:

- Sabine Lanteri (slanteri@udel.edu) – Biological Sciences, Biomedical Engineering, Chemistry & Biochemistry, Chemical & Biomolecular Engineering

More than 200 research guides <guides.lib.udel.edu/> in all subject areas have been developed and are maintained by librarian liaisons. These research guides describe library resources and assist students in the research process. These guides introduce students to a wide array of useful resources including databases, eJournals, eBooks, reference materials, visual material and more. The librarians mentioned above are also available to work with faculty to develop research guides for specific courses within this program.

The Library subscribes to more than 400 online databases <library.udel.edu/databases/> which support research in all areas. Among the most important databases for the study and research of applied molecular biology, biotechnology, and medical laboratory science are: *Cochrane Library*, *PubMed*, *Scopus*, *Web of Science*, *Springer Nature Experiments*, *BIOSIS Citation Index*, *SciFinder Scholar*, *Compendex*, *TOXNET*, and *National Center for Biotechnology Information (NCBI)*.

The Library also provides online access to *Bates' Visual Guide to Physical Examination*, the *LWW Health Library* (anatomical sciences and physical therapy sections), *Lippincott Advisor*, and *Primal Pictures*, "the world's most detailed 3D model of human anatomy online." Access to *JoVE Video Journal* and *JoVE Science Education* is also available. These resources may be useful to students in this program.

In addition to its extensive print-based collections, the Library provides access to more than 100,000 electronic journals <library.udel.edu/ejournals/> and more than 670,000 electronic books <library.udel.edu/ebooks/>. Within the Library's eJournal collection, the sciences are particularly strong, including almost all the journals published by Elsevier, Springer, and Wiley as well as smaller publishers such as American Society for Microbiology, American Medical Association, American Society for Clinical Pathology, BioMed Central, PubMed Central, Oxford University Press, Nature, and Annual Reviews.

Esther E. Biswas-Fiss

October 19, 2018

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Within the eBook collection, online access to most books published by Springer from 2005-present is of particular importance. Other related eBooks are available from the NCBI Bookshelf, the Colloquium Digital Library of Life Sciences, National Academies Press, ProQuest Ebook Central, and EBSCOhost eBooks

The Library subscribes to *RefWorks*, a web-based citation management tool that can be used with most databases. Access to *EndNote Online* via the Library's *Web of Science* subscription is also available.

The Library has strong collections of film and video <library.udel.edu/filmandvideo/> which support study and teaching in all subject areas.

The Library has a nationally recognized Student Multimedia Design Center <library.udel.edu/multimedia/> which provides access to equipment, software, and training related to the creation of multimedia projects. The Student Multimedia Design Center includes over 80 workstations, six studios, and two hands-on instruction rooms focused on multimedia creation. University of Delaware users also may borrow a wide variety of multimedia equipment. Through its Multimedia Literacy program, the Student Multimedia Design Center provides instructional support for faculty seeking to incorporate multimedia into their assignments.

The Library also maintains an Institutional Repository <udspace.udel.edu/>, which archives research reports, documents, and other resources produced by University of Delaware faculty and students.



Trevor A. Dawes

Vice Provost for Libraries and Museums
and May Morris University Librarian