THE OHIO STATE UNIVERSITY

College of Medicine

Department of Biomedical Education and Anatomy

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May 31, 2017

W. Randy Smith, PhD
Vice Provost, Academic Programs
Office of Academic Affairs
203 Bricker Hall
190 North Oval Mall
Columbus, Ohio 43210

Dear Randy:

The College of Medicine's Department of Biomedical Education and Anatomy was approved by the Board of Trustees at the end of June 2016. In our proposal for the development of this department, we requested to move the Biomedical Science undergraduate major from the School of Health and Rehabilitation Science to the new department. This transition has been a smooth process and now that this has been accomplished we need to have the College of Medicine (as opposed to the School of Health & Rehabilitation Sciences) confer the Bachelor of Science in Biomedical Science. In addition, this is how we would like the diploma to read.

I attached and updated the original proposal for the Major and have included the most recent curricular guide. As a reminder, the first cohort graduated from BMS in 2009. Our graduation numbers are as follows: 2009: 12, 2010: 20, 2011: 14, 2012: 13, 2013: 15, 2014: 16, 2015: 16, 2016: 15, 2017: 12. TOTAL: 133. Our graduates have been very successful with most matriculating into medical schools across the country. Graduates have also been successful in gaining entry into other health professions schools as well as graduate and MD/PhD programs. The projected BMS enrollment for the 2017-2018 academic year is as follows: Freshmen: 26, Sophomores: 21, Juniors: 23, Seniors: 21. TOTAL: 91.

Please do not hesitate to reach out if you require any further information regarding this program.

Sincerely,

Daniel M. Clinchot, MD
Chair, Department of Biomedical Education and Anatomy
Vice Dean for Education
Associate Vice President for Health Sciences Education College of Medicine
The Ohio State University

DMC:sl

PROPOSAL

for

BIOMEDICAL SCIENCE MAJOR

I. GENERAL INFORMATION

1. Give the name of the proposed major.

Biomedical Science

2. State what degree students completing the major will receive.

Bachelor of Science in Biomedical Science

3. State the proposed implementation date.

Autumn 2017

4. Identify the academic units (e.g., department, college, etc.) responsible for administrating the major program.

Department of Biomedical Education and Anatomy, School of Biomedical Science, College of Medicine

II. RATIONALE/GOALS/OBJECTIVES

5. Describe the rationale/purpose of the major.

Biomedical research, graduate education in the biomedical sciences, and medical education are increasingly based on an integrative, multidisciplinary approach to disease. Within the College of Medicine, the PhD program in Biomedical Sciences and the MD curriculum reflect this approach and attract some of the finest students from around the country. The College of Medicine is in a position to continue to support this concept in an undergraduate major that provides a unique and challenging academic experience for students who wish to pursue careers in academic medicine, biomedical research, or other health-related professions.

This proposal sets forth a unique curriculum model in which very talented students are recruited to an undergraduate major that emphasizes significant exposure to research in addition to a multidisciplinary approach to the study of the biomedical sciences. While there are majors in biomedical science at other colleges and universities, this program is unique both in its selectivity, emphasis on research and integrated approach to the study of biomedical science, and involvement of undergraduate students within research and the academic environment of a college of medicine.

THE SCHOOL OF BIOMEDICAL SCIENCE (SBS) was formed in 1999 to represent the basic scientists in the College of Medicine from the departments of Biomedical Education and Anatomy; Biological Chemistry and Pharmacology; Biomedical Informatics; Cancer Biology and Genetics; Microbial Infection and Immunity; Neuroscience; and Physiology and Cell Biology. The mission of the SBS is to foster excellence in biomedical research and education in the Wexner Medical Center and Ohio State.

BIOMEDICAL RESEARCH in the Wexner Medical Center is increasingly focused upon a multidisciplinary approach to disease (https://medicine.osu.edu/research/Pages/index.aspx). Current centers and institutes include The Ohio State University Comprehensive Cancer Center; Dorothy M. Davis Heart and Lung Research Institute; Institute for Behavioral Medicine Research; Mathematical Biosciences Institute; Center for Microbial Interface Biology; Center for Regenerative Medicine and Cell Based Therapies; Primary Care Academic Institute; and Clinical Research Center. Faculty from the SBS and each of its departments support these research efforts. Students in the Biomedical Science major benefit from experiencing firsthand this collaborative environment throughout their undergraduate experiences.

GRADUATE EDUCATION within the Wexner Medical Center and the SBS has been combined into a single program, the Biomedical Sciences Graduate Program or BSGP (https://medicine.osu.edu/admissions/phdbs/Pages/index.aspx). The BSGP admitted its first class in summer 2001. When compared to the previous applicant pool of individual departmental programs, the number and quality of the students increased and included a significantly higher percentage of domestic applicants. The theme of the BSGP is “The Biology of Human Disease” and the program has a graduate faculty of 170 members in 19 departments. The students in the Biomedical Science major are located near the administrative and student center of the BSGP.

MEDICAL EDUCATION for the majority of students is a systems-based curriculum presentation that integrates normal and pathologic concepts from multiple disciplines within a content block. Emphasis on didactic lecture is significantly reduced and replaced with increased emphasis on small group learning. Students in the Biomedical Science major are in the same location that supports medical student education.

THE PURPOSE OF THE BIOMEDICAL SCIENCE MAJOR is to prepare graduates for post-baccalaureate entry into professional and graduate programs in the biomedical and health sciences. The major is intended for a small and select subset of students who have demonstrated a strong interest in and commitment to academic medicine or biomedical research. Academic medicine is comprised of physicians who practice the art of medicine and are active in research and education at all levels. The ideal outcome of the major is graduates who will become tomorrow’s leaders as academic physicians or biomedical researchers.

This major is designed to meet the requirements for the Bachelor of Science degree and builds on the coursework within the university in the natural and physical sciences, along with the other relevant coursework to complete the General Education (GE) requirements. This curriculum does not supplant other majors in the university that prepare graduates for medicine or research careers; rather, it offers an excellent opportunity for the university to provide another attractive academic program as an option to undergraduates. Within the curriculum, students are able to access the academic strength of the College of Medicine in the biomedical sciences and medicine to have a unique undergraduate curriculum. Key components of the major are as follows:

Administration

- The Department of Biomedical Education and Anatomy is located in the College of Medicine. The mission of the department if to foster excellence in training the next generation of the biomedical workforce. The Biomedical Science major is in alignment with this mission statement.

- Students have clear goals toward preparation for a career as a biomedical researcher or a clinician scientist; however, students can easily complete the prerequisites for medicine and other health-related programs (e.g., dentistry, nurse practitioner, occupational therapy, optometry, pharmacy, physical therapy, public health, veterinary medicine, etc.) while completing the Biomedical Science curriculum. This allows students additional flexibility if their career goals change. They can pursue other options in healthcare while still completing the Biomedical Science major and graduating in four years.

- The selection of students involves multiple steps. First, students must apply for freshman admission to Ohio State via the Common Application by the November 1st early action deadline. Next, students must submit the Biomedical Science Major Application by November 15th. This application seeks to learn more about why applicants want to do this major and their career goals. Further, information is sought on previous science opportunities pursued, such as summer research experiences and science fair projects.

  Many factors are considered when determining who will be selected for interviews, including academic performance in high school, strength of curriculum, grade point average, class rank, and standardized test scores. Other factors include past experiences with research and motivation for career in medicine and/or research as demonstrated by essay responses.

  In the interview, students are evaluated on their communication skills, maturity, and ability to articulate their career goals and why this major best prepares them to meet their goals. Admission offers are made after the interview phase. The goal is to admit high ability students who best

demonstrate an interest in research.

- Admission into the major is competitive, and some students who apply are not accepted. Because these are academically capable students, it is in the best interest of everyone to help these students find an acceptable major at Ohio State rather then attending another university. The administration and leadership of the Biomedical Science major work in tandem with the University Honors & Scholars Center and academic units to ensure these students find an acceptable major at Ohio State.

- Admitted students must meet the requirements for the Bachelor of Science in Biomedical Science in the College of Medicine. Students participating in the Honors Program must complete the college's honors requirements to graduate with an honors designation.

- Students are expected to maintain at least a 3.4 cumulative GPA. This is typically the minimum GPA to be competitive for most post-baccalaureate programs in the health sciences. Students who fall below a 3.4 GPA receive extensive counseling. In some cases, the student may have different goals which may still be achieved by completing the major in Biomedical Science and the student will remain in the major. If the GPA drops below 3.0, the student is counseled into another major.

- The program provides a close advisor/mentor relationship for each student throughout the time in the program. This support ensures that students have access to physician and research faculty in the College of Medicine and the Wexner Medical Center through presentations, service learning opportunities, etc. in addition to the requirements in the major. This advisor/mentor relationship follow students throughout their time in the major to ensure they are well prepared to make choices about post-graduate opportunities, able to obtain recommendations and support from faculty, and are prepared for the application process, including interview skill development.

- A program manager designated exclusively for the major is already in place and is responsible for recruitment, academic advising, career counseling, student programming, and teaching the Biomedical Science Survey course. Steven Mousetes, the current program manager since 2013, has more than 20 years of experience in higher education. His previous positions at Ohio State include serving as the Assistant Director for Honors in the University Honors & Scholars Center and the Coordinator of First-Year Experience and Academic Advisor in the College of Nursing.

New Coursework

- Several courses have been developed specifically for the students in the Biomedical Science major. These courses are kept to a small enrollment, taught by faculty within the College of Medicine, and designed to be challenging academic experiences with a goal to improving higher order skills.

- Each student in the major is required to complete a minimum two year research experience in a supervised clinical or basic research setting. The junior year Biomedical Science curriculum is structured around the students' research experiences. In this two course sequence, assignments are made to assure that students acquire advanced research skills and are able to communicate these in oral and written form to their peers and faculty. During their junior year, students are expected to present at the Denman Undergraduate Research Forum and/or Trainee Research Day.

- During the senior year, students are enrolled in a three-course Special Topics series. The topic of the course can vary each semester but focus on a disease or disease process that is the subject of a current research theme being conducted at the Wexner Medical Center. Using the research topic as a framework, faculty from each of the departments in the School of Biomedical Science provide multidisciplinary expertise to bring the unique content and perspectives of each of the disciplines to the problem.

- The major includes two interdisciplinary courses from the College of Medicine, building on essential knowledge important for a career in medicine or biomedical science. The courses are entitled, "Concepts in Healthcare." The first course focuses on the humanistic aspects of healthcare, including social and personal perspectives, cultural diversity, and healthcare disparities. The second course addresses policy and regulatory issues in healthcare and biomedical science, including research funding, healthcare reform, and public health.

- In addition to prerequisite and GE requirements, the curriculum requires advanced science coursework in the College of Medicine. However, the curriculum has been made flexible enough to allow students ample opportunity to take coursework that will meet their individual needs.

6. State the general and specific educational goals and objectives of the major.

The overall goal of the Biomedical Science major is to prepare graduates who:

- are prepared for success in a professional or graduate program in the health sciences. The Biomedical Science major serves as an excellent undergraduate preparation for graduate study in non-health areas, such as, business, engineering, or law.

- possess the motivation to pursue graduate/professional education in biomedical research and/or the health sciences and be a leader in improving the nation's healthcare delivery system.

- have the ability to acquire and evaluate information from a wide data source as it relates to complex problems.

- have the ability to think critically, communicate effectively, work collaboratively, and function comfortably in various cultural, political, and social environments within the context of healthcare and the biomedical sciences.

- are sensitive to the humanistic aspects of healthcare and healthcare-related services.

- possess knowledge and skills that are fundamental to the formulation, conduct, and reporting of clinical or basic science research.

- appreciate and value the importance of research and the advancement of knowledge for the progress of society.

- adapt to challenges and opportunities by bringing a wide knowledge base to problem solving tasks, and who integrate life-long learning into all phases of life.

- have a knowledge of policy issues related to healthcare and the interaction of social, political, and environmental factors that impact the field.

- are prepared to enter the workforce in areas such as pharmaceutical sales, forensic science labs, genetics labs, and other entry-level lab positions.

7. Identify any unique characteristics or resources that make it particularly appropriate for Ohio State to offer the proposed major.

The quality of Ohio State's medical education and academic medical center make it particularly appropriate for to offer the Biomedical Science major. The curricula in the MD program and the BSGP are taught to emphasize the integration of basic and clinical sciences, and the importance of active learning and teamwork to solve complex problems. Because College of Medicine faculty teach at all educational levels, advances in educational methods are used with

the undergraduates, making them more prepared for the type of classroom experience they will encounter in their professional and graduate programs.

Having the established BSGP in the School of Biomedical Science is another reason Ohio State is a distinctive strength for offering this major. Undergraduates reap the rewards of being immersed in the same setting as the graduate students. They use the same classrooms, work together in the same labs, and learn from the same faculty. Although the faculty and researchers serve in the traditional mentor capacity, the BSGP students can enhance the undergraduates' experience by serving as peer mentors.

The major is quite focused in that it graduates highly talented students who are clearly dedicated to entering post-baccalaureate programs in biomedical research and the health sciences. The university offers strength in the liberal arts and sciences, and the College of Medicine and the Wexner Medical Center have nationally recognized educational and research programs in medicine and biomedical sciences. Bringing these resources together creates a unique curriculum dedicated to meeting the educational goals of these students.

It should be emphasized that the academic, research, and clinical enterprise within the College of Medicine and Wexner Medical Center is one of the largest in the United States with funding and revenues of over one billion dollars annually. It includes almost 1,500 faculty members, more than 800 students pursuing medical degrees, and approximately 1,200 students enrolled in undergraduate and graduate programs in the School of Health and Rehabilitation Sciences. Because of its unique academic, research, and clinical mix, the College of Medicine is in an excellent position to provide the coursework and educational experiences for the Biomedical Science major.

8. Cite the benefits for students, the institution, and the region or state.

The Biomedical Science major provides many specific benefits to accepted students. Biomedical Science students are immersed in the multidisciplinary, integrated approach to human disease that mirrors the biomedical research enterprise and graduate/medical student education. Their home location within the Department of Biomedical Education and Anatomy provides easy access to College of Medicine faculty and research opportunities in the Wexner Medical Center. Students graduate from a challenging curriculum, sufficient to prepare them for admission to any post-baccalaureate program in the health sciences. Within the curriculum, students have a minimum two year supervised research experience that provides the skills and appreciation of clinical and basic science investigation. Coursework in the major stresses independent learning, teamwork to solve complex problems, and oral and written communication skills that can be applied in any career choice. Minors outside of the sciences and a diversity of non-science coursework are strongly encouraged. Biomedical Science classes are small and mentoring relationships with College of Medicine faculty are emphasized. Over the time in the major, this highly individualized approach results in students developing strong support networks among their peers and in

the College of Medicine and Wexner Medical Center that are invaluable in facilitating application and acceptance to post-baccalaureate programs.

The benefits to Ohio State are significant. The Biomedical Science major enrolls a relatively small number of students (~26 per cohort) each year; however, these students increase the number of high ability students enrolled in science and honors courses at all levels, and, in particular, those required for the major. The College of Medicine places significant resources to widely advertise the major and recruit these students and, in this process, Ohio State certainly benefits. The university must continually compete with other colleges and universities to attract the best academic talent. This major highlights an area of excellence within the university and creates an opportunity for undergraduate students interested in healthcare and research as a career. The more successful the major is, the more the university as a whole benefits. Potential students who only have an interest in Ohio State because of the Biomedical Science major make a campus visit that will educate them on the university as well as the major. Although some of the students may not find a fit in the Biomedical Science major as they learn more about it, they may find an unexpected fit with the university and enroll at Ohio State in another major. Any major or program that brings more high ability students to campus for a visit helps the entire university community. The university benefits considerably through the increased visibility provided by the major and the high quality of the undergraduates recruited.

9. List similar majors offered in both public and private institutions in Ohio and the U.S. Explain how these majors compare to the one proposed.

There are 85 College's and Universities that now offer a Biomedical Science undergraduate major. However at the time of the creation of this major there were no similar majors in the state of Ohio. At that time However, none of these schools had their biomedical science programs housed in a college of medicine, none had a research requirement, and none offer the multidisciplinary coursework that Ohio State's Biomedical Science major does. Therefore, these other programs are not considered to be comparable programs. The uniqueness of the Biomedical Science allows Ohio State to be a benchmark institution for providing this educational experience to motivated and highly qualified students.

10. Cite the enrollment patterns of similar majors in Ohio or in the United States.

As this is an established degree our enrollment for 2017-2018 is as follows: Freshmen: 26, Sophomores: 21, Juniors: 23, Seniors: 21. TOTAL: 91. We have had no difficulty in achieving enrollment targets since the degree has been offered.

11. Describe career opportunities and/or opportunities for graduate or professional study available to persons who complete the major.

The Biomedical Science major is geared primarily for students who have a clear goal toward graduate or professional study, particularly related to the health sciences. The formal experiences (courses and research) and informal experiences (seminars, mentoring, and advisement) specifically "track" students in the major toward these goals. As noted previously, the major allows the flexibility for students to complete prerequisite courses for any graduate-level health professions program, including dentistry, nurse practitioner, occupational therapy, optometry, pharmacy, physical therapy, public health, and veterinary medicine.

An emphasis of the program is to provide the curriculum and the individualized support so that each student has a solid network of faculty and staff relationships to assist with applications, making decisions regarding research interests for a graduate program, or, perhaps, merging these opportunities toward an MD/PhD program and a career in academic medicine.

For the students who choose to enter the workforce, this major provides them an intellectual background for a variety of careers, including those that require analytical skills, critical thinking skills, and communication skills. Specific jobs could include, but are not limited to health consulting, technical writing, pharmaceutical sales, and entry-level work in genetics labs or forensic science labs. However, the primary output goal is to place graduates into a variety of post-baccalaureate programs across the county.

12. Describe any licensure or certification for which this major will prepare students.

This major does not prepare students for any field that requires licensure or certification.

III. RELATIONSHIP TO OTHER PROGRAMS

13. Describe current major and minor programs in the department(s) and how they relate to the proposed major.

There are no similar majors or minors in the College of Medicine, the School of Biomedical Science, or the School of Health and Rehabilitation Sciences. The Health Sciences major has quite different goals and is designed to attract other types of students.

14. Identify any overlaps with other programs or departments within the University. Append letters of concurrence or objection from related units.

The College of Arts and Sciences provides much of the pre-med coursework (e.g., biology, biochemistry, chemistry, organic chemistry, and physics) students must complete in conjunction with any undergraduate major. The coursework for students entering the Biomedical Science major includes pre-med requirements; further, students take appropriate coursework within the College of Arts and Sciences fulfill GE requirements. Pre-med students, regardless of their major,

take similar classes the first two years of college in preparation for the Medical College Admission Test (MCAT). These first two years of pre-med courses largely mirror the first two years of several majors in the natural sciences. The Biomedical Science major is not redundant to any course of study in the university and takes advantage of the unique curriculum opportunities available within the College of Medicine.

Undergraduate students from a variety of academic majors currently participate in Wexner Medical Center research labs. The major does not compromise the research opportunities for students in other colleges at Ohio State.

15. Indicate any cooperative arrangements with other institutions and organizations that will be used to offer this major.

Currently, there are no other cooperative arrangements related to this major.

16. Specify any articulation arrangements (direct transfer opportunities) with other institutions that will be in effect for the major.

There are no articulation agreements in place for this major.

17. Provide information on the use of consultants or advisory committees in the development of the major. Describe any continuing consultation.

A number of faculty in the College of Medicine have provided critical consultation on the curriculum. The Executive Curriculum Committee of the College of Medicine plays an ongoing role in the refinement of the Biomedical Science major.

18. Indicate whether this major or a similar major was submitted for approval previously. Explain at what stage and why that proposal was not approved or was withdrawn.

This major was submitted and approved in 2005 as the Biomedical Science major with a Bachelor of Science in Allied Health Professions. In 2012, the name of the School of Allied Medical Professions changed to the School of Health and Rehabilitation Sciences. Thus, the degree name changed to Bachelor of Science in Health and Rehabilitation Sciences.

19. Indicate where students will be drawn from, e.g., existing academic programs, outside of the university, etc. Estimate the mix of students entering the major internally and externally.

Recruitment is done in coordination with other departments on campus, such as Undergraduate Admissions, the University Honors & Scholars Center, and the Office of Diversity and Inclusion. All prospective students wanting to learn about the Biomedical Science major are asked to participate in a visit coordinated by Undergraduate Admissions. This ensures that students interested in the Biomedical Science major are aware of the freshman admission process to the

university, given an overview of the university as a whole, and exposed to all the majors the university has to offer.

Students are admitted as freshmen directly into the Biomedical Science major via a competitive admissions process. Factors for admission include previous experience with research, high school coursework and grades, extra curricular activities, communication skills, and standardized test scores. It is expected that all students enter the program as first semester freshmen. The primary recruitment goal of this major is to directly admit as incoming freshman the most academically capable high school seniors.

Students not admitted to the major are handled in a number of ways. Currently, the Colleges of Engineering, Business, Education, and Pharmacy have admission criteria for direct enrollment. Students who do not meet the admissions criteria can be placed in University Exploration. However, given the caliber of these students, extra steps are taken to try and keep them at Ohio State. For students who are admitted to the Biomedical Science major and decide later that this is not the program they want or for students who are not able to maintain the required grade point average for continuance in the major, there are a variety of ways in which they are assisted, depending upon the individual situation. Students interested in pursuing another major are given contacts in the appropriate college or department and support toward setting an advising appointment. If a student does not know what career or major he/she wants to pursue, counseling with a member of Career Counseling and Support Services in the Younkin Success Center is recommended.

It needs to be emphasized that the Biomedical Science major allows any student to complete all the necessary requirements to make application to any of the post-graduate programs in the health sciences. Thus, as a student considers possible curriculum alternatives, it is stressed that this major offers more career opportunities than medicine and biomedical research.

VI. STUDENT ENROLLMENT

20. Indicate the number of students you anticipate will be admitted to the major each year.

Approximately, 26 students enter the major as incoming freshman. It is expected that some of the 26 students admitted each year will voluntarily change majors, not maintain the minimum GPA for continuance in the major, and transfer to another university. The goal is to graduate 20 students from the major annually.

V. REQUIREMENTS

21. List the courses (department, title, credit hours, description) which constitute the requirements and other components of the major. Indicate which courses are currently offered and which will be new. Append a semester-by-semester sample program and all New Course, Course

Change, and Course Withdrawal forms necessitated by the implementation of the proposed major.

For the current coursework required to the complete the Biomedical Science major, please see the attached curriculum guide.

22. State the minimum number of credits required for completion of the major.

The minimum number of credits required for this academic major is 122. This includes GE requirements, required prerequisites or supplements to the major beyond those included in the GE's, core requirements, and directed electives within the major.

23. State the average number of credits expected for a student at completion of the major.

A typical student has a minimum of 122 hours for completion of the Biomedical Science major. However, many students enter Ohio State with credits already earned (e.g., AP credit, post-secondary enrollment coursework, placement test credit, etc.) These types of credits may cause students to exceed the 122 minimum hours required for graduation.

24. Give the average number of credits taken per semester by a typical student. Estimate the average for each year.

In general, students 14-17 credit hours per semester. Assuming full-time status, students enroll for 30-33 hours per academic year (autumn and spring semesters).

	Year 1	Year 2	Year 3	Year 4
Full-time	30	31	33	28

25. Give the number of credits a student is <u>required</u> to take in other departments.

Students take extensive coursework in other departments to meet GE requirements, prerequisites, and supplements to the major. For example, students take at 10 hours or general chemistry, 8 hours of biology, 10 hours of organic chemistry, 10 hours of physics, and 10 hours of calculus.

26. Give the number of credits a typical student might take as electives in other departments.

Students complete at least 16 credit hours free, advanced science electives from a variety of approved departments:

Anatomy
Biochemistry
Biological Chemistry and Pharmacology
Biomedical Sciences Graduate Program

Biomedical Informatics
Cancer Biology and Genetics
Chemistry
Evolution, Ecology and Organismal Biology
Microbiology
Molecular Genetics
Neuroscience
Physiology and Cell Biology

27. Describe other major requirements in addition to course requirements, e.g., examinations, internships, final projects.

The major includes a key academic experience. Students are required to participate in a two year research experience under the mentorship of a faculty member in the College of Medicine.

28. Identify from which specialized professional association(s) accreditation will be sought. List any additional resources that will be necessary to gain such accreditation.

This major does not require any specialized accreditation.

29. Describe the number and qualifications of full-time and part-time faculty. List current faculty and areas of expertise. Describe the number and type of additional faculty needed.

The faculty for the 2016-2017 academic year and the courses they instructed are as follows:

Freshman Courses

Biomedical Science Survey (BIOMSCI 1100)
Instructor: Steven Mousetes, MEd, MLS
Biomedical Science Program Manager, Biomedical Education and Anatomy

Mastering the Biomedical Literature I (BIOMSCI 2891H)
Instructor: Stephanie Schulte, MLIS
Associate Professor, Health Science Library

Sophomore Courses

Mastering the Biomedical Literature II (BIOMSCI 2892H)
Instructor: John Gunn, PhD
Professor, Microbial Infection and Immunity

Biomedical Science Laboratory Techniques (BIOMSCI 2900H)
Instructors: Samir Acharya, PhD
Senior Research Scientist, Cancer Biology and Genetics

Ioan Beldean, MA

Research Associate I, Health Sciences Administration

John Gunn, PhD
Professor, Microbial Infection and Immunity

W. James Waldman, PhD
Associate Professor, Pathology

Junior Courses

Biomedical Science Research Experience I (BIOMSCI 3891H)
Instructors: Anthony Brown, PhD
Professor, Neuroscience

Andrew Fischer, PhD
Professor, Neuroscience

Traci Wilgus, PhD
Associate Professor, Pathology

Biomedical Science Research Experience II (BIOMSCI 3892H)
Instructors: Anne Strohecker, PhD
Assistant Professor, Cancer Biology and Genetics

Amanda Toland, PhD
Associate Professor, Cancer Biology and Genetics

Noah Weisleder, PhD
Associate Professor, Physiology and Cell Biology

Senior Courses

Concepts in Healthcare I: Humanistic and Social Issues in Medicine and Biomedical Science (BIOMSCI 4200H)
Instructors: C. Alexander Grieco, MD
Assistant Professor-Clinical, Biomedical Education and Anatomy

Concepts in Healthcare II: Introduction to Health Policy and Leadership in Healthcare (BIOMSCI 4210H)
Instructor: Andrew Thomas, MD, MBA
Associate Professor-Clinical, General Internal Medicine

Special Topics in Biomedical Science I: Immunology and Infectious Disease (BIOMSCI 4810H)
Instructors: Jesse Kwiek, PhD
Associate Professor, Microbial Infection and Immunity

Jordi Torrelles, PhD
Associate Professor, Microbial Infection and Immunity

Special Topics in Healthcare II: Genetics and Neurological Disease (BIOMSCI 4820H)
Instructors: Candice Askwith, PhD
Associate Professor, Neuroscience

Kirk Mykytyn, PhD
Associate Professor, Biological Chemistry and Pharmacology

Special Topics in Healthcare III: Cancer Research (BIOMSCI 4830H)
Instructor: Pawan Kumar, PhD
Research Assistant Professor, Otolaryngology

30. Describe existing facilities, equipment, and off-campus field experiences and clinical sites to be used. Indicate how the use of these facilities, equipment, etc., will impact other existing programs.

Adequate educational facilities (classrooms and labs) are available within the College of Medicine and Wexner Medical Center. All Biomedical Science courses are taught in Graves Hall. Some courses are enhanced by using the Clinical Skills Education and Assessment Center in Prior Hall. Office space for the faculty director and program manager is allocated.

31. Describe additional university resources, including libraries that will be required for the new major.

No new additional resources are needed for this major. Students utilize current resources, including the John A. Prior Health Sciences Library.

32. Describe the major as it would appear in the appropriate college bulletin.
The Biomedical Science undergraduate major in the College of Medicine is designed for students who wish to pursue a career in biomedical research and/or health sciences field. Graduates will complete a curriculum that includes coursework related to the health sciences, research, and biomedical science.

Curriculum Guide

Biomedical Science Major

Class of 2021

Summer 2017

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General Notes

1. Full time enrollment is 12 credit hours per semester, with a typical course load being 14-17 hours per semester. Full time tuition is the same for 12-18 credit hours. Students who want to take more than 18 hours must receive permission from their advisor and pay additional fees.

2. Hours required to graduate are 122. You need 30 hours to have sophomore rank, 60 hours to have junior rank, and 90 hours to have senior rank.

3. See Appendix 1 for a sample BMS curriculum.

4. The university pushes a motto of "Take 5," meaning students should take five courses per semester. This is not necessarily the case for science students, as many math and science courses are higher in credit hours. Please refer to the sample BMS curriculum.

5. All BMS students take their BMS courses in the order listed and with their cohort.

6. The BMS curriculum is four years in length and cannot be accelerated.

7. Freshmen are expected to successfully complete their general chemistry and math requirements, as well as their BMS courses.

8. Sophomores are expected to successfully complete their biology, organic chemistry, and statistics requirements, as well as their BMS courses.

9. Juniors are expected to successfully complete their physics requirement, as well as their BMS courses.

10. Seniors are expected to have all graduation requirements successfully completed by the end of the spring semester.

11. If a student does not successfully complete a BMS courses, he/she cannot continue with the BMS curriculum without permission from the faculty director and program manager.

Curriculum Breakdown

The BMS curriculum can be broken into four parts:

1. General Education (GE)
2. Required Science Courses
3. Science Electives
4. BMS Courses

I. General Education (GE) Requirements

A. Writing
B. Math
C. Data Analysis
D. Science
E. Literature
F. Social Science
G. Historical Study
H. Visual and Performing Arts
I. Social Diversity in the United States
J. Global Studies

A. Writing: 6 semester hours
BMS Students must complete two writing courses, one at the 1110 level and one at the 2367 level.

B. Math
BMS students must complete through Math 1152.

C. Data Analysis: 3 semester hours
BMS students must take either 2450 or 2480.

D. Science
No additional science courses beyond the required courses are needed.

E. Literature: 3 semester hours
BMS students must complete one literature course.

F. Social Science: 6 semester hours
BMS students must take two social science courses from two different subcategories (i.e., Individuals and Group, Organization and Polities, OR Human, Natural, and Economic Resources).

G. Historical Study: 6 semester hours
BMS students must take one history course AND a second history course or a Cultures and Ideas course.

H. Visual and Performing Arts: 3 semester hours
BMS students must complete one Visual and Performing Arts course.

I. Social Diversity in the United States
BMS students must take one Social Diversity course, which is typically embedded into another GE requirement (these are the “dot” courses).

J. Global Studies
BMS students must take two Global Studies courses, which are typically embedded into other GE requirements (these are the “ampersand” courses).

II. Required Science Courses

A. General Chemistry
B. General Biology
C. Organic Chemistry
D. General Physics

A. General Chemistry (10 semester hours): All BMS students are expected to successfully complete a year of General Chemistry by the end of their freshman year. The course numbers for non-honors General Chemistry are 1210 and 1220, and they are each five semester hours. The course numbers for honors General Chemistry are 1910H and 1920H, and they are also 5 semester hours each.
AP scores: 3 = Chem 1110, 4 or 5 = Chem 1210

B. General Biology (8 semester hours): All BMS students are expected to successfully complete a year of General Biology by the end of autumn semester of their sophomore year. It is expected that some students will complete the General Biology requirement by the end of their freshman year. The course numbers for General Biology are 1113 and 1114, and they are four semester hours each. Honors versions of these courses are designated by an "H." Biology 1113 and 1114 can be taken in any order; 1113 is not a prerequisite for 1114.
AP scores: 3 = Biology 1101, 4 = Biology 1113, 5 = Biology 1113 and 1114

C. Organic Chemistry (10 semester hours): All BMS students are expected to successfully complete a year of Organic Chemistry with lab by the end of their sophomore year. The course numbers for non-honors Organic Chemistry lectures are 2510 (offered in AU and SP) and 2520 (offered in AU and SP), and they are four semester hours each. The course numbers for honors Organic Chemistry lectures are 2910H (AU only) and 2920H (SP only). Both non-honors and honors courses consist of 3 hours of lecture and 1 hour of recitation per week.
The course numbers for Organic Chemistry labs are 2540 and 2550, and they are two semester hours each. Labs consist of 1.5 hours of lectures and 4 hours of lab per week. Ideally, the first lecture and the first lab are taken simultaneously in the autumn semester of sophomore year, and the second lecture and second lab are taken in the following spring semester.

D. General Physics (10 semester hours): All BMS students are expected to successfully complete a year of General Physics by the end of their junior year, with the expectation that many will complete the series by the end of their sophomore year. Students have two options for completing their Physics requirement: algebra-based Physics and calculus-based Physics. The course numbers for algebra-based Physics are 1200 and 1201, and they are five semester hours each. The course numbers for calculus-based Physics are 1250 and 1251, and they are five semester hours each.
AP scores for Physics 1: 3, 4, or 5 = Physics 1200
AP scores for Physics 2: 3, 4, or 5 = Physics 1201

AP Scores for Physics C (Electricity and Magnetism): 3, 4, or 5 = Physics 1251
AP scores for Physics C (Mechanics): 3, 4, or 5 = 1200; 4 or 5 = 1250

III. BMS Courses

Freshman Year

- Biomedical Science Survey (BIOMSCI 1100): 1 semester hour
- Mastering the Biomedical Literature I (BIOMSCI 2891H): 2 semester hours

Sophomore Year

- Mastering the Biomedical Literature II (BIOMSCI 2892H): 2 semester hours
- Biomedical Science Laboratory Techniques (BIOMSCI 2900H): 2 semester hours

Junior Year

- Biomedical Science Research Experience I (BIOMSCI 3891H): 5 semester hours
- Biomedical Science Research Experience II (BIOMSCI 3892H): 5 semester hours

Senior Year

- Concepts in Healthcare I: Humanistic and Social Issues in Medicine & Biomedical Science (BIOMSCI 4200H): 3 semester hours
- Concepts in Healthcare II: Introduction to Health Policy and Leadership in Healthcare (BIOMSCI 4210H): 3 semester hours
- Special Topics in Biomedical Science I: Immunology and Infectious Disease (BIOMSCI 4810H): 3 semester hours
- Special Topics in Biomedical Science II: Genetics and Neurological Disease (BIOMSCI 4820H): 1.5 semester hours
- Special Topics in Biomedical Science III: Cancer Research; Bench to Bedside and Back (BIOMSCI 4830H): 1.5 semester hours

See the sample curriculum in Appendix 1.

IV. Science Electives

- Rule #1: BMS students must take 16 semester hours of science electives.
- Rule #2: 10 of the 16 hours must be science courses offered in the College of Medicine's foundational sciences departments.
- Rule #3: All of the 16 hours must be at the 3000 level or higher.
- Rule #4: The approved departments from which to select the science electives are Anatomy; Biochemistry; Biological Chemistry and Pharmacology; Biomedical Sciences Graduate Program; Biomedical Informatics; Cancer Biology and Genetics; Chemistry; Evolution, Ecology and Organismal Biology; Microbiology; Molecular Genetics; Neuroscience; Physiology and Cell Biology;

See Appendix 2 for additional details on Science Electives.

Appendix 1: Sample BMS Curriculum

Autumn Semester

Freshmen	**Hours**
BIOMSCI 1100	1
Chemistry 1210 or 1910H	5
Math 1151	5
English 1110	3
Total hours	**14**

Sophomores	**Hours**
BIOMSCI 2892H	2
O Chem Lec I 2510 or 2910H	4
O Chem Lab I 2540	2
Biology 1113 or 1114 (H)	4
Statistics 2450 or 2480	3
Total hours	**15**

Juniors	**Hours**
BIOMSCI 3891H	5
Physics II 1201 or 1251	5
Science Elective	4
Second Writing GE	3
Total hours	**17**

Seniors	**Hours**
BIOMSCI 4200H	3
BIOMSCI 4810H	3
Science Elective	5
Historical Study GE	3
Total hours	**14**

Spring Semester

Freshmen	**Hours**
BIOMSCI 2891H	2
Biology 1113 or 1114 (H)	4
Chemistry 1220 or 1920H	5
Math 1152	5
Total hours	**16**

Sophomores	**Hours**
BIOMSCI 2900H	2
O Chem Lec II 2520 or 2920H	4
O Chem Lab II 2550	2
Physics I 1200 or 1250	5
Social Science GE	3
Total hours	**16**

Juniors	**Hours**
BIOMSCI 3892H	5
Science Elective	5
Literature GE	3
Social Science GE	3
Total hours	**16**

Seniors	**Hours**
BIOMSCI 4210H	3
BIOMSCI 4820H	1.5
BIOMSCI 4830H	1.5
Science Elective	2
Historical Study GE	3
Visual and Performing Arts GE	3
Total hours	**14**

Appendix 2: Sample Science Electives

Subject	Title	Course	Hrs
Anatomy	Advanced Human Anatomy for Undergraduates	3300	5
Anatomy	Human Embryology	6600	2
Anatomy	Human Histology	6700	4
Biochemistry	Introduction to Biological Chemistry	4511	4
Biochemistry	Biochemistry and Molecular Biology I	5613	3
Biochemistry	Biochemistry and Molecular Biology II	5614	3
Biological Chemistry and Pharmacology (BIOPHRM)	Fundamentals of Medical Biochemistry I	3311	3
BIOPHRM	Fundamentals of Medical Biochemistry II	3312	3
BIOPHRM	Introduction to General Pharmacology	5600	3
Biomedical Sciences Graduate Program (BGSP)	Any Course		
Biomedical Informatics	Introduction to Biomedical Informatics	5710	3
Biomedical Informatics	Introduction to Bioinformatics	5730	3
Cancer Biology and Genetics (CBG)	Evolution of Emerging Viruses	5000	2
CBG	Sexuality, Health and Sexually-Transmitted Pathogens	5696	2
CBG	Cellular and Molecular Immunology	7010	3
Evolution, Ecology and Organismal Biology (EEOB)	Evolution	3310	4
Microbiology	Basic and Practical Microbiology	4000	4
Microbiology	General Microbiology	4100	5
Microbiology	Microbial Pathogenesis and Immunobiology	4110	3
Microbiology	Microbial Genetics	4130	3
Microbiology	Immunology	5122	2
Molecular Genetics	General Genetics	4500	3
Molecular Genetics	Molecular Genetics	4606	4
Molecular Genetics	Cancer Genetics	5300	2
Molecular Genetics	Cell Biology	5607	3
Molecular Genetics	Genes and Development	5608	3
Neuroscience	Cellular and Molecular Neuroscience	3000	3
Neuroscience	Introduction to Neurophysiology	3010	3
Neuroscience	Structure and Function of the Nervous System	3050	3
Physiology	Human Physiology	3200	5
Physiology	Advanced Human Physiology I	6101	3
Physiology	Advanced Human Physiology II	6102	3

Courses in Bold count towards elective hour requirement within the College of Medicine