Molecular Biophysics and Biochemistry

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MB&B Overview

Members of the Department of Molecular Biophysics and Biochemistry (MB&B) are united by a common view that processes in biology are understood when molecular, chemical, kinetic and thermodynamic contributions to mechanisms have been elucidated. Faculty and students are joined by a shared fascination with biochemistry, physical chemistry, structural biology, computation, spectroscopy, macromolecular engineering, imaging and the molecular basis of disease.

The core elements of our discipline are:

Biophysics 3 credits for BA, 4 credits for BS and BS/MS
Biochemistry 3 credits
Science & Society 1/2 credit

Additional requirements in MB&B serve to:

- support the core elements as prerequisites or accompanying labs
- teach advanced topics that make use of these underpinnings
- teach the technology that enables scholarship in our discipline
- give opportunity to seniors to demonstrate mastery of the discipline in writing

Practical Skills 1 credit for BA, 2 credits for BS and 1 for BS/MS
Electives 1 credit for BA, 2 credits for BS and 6 for BS/MS
Senior Thesis 1 credit for BA and BS, 4 for BS/MS

Three quarters of MB&B graduates matriculate into PhD, MD and MD/PhD programs. Other recent graduates have joined companies specializing in finance, management consulting, biotechnology and pharma. Others have matriculated in law or business school and doctoral programs in the humanities. Still others have performed 1-2 years of public service, entered secondary education or joined the US armed forces as officers.

To directly engage students' interests and career goals, concentrations are available. These are sets of electives, curated by the faculty, that count towards elective requirements and appear on your official Yale transcript. MB&B students may concentrate in **Medicine**, **Computational Biology & Bioinformatics**, **Biophysics and Structural Biology**, **Chemical Biology, Biochemistry**, or **Environment and Climate Change**.

Introductory Courses for First Years

We recommend you prioritize completing courses in the box below by the end of your first year. These courses are prerequisites for **MB&B 2750 Biology at the Molecular Level**, a course open to everyone and that ~3/4 of MB&B students take as sophomores as their gateway into the major. Don't worry if you do not complete or place out of all 5 of these credits by the end of the first year! The MB&B major is still open to you.

CHEM 1610	General Chemistry I
CHEM 1340L	General Chemistry I lab (1/2 credit)
CHEM 1650	General Chemistry II
CHEM 1360L	General Chemistry II lab (1/2 credit)
MATH 1120	Calculus I
BIOL 1010	**Biochemistry and Biophysics (taught by MB&B Profs!)***
BIOL 1020	Cell Biology and Membrane Physiology*

*Can be taken concurrently with **MB&B 2750** with instructor permission.

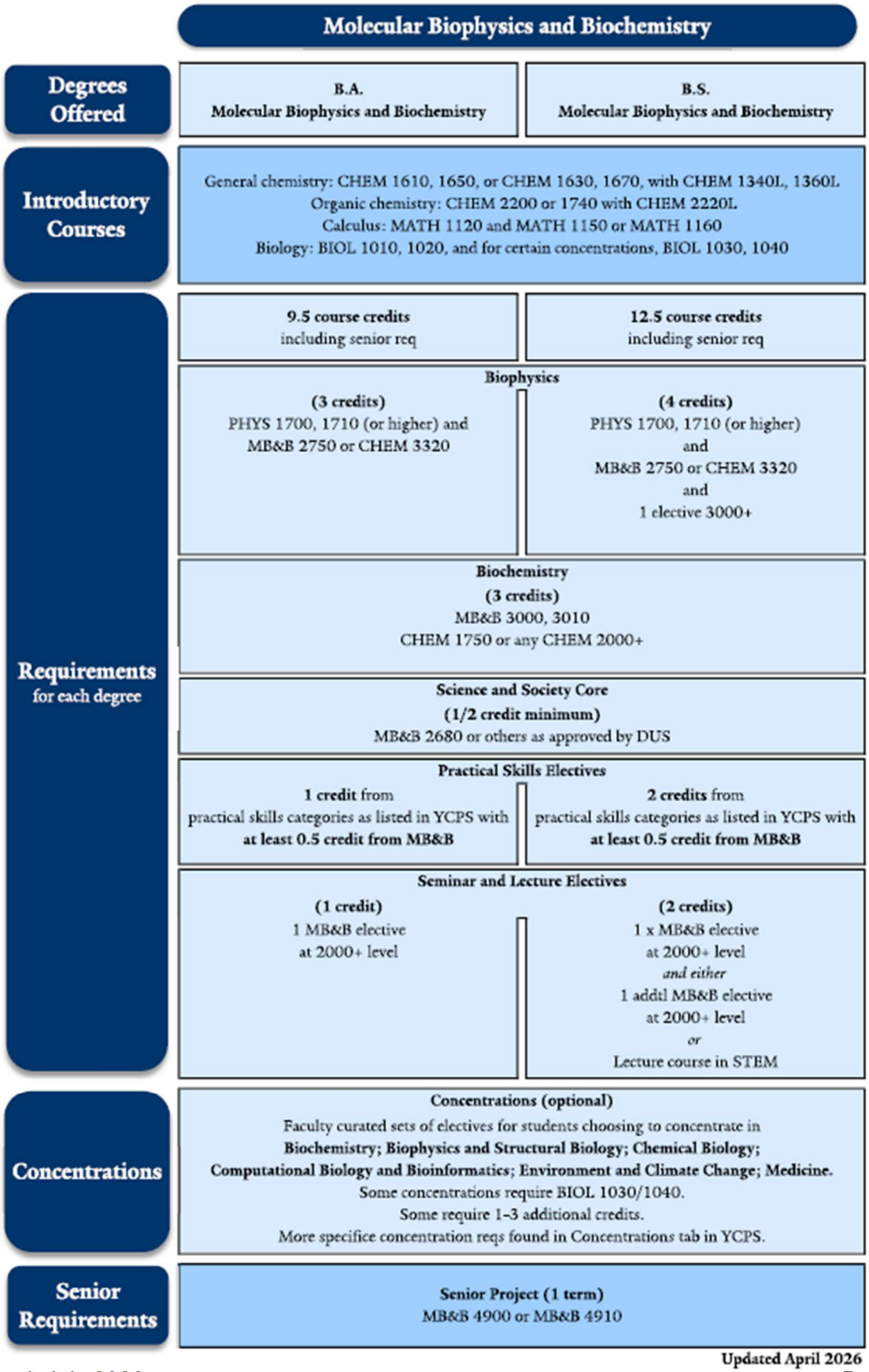
We further recommend students complete the 2.5 credits below as soon as they are able. These are prerequisites for courses that MB&B students typically take in their junior year.

CHEM 2200	Organic Chemistry I	(~2/3 of MB&B students take as sophomores)
CHEM 2220L	Organic Chemistry I Lab	(~2/3 of MB&B students take as sophomores)
MATH 1150 or 1160	Calculus II	(~1/4 of MB&B students defer this sophomore year)

The ½ credit courses below prepare students for conducting research in faculty labs across Yale and beyond, are co-taught and co-listed with Physics. Taking any two modules is also one of several ways to satisfy premedical physics lab requirements. These modules are available to both first-year and 2nd year students and are offered every semester to help students plan and balance their coursework demands across the liberal arts.

MB&B 1210L Introduction to Physics in Living Systems Lab I: Observation and Analysis I
MB&B 1220L Introduction to Physics in Living Systems Lab II: Observation and Analysis II
MB&B 1230L Introduction to Physics in Living Systems Lab III: Mechanics
MB&B 1240L Introduction to Physics in Living Systems Lab IV: Electricity, Magnetism & Radiation

First Year Advising: Students are welcome to declare MB&B as their major at any time. Completing introductory course work is not required to declare the major. We encourage declaration as it improves our ability to advise and send you pertinent information and dates. Once declared, MB&B students are assigned one academic faculty advisor through whom they may also petition to have courses waived. Declaration of major is non-binding at Yale and changing major does not require anyone's approval. If you are not a declared major, no problem! Just send questions to MBBUndergrad@yale.edu and check your email for informational events.


Molecular Biophysics and Biochemistry
Degrees Offered
B.A.
Molecular Biophysics and Biochemistry
B.S.
Molecular Biophysics and Biochemistry
Introductory Courses
General chemistry: CHEM 1610, 1650, or CHEM 1630, 1670, with CHEM 1340L, 1360L
Organic chemistry: CHEM 2200 or 1740 with CHEM 2220L
Calculus: MATH 1120 and MATH 1150 or MATH 1160
Biology: BIOL 1010, 1020, and for certain concentrations, BIOL 1030, 1040
Requirements for each degree
9.5 course credits
including senior req
12.5 course credits
including senior req
Biophysics
(3 credits)
PHYS 1700, 1710 (or higher) and
MB&B 2750 or CHEM 3320
(4 credits)
PHYS 1700, 1710 (or higher)
and
MB&B 2750 or CHEM 3320
and
1 elective 3000+
Biochemistry
(3 credits)
MB&B 3000, 3010
CHEM 1750 or any CHEM 2000+
Science and Society Core
(1/2 credit minimum)
MB&B 2680 or others as approved by DUS
Practical Skills Electives
1 credit from
practical skills categories as listed in YCPS with
at least 0.5 credit from MB&B
2 credits from
practical skills categories as listed in YCPS with
at least 0.5 credit from MB&B
Seminar and Lecture Electives
(1 credit)
1 MB&B elective
at 2000+ level
(2 credits)
1 x MB&B elective
at 2000+ level
and either
1 addtl MB&B elective
at 2000+ level
or
Lecture course in STEM
Concentrations
Concentrations (optional)
Faculty curated sets of electives for students choosing to concentrate in
Biochemistry; Biophysics and Structural Biology; Chemical Biology;
Computational Biology and Bioinformatics; Environment and Climate Change; Medicine.
Some concentrations require BIOL 1030/1040.
Some require 1–3 additional credits.
More specifice concentration reqs found in Concentrations tab in YCPS.
Senior Requirements
Senior Project (1 term)
MB&B 4900 or MB&B 4910
Updated April 2026

Core Elements of the Majors

Biophysics:

Rationale: Understanding biology requires a broad understanding of physical principles.

BA & BS majors: A two-semester sequence PHYS 1700/1710 or higher.

BS/MS majors: A two-semester sequence PHYS 1800/1810 or higher. If you are considering the BS/MS path, you must take physics at this level or higher.

Accompanying labs for the above classes are not required but can be used to fulfill **Practical Skills** requirements described below.

Rationale: Integral to understanding molecular mechanism in biochemistry is the formal study of thermodynamics, spectroscopy, quantitative methods for analysis and atomic structure determination. For BA students, one, and for BS and BS/MS students two lecture courses must be taken on one or more of these topics. Reading-based seminar and laboratory courses are typically excluded.

All Majors: Our recommended route is to begin with the introductory class, **MB&B 2750 "Biology at the Molecular Level"**. This class requires only General Chemistry and BIOL 1010 as its pre-requisites and focuses strongly on biological applications. **MB&B 2750** is typically taken by students in the spring of their sophomore year.

Acceptable alternatives to **MB&B 2750** are formal courses in thermodynamics from other departments: CHEM 3320, CENG 3000, APHY 4200 and MENG 2110. **Note, MB&B 2750 may not be taken after these courses.**

BS Majors: A 3000+ seminar or lecture course which emphasizes thermodynamics, spectroscopy or analytical methods in physical natural sciences, physical engineering sciences, math, statistics, or computer science.
Acceptable courses include: APHY 4200, CENG 3000, CHEM 3320, 3330, 4060, 4070, 4170, 4660, 4720, 4960, CPSC 2230, **MB&B 3300, 3610, 3640, 4200, 4350, 4520, and 5290**, EPS 3100, 3230, 3350, EVST 3620, MENG 2110, S&DS 3510. **Note: Most courses in Biomedical Engineering and Chemical Biology are excluded from being used to fulfill this requirement**.

Alternatives may be petitioned through your faculty advisor (see **Policies and Procedures**) based on the courses commitment to the above rationale.

BS/MS: CHEM 3320, CENG 3000, APHY 4200 or MENG 2110. However, if one of these classes is taken in lieu of MB&B 2750, you may follow the guidance for BS

majors. CHEM 3330 can further be used towards fulfillment of 5000+ elective requirements.

Biochemistry:

MB&B 3000/3010 is a two semester, comprehensive sequence that defines MB&B's perspective on biochemistry. It is required of all majors.
Course substitutions and Credit/D/Fail for **MB&B 3000/3010** are **not** permitted.

The prerequisites for MB&B 3000/3010 is one semester of organic chemistry with lab, BIOL 1010 and BIOL 1020. While we recommend this course sequence be taken in year 3, about ⅓ of majors take this course sequence in year 2. MB&B 3000 may be taken concurrently with organic chemistry. There is no accompanying lab to MB&B 3000 or 3010.

An additional 2000+ level course in Chemistry, or CHEM 1750, is required of all majors to further support understanding of Biochemistry. Majors typically take a second semester of organic chemistry, or inorganic chemistry, or options specified by particular concentrations. Accompanying labs are not required.

BS/MS: Students who elect to take the graduate level equivalent of these courses, MB&B 6000/6010, should be aware that these courses will **not** count toward the coursework requirements on the master's side of the degree.

Science & Society:

This requirement formalizes the MB&B faculty's view that the intersection of our discipline with human identity and society is critically important to the training of the next generation and the continued education of ourselves. Matters of personal and group identity underpin the history of our discipline's development, the lived experience of our field's practitioners, the achievement of excellence by diverse cultures co-working in our labs and the interaction of ourselves and our graduates with the public in its secondary schools, businesses, hospitals and government.

All majors take at least ½ credit of 1000+ coursework in this area. One mechanism is to take the initiative and independently explore this interface by taking **MB&B 2680**, "Society, Identity and STEM". This half-credit course meets in the second half of term and is taken simultaneously or immediately following any humanities course with significant focus on race, ethnicity, gender, sexuality, disability, veteran status, religion or any other aspect of human identity. MB&B 2680 may be taken up to two times for a letter grade.

An alternative approach to fulfilling this requirement is to take one of many courses at Yale that directly address this topic. A list of pre-approved courses as of Fall 2026 is located here: https://docs.google.com/spreadsheets/d/1ljk0JqjJ5ZRqTpcf3-dxjlCuf3wDo4wBxMCL4uv9Um4/edit?gid=0#gid=0
Petitions for **course substitutions** (see below) are encouraged.

Additional Requirements

Practical Skills:

Many practical skills are vital to effective bench and computer-based research in biology and physics. Other practical skills benefit our ability to generate and test hypotheses and establish rigor when performing statistical analyses of data sets large and small. The juxtaposition of concepts and practical implementation in coursework results in lasting understanding.

BA majors take one credit and BS majors take two credits: across at least two of three categories: **Physics Lab**, **Biochemistry Lab** and **Critical Tools**. One or more courses (at least ½ credit) must be from MB&B. Courses that can be used to satisfy more than one category may not be double counted.

- **Physics Lab: MB&B 1210L, 1220L, 1230L, 1240L, 4700***, PHYS 1650L, 1660L, CHEM 3550L and other 2000+ level lab courses with **advisor approval** (see **Policies and Procedures**).
- **Biochemistry Lab: MB&B 2510L, 4700***, CHEM 3550L, and others including MCDB/EEB/BENG 2000+ lab courses with **advisor approval** (see **Policies and Procedures).**
- **Critical Tools: MB&B 4350, 4700***, S&DS 1000+, 2380, CPSC 1000+ and others with **advisor approval** (see **Policies and Procedures**).

BS/MS majors: Practical Skills are subsumed in the required BS/MS coursework (MB&B 4700, 5700, and 5701). See page 3 of the BS/MS application.

*This is research for credit coursework. Up to two credits may be taken for a letter grade. Categorization of the coursework into one of the three skills is dependent on your project and/or the lab in which your project is conducted.

Electives

Seminar or lecture-based coursework as follows:

BA majors: One 2000+ level in MB&B

BS majors: One 2000+ level in STEM and one 2000+ level in MB&B

BS/MS majors: Two 5000+ level* seminar or lecture credits in MB&B plus
Four 5000+ level* seminar or lecture credits in natural science, math, statistics or engineering. Note, many graduate courses are ½ semester modules. It is common for more than six courses to be used to reach six credits.

IMPORTANT:

- A maximum of two of the 6 may be double counted towards fulfilling both the BS and MS degree requirements.
- Undergraduate (1000-4000) course that also hold graduate (5000+) numbers cannot be retroactively changed. Students considering BS/MS are strongly encouraged to sign up using the graduate number.
- Most but NOT ALL graduate courses count towards fulfillment of these electives. The DUS must explicitly approve the use of any 5000+ level course for fulfillment of the BS/MS elective requirements. Requests for approval should be sent to DUS by your faculty advisor.

Senior Requirements

BA and BS majors: MB&B 4900/4910 is a one credit course that culminates in the writing of a thesis in the fall or spring term of senior year.

BS/MS majors: Completion of 5 credits of research for credit. All 5 credits of research are expected to take place within the same lab and culminate in a 50-page thesis and a public oral defense during reading period of your final semester.

- **MB&B 4700** is required by the end of fall semester of junior year as a prerequisite for application to the program.
- **MB&B 5700 and 5710** are taken during senior year.

Credit/D/Fail No core course (MB&B 3000/3010 and Senior Requirement) taken Credit/D/Fail. No more than one non-core course may be applied toward the requirements of the major. This does count against Yale's limit of 6 total Credit/D/Fail courses. Qualifying courses must be 4000+ in MB&B, and 3000+ in any other STEM subject. For B.S./M.S. students, all required coursework must be taken for a letter grade.

Concentrations

Concentrations in MB&B are sets of electives, curated by faculty, designed to focus attention onto specific subfields of Molecular Biophysics and Biochemistry. Concentrations appear on a student's official Yale transcript and are currently available in **Biophysics and Structural Biology**, **Chemical Biology**, **Computational Biology and Bioinformatics**, **Medicine**, **Biochemistry** and **Environment & Climate Change**.

Electives for concentrations can be used to fulfill the total of 3.5 elective credits for BA majors and 6.5 elective credits for the BS major. In other words, electives for concentrations can be freely double counted with electives for the BA or BS degrees. For example, a BS major concentrating in **Medicine** must fulfill one course in statistics. S&DS 2200 can fulfill the concentration's requirement and also count as a 2000+ level STEM elective for the major.

For BS/MS majors, electives for the concentration apply only to the BS. A maximum of two electives may be double counted towards fulfilling both the BS and MS portions of the degree:

The complete space of electives for BA and BS majors can be summarized as follows:

- CHEM 2000+ or CHEM 1750
  1 credit BA, BS
- 3000+ in physical sci, physical engineering, math, statistics, or computer sci.
  1 credit BS
- Science and Society
  ½ credit BA, BS
- Practical Skills
  2 credit BS, 1 credit BA (1/2 credit of which must be in MB&B)
- STEM elective at 2000+
  1 credit BS
- MB&B elective at 2000+
  1 credit BA, BS

Placement exams and acceleration credits **do not** count towards completion of concentration-specific requirements. For example, a B.S. Major who places out of 1000-level statistics and is pursuing a concentration in **Computational Biology and Bioinformatics** is still expected to complete the concentration's requirement for 3 courses in MATH/S&DS/COMP.

Concentration in **Medicine**

The MB&B concentration in **Medicine** is designed for students with strong interests in the molecular basis of physiology and disease. MB&B offers a unique lens on these subjects as it was formed as a merger of the Yale Medical School Department of Biochemistry and the Yale College Department of Molecular Biophysics. MB&B faculty maintain labs in both schools (as well as West Campus) and instructs both Yale undergraduates and Yale medical school students. Majors aspiring to graduate studies in biomedical sciences, work in biotechnology or enter medical school are particularly encouraged to fulfill this concentration:

Requirements

Genetics and Development and Ecology and Evolution (1 credit): BIOL 1030/1040 or higher

Organic Chemistry (1 credit): Second term organic chemistry, CHEM 1750 or CHEM 2210
Accompanying lab is not required.

Statistics (1 credit): S&DS 1000+ or (MATH 2000+ in these subjects: linear algebra, probability, statistics or stochastic processes)

Psychology (1 credit): PSYC 1100 or higher

Physics lab (2 courses totaling 1 credit or more): **MB&B 1210L, MB&B 1240L,** PHYS 1650L, PHYS 1660L or **MB&B 3640** and others. See **course substitutions** policy below.

Research (1 credit): Research for credit on a project focused on basic biological or biomedical research, **MB&B 4700.** Alternatively, course-based undergraduate biomedical research experience (CURE), **MB&B 2510L**, **MCDB 2910L** and others. See **course substitutions** policy below.

Advanced (3000+) Biomedical Lecture or Seminar (1 credit):

MB&B 3520 Biomedical Data Science, Mining and Modeling
MB&B 4450 Methods and Logic in Molecular Biology
MB&B 4490 Medical Impact of Basic Science
BENG 3200 Physiological Systems
MCDB 3150 Pathobiology
MCDB 4500 The Human Genome

Other choices for the above are encouraged and possible by petition. See **course substitutions** policy below.

Note: The core BS major requires 12.5 credits while the core BA major requires 9.5 credits. For students with no advanced preparation in STEM, the concentration in **Medicine** (see **sample schedules**) can be completed with 2 additional credits over the core BS major and 3 additional credits over the core BA requirements.

Computational Biology & Bioinformatics

The MB&B concentration in **Computational Biology & Bioinformatics** is designed for students with a combination of strong interests in computer science, data science, statistics and biology. Majors aspiring to graduate studies in computational biology, bioinformatics, medical informatics or biotechnology are particularly encouraged to fulfill this concentration:

Requirements

Genetics and Evolutionary Biol (1 credit, BA):	BIOL 1030 and 1040, or follow the BS guideline.
Genetics and Evolutionary Biol (1 credit, BS):	A 2000+ elective in genetics, molecular biology or evolutionary biology. This elective may be used in place of MB&B's requirement for a 2000+ elective in Chemistry: MCDB 2000, MCDB 2020, MCDB 3100, **MB&B 3300** and others.
Computer Sci, Math, Stats (2 credits, BA):	CPSC 2010 and S&DS 1000+
Computer Sci, Math, Stats (3 credits, BS):	CPSC 2010 and (S&DS 2380 or S&DS 2410) and (CPSC 2230 or S&DS 2650). CPSC 2230 may be used to fulfill the 3000+ elective requirement in physical sci, physical engineering, math, statistics, or computer sci.

Advanced Computational Biology & Bioinformatics 3000+ (1 credit):

MB&B 3520	Biomedical Data Science, Mining and Modeling
CPSC 4530	Unsupervised Learning for Big Data

Other choices for the above are encouraged and possible by petition.
See **course substitutions** policy below.

Note: The core BS major requires 12.5 credits while the core BA major requires 9.5 credits. For students with no advanced preparation in STEM, the **Computational Biology & Bioinformatics** concentration (see sample schedules) can be completed with 3 additional credits over the core BS major and 3 additional credits over the core BA requirements.

Chemical Biology

Chemical Biology leverages the tools and concepts of chemistry to understand, leverage and/or manipulate biological processes. Students interested in the MB&B concentration in **Chemical Biology** select electives from organic and inorganic chemistry as well as advanced courses in cell biology. Majors interested in additional studies in chemical biology, drug-development and/or biotechnology after graduation are particularly encouraged to fulfill this concentration:

Requirements

Organic Chemistry II (1.5 credits):
Second semester of organic chemistry with accompanying ½ credit lab.

Cell Biology and Chemistry (3 credits, BS):
2 x 2000+ and 1 x 3000+ electives in Chemistry or Cell Biology.
At least one of the credits must come from Cell Biology or Chemistry.

Cell Biology (1 credit, BA):
1 x 2000+ elective in Cell-based biology

Research in Chemical Biology (1 credit):
Research for credit on a Chemical Biology project (broadly interpreted), **MB&B 4700.** Alternatively, **MB&B 3640** or course-based undergraduate chemical biology research experience (CURE) by petition to advisor. See **course substitutions** policy below.

Advanced (3000+) Chemical Biology Lecture or Seminar (1 credit):

MB&B 4430	Advanced Eukaryotic Cell Biology
CHEM 4190/4240	Foundations of Chemical Biology I / II

Other choices for the above are encouraged and possible by petition.
See **course substitutions** policy below.

Note: The core BS major requires 12.5 credits while the core BA major requires 9.5 credits. The concentration in **Chemical Biology** (see sample schedules) can be completed with one additional credit requirement over the core BS major and two additional credits over the core BA requirements.

Biochemistry

The MB&B concentration in Biochemistry is geared towards students seeking robust training in structure and function of nucleic acids and proteins in the context of life processes. Molecular length scale biochemistry is foundational to the mechanisms by which dynamic networks of molecular machines enable everything from cellular function to whole organism physiology. Failures in these networks are responsible for pathology in plants and animals, agriculture, and medicine. MB&B majors interested in working in these fields directly after graduation, or who hope to pursue graduate studies including PhD and MD/PhD are particularly encouraged to fulfill this concentration:

Requirements

Genetics and Development and Ecology and Evolution (1 credit): BIOL 1030/1040 or above.

Molecular, Cellular or Organismal Biology 2000+ (1 credit): MCDB 2050, MCDB 2020, and others with advisor approval.

Research in Biochemistry (1 credit): Research for credit on a project with biochemical emphasis (broadly interpreted), **MB&B 4700.** Alternatively, course-based undergraduate research experience (CURE) in biochemistry by petition to advisor.

Advanced Biochemistry Lecture or Seminar 3000+ (1 credit BA, 2 credits BS):

MB&B 3650 Biochemistry and our Changing Climate
MB&B 3310 Modeling Biological Systems
MB&B 4450 Methods & Logic in Molecular Biology
MB&B 4490 Medical Impact of Basic Research
MB&B 4430 Advanced Eukaryotic Cell Biology

Other choices for the above are encouraged and possible by petition to advisor.
See **course substitutions** policy below.

Note: The core BS major requires 12.5 credits while the core BA major requires 9.5 credits. For students with no advanced preparation in STEM, the concentration in **Biochemistry** (see sample schedules) can be completed with two additional credit requirements over the core BS major and 3 additional credits over the core BA requirements.

Environment and Climate Change

The MB&B concentration in Environment and Climate Change is geared towards students seeking robust training in life processes as they affect, and are affected by the environment, human activity and climate change. MB&B majors interested in working in these fields directly after graduation, or who hope to pursue graduate studies including PhD are particularly encouraged to fulfill this concentration:

Requirements

Physical Environmental Science 3000+ (1 credit BS)

May be used to fulfill 3000+ requirement in physical/engineering sciences.

EVST 3620	Observing Earth from Space	EPS 3350	Physical Oceanography
EPS 3100	Isotope Geochemistry	CHEM 3320	Thermodynamics
EPS 3230	Climate Dynamics	CHEM 3330	Quantum Mechanics

Environmental Chemistry 2000+ (1 credit)

May be used to fulfill 2000+ elective requirement in Chemistry

EVST 3070	Organic Pollutants in the Env.	CHEM 2520	Inorganic Chemistry
EPS 3100	Isotope Geochemistry	ENVE 4380	Environmental Org Chemistry

Math, Statistics and/or Computer Science (1 credit)

May be used to fulfill one credit of practical skills requirement for BA and BS

Math 1200/1210/2200 or higher, S&DS 1000+ or CPSC 1000+

Ecology and Evolution 1000+ (1 credit)

Courses at 2000+ may be used to fulfill 200+ STEM requirement for BS

BIOL 1040	Principles of Ecology and Evolutionary Biology		
E&EB 2250	Evolutionary Biology.	ANTH 2667	Human Evolution

Environmental Sciences 1000+ (1 credit)

Courses at 2000+ may be used to fulfill 2000+ STEM requirement for BS

CENG 1200	Intro to Environmental Engineering	EPS 1010	Climate Change
EPS 1400	Atmosphere, Ocean & Climate Change	EVST 2200	General Ecology
EVST 2550	Environmental Geomicrobiology	EPS 1250	History of Life
EPS 2320	Earth Surface Processes	EPS 2610	Minerals & Human Health

Advanced Environment Lecture or Seminar 3000+ (1 credit BA, 2 credits BS)

MB&B 3650 may be used to fulfill 2000+ MB&B requirement for all degrees

MB&B 3650	Biochemistry & Our Changing Climate	ENVE 4410	Bio Processes in Environmental Engineering
ENVE 4100	Environ. Tech in the Developing World		
ENVE 4640	Engineering Solutions to Climate Change	EPS 3230	Climate dynamics
EVST 4005	Biotechnology & Developing World	ENVE 3600	Bio-Inspired & Sustainable Design
EPS 3550	Extraordinary Glimpses of Past Life	ENVE 4380	Environ. Organic Chem.

Other choices for the above are encouraged and possible by petition.
See **course substitutions** policy below.

Note: The core BS major requires 12.5 credits while the core BA major requires 9.5 credits. For students with no advanced preparation in STEM, the concentration in **Environment and Climate Change** (see sample schedules) can be completed with one additional credit requirements over the core BS and core BA requirements.

Biophysics and Structural Biology

The MB&B concentration in **Biophysics and Structural Biology** is designed for students with strong interests in life processes on the molecular length scale. Majors aspiring to graduate studies in biophysics, molecular medicine and biotechnology are particularly encouraged to fulfill this concentration.

Biophysics and Structural Biology are made possible by fundamental quantitative and physical tools such as linear algebra, Fourier analysis, x-ray diffraction, imaging and optical spectroscopy to measure biomolecular dynamics and atomic resolution structure. Seminar courses applicable to this area focus on the basic biology enabled by exquisitely specific macromolecular interactions, the molecular basis of disease and drug-design.

Requirements

Comp. Sci, Math, Statistics (1 credits, BA):	MATH 1200, 1210, 2250, or S&DS 1000+, or CPSC 1001
Comp. Sci, Math, Statistics (1 credits, BS):	MATH 1200, 1210, 2250 or S&DS 2380, or CPSC 1001
Biophysical Chemistry (1 credit, BS):	CHEM 3320 or **MB&B 4310** or any 3000+ elective in thermodynamics, statistical mech, quantum mechanics or spectroscopy.

Research in Biophysics and Structural Biology (1 credit): Research for credit on a solution biophysical or structural biology project (broadly interpreted), **MB&B 4700.** Alternatively, CHEM 3550L, or course-based undergraduate biophysical or structural biology research experience (CURE) by petition. See **course substitutions** policy below.

Tools and Quantitative Analysis (1 credit, BS): 2000+ course with emphasis on measurement and/or modeling of energy, kinetics, or structure relevant to the molecular length scale. **MB&B 3300, 4200/4310, 4350,** CHEM 3330, 4060, 4920, and others.

Advanced Biophysics and Structural Biology Lecture or Seminar (1 credit):

MB&B 4200 Macromolecular Structure and Biophysical Analysis

MB&B 4310 Illuminating Biomolecular Mechanism with Structure

MB&B 5200 Boot Camp Biology

MB&B 5290 Structural Biology and Drug Discovery

Other choices for the above are encouraged and possible by petition.
See **course substitutions** policy on the next page.

Note: The core BS major requires 12.5 credits while the core BA major requires 9.5 credits. For students with no advanced preparation in STEM, the concentration in **Biophysics and Structural Biology** (see sample schedules) can be completed with one additional credit requirements over the core BS major and 2 additional credits over the core BA requirements.

Policies and Procedures

MB&B Faculty Advisors: Students are assigned a member of MB&B faculty for academic advising as soon as they declare their major. Requests for change in advisor should be sent to the MB&B Registrar via email (MBBUndergrad@yale.edu). Justification is not required.

Course Substitutions: Students may **petition for course substitutions by submitting the relevant course syllabus along with a brief written justification (<300 words) to their MB&B faculty advisor**. Requests in line with MB&Bs goals described above are always welcome. If the substitution is approved, the advisor will notify the MB&B Registrar (MBBUndergrad@yale.edu) so the student's record can be updated accordingly. Please note that if a student changes majors, any approved course substitutions will be removed and will not carry over to the new major.

Credit/D/Fail: To encourage BA and BS majors to explore more challenging coursework, students are welcome to complete one credit requirement as Credit/D/Fail. This option may **not** be used for MB&B 3000/3010 or Senior Project. This will not affect your ability to graduate with distinction but does count against Yale's limit of 6 total Credit/D/Fail courses. Qualifying courses must be 4000+ in MB&B, and 3000+ in another STEM subject.

For BS/MS students, all required coursework must be taken for a letter grade.

DUS Approvals: DUS approvals for waivers, course substitutions, endorsement of petitions to the Committee on Honors and Academic Standing, applications to the BS/MS program etc., are initiated by an email of support from students' assigned **MB&B faculty advisors**. The faculty advisor functions as the student's advocate on requests to the DUS with the MB&B Registrar giving oversight and interfacing with the University Registrar. Important: one-on-one meetings by majors with their **MB&B faculty advisor** during every registration period are logged. Failures to schedule meetings and missed meetings are factored into the DUS approval process.

BS/MS Program: Students considering the BS/MS program are urged to follow its course requirements throughout their time at Yale. Entry to the program requires application to the department via a form downloadable from the MB&B web site and is due to the DUS by November 24 of your junior year. Factors affecting the success of your application are as follows:

1. A well-established relationship with a Yale research lab as evidenced by successful completion of MB&B 4700 by no later than fall term of junior year.
2. One or more of the following:
    a. Completion of a summer (10-weeks) of full-time research in your intended dissertation lab, i.e. the lab in which you took or will take MB&B 4700
    b. Completion of a summer (10-weeks) of full-time research at any University, industry or govt research lab during a summer after matriculating at Yale
    c. Intent to work in your Yale-based dissertation lab during the summer of your junior year, endorsed explicitly by your research supervisor.
3. Written personal motivation for pursuing the dual degree and at least one meeting to discuss this with your MB&B faculty advisor.

4. Endorsement of your application by your MB&B faculty advisor.
5. Endorsement of your application by your research supervisor.
6. Endorsement of your application by the instructor in charge of MBB 4700

Successful applicants will be invited by the DUS to apply directly to the Yale Graduate School in December 2026.

Sample Schedules

Sample schedules are available on our website for hypothetical students who arrive at Yale with no advanced preparation. For perspective:
About 1/3 of MB&B students place out of General Chemistry
About 4/5 of MB&B students place out of Calculus I.