B.S. IN BIOCHEMISTRY

Major

The Bachelor of Science (B.S.) degree in either BCHM or BCHN requires 23 total credits of BMB courses: 17 credits of required BMB courses plus six credits of elective BMB courses. At least two elective BMB credits must come from a BMB lab course, either BMB 145, BMB 245, BMB 402, or BMB 545. To satisfy the College of Arts and Sciences writing requirement in the discipline, BMB majors must complete for writing credit (W) either BMB 507, BMB 511, or BMB 545. For all students, a grade of C or better must be earned in each BMB course. For current UM students to declare either major or minor in BMB, a UM cumulative grade point average of 2.9 is required. For transfer students to declare either major or minor in BMB, a grade point average of 3.5 is required. The Department will make its own independent determination on a case-by-case basis concerning the equivalency of courses taken at other universities. The two possible academic tracks, BCHM and BCHN, differ by two required upper level BMB lecture courses.

Curriculum Requirements

Code	Title	Credit Hours
Required BMB Courses		
Students must complete all six BMB lecture courses listed in either Track 1 or Track 2:		17
Track 1 (BCHM)		
BMB 401	Biochemistry for the Biomedical Sciences	
BMB 506	Biomedical Case Studies	
BMB 507	Protein Structure, Function and Biology [1]	
BMB 509	Molecular Biology of the Gene	
BMB 514	Genetics and Genomics: Principles, Mechanisms, and Use	
BMB 555	Cellular Structure, Function, and Biology	
Track 2 (BCHN)		
BMB 401	Biochemistry for the Biomedical Sciences	
BMB 506	Biomedical Case Studies	
BMB 417	Metabolic Regulation	
BMB 514	Genetics and Genomics: Principles, Mechanisms, and Use	
BMB 519	Epigenetics and Nutrition	
BMB 555	Cellular Structure, Function, and Biology	
Elective BMB Courses		
Students in either Track 1 or 2 must complete at least six credits of elective BMB courses. At least two elective BMB credits must come from a BMB lab course, either BMB 145, BMB 245, BMB 402, or BMB 545.		6
BMB 145	Introduction to BMB Research	
BMB 245	Foundations in BMB Research [2]	
BMB 402	Principles of Experimental BMB [1]	
BMB 411	Readings in BMB [2]	
BMB 417	Metabolic Regulation	
BMB 501	Senior Seminars [2]	
BMB 507	Protein Structure, Function and Biology [1]	
BMB 509	Molecular Biology of the Gene	
BMB 511	Topics in BMB [1,2]	
BMB 518	Nanomedicine	
BMB 519	Epigenetics and Nutrition	
BMB 545	Research Problems in BMB [1,2]	
Biology		
BIL 150	General Biology	4
BIL 151	General Biology Laboratory	1
or BIL 153	Introductory Biology/Chemistry Laboratory I	
BIL 160	Evolution and Biodiversity	4
BIL 161	Evolution and Biodiversity Laboratory	1
or BIL 163	Introductory Biology/Chemistry Laboratory II	
Chemistry [3]		

CHM 121	Principles of Chemistry	4
CHM 113	Chemistry Laboratory I	1
CHM 221	Introduction to Structure and Dynamics	4
CHM 205	Chemical Dynamics Laboratory	1
CHM 222	Organic Reactions and Synthesis	4
CHM 206	Organic Reactions and Synthesis Laboratory	2
or CHM 207	Chemical Dynamics and Organic Synthesis Laboratory	
Physics [4]		
PHY 201	University Physics I for the Sciences	4
or PHY 211	University Physics I for PRISM	
or PHY 101	College Physics I	
PHY 106	College Physics Laboratory I	1
PHY 202	University Physics II for the Sciences	4
or PHY 212	University Physics II for PRISM	
or PHY 102	College Physics II	
PHY 108	College Physics Laboratory II	1
Mathematics [5]		
MTH 161	Calculus I	4
or MTH 171	Calculus I	
MTH 162	Calculus II	4
or MTH 172	Calculus II	
Statistics or Computer [6]		
PSY 292	Introduction to Biobehavioral Statistics Section B	3
or PSY 291	Introduction to Biobehavioral Statistics	
or SOC 211	Quantitative Methods for Sociologists	
or HCS 202	Introductory Statistics in Health Care	
or MTH 224	Introduction to Probability and Statistics	
or CSC 120	Computer Programming I	
or CSC 210	Computing for Scientists	
General Education Requirements		
Written Communication Skills:		
WRS 105	First-Year Writing I	3
WRS 106	First-Year Writing II	3
or WRS 107	First-Year Writing II: STEM	
or ENG 106	Writing About Literature and Culture	
Quantitative Skills:		
MTH 161	Calculus I (fulfilled through the major)	
Areas of Knowledge:		
Arts and Humanities Cognate		9
People and Society Cognate		9
STEM Cognate (9 credits) (fulfilled through the major)		
Other Required Courses		
Language Requirement [7]		3
Electives [8]		23
Total Credit Hours		**120**

1 Writing credit (W) may be obtained in this course.

2 These courses may be taken more than once for additional credits.

3 To enroll in CHM 121/CHM 113, students must have completed or be co-enrolled in either MTH 140, MTH 141, MTH 161, MTH 171. If math placement is below MTH 140, then students must complete CHM 110. Completion of CHM 110 will qualify students for CHM 121.

4 PRISM students take PHY 211/PHY 106 and PHY 212/PHY 108. Students who struggle with calculus are recommended to take PHY 101/PHY 106 and PHY 102/PHY 108. A more advanced physics course series can be substituted (e.g., PHY 221, PHY 222/PHY 224, and PHY 223/PHY 225).

5 PRISM students take MTH 171 and MTH 172. Students may also complete the series MTH 140/MTH 141/MTH162.

[6] PRISM students take CSC 210.

[7] Students must complete at least one (1) 200-level course in a foreign language, e.g., SPA 201 (Intermediate I). Typically, students with appropriate high school training in a foreign language can safely begin with SPA 102 (Beginner II), totaling 6 language credits. If no background, then students will complete SPA 101 (Beginner I), SPA 102, and SPA 201, totaling 9 credits. These course numbers pertain to all foreign language courses at UM, e.g., Spanish (SPA), French (FRE), Italian (ITA), German (GER), Chinese (CHI), etc.

[8] Elective credits (3-6) may include Beginner I and/or II language courses.

Sample Plan of Study

Biochemistry and Molecular Biology - Track 1 (BCHM)

Freshman Year		
Fall		**Credit Hours**
BIL 150	General Biology	4
BIL 151 or 153	General Biology Laboratory or Introductory Biology/Chemistry Laboratory I	1
CHM 121	Principles of Chemistry	4
CHM 113	Chemistry Laboratory I	1
MTH 161 or 171	Calculus I or Calculus I	4
WRS 105	First-Year Writing I	3
	Credit Hours	**17**
Spring		
BIL 160	Evolution and Biodiversity	4
BIL 161 or 163	Evolution and Biodiversity Laboratory or Introductory Biology/Chemistry Laboratory II	1
CHM 221	Introduction to Structure and Dynamics	4
CHM 205	Chemical Dynamics Laboratory	1
MTH 162 or 172	Calculus II or Calculus II	4
WRS 106, 107, or ENG 106	First-Year Writing II or First-Year Writing II: STEM or Writing About Literature and Culture	3
	Credit Hours	**17**
Sophomore Year		
Fall		
CHM 222	Organic Reactions and Synthesis	4
CHM 206	Organic Reactions and Synthesis Laboratory	2
PHY 201, 211, or 101	University Physics I for the Sciences or University Physics I for PRISM or College Physics I	4
PHY 106	College Physics Laboratory I	1
PSY 110	Introduction to Psychology ((P&S Cognate Elective 1)) [1]	3
SPA 102	Elementary Spanish II	3
	Credit Hours	**17**
Spring		
BMB 401	Biochemistry for the Biomedical Sciences	4
BMB 411	Readings in BMB	1
PHY 202, 212, or 102	University Physics II for the Sciences or University Physics II for PRISM or College Physics II	4
PHY 108	College Physics Laboratory II	1

PSY 292, 291, SOC 211, MTH 224, CSC 120, or CSC 210	Introduction to Biobehavioral Statistics Section B ((P&S Cognate Elective 2)) [1] or Introduction to Biobehavioral Statistics or Quantitative Methods for Sociologists or Introduction to Probability and Statistics or Computer Programming I or Computing for Scientists	3
SPA 201	Intermediate Spanish I	3
	Credit Hours	**16**
Junior Year		
Fall		
BMB 514	Genetics and Genomics: Principles, Mechanisms, and Use	3
BMB 506	Biomedical Case Studies	1
BMB 402 or 245	Principles of Experimental BMB or Foundations in BMB Research	2
APY 413, PSY 210, or PSY 230	Medical Anthropology ((P&S Cognate elective 3)) [1] or Social Psychology or Child and Adolescent Development	3
A&H Cognate Elective 1 [1]		3
Elective		3
	Credit Hours	**15**
Spring		
BMB 555	Cellular Structure, Function, and Biology	3
BMB 545	Research Problems in BMB	3
A&H Cognate Elective 2 [1]		3
Electives		6
	Credit Hours	**15**
Senior Year		
Fall		
BMB 507	Protein Structure, Function and Biology	3
BMB 545 or 511	Research Problems in BMB or Topics in BMB	3
A&H Cognate Elective 3 [1]		3
Electives		6
	Credit Hours	**15**
Spring		
BMB 509	Molecular Biology of the Gene	3
BMB 545 or 511	Research Problems in BMB [2] or Topics in BMB	3
BMB 501	Senior Seminars	1
BMB 518	Nanomedicine	3
Elective		3
	Credit Hours	**13**
	Total Credit Hours	**125**

1 P&S (People & Society) and A&H (Arts and Humanities) Cognate Electives.

2 BMB 402, BMB 507, BMB 511, and BMB 545 come with writing credit (W). BMB 545 may be taken for 3-12 credit hours. Variations of the above program are feasible for students entering with advanced standing on the basis of placement tests or transfer credit hours with permission of the biochemistry advisor.

Sample Plan of Study

Biochemistry and Nutrition - Track 2 (BCHN)

Freshman Year		
Fall		**Credit Hours**
BIL 150	General Biology	4
BIL 151 or 153	General Biology Laboratory or Introductory Biology/Chemistry Laboratory I	1
CHM 121	Principles of Chemistry	4
CHM 113	Chemistry Laboratory I	1
MTH 161 or 171	Calculus I or Calculus I	4
WRS 105	First-Year Writing I	3
	Credit Hours	**17**
Spring		
BIL 160	Evolution and Biodiversity	4
BIL 161 or 163	Evolution and Biodiversity Laboratory or Introductory Biology/Chemistry Laboratory II	1
CHM 221	Introduction to Structure and Dynamics	4
CHM 205	Chemical Dynamics Laboratory	1
MTH 162 or 172	Calculus II or Calculus II	4
WRS 106, 107, or ENG 106	First-Year Writing II or First-Year Writing II: STEM or Writing About Literature and Culture	3
	Credit Hours	**17**
Sophomore Year		
Fall		
CHM 222	Organic Reactions and Synthesis	4
CHM 206	Organic Reactions and Synthesis Laboratory	2
PHY 201, 211, or 101	University Physics I for the Sciences or University Physics I for PRISM or College Physics I	4
PHY 106	College Physics Laboratory I	1
PSY 110	Introduction to Psychology ((P&S Cognate Elective 1)) [1]	3
SPA 102	Elementary Spanish II	3
	Credit Hours	**17**
Spring		
BMB 401	Biochemistry for the Biomedical Sciences	4
BMB 411	Readings in BMB	1
PHY 202, 212, or 102	University Physics II for the Sciences or University Physics II for PRISM or College Physics II	4
PHY 108	College Physics Laboratory II	1
PSY 292, 291, SOC 211, MTH 224, CSC 120, or CSC 210	Introduction to Biobehavioral Statistics Section B ((P&S Cognate Elective 2)) [1] or Introduction to Biobehavioral Statistics or Quantitative Methods for Sociologists or Introduction to Probability and Statistics or Computer Programming I or Computing for Scientists	3
SPA 201	Intermediate Spanish I	3
	Credit Hours	**16**

Junior Year		
Fall		
BMB 514	Genetics and Genomics: Principles, Mechanisms, and Use	3
BMB 506	Biomedical Case Studies	1
BMB 402 or 245	Principles of Experimental BMB or Foundations in BMB Research	2
APY 413, PSY 210, or PSY 230	Medical Anthropology ((P&S Cognate elective 3)) [1] or Social Psychology or Child and Adolescent Development	3
A&H Cognate Elective 1 [1]		3
Elective		3
	Credit Hours	**15**
Spring		
BMB 555	Cellular Structure, Function, and Biology	3
BMB 545	Research Problems in BMB	3
A&H Cognate Elective 2 [1]		3
Electives		6
	Credit Hours	**15**
Senior Year		
Fall		
BMB 417	Metabolic Regulation	3
BMB 545 or 511	Research Problems in BMB or Topics in BMB	3
A&H Cognate Elective 3 [1]		3
Electives		6
	Credit Hours	**15**
Spring		
BMB 519	Epigenetics and Nutrition	3
BMB 545 or 511	Research Problems in BMB [2] or Topics in BMB	3
BMB 501	Senior Seminars	1
BMB 518	Nanomedicine	3
Electives		3
	Credit Hours	**13**
	Total Credit Hours	**125**

1 P&S (People & Society) and A&H (Arts and Humanities) Cognate Electives.

2 BMB 402, BMB 511, and BMB 545 come with writing credit (W). BMB 545 may be taken for 3-12 credit hours. Variations of the above program are feasible for students entering with advanced standing on the basis of placement tests or transfer credit hours with permission of the biochemistry advisor.

Student Learning Outcomes

- BMB majors, in both BCHM and BCHN tracks, will demonstrate effective writing skills, especially related to the ability to compose a thorough scientific review article.
- BMB majors, in both BCHM and BCHN tracks, will demonstrate effective critical thinking skills, notably related to the ability to readily analyze, synthesize, and draw valid conclusions from published reports in the field of biochemistry.
- BMB majors, in both BCHM and BCHN tracks, will demonstrate essential skills required to conduct supervised research in the field of biochemistry.