

# BS in Cellular and Molecular Biochemistry

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Students in this program will interact closely with faculty members from the Departments of Biological Sciences and Chemistry, and will enjoy a training oriented toward the development of problem solving skills and critical thinking, tightly intertwined with the development of practical laboratory skills. Students graduating from this program will have a thorough education in basic biology and chemistry, and an in depth knowledge of molecular biology, cellular biology, and cellular and molecular biochemistry. At the practical level, students graduating from this program will have extensive knowledge of basic laboratory techniques, including preparation of reagents, solutions, and media for bacterial, cellular, and biochemical analyses, and will be competent in the most-extensively used techniques in the cellular, molecular, and biochemical laboratory environments, including protein and DNA purification and analysis methods, tissue culture, and recombinant DNA technologies. A degree in Cellular and Molecular Biochemistry will provide a sound preparation for graduate studies in biochemistry, molecular biology, cellular biology, cancer, infectious diseases, medicine, and other health-related fields, and provide the student with the technical and intellectual skills to pursue employment in areas related to biotechnology and biomedical research in the academic, pharmaceutical, and biotechnology industries.

## Marketable Skills

1. Communication: Reach mutual understanding through the effective exchange of information, ideas, and feelings.
2. Critical thinking: Analyze and evaluate issues to solve problems and develop informed opinions.
3. Organization: Use resources effectively and efficiently to stay focused on different tasks.
4. Problem-solving: Find solutions to difficult or complex issues.
5. Research: Be able to search, investigate and critically analyze information in response to a specific research question.
6. Time management: Prioritize goals and organize time to be more productive and efficient.

The requirements for the BS degree in Cellular and Molecular Biochemistry consist of the general College of Science requirements: completion of at least 120 semester credit hours, a minimum of 37 of which must be in upper-division coursework, and completion of the University's General Education Core, which includes mathematics requirements MATH 1411. In addition, MATH 1312 or STAT 2480 is required.

For more information contact CORE (<https://www.utep.edu/science/core/>) advisors.

## Fast Track

The Fast-Track Program (<http://catalog.utep.edu/admissions/undergraduate/fast-track/#text>) enables outstanding undergraduate UTEP students to receive both undergraduate and graduate credit for up to 15 hours of UTEP course work as determined by participating Master's and Doctoral programs.

Not all undergraduate programs have elected to participate in the Fast Track option, so students should see their departmental graduate advisor for information about requirements and guidelines. A list of courses that have been approved for possible use at the graduate level is found here (<http://catalog.utep.edu/admissions/undergraduate/fast-track/#fasttrackcoursestext>).

M.S. in Biomedical Engineering (<http://catalog.utep.edu/grad/college-of-engineering/metallurgical-materials-engineering/20biomedical-engineering-ms/>)/ **B.S. in Biological Sciences: Biomedical Concentration; B.S. in Cellular and Molecular Biochemistry; B.S. in Microbiology**

Code	Title	Hours
BIOL 5301	Select Adv Topics Biol Science *	3
BIOL 5308	Rsrch Funding & Prof Developmt	3
BIOL 5311	Neurobiology of Brain Diseases	3
BIOL 5320	Endocrinology	3
BIOL 5330	Cancer Biology	3
BME 5301	BME for Global Health	3
BME 5302	Telemedicine & Imaging Info.	3
BME 5303	Research & Lab Methods	3
BME 5304	BME Device Design & Regulation	3
BME 5310	Biomaterials	3
BME 5313	Tissue Engineering	3
BME 5321	Biomechatronics	3
BME 5353		3
BME 5390	Special Topics in BME	3

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Advisor approval needed

## Degree Plan

Required Credits: 120

Code	Title	Hours
<b>University Core <sup>C</sup></b>		
Complete the University Core Curriculum requirements. (p. 3)		42
<b>Designated Core <sup>C</sup></b>		
MATH 1411	Calculus I	
PHYS 1403 & PHYS 1404	General Physics I and General Physics II	
<b>OR</b>		
PHYS 2320 & PHYS 2120	Introductory Mechanics and Laboratory for PHYS 2320	
and		
PHYS 2321 & PHYS 2121	Introductory Electromagnetism and Laboratory for PHYS 2321	
<b>Cellular and Molecular Biochemistry Requirements:</b>		
<b>Required Chemistry Courses: <sup>C</sup></b>		
CHEM 1105	Laboratory for CHEM 1305	1
CHEM 1106	Laboratory for CHEM 1306	1
CHEM 1305	General Chemistry	3
CHEM 1306	General Chemistry	3
CHEM 2124	Lab for Organic Chemistry 2324	1
CHEM 2125	Lab for Organic Chemistry 2325	1
CHEM 2324	Organic Chemistry	3
CHEM 2325	Organic Chemistry	3
CHEM 3131	Lab for Chemistry	1
CHEM 3330	Biochem I: Struc & Function	3
CHEM 3332	Biochem II: Metabol & Bioener	3
<b>Required Biology Courses:</b>		
BIOL 1107	Topics in Study of Life I <sup>C</sup>	1
BIOL 1108	Organismal Biology Laboratory <sup>C</sup>	1
BIOL 1305	General Biology <sup>C</sup>	3
BIOL 1306	Organismal Biology <sup>C</sup>	3
BIOL 3320	Genetics	3
CBCH 3316 & BIOL 3115	Membrane Biology and Molecular Cell Biol Laboratory <sup>C</sup>	4
CBCH 4310	Techniques in Mol Biochem <sup>C</sup>	3
CBCH 4320	Adv Topics in Mol Biochem	3
MICR 2340 & MICR 2141	General Microbiology and Gen Microbiology Laboratory <sup>C</sup>	4
MICR 3345 & MICR 3146	Microbial Physiology and Microbial Physiology Lab	4
MICR 3449	Prokaryotic Molecular Genetics	4
MICR 4353 & MICR 4154	Immunology and Immunology Laboratory	4
<b>CBCH Major:</b>		
BIOL 3314 & BIOL 3115	Molecular Cell Biology and Molecular Cell Biol Laboratory	4
CBCH 4414	Cellular Biochemistry	4
MATH 1312 or STAT 2480	Calculus II Elementary Statistical Methods	3-4
<b>Prescribed Course Electives:</b>		
Select five hours of the following:		5

BIOL 3192	Professional Development Sem.
BIOL 3330	Histology
BIOL 4198	Special Problems
BIOL 4298	Special Problems
BIOL 4388	Mammalian Physiology
BIOL 4398	Special Problems
CHEM 4134	Structural Biochemistry Lab
CHEM 4176	Introduction to Research
CHEM 4334	Structural Biochemistry
CHEM 4376	Introduction to Research
MICR 3343 & MICR 3144	Pathogenic Microbiology and Pathogenic Microbiology Lab
MICR 4351	General Virology
MICR 4355	Medical Mycology
ZOOL 3464	Medical Parasitology
ZOOL 4384	Neurobiology

**Total Hours** **120**

C Course requires a grade of C or better.

1 A total of thirty-seven hours of upper division coursework is required for all Bachelor of Science degrees.

## University Core Curriculum

The department may make specific suggestions for courses which are most applicable towards your major.

All courses require a C or better

### I. Communication (six hours)

Code	Title	Hours
The objective of the communication component is to enable the student to communicate effectively in clear and correct prose or orally in a style appropriate to the subject, occasion, and audience.		
Select six hours of the following:		6
For students whose secondary education was in English:		
COMM 1611	Written and Oral Communication	
ENGL 1313	Writing About Literature	
RWS 1301	Rhetoric & Composition I	
RWS 1302	Rhetoric & Composition 2	
RWS 1601	Rhetoric, Composition & Comm	
For students whose secondary education was not in English:		
ESOL 1311	Expos Engl Compos-Spkr Esl	
ESOL 1312	Res & Crit Writng Spkr Esl	
<b>Total Hours</b>		<b>6</b>

### II. American History (six hours)

Code	Title	Hours
The objectives of the history component are to expand students' knowledge of the origin and history of the U.S., their comprehension of the past and current role of the U.S. in the world, and their ability to critically evaluate and analyze historical evidence. U.S. history courses (three hours must be Texas history) include:		
HIST 1301	History of U.S. to 1865	3
HIST 1302	History of U.S. Since 1865	3
<b>Total Hours</b>		<b>6</b>

**III. Language, Philosophy & Culture (three hours)**

Code	Title	Hours
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The objective of the humanities component is to expand students' knowledge of the human condition and human cultures, especially in relation to behaviors, ideas, and values expressed in works of human imagination and thought. Through study in disciplines such as literature and philosophy, students engage in critical analysis and develop an appreciation of the humanities as fundamental to the health and survival of any society.

Select one of the following:	3
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AFST 2300	Intro-African Amer Studies
CHIC 2302	Latina/o Presence in the U.S.
ENGL 2311	English Literature
ENGL 2312	English Literature
ENGL 2313	Intro to American Fiction
ENGL 2314	Intro to American Drama
ENGL 2318	Intro to American Poetry
FREN 2322	Making of the "Other" Americas
HIST 2301	World History to 1500
HIST 2302	World History Since 1500
PHIL 1301	Introduction to Philosophy
PHIL 2306	Ethics
RS 1301	Introduct to Religious Studies
SPAN 2340	Seeing & Naming: Conversations
WS 2300	Introduction to Womens Studies
WS 2350	Global Feminisms

<b>Total Hours</b>	<b>3</b>
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**IV. Mathematics (three hours)**

Code	Title	Hours
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The objective of the mathematics component is to develop a quantitatively literate college graduate. Every college graduate should be able to apply basic mathematical tools in the solution of real-world problems.

Select one of the following:	3
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MATH 1309	College Algebra
MATH 1310	Trigonometry and Conics
MATH 1319	Math in the Modern World
MATH 1320	Math for Social Sciences I
MATH 1411	Calculus I
MATH 1508	Precalculus <sup>1,2</sup>
MATH 2301	Math for Social Sciences II
STAT 1380	Statistical Literacy
STAT 2480	Elementary Statistical Methods

1 A higher-level course in the calculus sequence can be substituted.

2 TCCN MATH 1314 will also satisfy this requirement.

<b>Total Hours</b>	<b>3</b>
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**V. Life & Physical Sciences (six hours)**

Code	Title	Hours
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The objective of the study of the natural sciences is to enable the student to understand, construct, and evaluate relationships in the natural sciences, and to enable the student to understand the bases for building and testing theories. The courses listed are for non-majors; the major courses in the discipline can be substituted for the non-major sequence. A minimum of two semesters of lecture and one semester of laboratory associated with one of the courses, or two semesters of combined (3 credit) lecture-laboratory courses (Only six hours apply toward the required 42.):

Select one of the following:	1-4
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ASTR 1107	Astronomy Lab I
ASTR 1307	Elem Astronomy-Solar System

ASTR 1308	Elem Astr Stars & Galaxies
BIOL 1103	Introductory Biology Lab
BIOL 1104	Human Biology Laboratory
BIOL 1107	Topics in Study of Life I
BIOL 1108	Organismal Biology Laboratory
BIOL 1203	Introductory Biology
BIOL 1304	Human Biology
BIOL 1305	General Biology
BIOL 1306	Organismal Biology
BIOL 2111	Human Anat/Physio Lab I
BIOL 2113	Human Anat/Physio Lab II
BIOL 2311	Human Anat/Physiology I
BIOL 2313	Human Anat/Physiology II
CHEM 1105	Laboratory for CHEM 1305
CHEM 1106	Laboratory for CHEM 1306
CHEM 1107	Intro General Chemistry Lab
CHEM 1108	Intro Organic & Biochem Lab
CHEM 1305	General Chemistry
CHEM 1306	General Chemistry
CHEM 1307	Intro to General Chemistry
CHEM 1308	Intro Organic & Biochemistry
ESCI 1101	Environmental Sci. Lab
ESCI 1102	Non-major Lab for ESCI 1301
ESCI 1202	Intro to Environment Science 2
ESCI 1301	Intro to Environmental Sci
GEOG 1106	Laboratory for GEOG 1306
GEOG 1306	Physical Geography
GEOL 1103	Lab for GEOL 1313
GEOL 1104	Lab for GEOL 1314
GEOL 1111	Principles of Earth Sci - Lab
GEOL 1112	Laboratory for Geology 1212
GEOL 1211	Principles of Earth Sciences
GEOL 1212	Principles of Earth Science
GEOL 1230	The Blue Planet
GEOL 1231	Natural Hazards
GEOL 1313	Intro to Physical Geology
GEOL 1314	Intro to Historical Geol
HSCI 2302	Fundamentals of Nutrition
HSCI 2303	Wellness Dynamics
MICR 2330	Microorganisms and Disease
PHYS 1403	General Physics I
PHYS 1404	General Physics II
PHYS 2120	Laboratory for PHYS 2320
PHYS 2121	Laboratory for PHYS 2321
PHYS 2320	Introductory Mechanics
PHYS 2321	Introductory Electromagnetism

**Total Hours****6****VI. Political Science (six hours)**

Code	Title	Hours
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The objectives of the political science component are to expand students' knowledge of the origin and evolution of the U.S. and Texas political systems, focusing on the growth of political institutions, and on the constitutions of Texas and the United States; and to enhance their understanding of federalism, states rights, and individual civil liberties, rights, and responsibilities.

## Required Courses:

POLS 2310	Introduction to Politics	3
POLS 2311	American Govern & Politics	3
<b>Total Hours</b>		<b>6</b>

**VII. Social and Behavioral Sciences (three hours)**

Code	Title	Hours
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The objective of the social and behavioral science component is to increase students' knowledge of how social and behavioral scientists discover, describe, and explain the behaviors and interactions among individuals, groups, institutions, events, and ideas. Such knowledge will better equip students to understand themselves and the roles they play in addressing the issues facing humanity.

Select one of the following: 3

ANTH 1301	Intro-Phys Anth/Archeolog	
ANTH 1302	Intro-Cultural Anthropology	
ANTH 1310	Cultural Geography	
ANTH 2320	Intro to Linguistics	
CE 2326	Econ for Engrs & Scientists	
ASIA 2300	Asian American Studies	
COMM 2350	Interpersonal Communication	
COMM 2372	Mass Media and Society	
ECON 2303	Principles of Macroeconomics	
ECON 2304	Principles of Microeconomics	
EDPC 1301	Introduction to Ed Psychology	
EDU 1342	Action Research in Classrooms	
ENGL 2320	Introduction to Linguistics	
GEOG 1310	Cultural Geography	
LEAD 2300	Community Service	
LING 2320	An Intro. to Linguistics	
LING 2340	Lang. Inside & Out: Sel Topics	
PSYC 1301	Introduction to Psychology	
SOCI 1301	Introduction to Sociology	
SOCI 1310	Cultural Geography	

**Total Hours** 3

**VIII. Creative Arts (three hours)**

Code	Title	Hours
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The objective of the visual and performing arts component is to expand students' knowledge and appreciation of the human imagination as expressed through works of visual art, dance, music, theatre and film. Through study in these disciplines, students will form aesthetic judgments and develop an appreciation of the arts as fundamental to the health and survival of any society.

Select one of the following: 3

ART 1300	Art Appreciation	
ARTH 1305	History of Art I	
ARTH 1306	History of Art II	
CHIC 1311	Chicana/o Fine Arts Appreciat	
DANC 1304	Dance Appreciation	
FILM 1390	Intro-Art of Motion Pict.	
MUSL 1324	Music Appreciation	
MUSL 1327	Jazz to Rock	
MUSL 2321	Music, Culture, and Society	
THEA 1313	Introduction to Theatre	

**Total Hours** 3

**IX. Component Area Option (six hours)**

Code	Title	Hours
The objective of the institutionally designated option component is to develop the critical thinking skills and academic tools required to be an effective learner. Special emphasis is placed on the use of technology in problem-solving, communications, and knowledge acquisition.		
Select two of the following:		6
BUSN 1301	Intro to Global Business	
COMM 1301	Public Speaking	
COMM 1302	Business/Profession Comm	
CS 1310	Intro-Computational Thinking	
CS 1320	Computer Programming Sci/Engr	
EL 1301	Eng Innovation and Leadership	
LEAD 1300	Introduction to Leadership	
SCI 1301	Inquiry in Math & Science	
UNIV 1301	Seminar/Critical Inquiry	
<b>Total Hours</b>		<b>6</b>

**4-Year Sample Degree Plan****BS in Cellular and Molecular Biochemistry (Starting with Calculus)**

Code	Title	Hours
<b>BS CELLULAR AND MOLECULAR BIOCHEMISTRY (STARTING WITH CALCULUS)</b>		
<b>FRESHMAN</b>		
<b>Fall</b>		
BIOL 1305 & BIOL 1107	General Biology and Topics in Study of Life I	4
MATH 1411	Calculus I	4
SCI 1301	Inquiry in Math & Science	3
RWS 1301	Rhetoric & Composition I	3
<b>Spring</b>		
BIOL 1306 & BIOL 1108	Organismal Biology and Organismal Biology Laboratory	4
CHEM 1305 & CHEM 1105	General Chemistry and Laboratory for CHEM 1305	4
RWS 1302	Rhetoric & Composition 2	3
Social & Behavioral Sciences		3
<b>SOPHOMORE</b>		
<b>Fall</b>		
CHEM 1306 & CHEM 1106	General Chemistry and Laboratory for CHEM 1306	4
HIST 1301	History of U.S. to 1865	3
PHYS 1403	General Physics I	4
MICR 2340 & MICR 2141	General Microbiology and Gen Microbiology Laboratory	4
<b>Spring</b>		
CHEM 2324 & CHEM 2124	Organic Chemistry and Lab for Organic Chemistry 2324	4
COMM 1301	Public Speaking	3
PHYS 1404	General Physics II	4
HIST 1302	History of U.S. Since 1865	3
<b>JUNIOR</b>		
<b>Fall</b>		
BIOL 3320	Genetics	3
CHEM 2325 & CHEM 2125	Organic Chemistry and Lab for Organic Chemistry 2325	4

POLS 2310	Introduction to Politics	3
Creative Arts Elective		3
Language, Philosophy, and Culture		3
<b>Spring</b>		
CHEM 3330 & CHEM 3131	Biochem I:Struc & Function and Lab for Chemistry	4
STAT 2480 or MATH 1312	Elementary Statistical Methods Calculus II	3-4
POLS 2311	American Gover & Politics	3
Menu Electives in Major		3
Menu Electives in Major		3
<b>SENIOR</b>		
<b>Fall</b>		
CBCH 4310	Techniques in Mol Biochem	3
CBCH 3316 & BIOL 3115	Membrane Biology and Molecular Cell Biol Laboratory	4
MICR 3345 & MICR 3146	Microbial Physiology and Microbial Physiology Lab	4
MICR 4353 & MICR 4154	Immunology and Immunology Laboratory	4
<b>Spring</b>		
BIOL 4198	Special Problems	1
CBCH 4320	Adv Topics in Mil Biochem	3
CBCH 4414	Cellular Biochemistry	4
CHEM 3332	Biochem II: Metabol & Bioenerg	3
MICR 3449	Prokaryotic Molecular Genetics	4
<b>Total Hours</b>		<b>119-120</b>

## BS in Cellular and Molecular Biochemistry (Starting with Pre-Calculus)

Code	Title	Hours
<b>BS CELLULAR AND MOLECULAR BIOCHEMISTRY (STARTING WITH CALCULUS)</b>		
<b>FRESHMAN</b>		
<b>Fall</b>		
BIOL 1305 & BIOL 1107	General Biology and Topics in Study of Life I	4
MATH 1508	Precalculus	5
SCI 1301	Inquiry in Math & Science	3
RWS 1301	Rhetoric & Composition I	3
<b>Spring</b>		
BIOL 1306 & BIOL 1108	Organismal Biology and Organismal Biology Laboratory	4
CHEM 1305 & CHEM 1105	General Chemistry and Laboratory for CHEM 1305	4
COMM 1301	Public Speaking	3
MATH 1411	Calculus I	4
RWS 1302	Rhetoric & Composition 2	3
<b>SOPHOMORE</b>		
<b>Fall</b>		
CHEM 1306 & CHEM 1106	General Chemistry and Laboratory for CHEM 1306	4
HIST 1301	History of U.S. to 1865	3
MICR 2340 & MICR 2141	General Microbiology and Gen Microbiology Laboratory	4
PHYS 1403	General Physics I	4



**Spring**

CHEM 2324 & CHEM 2124	Organic Chemistry and Lab for Organic Chemistry 2324	4
PHYS 1404	General Physics II	4
HIST 1302	History of U.S. Since 1865	3

**JUNIOR****Fall**

BIOL 3320	Genetics	3
CHEM 2325 & CHEM 2125	Organic Chemistry and Lab for Organic Chemistry 2325	4
POLS 2310	Introduction to Politics	3
Creative Arts Elective		3
Language, Philosophy, and Culture		3

**Spring**

CHEM 3330 & CHEM 3131	Biochem I: Struc & Function and Lab for Chemistry	4
STAT 2480 or MATH 1312	Elementary Statistical Methods Calculus II	3-4
POLS 2311	American Gover & Politics	3
Menu Electives in Major		3

**SENIOR****Fall**

CBCH 4310	Techniques in Mol Biochem	3
CBCH 3316 & BIOL 3115	Membrane Biology and Molecular Cell Biol Laboratory	4
MICR 3345 & MICR 3146	Microbial Physiology and Microbial Physiology Lab	4
MICR 4353 & MICR 4154	Immunology and Immunology Laboratory	4
Social & Behavioral Sciences		3

**Spring**

BIOL 4198	Special Problems	1
CBCH 4320	Adv Topics in Mil Biochem	3
CBCH 4414	Cellular Biochemistry	4
CHEM 3332	Biochem II: Metabol & Bioenerg	3
MICR 3449	Prokaryotic Molecular Genetics	4

**Total Hours****121-122**