UNDERGRADUATE ADVISING GUIDE

BIOCHEMISTRY B.S. DEGREE

For the Bachelor of Science degree in biochemistry, the objective of this curriculum is to provide the student with a strong background in science, and to prepare the student for entry into professional schools, graduate study and/or highly technical scientific careers after graduation. There are sufficient individual choices in the curriculum to allow students to tailor their programs to any of several areas of specialization (or concentrations) by appropriate use of elective hours.

Tips and Things You Need to Know:

- The major is BIOCHEMISTRY with ELEVEN CONCENTRATIONS to choose from: Pre-Medicine, Pre-Pharmacy, Pre-Dental, Pre-Optometry, Pre-Veterinary, Pre-MBA, Science (Research), Forensic Science, Bioinformatics, Entomology or Plant Pathology.

- Get to know your BIOCHEMISTRY (BCH) ADVISOR. Contact the BCH departmental main office in Rm. 402 Dorman Hall or call 325-2640 to find out who your advisor is if you do not know. You can get contact information for your advisor on the department website, or ask the main office. If you cannot determine who your advisor is, or you have a problem or need additional information, contact the Department Head (Jeffrey F. D. Dean at jeff.dean@msstate.edu).

- Students should learn to use the University Degree Audit System, called CAPP (Curriculum, Advising, and Program planning). In Banner, students should enter their NETID and view current or previously generated CAPP compliances to view progress in meeting curriculum requirements. Students can also use the "What-If" option to investigate interest in other concentrations and/or evaluate opportunities for a double major.

- Students can transfer up to 60 hours of community college / junior college credit into their BCH program at MSU. It is the student's responsibility to work with their former institution and the MSU registrar to have coursework transferred. Note that transferred credits must articulate (or directly substitute) for specific program requirements, and not every course transferred may be usable or articulate directly. See your advisor or the Department Head for assistance is needed.

- The Biochemistry B.S. degree is a comprehensive degree, and the design of our curriculum meets "typical" requirements, relative to our concentrations, where students may head after graduation (e.g., medical school, graduate school, etc.). Nevertheless, there is no way we (as advisors) can be aware of all requirements for all post-B.S. opportunities or admission / entry requirements for advanced degree programs. Therefore, it is the student's responsibility to let their advisor know if they have a specific or non-traditional requirement needed in their program. Fortunately, the BCH curriculum, unlike some other programs, has enough flexibility to accommodate such needs as science and/or technical electives where feasible.

ALL Biochemistry B.S. students MUST complete the following General Education Requirements:

- English Composition (6 hours)

  EN 1103 English Comp I OR EN 1163 Accelerated Comp I

  EN 1113 English Comp II OR EN 1173 Accelerated Comp II

  Note: Students that may go on to Professional school who received AP credit where an "S" grade is given (i.e., satisfactory), or complete an accelerated English course where credit is given for the other English class as an "S" grade, need to make sure they complete 6 hours of graded English (preferably with a writing component). This can be done by taking an additional English course as a Humanities requirement (see below).

- Mathematics (6 hours)

  MA 1713 Calculus I

  MA 1723 Calculus II

  Note: For students who must take pre-requisite math classes (e.g., College Algebra, Trigonometry, etc.) due to lower math ACT scores or other reasons, these pre-requisite math courses can count in the curriculum as Free Electives. Students that may go on to Professional school who received AP credit where an "S" grade is given (i.e., satisfactory) for calculus, need to make sure they complete 6 hours of graded math.

- Humanities (6 hours)

  Note that any of the Humanities electives as listed in the MSU Undergraduate Catalog under the approved Humanities General Electives can be used to meet this requirement. Note that some BCH degree concentrations require specific humanities courses in order to complete the concentration requirements (see concentration-specific courses).

- Fine Arts (3 hours)

  Note: Any of the Fine Arts electives as listed in the MSU Undergraduate Catalog under the approved Fine Arts General Electives can be used to meet this requirement.

- Social Sciences (6 hours)

  Note: Any of the Social/Behavioral Science electives as listed in the MSU Undergraduate Catalog under the approved Social/Behavioral General Electives can be used to meet this requirement. Some BCH degree concentrations require specific social/behavioral

science courses in order to complete the concentration requirements (see concentration-specific courses).

- Oral Communication Requirement

  CO 1003 - Fundamentals of Public Speaking

  Note: This is the only course accepted as the oral communication requirement. Transfer courses may be accepted if they indicate "public speaking or speech" in the title. Introduction to Communication, or similar communication courses, without a public speaking component cannot be accepted.

- Writing Requirement

  No course requirement since the university requirement is satisfied by successful completion of BCH 4414 and BCH 4804. Note that some post-B.S. programs may require a specific writing requirement (though not typical). The student should assess this and, if required, a writing course can count in the BCH curriculum as a Free Elective.

- Computer Literacy

  No course requirement since the university requirement is satisfied by successful completion of BCH 4414, BCH 4713 and BCH 4804. Note that some post-B.S. programs may require a specific computer requirement (though not typical). The student should assess this and, if required, a computer course can count in the BCH curriculum as a Free Elective.

Double Majors / Minors:

- Because the Biochemistry curriculum has some flexibility in coursework built-in to the science or technical electives, students may want to pursue double majors or minors in other disciplines or degree programs to augment or enhance their BCH degree program. Some concentrations in the BCH major are "easier" than others (in terms of time or credit hours required, not difficulty in coursework) to work into their programs while still pursuing graduation in a 4-year time-frame.

- It is imperative that students visit with a "Minor Advisor" in the discipline or degree program they are interested in pursuing. Some minors are well documented in the MSU Undergraduate Catalog, however meeting with a minor advisor is highly encouraged to assure the correct courses, sequence of courses and required course credit hours are obtained.

- It is even more imperative that students visit with a "Major Advisor" in the discipline or degree program they are interested in pursuing the Double Major. A double major required declaration of the double major and a secondary major declaration form.

- See your BCH advisor or the Department Head for guidance on pursuing this option in your program.

ALL Biochemistry B.S. students MUST complete the following MAJOR CORE Science Requirements:

- Chemistry
  - CH 1213 Chemistry I
  - CH 1211 Investigations in Chemistry I
  - CH 1223 Chemistry II
  - CH 1221 Investigations in Chemistry II
  - CH 4513 Organic Chemistry I
  - CH 4511 Organic Chemistry Lab
  - CH 4523 Organic Chemistry II
  - CH 4521 Organic Chemistry Lab

- Biology
  - BIO 1134 Biology I
  - BIO 1144 Biology II
  - BIO 3304 General Microbiology

- Physics
  - PH 1113 General Physics I OR PH 2213 Physics I
  - PH 1123 General Physics II OR PH 2223 Physics II
  - PH 1133 General Physics III OR PH 2233 Physics III (see note below)

  Note that at MSU, Physics is a three course series (three credit hours each) for a total of nine hours. Six hours of physics (Physics I/II) is only required in some BCH concentrations (Science, Bioinformatics, Forensic Science, Pre-MBA, Entomology and Plant Pathology). Most Pre-Professional concentrations (Pre-Medicine, Pre-Dental, Pre-Optometry and Pre-Pharmacy) require a minimum of eight hours of Physics due to Professional School program requirements, so students taking physics at MSU need to complete the three-course series (or see below). For Pre-Veterinary students, only six hours is required due to the MSU-CVM requirements; however, other Veterinary Schools may require eight hours and it is up to the student to determine whether Physics III or eight hours is required in their program. A BCH student in ANY concentration may choose to take Physics I and II at another institution off-campus (at four hours each, or a total of eight hours), and transfer the credit to MSU which will complete the Physics requirement in the BCH program. Where the MSU Physics III course may have been required in a specific BCH concentration, if eight hours of physics is achieved/transferred, a student can substitute a science or technical elective in its place. Students are only required to take the trigonometry-based physics series (e.g., PH 1113, 1123, 1133), however those that enjoy math or calculus may want to take the calculus-based physics series (e.g., PH 2213, 2223, 2233).

ALL Biochemistry B.S. students MUST complete the following BIOCHEMISTRY CORE Requirements:

- BCH 1001 Intro to Biochemistry
- BCH 3901 Senior Seminar
- BCH 4414 Protein Methods
- BCH 4503 Scientific Communication Skills
- BCH 4603 General Biochemistry I
- BCH 4613 General Biochemistry II
- BCH 4623 Biochemistry of Special Tissues
- BCH 4713 Molecular Biology
- BCH 4804 Molecular Biology Methods

Note that since these BCH courses represent the heart of the Mississippi State University Biochemistry degree, they cannot be substituted with BCH or similar courses from other institutions. These BCH courses must be taken at Mississippi State University. The only exception would be courses taken through an approved MSU "National Student Exchange" program.

BIOCHEMISTRY DEGREE PROGRAM CONCENTRATIONS:

The Biochemistry Curriculum is a 120 hour program (except the Bioinformatics Concentration which is 121 hours). The General Education requirements are University-required program pre-requisites. The Major Core Requirements meet the background requirements needed for a science-related curriculum. The Biochemistry Core represents the heart of the Biochemistry program. The remainder of the program course hour requirements are fulfilled through various concentration requirements depending on the goals of the student and career objectives (whether it is an advanced degree through professional school, graduate program entry, or direct employment after graduation). Below are the Concentrations and the course requirements for these BCH curricular options. Where a concentration indicates "Science and/or Technical Electives", a list of these can be found at the end of this guide in the Appendix and creates flexibility in the program based on student's interests and permits consideration of a double major, minor or certificate program from another discipline as part of the BCH degree program. Where a concentration indicates "Free Electives", students can apply any college credit or courses in this part of the program (e.g., unusable pre-requisite courses, golf, nuclear physics, yoga, additional science or technical electives, etc.). Transfer courses can be used to meet science or technical electives if they are "program-relevant" and usually upper division, or free electives provided the number of transfer hours is less than 60 hours.

- BCH Degree Concentrations: Pre-Medicine, Pre-Pharmacy, Pre-Dental, Pre-Optometry, Pre-Veterinary, Pre-MBA, Science (Research), Forensic Science, Bioinformatics, Entomology or Plant Pathology.

Pre-Medicine Concentration (MED)

Biochemistry is an excellent preparation for medical school. In order to be better prepared for the Medical College Admissions Test (MCAT), medical school classes, and to meet medical school entrance requirements, the following courses are required in lieu of technical or general electives.

- BIO 2103 Cell Biology OR BIO 4114 Cellular Physiology
- BIO 3004 Human Anatomy OR BIO 3014 Human Physiology OR VS 3014 Anatomy & Physiology OR BIO 4514 Animal Physiology
- BIO 3103 Genetics OR BIO 4133 Human Genetics
- PH 1133 General Physics III OR PH 2233 Physics III OR a science/technical elective if transferring 8 hours of Physics to the program from outside MSU.
- PHI 1123 Intro to Ethics OR PHI 2123 Medical Ethics OR Science Elective (3 hours)

  NOTE: PHI 1123 Intro to Ethics may be used to fulfill three of the six hours of General Education Humanities requirements. Students taking this course can apply this as a humanities elective (if they so choose) and then can take either PHI 2123 Medical Ethics or any other approved Science elective to fulfill this technical elective requirement.
- SIX (6) hours of Science or Technical Electives
- EIGHT to NINE (8-9) hours of General or Free electives
- Total hours needed for major: 120
- Note that some medical schools may have non-traditional or non-typical entry requirements, may have specific writing requirements, or may NOT accept "S" grades or on-line coursework (even though these may be accepted in your BCH undergraduate program). Be aware of institutional requirements where you might apply to medical school, and share any requirements not met in your BCH program with your program advisor so that we can assist you in working these into your curriculum.
- Medical Schools are looking for demonstration of your "commitment to health care". Work diligently to amass physician shadowing hours, volunteer your time, develop leadership skills, demonstrate maturity, and establish a strong work ethic. A great GPA and MCAT score will get your foot in the door, but your mastery of the "soft skills" (writing, communication and purpose-driven involvement) will speak volumes in your application, personal statement and interview.
- Several courses are highly recommended for pre-medicine students: KI 2603 Medical Terminology, PHI 2123 Medical Ethics and EPP 4173 Medical/Veterinary Entomology along with any combination of additional anatomy and/or physiology coursework.

Pre-Dental Concentration (DENT)

Biochemistry is an excellent preparation for Dental School. This concentration prepares students for the Dental Admissions Test, dental school classes, and to meet dental school requirements. The following courses are required as either Social Science core courses or in lieu of technical or general electives.

- PSY 1013 General Psychology – this course MUST be on your program as a social science elective as "most" Dental School require this elective in your pre-dental program of study. The remaining 3 hours of Social/Behavioral Sciences should be chosen from the approved General Education courses as listed in the Undergraduate Catalog.
- BIO 2103 Cell Biology OR BIO 4114 Cellular Physiology
- BIO 3004 Human Anatomy OR BIO 3014 Human Physiology OR VS 3014 Anatomy & Physiology OR BIO 4514 Animal Physiology
- ST 2113 Introduction to Statistics
- PH 1133 General Physics III OR PH 2233 Physics III OR a science/technical elective if transferring 8 hours of Physics to the program from outside MSU.
- PHI 1123 Intro to Ethics OR PHI 2123 Medical Ethics OR Science Elective (3 hours)

  NOTE: PHI 1123 Intro to Ethics may be used to fulfill three of the six hours of General Education Humanities requirements. Students taking this course can apply this as a humanities elective (if they so choose) and then can take either PHI 2123 Medical Ethics or any other approved Science elective to fulfill this technical elective requirement.
- SIX (6) hours of Science or Technical Electives
- EIGHT to NINE (8-9) hours of General or Free electives
- Total hours needed for major: 120
- Note that some dental schools may have non-traditional or non-typical entry requirements, may have specific writing requirements, or may NOT accept "S" grades or on-line coursework (even though these may be accepted in your BCH program). Be aware of institutional requirements where you might apply to dental school, and share any requirements not met in your BCH program with your advisor so that we can assist you in working these into your curriculum.
- Dental Schools are looking for demonstration of your "commitment to health care". Work diligently to amass dental shadowing hours, volunteer your time, develop leadership skills, demonstrate maturity, and establish a strong work ethic. A great GPA and DAT score will get your foot in the door, but your mastery of the "soft skills" (writing, communication and purpose-driven involvement) will speak volumes in your application, personal statement and interview.

Pre-Optometry Concentration (OPT)

Biochemistry is an excellent preparation for Optometry School. This concentration prepares students for the Optometry Admissions Test, optometry school classes, and to meet optometry school requirements. The following courses are required as either Social Science courses or in lieu of technical electives.

- PSY 1013 General Psychology – this course MUST be on your program as a social science elective as "most" Optometry School require this elective in your pre-optometry program of study. The remaining 3 hours of Social/Behavioral Sciences should be chosen from the approved General Education courses as listed in the Undergraduate Catalog.
- BIO 2103 Cell Biology OR BIO 4114 Cellular Physiology
- BIO 3004 Human Anatomy OR BIO 3014 Human Physiology OR VS 3014 Anatomy & Physiology OR BIO 4514 Animal Physiology
- ST 2113 Introduction to Statistics
- PH 1133 General Physics III OR PH 2233 Physics III OR a science/technical elective if transferring 8 hours of Physics to the program from outside MSU.
- PHI 1123 Intro to Ethics OR PHI 2123 Medical Ethics OR Science Elective (3 hours)

  NOTE - PHI 1123 Intro to Ethics may be used to fulfill three of the six hours of General Education Humanities requirements. Students taking this course can apply this as a humanities elective (if they so choose) and then can take either PHI 2123 Medical Ethics or any other approved Science elective to fulfill this technical elective requirement.
- SIX (6) hours of Science or Technical Electives
- EIGHT to NINE (8-9) hours of General or Free electives
- Total hours needed for major: 120
- Note that some optometry schools may have non-traditional entry requirements, may have specific writing requirements, or may NOT accept "S" grades or on-line coursework (even though these may be accepted in your BCH program). Be aware of institutional requirements where you might apply to optometry school, and share any requirements not met in your BCH program with your advisor so that we can assist you in working these into your curriculum.
- Optometry Schools are looking for demonstration of your "commitment to health care". Work diligently to amass optometry shadowing hours, volunteer your time, develop leadership skills, demonstrate maturity, and establish a strong work ethic. A great GPA and OAT score will get your foot in the door, but your mastery of the "soft skills" (writing, communication and purpose-driven involvement) will speak volumes in your application, personal statement and interview.

Pre-Pharmacy Concentration (PPHR)

Some Pharmacy school may require only two to three years of college work for entry. However, four-year undergraduate programs can be of benefit to students, and completion of the four year degree is important is one's circumstance changes later on in life to have completed an academic B.S. degree. Biochemistry graduates have been very successful in Pharmacy School and perform very well on the Pharmacy College Admissions Test.

- The following courses are required as either Social Science core courses or in lieu of technical or general electives.

  PSY 1013 General Psychology OR SO 1003 Introduction to Sociology

  EC 2113 Principles of Macroeconomics AND EC 2123 Principles of Microeconomics

- ST 2113 Introduction to Statistics
- BIO 3103 Genetics OR BIO 4113 Human Genetics
- BIO 4405 Pathogenic Microbiology
- BIO 4413 Immunology
- BIO 4514 Animal Physiology
- PHI 2123 Medical Ethics
- PH 1133 General Physics III OR PH 2233 Physics III OR a science/technical elective if transferring 8 hours of Physics to the program from outside MSU.
- FOUR (4) hours OF General or Free electives
- Total hours needed for major: 120
- Note that some pharmacy schools may have non-traditional or non-typical entry requirements, may have specific writing requirements, or may NOT accept "S" grades or on-line coursework (even though these may be accepted in your BCH program). The MSU Biochemistry degree program for the Pre-Pharmacy concentration is developed to pattern the required articulation of classes to Pharmacy School at the University of Mississippi's School of Pharmacy. Other Pharmacy Schools may require alternate coursework, so it is important that students determine requirements if different or more stringent coursework is required.

Pre-Veterinary Medicine Concentration (PVBC)

Biochemistry is an excellent preparation for veterinary medical school. In order to be better prepared for the Graduate Record Examination (GRE) or Veterinary College Admissions Test (VCAT), veterinary medical school classes, and to meet veterinary medical school entrance requirements, the following courses are required in lieu of technical or general electives.

- BIO 3103 Genetics OR BIO 4133 Human Genetics
- VS 3014 Anatomy and Physiology OR BIO 4514 Animal Physiology
- BIO 2103 Cell Biology OR BIO 4114 Cellular Physiology
- TWELVE (12) hours Science or Business Technical Electives

  Note that students are encouraged to pursue elective classes in other departments to meet science, technical or business electives of interest to the student: Animal and Dairy Science, Poultry Science, Food Science, Wildlife, Fisheries and Aquaculture, Agricultural Economics, College of Veterinary Medicine – Veterinary Technician program, Biological Sciences, Entomology coursework, etc. Students are highly encouraged to take at least one business-oriented course (Agriculture and Resource Economics, Accounting, Entrepreneurship, or similar course). Students are also encouraged to consider taking EPP 4173 Medical/Veterinary Entomology and either a course in veterinary terminology or medical terminology.
- SIX (6) hours Social Sciences (See General Education courses)
- EIGHT to NINE (8to 9) hours General/Free Electives
- Total hours needed for major: 120
- The pre-veterinary concentration in BCH patterns requirements to the MSU College of Veterinary Medicine entry requirements. MSU-CVM only requires six (6) hours of physics, while other veterinary school admission requirements may require eight (8) hours. Similarly, students applying to other veterinary schools out-of-state need to be aware of any non-typical admission requirements so these can be worked into their program as science, technical or free electives.

Three year program (3+1) for early admission into the COLLEGE of VETERINARY MEDICINE

The aim of this curriculum option is to allow a student to matriculate through the Biochemistry program for three years (95 hours) and then proceed into the College of Veterinary Medicine under their early admissions policy. Successful completion of the courses taken during the first year in Veterinary Medicine (equivalent to 25 hours) will satisfy the Department's requirements for technical electives and allow the University to grant the student a B.S. in Biochemistry and Molecular Biology after this period. This three-year, early application option requires careful planning, and needs to be declared early in the program in order to complete degree requirements.

Forensic Sciences Concentration (FOSC)

This concentration provides the student with a B.S. in Biochemistry incorporating a strong background in the biochemical sciences along with a rigorous preparation in the general area of criminology and forensics. Because of the ever increasing use of molecular sciences in forensics, graduates with this specialization should be employable by crime labs or by industry using DNA profiling, biochemistry/toxicology, or other biometric techniques. Internships are encouraged. The following courses are required as either Social Science core courses or in lieu of technical or general electives.

- PSY 1013 General Psychology AND SO 1003 Introduction to Sociology are required social science electives
- CH 2313 Analytical Chemistry OR PSY 3103 Intro to Psychological Statistics OR ST 2113 Introduction to Statistics
- SO 3603 Criminology
- CRM 3103 Contemporary Issues in Criminal Justice
- SO 3313 Deviant Behavior OR PSY 4213 Psychology of Abnormal Behavior
- PSY 4373 Forensic Psychology OR AN 4313 Forensic Anthropology OR CSE 4273 Intro to Computer Forensics OR BIO 3103 Genetics OR EPP 4313 Forensic Entomology
- BIO 2103 Cell Biology OR BIO 4114 Cellular Physiology
- BCH 2013 Intro to Forensic Science
- BCH 4333 Advanced Forensics Science
- SO 4513 Correctional Systems OR Science elective
- THREE to FOUR (3 to 4) hours General/free electives
- Total hours needed for major: 120

Science Concentration (SCI)

The Science concentration provides students with core classes towards a degree in biochemistry coupled with undergraduate research and/or internship requirements. Additional coursework as technical electives concentrate on cell biology, anatomy and/or physiology, with much of the coursework remaining flexible to allow students to explore specialized subject matter or broad areas of interest in the sciences. This concentration is intended for students that may pursue graduate research after their undergraduate degree, or those seeking to tailor a specialization to their interest or intended career track. The following courses are required in lieu of technical or general electives.

- BCH 4100 BCH Internship OR BCH 4000 Directed Individual Study
- BIO 3014 Human Physiology OR VS 3014 Anatomy and Physiology OR BIO 4514 Animal Physiology
- BIO 2103 Cell Biology OR BIO 4114 Cellular Physiology
- TWELEVE (12) hours Science or business technical electives
- EIGHT to NINE (8 to 9) hours General/free electives
- Total hours needed for major: 120
- Students pursuing this concentration in the BCH curriculum should strongly consider a double major or a minor. The flexibility in this concentration choice with more than 20 hours of science, technical or free electives lends itself to this option.

Accelerated M.S. or Ph.D. Graduate Program Entry/Option

This program requires careful planning by the student in order to complete the requirements for the B.S. while beginning a research program that can result in successful matriculation into a Master's thesis or non-thesis in BCH, or a Ph.D. program in BCH or Molecular Biology (MOLB). It is critical that BCH 4603 General Biochemistry I be scheduled in the spring of the sophomore year. The student will be expected to begin graduate coursework, possibly research, and have identified a major professor in the senior year. The student must complete the courses required for completion of the B.S. degree with no more than 10 hours remaining in the semester of expected graduation. The student should schedule a graduate level BCH course or related graduate course and/or ST 8114 in the spring of the senior year. Students interested in beginning graduate study while still completing their B.S. should apply early in the undergraduate program and seek out their advisor to facilitate the scheduling of appropriate courses. In addition to applying for admission to the graduate program, the student must also take the Graduate Record Examination early enough so that the results are available by the beginning of the semester in which the student expects to graduate. See your advisor or the Department Head for more information.

Bioinformatics Concentration (BINF)

This concentration provides the student with a B.S. in Biochemistry and Molecular Biology incorporating a strong background in the biochemical sciences along with a rigorous preparation in the field of computer science. The graduate will be able to either enter graduate school or directly enter a career requiring knowledge of bioinformatics. This exciting field applies computational and database skills to molecular biological problems. Practitioners routinely mine genomic databases for information relating to basic understanding of life processes as well as information providing clues for medical and agricultural advances. This program also constitutes a minor in computer science. Students MUST take the following courses in lieu of technical and general electives.

- CSE 1284 Introduction to Computer Programming
- CSE 1384 Intermediate Computer Programming
- CSE 2383 Data Structures and Analysis of Algorithms
- CSE 2813 Discrete Structures
- CSE 3813 Introduction to Formal Languages and Automata
- CSE 4613 Bio-computing
- CSE 4633 Artificial Intelligence
- CSE 4623 Computational Biology
- CSE 4833 Intro to Analysis of Algorithms
- ST 3123 Introduction to Statistical Inference OR Computer Science Elective
- NOTE: Completion of the Bioinformatics program can also constitute a minor in Computer Science from the Department of Computer Science and Engineering, and students can receive a Certificate in Computational Biology from the Institute of Digital Biology. Note that students must declare to the appropriate program and/or departmental advisor to receive credit for a degree minor and/or to receive a Certificate
- Total hours needed for major with this concentration is 121 hours (not the typical 120).

Pre-MBA Concentration (PMBA)

This concentration provides the student with a B.S. in Biochemistry incorporating a strong background in science while preparing the student for immediate entry into a graduate program leading to an advanced business degree: either the Master of Business Administration or the Master of Agribusiness Management. Either program can be completed in a minimum of three semesters. Students thus educated may enter into management level positions in the biotech or agribusiness industry. The following courses are required as either Social Science core courses or in lieu of technical or general electives.

- ACC 2013 Financial Accounting
- ACC 2023 Managerial Accounting
- EC 2113 Macroeconomics
- EC 2123 Microeconomics
- BQA 2113 Business Statistics I
- BQA 3123 Business Statistics II
- MGT 3114 Principles of Management and Production
- MKT 3013 Principles of Marketing
- FIN 3123 Financial Management
- THREE (3) hours Computer elective
- SIX (6) hours General/Free electives
- Total hours needed for major: 120

Entomology concentration (ENT)

This concentration provides a student with a B.S. in Biochemistry but incorporates a focal area in entomology. Students receive excellent training in the biochemical sciences, coupled with general and specific entomology subject areas from which the student can choose subject matter in their areas of interest. The following courses are required in lieu of technical or general electives.

- EPP 4154 General Entomology
- EPP 4164 Insect Taxonomy
- EPP 4263 Principles of Insect Pest Management
- EPP 4335 Insect Physiology
- Choose THREE (3) of the following:
    - EPP 3124 Forest Pest Management
    - EPP 3423 Ornamental and Turf Insects
    - EPP 4173 Medical / Veterinary Entomology
    - EPP 4234 Field Crop Insects
    - EPP 4244 Aquatic Entomology
    - EPP 4543 Toxicology & Insecticide Chemistry
    - EPP XXX Forensic Entomology
- THREE to SIX (3 to 6) hours General/free electives
- Total hours needed for major: 120

Plant Pathology concentration (PPTH)

This concentration provides a student with a B.S. in Biochemistry but incorporates a focal area in plant pathology. Students receive excellent training in the biochemical sciences, coupled with general and specific plant pathology subject areas in plant disease epidemiology, pathology and disease identification/diagnostics. The following courses are required in lieu of technical or general electives.

- BIO 2113 Plant Biology OR PSS 1313 Plant Science
- PSS 2443 Horticulture and Crop Physiology OR PSS 4553 Plant Growth and Development OR BIO 4214 General Plant Physiology
- EPP 3124 Forest Pest Management
- EPP 4113 Principles of Plant Pathology
- EPP 4152 Adv Fungal Taxonomy - Fungi Imperfecti
- EPP 4163 Plant Disease Management
- EPP 4214 Diseases of Crops
- EPP 4523 Turfgrass Diseases
- FIVE to SIX (5 to 6) hours General/free electives
- Total hours needed for major: 120

APPENDIX

Listing of MSU courses that students may choose as "Science" or "Computer" Electives where appropriate relative to the concentration.

- **Computer electives students may choose from for Pre-MBA concentration:**

  AEC 2113 - Computer Applications for Agriculture and Life Sciences
  TKT 1273 – Computer Applications

  OR other computer applications course as available (MSU, transfer, etc.)

- **Science / Technical Electives:**

The following list is not meant to be all inclusive, but represent possible "science" technical electives we would accept in the BCH curriculum where "science" electives are stipulated within the various concentrations. Students would work with their advisor to select these classes, but may choose from this list to articulate into their CAPP profile as relevant to their areas of interest, or if working towards a certificate, minor or double major, or if they would help them achieve a well-rounded program. This list is based on the current MSU offerings by department, and would be annually reviewed for additions, deletions or modifications as necessary within the department. There may be department-specific or prerequisite issues with some of these classes, and students would need to evaluate these along with consultation with their advisor or the instructor of record for the course listed. You will note that while the preponderance of courses listed are "science"-related, however there are some courses in areas that might be related to "professional development", business, general STEM areas, or courses we feel may augment pre-professional programs of study, minors, double majors, etc.

ABE 2421 – Analytic Methods
ABE 3413 – Bioinstrumentation I
ABE 3813 – Biological Properties of Materials
ABE 4423 – Bioinstrumentation II
ABE 4513 – Dynamics of Aging
ABE 4523 – Biomaterials
ABE 4533 – Rehabilitation Engineering
ABE 4613 – Biomechanics
ABE 4723 – Tissue Engineering
ABE 4803 – Biosystems Simulation
AIS 3803 – Leadership Development in Agriculture and life Sciences
ADS 1114 – Introduction to Animal Science
ADS 4115 – Animal Nutrition
ADS 4243 – Food Composition and Reactions
ADS 4613 – Physiology of Reproduction
ADS 4623 – Physiology of Lactation
AN 1343 – Introduction to Biological Anthropology
AN 4333 – Primate Behavior
AN 4133 – Medical Anthropology

AN 4303 – Human Variation and Origins
AN 4313 – Forensic Anthropology
BCH 2013 – Introduction to Forensic Science
BCH 4000 – Directed Individual Study
BCH 4100 – Biochemistry and Molecular Biology Internship
BCH 4253 – Nutritional Biochemistry
BCH 4333 – Advanced Forensic Science
BCH 4990 – special topics in Biochemistry
BIO 2004 – Human Anatomy
BIO 2014 – Human Physiology
BIO 2103 – Cell Biology
BIO 2113 – Plant Biology
BIO 3103 – Professional Writing for Biology
BIO 3103 – Genetics
BIO 3303 – Parasitology
BIO 3404 – Bacterial Cultivation
BIO 3504 – Comparative Anatomy
BIO 3524 – Biology of Vertebrates
BIO 4113 – Evolutionary biology
BIO 4114 – Cellular Physiology
BIO 4133 – Human Genetics
BIO 4203 – Taxonomy of Spermatophytes
BIO 4204 – Plant Anatomy
BIO 4213 – Plant Ecology
BIO 4214 – General Plant Physiology
BIO 4224 – Aquatic Botany
BIO 4303 – Bioinstrumentation
BIO 4304 – Quantitative Methods I
BIO 4314 – Quantitative Methods II
BIO 4324 – Microbiology and Ecology in Soil
BIO 4404 – Environmental Microbiology
BIO 4405 – Pathogenic Micro
BIO 4413 – Immunology
BIO 4414 – Micro of Foods
BIO 4433 – Principles of Virology
BIO 4442 – Bacterial Genetics Lab
BIO 4443 – Bacterial Genetics
BIO 4463 – Bacterial Physiology
BIO 4503 – Vertebrate Histology
BIO 4504 – Comparative Vertebrate Embryology
BIO 4514 – Animal Physiology
BIO 4603 – Ethnobotany
BIO 4673 – Biology of Industrial Microbiology
CH 2313 – Analytical Chemistry
CH 2311 – Analytical Chemistry Lab
CH 4113 – Advanced Chemistry Research Skills
CH 4303 – Environmental Chemistry
CH 4351 – Analytical Chemistry II Lab

CH 4353 – Analytical Chemistry II
CH 4404 – Biophysical Chemistry
CSE 4273 – Computer Forensics
CSE 4613 – Bio-computing
CSE 4623 – Computational Biology
COE 3313 – Rehabilitation Services
COE 4303 – Rehabilitation – Visual Impairments
COE 4353 – Adaptive Technologies and Disabilities
COE 4713 – Issues in Aging
EPP 2213 – Introduction to Insects
EPP 2990 – Special Topics in EPP
EPP 3124 – Forest Pest Management
EPP 3423 – Ornamental Turf Insects
EPP 4113 – Principles of Plant Pathology
EPP 4152 – Taxonomy - Fungi Imperfecti
EPP 4154 – General Entomology
EPP 4162 – Taxon Ascomycetes
EPP 4163 – Plant Disease Management
EPP 4164 – Insect Taxonomy
EPP 4172 – Taxon Basidiomycetes
EPP 4173 – Med Veterinary Entomology
EPP 4182 – Taxon Oom and Zyg
EPP 4214 – Disease of Crops
EPP 4234 – Field Crop Insect
EPP 4244 – Aquatic Entomology
EPP 4263 – Principles Insect Pest Management
EPP 4313 – Forensic Entomology
EPP 4335 – Anatomy and Physiology of Insects
EPP 4523 – Turfgrass Diseases
EPP 4543 – Toxicology & Insect Chemistry
EPP 4990 – Intro to Insects Special Topics in EPP
EP 2013 – Introduction to Exercise Science
EP 3183 – Exercise Psychology
EP 3233 – Anatomical Kinesiology
EP 3304 – Exercise Physiology
EP 3613 – Exercise Electrocardiography
EP 3623 – Exercise Physiology II
EP 3643 – Applied Anatomy & Pathophysiology
EP 4123 – Aging and Physical Activity
EP 4143 – Aging and Disability
EP 4503 – Mechanical Analysis Move
EP 4703 – Neural Control of Human Movement
FNH 2293 – Individual & Family Nutrition
FNH 4114 – Analysis of Food Product
FNH 4233 – Medical Nutrition Therapy
FNH 4241 – Applied Food Chemistry
FNH 4243 – Food Composition & Reaction
FNH 4263 – Nutrition & Chronic Disease

FNH 4293 – Vitamin, Mineral & Supplement
FNH 4393 – Prevention of Disease
FNH 4414 – Microbiology of Foods
FO 2443 – Essentials of Biotechnology
HI 4333 – U.S. History of Medicine
HI 4653 – History of Science and Technology
HS2803 – Prenatal and Infant Development
HS 4403 – Introduction to Gerontology
KI 2213 – Emergency Health Care
KI 2603 – Medical Terminology
MGT 3213 – Organizational Communication
MGT 3323 – Entrepreneurship
MA 2113 – Introduction to Statistics
MA 2733 – Calculus III
MA 2743 – Calculus IV
MA 3123 – Introduction to Statistical Inference
MIC 1123 – Science of Public Health
MIC 2003 – Communicable Disease Control
MIC 2013 – Foodborne Disease Control
MIC 2023 – Vectorborne Disease Control
MIC 2033 – Waterborne Disease Control
MIC 2043 – Microbial Ecology of Foods
PHI 2123 – Medical Ethics
PHI 4163 – Research Ethics
PO 3834 – Microbiology of food Animal Production
PO 4833 – Avian Anatomy
PO 4843 – Avian Physiology
PSS 3923 – Plant Propagation
PSS 4113 – Agricultural Crop Physiology
PSS 4444 – Plant Tissue Culture
PSS 4553 – Plant Growth & Develop
PSS 4603 – Soil Chemistry
PSY 3103 – Introduction Psychology Statistics
PSY 3203 – Psychology of Gender Differ
PSY 3213 – Psychology of Abnormal Behavior
PSY 3413 – Human Sexual Behavior
PSY 3713 – Cognitive Psychology
PSY 3723 – Cognitive Neuroscience
PSY 4373 – Forensic Psychology
PSY 4403 – Biological Psychology
PSY 4423 – Sensation/Perception
ST 2113 – Introduction to Statistics
ST 3123 – Introduction to Statistical Inference
CVM 2443 – Essentials of Biotechnology
CVM 4513 – Environmental Toxicology
CVM 4523 – Basic Neuroscience
VS 3014 – Anatomy and Physiology
WFA 4173 – Fish Physiology

WFA 4263 – Wildlife Diseases
WFA 4323 – Wildlife Nutrition and Physiology
WFA 4423 – Herpetology
WFA 4433 – Mammology
WFA 4443 – Ornithology
WFA 4453 – Icthyology