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| For Academic Affairs and Research Use Only |
| Proposal Number | SM01 |
| CIP Code:  |  |
| Degree Code: |  |

**Reconfiguration of Existing Degree Program Proposal Form**

(Also requires Arkansas Department of Higher Education (ADHE) approval)

**[X] Undergraduate Curriculum Council**

**[ ] Graduate Council**

Signed paper copies of proposals submitted for consideration are no longer required. Please type approver name and enter date of approval.

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| John Hershberger | 1/10/2023 |

**Department Curriculum Committee Chair** |

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**COPE Chair (if applicable)** |
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| William Burns | 1/10/2023 |

**Department Chair** |

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**Head of Unit (if applicable)**   |
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| Mary Elizabeth Spence | 1/24/2023 |
| **Office of Accreditation and Assessment** |  |

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**Undergraduate Curriculum Council Chair** |
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| John Hershberger | 1/23/2023 |

**College Curriculum Committee Chair** |

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**Graduate Curriculum Committee Chair** |
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| Jennifer L. Bouldin | 1/27/2023 |

**College Dean** |

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| Len Frey | 2/22/2023 |

**Vice Chancellor for Academic Affairs** |
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**General Education Committee Chair (if applicable)**   |  |

1. **Contact Person** (Name, Email Address, Phone Number)

William Burns, wburns@astate.edu , 870-972-2535

1. **Title(s) of degree programs to be consolidated/reconfigured:**

BS Chemistry , emphasis in Pre-Health Profession Studies

1. **Proposed title of consolidated/reconfigured program:**

BS Biochemistry

1. **Proposed Effective Date:** Aug 15, 2023
2. **Reason for proposed program consolidation/reconfiguration:**

*(Indicate student need/demand (projected enrollment) for the proposed program and document that the program meets employer needs using the ADFA Workforce Analysis Form)*

The BS Chemistry, Pre-Health Profession Studies emphasis has been available since the 2011-2012 academic year (prior to this there was a BS Chemistry, Pre-Professional Studies emphasis). The emphasis was created because of the continuing student interest in professional health care related occupations, most notably as physicians, dentists, and chiropractors (this list has grown to now include physician assistants). Pursing such fields require students to complete courses in several STEM disciplines, most notably chemistry and biology, but also including physics and mathematics. As undergraduate level courses/content most appropriate for post-baccalaureate health related programs has evolved, it has become clear the BS Chemistry, Pre-Health Profession Studies emphasis has fallen out of favor. This has been substantiated by 1) the low number of students pursuing this degree option, 2) a review of current undergraduate courses recommended by the University of Arkansas Medical School, the New York Institute of Technology College of Osteopathic Medicine, the University of Tennessee Health Science Center, and the Arkansas College of Osteopathic Medicine, and 3) discussions with current A-State students interested in post-baccalaureate medical related programs. In an effort to create the most appropriate undergraduate degree for A-State students, it is proposed to create a BS Biochemistry degree by modifying the existing BS Chemistry, Pre-Health Profession Studies emphasis. Based on student interest in the Biochemistry degree, it is anticipated the first graduating class would be 10 students, resulting in 40-50 majors at any given time. Additionally, the U. S. Bureau of Labor Statistics Occupational Outlook Handbook indicates a 15% growth rate in biochemist/biophysicist employment during 2021-2031. This is much larger than the 5% growth rate predicted for all occupations. Students pursuing the proposed BS Biochemistry degree may also find employment as a forensic science or biological technician, both of which are expected to have above average growth rates for this same 10 year period. Thus, it is expected students pursuing this degree will have above average employment outlook if they decide not to pursue a post-baccalaureate health related program. Based on this projected employment growth, and the paucity of baccalaureate biochemistry programs in Arkansas (see Table II of section 10, below), additional biochemistry training capacity in the state is warranted.

1. **Provide current and proposed curriculum outline by semester.**

*For undergraduate programs, please use Appendix A-8-semester plan form*

 *Indicate total semester credit hours required for the proposed program. If new courses are needed for the reconfiguration, approval for the courses must be requested prior to approval for the new degree. Underline any new courses. Identify required general education core courses with an asterisk. If utilizing courses from other departments, please color-code them and provide a key.*

The proposed degree program will require 120 semester credit hours:

3 credit hours Making Connections

36 credit hours General Education (chem 1011, chem 1013, bio 2011, bio 2013, math 2204 are degree required general education courses)

55-56 credit hours major requirements (3 credit hours via Dept. Mathematics & Statistics, 8-14 credit hours via Dept. Biological Sciences

25-26 credit hours electives (of which 5-6 hours must be 3000/4000 level)

No new courses are needed for this proposed reconfiguration

1. **Will the proposed degree be offered:**
	1. **Traditional/Face-to-face**  Yes
	2. **Distance/Online**  No
		1. **If yes, indicate mode of distance delivery, and the percentage of courses offered via this modality (<50%, 50-99%, or 100%).**

Enter text...

* + 1. **If online, will it be offered through Global Initiatives/Academic Partnerships (AP)?**

Enter text...

1. **Will the proposed degree be offered off-campus?**  No
	1. **If yes, identify the off-campus location**

 Enter text...

1. **Provide documentation that proposed program has received full approval by licensure/certification entity, if required.**

 *(A program offered for teacher/education administrator licensure must be reviewed/approved by the Arkansas Department of Education prior to consideration by the Coordinating Board; therefore, the Education Protocol Form also must be submitted to ADHE along with the Letter of Notification).*

The proposed degree program does not require licensure/certification by an external entity, however voluntary external approval will be sought (see item 11, below).

1. **List institutions offering similar program and identify the institutions used as a model to develop the proposed program.**

Table 1 is the list of institutions in Arkansas and contiguous states offering a baccalaureate Biochemistry degree. Column three of this table indicates if the institution offers American Chemical Society (ACS) approved degrees. BS biochemistry programs at Middle Tennessee State University, Baylor University, and Texas Woman’s University (shown bold in Table I) were used as models in developing the proposed A-State BS biochemistry degree program.

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| **Table I** |
| **Name** | **State** | **ACS approved** | **Type** |
| Harding University | AR | N | 4-year, Private not-for-profit |
| John Brown University | AR | N | 4-year, Private not-for-profit |
| Centenary College of Louisiana | LA | Y | 4-year, Private not-for-profit |
| Louisiana State University and Agricultural & Mechanical College | LA | y | 4-year, Public |
| Loyola University New Orleans | LA | Y | 4-year, Private not-for-profit |
| Tulane University of Louisiana | LA | y | 4-year, Private not-for-profit |
| Xavier University of Louisiana | LA | Y | 4-year, Private not-for-profit |
| Drury University | MO | Y | 4-year, Private not-for-profit |
| Missouri Western State University | MO | y | 4-year, Public |
| Rockhurst University | MO | y | 4-year, Private not-for-profit |
| Saint Louis University | MO | y | 4-year, Private not-for-profit |
| University of Missouri-Columbia | MO | y | 4-year, Public |
| University of Missouri-St Louis | MO | y | 4-year, Public |
| College of the Ozarks | MO | N | 4-year, Private not-for-profit |
| Columbia College | MO | N | 4-year, Private not-for-profit |
| Maryville University of Saint Louis | MO | N | 4-year, Private not-for-profit |
| Missouri Baptist University | MO | N | 4-year, Private not-for-profit |
| Missouri Southern State University | MO | N | 4-year, Public |
| Westminster College | MO | N | 4-year, Private not-for-profit |
| William Jewell College | MO | N | 4-year, Private not-for-profit |
| Millsaps College | MS | y | 4-year, Private not-for-profit |
| Mississippi College | MS | y | 4-year, Private not-for-profit |
| Mississippi State University | MS | y | 4-year, Public |
| University of Mississippi | MS | y | 4-year, Public |
| Belhaven University | MS | N | 4-year, Private not-for-profit |
| Oklahoma State University-Main Campus | OK | y | 4-year, Public |
| University of Oklahoma-Norman Campus | OK | y | 4-year, Public |
| Oklahoma Baptist University | OK | N | 4-year, Private not-for-profit |
| Oklahoma Christian University | OK | N | 4-year, Private not-for-profit |
| Oral Roberts University | OK | N | 4-year, Private not-for-profit |
| Southern Nazarene University | OK | N | 4-year, Private not-for-profit |
| University of Tulsa | OK | N | 4-year, Private not-for-profit |
| Christian Brothers University | TN | y | 4-year, Private not-for-profit |
| Lipscomb University | TN | y | 4-year, Private not-for-profit |
| **Middle Tennessee State University** | TN | y | 4-year, Public |
| Union University | TN | y | 4-year, Private not-for-profit |
| Vanderbilt University | TN | y | 4-year, Private not-for-profit |
| Carson-Newman University | TN | N | 4-year, Private not-for-profit |
| Cumberland University | TN | N | 4-year, Private not-for-profit |
| Freed-Hardeman University | TN | N | 4-year, Private not-for-profit |
| King University | TN | N | 4-year, Private not-for-profit |
| Lee University | TN | N | 4-year, Private not-for-profit |
| Maryville College | TN | N | 4-year, Private not-for-profit |
| Southern Adventist University | TN | N | 4-year, Private not-for-profit |
| The University of the South | TN | N | 4-year, Private not-for-profit |
| Abilene Christian University | TX | y | 4-year, Private not-for-profit |
| Austin College | TX | y | 4-year, Private not-for-profit |
| **Baylor University** | TX | y | 4-year, Private not-for-profit |
| Lamar University | TX | y | 4-year, Public |
| Rice University | TX | y | 4-year, Private not-for-profit |
| Southern Methodist University | TX | y | 4-year, Private not-for-profit |
| Southwestern University | TX | y | 4-year, Private not-for-profit |
| Stephen F Austin State University | TX | y | 4-year, Public |
| Texas A & M University-College Station | TX | y | 4-year, Public |
| Texas Christian University | TX | y | 4-year, Private not-for-profit |
| Texas State University | TX | y | 4-year, Public |
| Texas Tech University | TX | y | 4-year, Public |
| **Texas Woman's University** | TX | y | 4-year, Public |
| The University of Texas at Arlington | TX | y | 4-year, Public |
| The University of Texas at Austin | TX | y | 4-year, Public |
| The University of Texas at Dallas | TX | y | 4-year, Public |
| The University of Texas at El Paso | TX | y | 4-year, Public |
| The University of Texas at San Antonio | TX | y | 4-year, Public |
| The University of Texas at Tyler | TX | y | 4-year, Public |
| University of Dallas | TX | y | 4-year, Private not-for-profit |
| University of Houston | TX | y | 4-year, Public |
| University of North Texas | TX | y | 4-year, Public |
| University of St Thomas | TX | y | 4-year, Private not-for-profit |
| University of the Incarnate Word | TX | y | 4-year, Private not-for-profit |
| East Texas Baptist University | TX | N | 4-year, Private not-for-profit |
| Lubbock Christian University | TX | N | 4-year, Private not-for-profit |
| McMurry University | TX | N | 4-year, Private not-for-profit |
| Our Lady of the Lake University | TX | N | 4-year, Private not-for-profit |
| Saint Edward's University | TX | N | 4-year, Private not-for-profit |
| Schreiner University | TX | N | 4-year, Private not-for-profit |
| Southwestern Adventist University | TX | N | 4-year, Private not-for-profit |
| St. Mary's University | TX | N | 4-year, Private not-for-profit |
| Texas Wesleyan University | TX | N | 4-year, Private not-for-profit |
| Trinity University | TX | N | 4-year, Private not-for-profit |
| University of Mary Hardin-Baylor | TX | N | 4-year, Private not-for-profit |
| Source: 1) National Center for Education Statistics (NCES) College Navigator website, <https://nces.ed.gov/collegenavigator/> 2) <https://www.acs.org/content/acs/en/education/policies/acs-approval-program.html#:~:text=The%20ACS%20Committee%20on%20Professional%20Training%20%28CPT%29%20establishes,ACS%20approval%20process.%20Benefits%20of%20an%20ACS-Approved%20Program>  |

Table II indicates the number of 1) baccalaureate granting institutions and 2) baccalaureate biochemistry degree programs in in Arkansas and contiguous states.

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| **Table II** |
| **State** | **# Baccalaureate Granting Institutions** | **# Baccalaureate Biochemistry Degree Programs\*** |
| Arkansas | 25 | 2 (8.0%)\*\* |
| Louisiana | 29 | 5 (17.2%) |
| Mississippi | 17 | 5 (29.4%) |
| Missouri | 64 | 13 (20.3%) |
| Oklahoma | 29 | 7 (24.1%) |
| Tennessee | 54 | 13 (24.0%) |
| Texas | 134 | 35 (26.1%) |
| total | 352 | 80 (22.7%) |
| Source: National Center for Education Statistics (NCES) College Navigator website, <https://nces.ed.gov/collegenavigator/> \* percent given in parenthesis\*\* Harding University and John Brown University |

1. **Provide scheduled program review or specialized accreditation initial review date (within 10 years of program implementation).**

The American Chemical Society (ACS) promotes excellence in chemistry education through the approval of baccalaureate chemistry programs. The baccalaureate chemistry program offered by the A-State Department of Chemistry & Physics is approved by the American Chemical Society. The current ACS approval status is “active”, and the program has been approved since April 1, 1989. Under the current ACS guidelines, programs must complete a 1) Annual Review Report (next Annual Review Report is due August 31, 2023), and 2) Periodic Review Report. The last periodic review was in 2018, and the next has a scheduled due date of June 30, 2025. The ACS Guidelines for Evaluation Procedures for Bachelor’s Degree Programs is currently under review, and it is expected revised guidelines/procedures will be approved in January 2023. The proposed guidelines are available in draft form, and were involved in the development of the proposed BS Biochemistry curriculum. The current plan is for the proposed biochemistry degree to seek approval under the new ACS guidelines. If ACS approval is not obtained, the proposed biochemistry degree program review will fall under the existing Arkansas Higher Education Coordinating Board (AHECB) program review schedule.

1. **Is there differential tuition requested?** *If yes, please fill out the New Program/Tuition and Fees Change Form.*

Yes, as there is for all chemistry and physics degree programs.

1. **Graduate programs only: Will this program require a comprehensive exam?**

NA

**Student Learning Outcomes**

Provide outcomes that students will accomplish during or at completion of this reconfigured degree. Fill out the following table to develop a continuous improvement assessment process.

*For further assistance, please see the ‘Expanded Instructions’ document available on the UCC - Forms website for guidance, or contact the Office of Assessment at 870-972-2989.*

**University Outcomes**

Please indicate the university-level student learning outcomes for which this new program will contribute. Please complete the table by adding program level outcomes (PLO) to the first column, and indicating the alignment with the university learning outcomes (ULO). If you need more information about the ULOs, go to the [University Level Outcomes Website](http://www.astate.edu/a/assessment/student-learning-outcomes/files/ULOs%20for%20Website2.pdf).

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|  | **ULO 1: Creative & Critical Thinking** | **ULO 2: Effective Communication** | **ULO 3: Civic & Social Responsibility** | **ULO 4: Globalization & Diversity** |
| Appropriately apply presented concepts and chemical principles to biochemistry related issues. | **X** |  |  |  |
| **PLO 2** |  |  |  |  |
| **PLO 3** |  |  |  |  |

***Note: Best practices suggest 4-7 outcomes per program; minors would have 1 to 4 outcomes.***

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| **Outcome 1** | Appropriately apply presented concepts and chemical principles to biochemistry related issues. |
| Assessment Procedure Criterion | The American Chemical Society (ACS) Division of Chemical Education Examinations Institute publishes exams in all major chemistry subdisciplines, including biochemistry. The ACS DUCK (Diagnostic of Undergraduate Chemistry Knowledge) exam is currently used as the BS and BA chemistry degree programs assessment instrument, and it is proposed an ACS biochemistry exam be adopted as the biochemistry degree program assessment instrument. Many institutions report ACS exam scores back to ACS, and this provides nationally norm scores which can be used to compare A-State student performance on the exam to a larger external student group. As an indirect measure, a campus-wide survey will provide student learning satisfaction data which will be used to improve the student learning experience. |
|  Which courses are responsible for this outcome? | The ACS biochemistry exam is A 60 question multiple exam requiring two hours. It is designed to be taken after a two-semester biochemistry course sequence, and thus will be administered to all biochemistry majors as the final exam for Chem 4443, Advanced Biochemistry (prerequisite chem 4243, Biochemistry). |
| Assessment Timetable | The outcome will be accessed each term Chem 4443 is taught, which is currently proposed to be the spring term of each academic year. The indirect measure will be regularly conducted by the Office of Accreditation and Assessment and the results reported to the chemistry and physics department. |
| Who is responsible for assessing and reporting on the results? | The exam will be administered by the faculty member teaching Chem 4443. An assessment benchmark score will be set by department faculty and the chair. Data analysis and action plans will also be performed/developed by department faculty teaching in the program and the department chair.  |

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| **Outcome 2** | Type outcome here. What do you want students to think, know, or do when they have completed the program? |
| Assessment Procedure Criterion | Please include direct and indirect assessment measure for outcome. |
| Which courses are responsible for this outcome? | List courses. |
| Assessment Timetable | What semesters, and how often, is the outcome assessed? |
| Who is responsible for assessing and reporting on the results? | Who is responsible for assessing, evaluating, and analyzing results, developing action plants, etc.?  |

*Please repeat as necessary.*

**Appendix A, 8-Semester Plan**

(**Referenced in #9** - **Undergraduate Proposals Only)**

*Instructions: Please identify new courses in italics*.

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| **Arkansas State University-Jonesboro****Degree: Bachelor of Science****Major: Biochemistry****Year: 2023-2024** |
| Students requiring developmental course work based on low entrance exam scores (ACT, SAT, ASSET, COMPASS) may not be able to complete this program of study in eight (8) semesters. Developmental courses do not count toward total degree hours. **Students having completed college level courses prior to enrollment will be assisted by their advisor in making appropriate substitutions. In most cases, general education courses may be interchanged between semesters.** A minimum of 45 hours of upper division credit (3000-4000 level) is required for this degree. |
| **Year 1** |  | **Year 1** |
| **Fall Semester** |  | **Spring Semester** |
| **Course No.** | **Course Name** | **Hrs** | **Gen Ed** |  | **Course No.** | **Course Name** | **Hrs** | **Gen Ed** |
| Chem 1011 \* | General Chemistry I Laboratory | 1 | y |  | Chem 1021 | General Chemistry II Laboratory | 1 | n |
| Chem 1013 \* | General Chemistry I | 3 | y |  | Chem 1023 | General Chemistry II | 3 | n |
| Phsc 1003 | Making Connections Chemistry & Physics | 3 | n |  | Math 2204 \* | Calculus I | 4 | y |
| Eng 1003 | Composition I | 3 | y |  | Bio 2011 \* | Biology of the Cell Laboratory | 1 | y |
|  | general education elective | 3 | y |  | Bio 2013 \* | Biology of the Cell | 3 | y |
|  | general education elective | 3 | y |  | Eng 1013 | Composition II | 3 | y |
| **Total Hours** |  | 16 |  |  | **Total Hours** |  | 15 |  |
| **Year 2** |  | **Year 2** |
| **Fall Semester** |  | **Spring Semester** |
| **Course No.** | **Course Name** | **Hrs** | **Gen Ed** |  | **Course No.** | **Course Name** | **Hrs** | **Gen Ed** |
| Chem 2004 | Descriptive Inorganic Chemistry | 4 | n |  | Chem 3111 | Organic Chemistry II Laboratory | 1 | n |
| Chem 3101 | Organic Chemistry I Laboratory | 1 | n |  | Chem 3113 | Organic Chemistry II | 3 | n |
| Chem 3103 | Organic Chemistry I | 3 | n |  | Phys 2064 | General Physics II | 4 | n |
| Phys 2054 | General Physics I | 4 | n |  | Bio 3011 | Genetics Laboratory | 1 | n |
| Stat 3233 | Applied Statistics I | 3 | n |  | Bio 3013 | Genetics | 3 | n |
|  |  |  |  |  |  | general education elective | 3 | y |
| **Total Hours** |  | 15 |  |  | **Total Hours** |  | 15 |  |
| **Year 3** |  | **Year 3** |
| **Fall Semester** |  | **Spring Semester** |
| **Course No.** | **Course Name** | **Hrs** | **Gen Ed** |  | **Course No.** | **Course Name** | **Hrs** | **Gen Ed** |
| Chem 4241 | Biochemistry Laboratory | 1 | n |  | Chem 4443 | Advanced Biochemistry | 3 | n |
| Chem 4243 | Biochemistry | 3 | n |  | Chem 427V (3) | Research in Chemistry | 3 | n |
| Chem 3153 | Survey of Physical Chemistry | 3 | n |  |  | general education elective | 3 | y |
|  | general education elective | 3 | y |  |  | elective | 3 | n |
|  | general education elective | 3 | y |  | Bio 4104 | Microbiology | 4 | n |
|  | elective | 3 | n |  |  |  |  |  |
| **Total Hours** |  | 16 |  |  | **Total Hours** |  | 16 |  |
| **Year 4** |  | **Year 4** |
| **Fall Semester** |  | **Spring Semester** |
| **Course No.** | **Course Name** | **Hrs** | **Gen Ed** |  | **Course No.** | **Course Name** | **Hrs** | **Gen Ed** |
|  | degree elective | 3 | n |  | Chem 4281 | Chemistry Seminar | 1 | n |
|  | elective | 3 | n |  |  | degree elective | 3 |  |
|  | elective | 3 | n |  |  | elective | 3 |  |
|  | elective | 3 | n |  |  | elective | 3 |  |
|  | elective | 2 | n |  |  | elective | 3 |  |
| **Total Hours** |  | 14 |  |  | **Total Hours** |  | 13 |  |
| **Total Jr/Sr Hours 45 Total Degree Hours 120** |
| **Graduation Requirements:**Note, no new courses are required.An asterisk (\*) indicates degree required general education course.Required courses offered by Department of Biological Sciences are highlighted in yellow.Required courses offered by Department of Mathematics & Statistics are highlighted in green.5-6 hours of the 25-26 hours of electives must be at 3000/4000 level in order to fulfil the minimum of 45 junior/senior hours baccalaureate graduation requirement  |

**Bulletin Changes**

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| **Instructions**  |
| **Please visit** [**http://www.astate.edu/a/registrar/students/bulletins/index.dot**](http://www.astate.edu/a/registrar/students/bulletins/index.dot) **and select the most recent version of the bulletin. Copy and paste all bulletin pages this proposal affects below. Please include a before (with changed areas highlighted) and after of all affected sections.** **\*Please note: Courses are often listed in multiple sections of the bulletin. To ensure that all affected sections have been located, please search the bulletin (ctrl+F) for the appropriate courses before submission of this form.**  |

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| **Department of Chemistry and Physics** |
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Return to: [Programs by Department](https://catalog.astate.edu/content.php?catoid=3&navoid=77)

*Associate Professor William Burns, Chair*
**Professors:** *Draganjac, Johnson, Kennon, Lorence, Sustich*
**Associate Professors:** *Alam, Ali, Biswas, Carroll, Hershberger, Izadyar, Koizumi, Merten, Ontko, Zhang*
**Instructors:** *Ahmed, K. Burns, Rougeau*

DELETE

The courses in chemistry and physics are designed to prepare individuals for a variety of postbaccalaureate options. The Bachelor of Science degree is for individuals who are seeking employment as chemical or physical professionals, or who wish to continue studies toward a Masters or Ph.D. Students who are looking to pursue a further degree in law, medicine, dentistry, or pharmaceuticals will find either the B.S. degrees in chemistry or physics or the Bachelor of Arts in Chemistry as an option for entry into the appropriate post-baccalaureate program. The Bachelor of Science Education degrees will lead to a rewarding career in secondary science education. In many of these programs, there are sufficient elective hours to allow students to customize their degrees for careers as diverse as technical
librarians, salesmen, writers, or translators.

Arkansas State University is on the approved list of the Committee on Professional Training (CPT) of the American Chemical Society. For certification of the completion of CPT standards for the B.S. degree in chemistry, students are recommended to take calculus-based physics.

**Recommended Program for Pre-Medical and Pre-Dental Students**

Students who wish to pursue a Doctor of Medicine or Doctor of Dentistry degree after finishing their baccalaureate studies are recommended to follow the program requirements for a Bachelor of Science in either chemistry or physics (see Pre-Professional Studies Emphasis Area in the listed degree requirements). Those who are seeking a Doctor of Pharmacy degree are recommended to pursue a Bachelor of Arts in Chemistry degree.

**Programs**

**Major**

* [Chemistry, BA](https://catalog.astate.edu/preview_program.php?catoid=3&poid=711)
* [Chemistry, BS](https://catalog.astate.edu/preview_program.php?catoid=3&poid=709)
* [Chemistry, BSE](https://catalog.astate.edu/preview_program.php?catoid=3&poid=713)
* [Chemistry, Emphasis in Pre-Health Profession Studies, BS](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710)
* [Chemistry, Emphasis in Pre-pharmacy, BA](https://catalog.astate.edu/preview_program.php?catoid=3&poid=712)
* [Physics, BS](https://catalog.astate.edu/preview_program.php?catoid=3&poid=714)
* [Physics, BSE](https://catalog.astate.edu/preview_program.php?catoid=3&poid=715)

**Minor**

* [Chemistry, Minor](https://catalog.astate.edu/preview_program.php?catoid=3&poid=716)
* [Physics, Minor](https://catalog.astate.edu/preview_program.php?catoid=3&poid=717)

Return to: [Programs by Department](https://catalog.astate.edu/content.php?catoid=3&navoid=77)

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| **Department of Chemistry and Physics** |
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Return to: [Programs by Department](https://catalog.astate.edu/content.php?catoid=3&navoid=77)

*Associate Professor William Burns, Chair*
**Professors:** *Draganjac, Johnson, Kennon, Lorence, Sustich*
**Associate Professors:** *Alam, Ali, Biswas, Carroll, Hershberger, Izadyar, Koizumi, Merten, Ontko, Zhang*
**Instructors:** *Ahmed, K. Burns, Rougeau*

REPLACE WITH

The courses in chemistry and physics are designed to prepare individuals for a variety of postbaccalaureate options. The Bachelor of Science Chemistry and Physics degrees are for individuals who are seeking employment as chemical or physical professionals, or who wish to continue studies toward a Masters or Ph.D. in these fields. Students who are looking to pursue a further degree in health related fields (i.e. medicine, dentistry...) will be best served with the Bachelor of Science Biochemistry degree. The Bachelor of Art Chemistry degree is designed for students interested in pursuing a science related job, but not necessarily in the field of chemistry. Students seeking a Doctor of Pharmacy degree are recommended to pursue a Bachelor of Arts in Chemistry degree, emphasis in pre-pharmacy. The Bachelor of Science Education degrees will lead to a rewarding career in secondary science education. In many of these programs, there are sufficient elective hours to allow students to customize their degrees for careers as diverse as technical librarians, salesmen, writers, or translators.

Arkansas State University is on the approved list of the Committee on Professional Training (CPT) of the American Chemical Society. For certification of the completion of CPT standards for the B.S. degree in chemistry, students are recommended to take calculus-based physics.

**Programs**

**Major**

* [Chemistry, BA](https://catalog.astate.edu/preview_program.php?catoid=3&poid=711)
* [Chemistry, BS](https://catalog.astate.edu/preview_program.php?catoid=3&poid=709)
* Biochemistry, BS
* [Chemistry, BSE](https://catalog.astate.edu/preview_program.php?catoid=3&poid=713)
* [Chemistry, Emphasis in Pre-pharmacy, BA](https://catalog.astate.edu/preview_program.php?catoid=3&poid=712)
* [Physics, BS](https://catalog.astate.edu/preview_program.php?catoid=3&poid=714)
* [Physics, BSE](https://catalog.astate.edu/preview_program.php?catoid=3&poid=715)

**Minor**

* [Chemistry, Minor](https://catalog.astate.edu/preview_program.php?catoid=3&poid=716)
* [Physics, Minor](https://catalog.astate.edu/preview_program.php?catoid=3&poid=717)

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| **Chemistry, Emphasis in Pre-Health Profession Studies, BS** |
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| **University Requirements:**See [University General Requirements for Baccalaureate degrees](https://catalog.astate.edu/content.php?catoid=3&navoid=67#university-general-requirements-for-all-baccalaureate-degrees)**First Year Making Connections Course:*** [PHSC 1003 - Making Connections Chemistry and Physics](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3**

**General Education Requirements:**See [General Education Curriculum for Baccalaureate degrees](https://catalog.astate.edu/preview_program.php?catoid=3&poid=447) **Sem. Hrs: 36****Students with this major must take the following:*** [MATH 2204 - Calculus I](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **4**
* [CHEM 1013 - General Chemistry I](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3**
* [CHEM 1011 - General Chemistry I Laboratory](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **1**
* [BIO 2013 - Biology of the Cell](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3**
* [BIO 2011 - Biology of the Cell Laboratory](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **1**
* *Twelve hours of Social Sciences (Required Departmental Gen. Ed. Option)*

**Major Requirements:*** [CHEM 1023 - General Chemistry II](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3**
* [CHEM 1021 - General Chemistry II Laboratory](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **1**
* [CHEM 2002 - Computers in Chemistry](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **2**
* [CHEM 2004 - Descriptive Inorganic Chemistry](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **4**
* [CHEM 3054 - Quantitative Analysis](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **4**
* [CHEM 3103 - Organic Chemistry I](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3**
* [CHEM 3101 - Organic Chemistry I Laboratory](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **1**
* [CHEM 3113 - Organic Chemistry II](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3**
* [CHEM 3111 - Organic Chemistry II Laboratory](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **1**
* [CHEM 3124 - Physical Chemistry I](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **4**
* [CHEM 3134 - Physical Chemistry II](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **4**
* [CHEM 4204 - Inorganic Chemistry](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **4**
* [CHEM 4224 - Instrumentation](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **4**
* [CHEM 4243 - Biochemistry](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3**
* [CHEM 427V - Research in Chemistry](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **Variable**
* [CHEM 4281 - Chemistry Seminar](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **1**
* [CHEM 4501 - Chemistry Capstone](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **1**
* [MATH 2214 - Calculus II](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **4**
* [MATH 3254 - Calculus III](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **4**
* [PHYS 2034 - University Physics I](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **4**
* [PHYS 2044 - University Physics II](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **4**

**Sub-total: 62****Emphasis Area (Pre-Health Profession Studies):**Six hours of the electives below must be upper-level.* [BIO 1303 - Biology of Animals](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3**
* [BIO 1301 - Biology of Animals Laboratory](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **1**
* Biology Electives **Sem. Hrs: 8**

**Sub-total: 12****Electives:*** Electives **Sem. Hrs: 7**

**Total Required Hours: 120** |

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| **Biochemistry, BS** |
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| **University Requirements:**See [University General Requirements for Baccalaureate degrees](https://catalog.astate.edu/content.php?catoid=3&navoid=67#university-general-requirements-for-all-baccalaureate-degrees)**First Year Making Connections Course:*** [PHSC 1003 - Making Connections Chemistry and Physics](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3**

**General Education Requirements:**See [General Education Curriculum for Baccalaureate degrees](https://catalog.astate.edu/preview_program.php?catoid=3&poid=447) **Sem. Hrs: 36****Students with this major must take the following:*** [MATH 2204 - Calculus I](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **4**
* [CHEM 1013 - General Chemistry I](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3**
* [CHEM 1011 - General Chemistry I Laboratory](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **1**
* [BIO 2013 - Biology of the Cell](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3**
* [BIO 2011 - Biology of the Cell Laboratory](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **1**
* *Twelve hours of Social Sciences (Required Departmental Gen. Ed. Option)*

**Major Requirements:*** [CHEM 1023 - General Chemistry II](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3**
* [CHEM 1021 - General Chemistry II Laboratory](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **1**
* [CHEM 2004 - Descriptive Inorganic Chemistry](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **4**
* [CHEM 3103 - Organic Chemistry I](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3**
* [CHEM 3101 - Organic Chemistry I Laboratory](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **1**
* [CHEM 3113 - Organic Chemistry II](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3**
* [CHEM 3111 - Organic Chemistry II Laboratory](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **1**
* [CHEM 3153 – Survey of Physical Chemistry](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** 3
* [CHEM 4243 - Biochemistry](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3**
* [CHEM 4241 – Biochemistry Laboratory](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **1**
* [CHEM 4443 – Advanced Biochemistry](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3**
* [CHEM 427V - Research in Chemistry](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **Variable**
* [CHEM 4281 - Chemistry Seminar](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **1**
* [PHYS 2054 – General Physics I](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **4**
* [PHYS 2064 – General Physics II](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **4**
* [BIO 3013 - Genetics](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3**
* [BIO 3011 – Genetics Laboratory](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **1**
* [BIO 4104 – Microbiology](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **4**
* [STAT 3233 – Applied Statistics](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3**
* Choose two of following: [BIO 4033 – Bioinformatics and Applications](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3,** [BIO 4103 - Virology](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3,** [BIO 4113 - Immunology](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3,** [BIO 4123 – Cell Signaling](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3,** [BIO 4133 – Cell Biology](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3,** [BIO 4173 – Molecular Biology](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3,** [BIO 4213 – Human Genetics](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3,** [CHEM 3054 – Quantitative Analysis](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **4,** [CHEM 4343 - Pharmacology](https://catalog.astate.edu/preview_program.php?catoid=3&poid=710&returnto=77) **Sem. Hrs:** **3**

**Sub-total: 55-56****Electives:*** Electives **Sem. Hrs: 25-26**

**Total Required Hours: 120** |

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