

# New Program Letter of Intent

Program Name: B.S. Biochemistry  
Degree Designation: Bachelor of Science  
Contact Person: Prof. Craig Grapperhaus  
Department: Chemistry  
School/College: College of Arts and Sciences  
Implementation Date: Fall 2023

## Lead Fiscal Officer's Confirmation and Signature:

As Senior Associate Dean for Finance and Strategy, I approve this letter of intent.

**David J. Schultz** Digitally signed by David J. Schultz  
Date: 2023.02.18 10:17:44 -05'00'


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David Schultz, College of Arts and Sciences Interim Date  
Senior Associate Dean for Finance and Strategy

**Accreditation Requirements:** None currently. Future accreditation will be sought from the American Society for Biochemistry and Molecular Biology.

## Dean's Confirmation and Signature:

As Dean of the College of Arts and Sciences, I approve this letter of intent and the related financial commitments.

  
\_\_\_\_\_  
David Owen, College of Arts and Sciences Dean      3/29/2023  
Date

## I. Program Abstract

The B.S. Biochemistry program is a rebranding of the B.S. Chemistry – Biochemistry Track program. This four-year undergraduate program will continue the interdisciplinary nature of the current Biochemistry Track with altered Chemistry and Biology course requirements to give students more options than the current B.S. Chemistry program. Course requirements will also be modified to include additional writing, statistics, and ethics requirements in line with American Society for Biochemistry and Molecular Biology (ASBMB) guidelines. The ultimate goal is to establish a Biochemistry degree accredited by the ASBMB. The new program will be attractive to pre-professional (pre-med, pre-dental, pre-pharmacy) students and students interested in careers in biochemistry and biotechnology. The standalone Biochemistry program will be more visible, distinctly marketable, and more attractive to students wanting a Biochemistry degree than the current Biochemistry track. This is a STEM+H degree with excellent growth potential. In a 2021 report by Gray & Associates for CPE, the recommendation for the Chemistry (B.S.) program was “fix to grow”. Specifically, it was noted to “consider the demand for “Biochemistry” and the lack of competition” and raised the question of a CIP code (26.0202) with additional investment in Biochemistry for growth potential.

## II. Educational Program Objectives

The B.S. Biochemistry program is a rebranding of the B.S. Chemistry – Biochemistry Track program. The program requirements will be altered to give students more options in Chemistry and Biology course selection than the current B.S. Chemistry program. Course requirements will also be modified to include additional writing, statistics, and ethics requirements in line with ASBMB guidelines.

The field of biochemistry sits at the interface of biology and chemistry. This program will provide students with an interdisciplinary experience that will prepare them for professional school (medicine, dental, pharmacy), graduate school (biochemistry, chemistry, biology, medicine), or a career as a scientist or technician in a biochemistry or related disciplines. The program will provide course instruction and hands on laboratory experience in chemistry, biology, and physics. All students will participate in experiential learning through participation in undergraduate research or a co-op/internship. The program will also emphasize communication (written and oral), teamwork, safety, and ethics in accordance with ASBMB guidelines. Once the program is established and sufficient data has been collected, an application for accreditation from the ASBMB will be submitted. After accreditation is awarded, students in the program will have the opportunity to take a certification exam to have their degree certified by the ASBMB.

Admissions to the B.S. Biochemistry program will be the same as the current admissions requirements to the B.S. Chemistry program – Biochemistry track. Specifically, admission to the major in Biochemistry will require completion of CHEM 202 (or equivalent course from another institution) with a grade of C or better. CHEM 202 is the second semester of our general chemistry sequence. To enroll in the first semester course, CHEM 201, new students need an Accuplacer AAF score of 250 or higher, a math ACT score of 26 (SAT Math of 610) or higher, or an ACT composite of 27 (SAT 1260) or higher. For students with more than 12 credit hours at UofL or

another university, an overall GPA equivalent to a C+(2.30) or higher, and a minimum grade of C (not C-) in MATH 180 or higher, or a minimum grade of C (not C-) in CHEM 101 or CHEM 105.

Graduation requirements include both university-wide requirements and the requirements of the Biochemistry degree program. To meet university-wide requirements, the student must:

- Complete an online degree application by the specified date at the beginning of the semester of graduation.
- Complete an application for and be accepted for admission into a major program.
- Satisfy all Cardinal Core requirements.
- Complete all required courses and program requirements listed in the degree program section of this catalog.
- Have a cumulative university GPA of at least 2.00, or higher if specified by the program.
- Have a cumulative program GPA of at least 2.00, or higher if specified by the program.
- Complete a minimum of 120 hours applicable to the program, or more if required by the program.
- Complete at least 60 hours at an accredited four-year institution.
- Complete at least 25-percent of the total credit hours required for the degree in residence at the University of Louisville.
- Complete 30 of the last 36 hours in residence at the University of Louisville.
- Have neither missing nor outstanding I or X grades.
- Satisfy any additional requirements specified by the major program and unit.
- Be discharged of all financial obligations to the University.
- Be formally recommended for the baccalaureate degree by the unit faculty and dean and approved by the Board of Trustees.

To meet biochemistry program requirements, the student must:

- Complete all College of Arts and Sciences requirements (13 – 15 credit hours) including GEN 100 or GEN 101, 6 – 8 credit hours of Foreign Language, 6 credit hours of Electives in Humanities or Social Sciences at the 300-level or above, and two writing requirement (WR) courses at the 300 level or above.
- Complete supporting courses in English (ENGL 303), Mathematics (MATH 205 and MATH 206), Philosophy (PHIL 321, 323, 325, or 328), and Physics (PHYS 221, 222, 223, 224 or PHYS 295, 296, 298, 299).
- Complete 28 credit hours of core Chemistry content (CHEM 201, 202, 207, 208, 209, 210, 341, 342, 343, 344, 425, 441, 470).
- Complete 8 credit hours of core Biochemistry content (CHEM 545, 546, 547).
- Complete 17 credit hours of core Biology content (BIOL 240, 242, 329, 330, 331, 350).
- Complete 8 credit hours of advanced electives in Chemistry (CHEM 430, 515, 527, 528, 529, 555, 557) or Biology (BIOL 400, 457 or 485, 458, 465, 541, 542) with at least three hours in Chemistry.
- Complete 3 credit hours of undergraduate research in Chemistry or Biology or complete 3 credit hours of co-op/internship in Chemistry or Biology.

- Complete a Culminating Undergraduate Experience (CUE) course.
- Have a cumulative GPA of at least 2.0 overall.
- Have a cumulative GPA of at least 2.0 in major courses (Chemistry and Biology).

The B.S. Biochemistry curriculum does not require the development of new courses. The curriculum consists of the following existing courses:

#### General Education Requirements

General Education Requirements\* 31

The following courses are required by the program and can satisfy the respective General Education Requirement:

CHEM 201	General Chemistry I - S	
CHEM 207	Introduction to Chemical Analysis I - SL	
MATH 205	Calculus I - QR	
PHYS 221	Fundamentals of Physics I - S	
or PHYS 295	Introductory Laboratories I - SL	

\*All degrees require the completion of the University-wide General Education Program (link provided above). Some General Education requirements may be met in the requirements for the major or supporting coursework, in which case additional electives may be required to complete the minimum hours for the degree. To complete the Business track in the **minimum number of hours** listed, some hours from the General Education Requirements must be satisfied by courses defined by the unit and/or program.

#### College/School Requirements

##### Arts & Sciences Requirements

GEN 100	Student Success Center First Year Experience	1
or GEN 101	Arts & Sciences First Year Experience	
Foreign Language	<sup>1</sup>	6-8
Electives in Humanities or Social Science at the 300 level or above	<sup>2</sup>	6
WR—two approved courses at the 300 level or above	<sup>3</sup>	
<b>Minimum Total Hours</b>		<b>13-15</b>

#### Program/Major Requirements

##### Departments of Chemistry and Biology

CHEM 201	General Chemistry I - S <sup>4</sup>	3
CHEM 202	General Chemistry II - S	3
CHEM 207	Introduction to Chemical Analysis I - SL <sup>4</sup>	1
CHEM 208	Introduction to Chemical Analysis II - SL	1
CHEM 209	Introduction to Chemical Analysis III	1
CHEM 210	Introduction to Chemical Analysis IV	1
CHEM 341	Organic Chemistry I	3
CHEM 342	Organic Chemistry II	3
CHEM 343	Organic Chemistry Laboratory I	2
CHEM 344	Organic Chemistry Laboratory II	2
CHEM 425	Instrumental and Statistical Analysis	3

CHEM 441	Elements of Physical Chemistry	3
or CHEM 465	Physical Chemistry I	
CHEM 470	Physical Chemistry Laboratory - WR <sup>3</sup>	2
CHEM 545	Biochemistry I	3
CHEM 546	Biochemistry Laboratory	2
CHEM 547	Biochemistry II	3
Undergraduate Research or Cooperative Internship <sup>5</sup>		3
BIOL 240	Unity of Life - S <sup>4</sup>	3
BIOL 242	Diversity of Life - S	3
BIOL 329	Cellular and Molecular Biology	3
BIOL 330	Genetics and Molecular Biology	3
BIOL 331	Genetics and Molecular Biology: Laboratory	2
BIOL 350	Biostatistics	3
CHEM/BIOL electives – see table below (at least 3 hours in CHEM)		8
<b>Minimum Total Hours</b>		<b>64</b>
Supporting Courses		
MATH 205	Calculus I – QR <sup>4</sup>	4
MATH 206	Calculus II	4
Complete one of the following sequences:		8-10
Sequence 1:		
PHYS 221	Fundamentals of Physics I - S	
PHYS 222	Fundamentals of Physics II - S	
PHYS 223	Fundamentals of Physics Lab I - SL	
PHYS 224	Fundamentals of Physics Laboratory II - SL	
Sequence 2:		
PHYS 295	Introductory Laboratories I - SL	
PHYS 296	Introductory Laboratories II - SL	
PHYS 298	Introductory Mechanics, Heat and Sound - S	
PHYS 299	Introductory Electricity, Magnetism and Light	
ENGL 303 - WR <sup>2,3</sup>		3
PHIL 321, 323, 325, or 328 <sup>2</sup>		3
<b>Minimum Total Hours</b>		<b>22-24</b>

<sup>1</sup> Completion of the second semester of a single foreign language; hours will vary depending on language taken

<sup>2</sup> Electives in Humanities or Social Sciences at the 300-level or above requirement; requirement is in addition to courses counted toward General Education. Requirement can be completed with ENGL 303 and PHIL 32X requirements.

<sup>3</sup> ENGL 303 and CHEM 470 satisfy the WR course requirements.

<sup>4</sup> Satisfies General Education requirement.

<sup>5</sup> Select from CHEM 390, 391, 392, 420, 491, or 492 or BIOL 405, 406, or 490

### Culminating Undergraduate Experience (Graduation requirement)

Requirement fulfilled by completing one of the following:

CHEM 390	Undergraduate Research - CUE, WR
CHEM 391	Undergraduate Research - CUE
CHEM 392	Undergraduate Research - CUE
CHEM 420	Cooperative Internship in Chemistry - CUE, WR
CHEM 430	Practicum in Chemistry Education - CUE
CHEM 491	Undergraduate Research - CUE

CHEM 528	Contemporary Methods of Organic Synthesis and Analysis – CUE
BIOL 405	Undergraduate Research - CUE
BIOL 406	Undergraduate Research - CUE, WR
BIOL 430	Undergraduate Teaching Assistant – CUE
BIOL 485	Microbial Physiology - CUE, WR
BIOL 541	Medicinal Plant Biochemistry - WR, CUE

Table of CHEM/BIOL electives (at least 3 hours must be in CHEM)

CHEM 426	Instrumental and Statistical Analysis Laboratory – WR	2
CHEM 430	Practicum in Chemistry Education - CUE	1-3
CHEM 515	Inorganic Chemistry	3
CHEM 527	Spectroscopic Identification of Organic Compounds - WR	3
CHEM 528	Contemporary Methods of Organic Synthesis and Analysis - CUE	2
CHEM 529	Contemporary Methods of Inorganic Synthesis and Analysis - WR	2
CHEM 555	Theory and Application of Computational Chemistry	3
CHEM 557	Bio-Organic Phenomena	3
BIOL 400	Histology	4
BIOL 430	Undergraduate Teaching Assistant – CUE	3
BIOL 457	Microbiology	3
or BIOL 485	Microbial Physiology - CUE, WR	
BIOL 458	Microbiology Laboratory	1
BIOL 465	Principles of Physiology	3
BIOL 541	Medicinal Plant Biochemistry - WR, CUE	3
BIOL 542	Gene Structure and Function - WR	3

The B.S. Biochemistry program strengthens the long-standing collaboration between Chemistry and Biology established in the B.S. Chemistry – Biochemistry Track. The proposed rebranding increases the number of credit hours in Chemistry + Biology from 62 to 64. Credit hours in Chemistry would change from 45-48 to 39-47 with hours in Biology changing from 14-17 to 17-25 providing for a more interdisciplinary experience. The increase in Biology credit hours includes the addition of BIOL 350 Biostatistics as a program requirement, which allows the program to meet ASBM guidelines for statistics without the creation of a new course. Additionally, the Biochemistry program would introduce program requirements in ethics (PHIL 321, 323, 325, or 328) and scientific and technical writing (ENGL 303) through collaborations with Philosophy and English in order to meet ASBM guidelines without the creation of new courses.

### III. Linkage with the Mission and Strategic Plan

As with the current B.S. Chemistry—Biochemistry track that it replaces, the proposed B.S. Biochemistry program clearly falls within the UofL mission by “1. teaching diverse undergraduate . . . students in order to develop engaged citizens, leaders, and scholars, 2. practicing research [and]scholarship.” The latter portion is encompassed by the required undergraduate research and opportunity to participate in the weekly departmental seminar series of distinguished visiting researchers.

The proposed B.S. Biochem fits the *Great Place to Learn* component of the 2019–2022 Strategic Plan. The curriculum modifications from the current B.S. Chemistry—Biochemistry track were targeted to informal feedback from students who have left the program in the past few years (changing the math requirement from a third semester of calculus to a statistics class and reducing the load of physical chemistry) in order better to “[a]ttract and enroll a capable, diverse, and engaged student body responsive to . . . workforce needs of the future” (L1.A1). These changes should also improve retention *within* the major (L1.A2), but nearly all students who transfer from the current Biochemistry track complete another degree, so the impact on overall UofL retention will likely be modest. The two semester biochemistry sequence (CHEM 545 and 547) are taught in the evening to make them more accessible to nontraditional students (L1.A2.3). The undergraduate research component and the ability to substitute an appropriate internship for it implement the structured experiential learning goal (L2.A1) and all aspects of pillar L3 because undergraduate research opportunities are both in Chemistry and allied departments, which may easily involve work on the Grand Challenges (L3.A1).

Similarly, the program is consonant with the draft 2022–2025 Strategic Plan. Strategy L1 recapitulates attracting and retaining an engaged student body, and the B.S. Biochemistry fulfills Action 1 as a program at the intersection of chemistry and biology. The curriculum changes “remove barriers to improve retention and persistence to graduation” (Action 3), and the evening key biochemistry courses in the evening reduces scheduling barriers (Action 3) by particularly making them more accessible to non-traditional student populations (Action 2). The B.S. Biochemistry will strongly emphasize application and extension of principles to new situations over memorization (as do all degree programs in the Department of Chemistry), so our graduates will be among the most trained to think critically and well-positioned to learn by extension of their knowledge base throughout their careers (Strategy L2, both Action 1 and Action 2).

Workforce market considerations will be treated in their own sections but recommend the B.S. Biochemistry because of the technical capabilities of the graduates to enter immediately biomedical and analytical laboratories in industries ranging from distilling to molecular diagnostics (Strategy L1 Action 1).

#### IV. Diversity and Inclusion

Biochemistry sits at the interface of Chemistry and Biology. Nationally, the number of undergraduate degrees awarded annually in the Biological Sciences is approximately eight times greater than the number of degrees in Chemistry based on the most recent 2018 data from the *NSF Report on Women, Minorities, and Persons with Disabilities in Science and Engineering*. In Chemistry 51% of degrees are awarded to females compared to 63% in the Biological Sciences. Both fields suffer from a low percentage of degrees award to underrepresented minorities (URM) with Chemistry at 20% and Biological Sciences at 22%. Over the past four years, the UofL Department of Chemistry has awarded 106 undergraduate degrees with 48% (51 of 106) awarded to females and 16% (17 of 106) to URM students. It is anticipated that the increased options in the Chemistry/Biology program requirements will be more attractive to female and URM

students in line with the national trends that show higher participation of these groups in Biological Sciences than in Chemistry.

The Chemistry department has also recently adopted outreach events focused on retention. These include early semester events for courses with high DFW rates to bring students together with faculty, peers, and university resources through social interactions. The first of these events are planned for General Chemistry (in collaboration with the Biology Department) and Organic Chemistry for Fall 2022. Additionally, students in the Biochemistry program will have the opportunity to conduct research with faculty in Chemistry and Biology. Chemistry recently established the position of Undergraduate Research Coordinator. This faculty member provides students with information on research openings, funding opportunities, and avenues to present research. The coordinator is a resource for students that need assistance finding a research mentor. Through this coordinator, the Chemistry and Biochemistry programs will seek to increase the number of Biochemistry/Chemistry students in the Louis Stokes Alliance for Minority Participation (LSAMP), which has a mission to help diversify the STEM industries through efforts aimed at increasing the number of students earning baccalaureate degrees in these disciplines.

## V. Student Demand

Over the past four years, Chemistry has averaged 10 B.S. Biochemistry-track degrees and 17 B.A./other B.S. track degrees and Biology has averaged 130 B.A./B.S. degrees. In a 2021 report by Gray & Associates for CPE, the recommendation for the Chemistry (B.S.) program was “fix to grow”. Specifically, it was noted to “consider the demand for “Biochemistry” and the lack of competition” and raised the question of a CIP code (26.0202) with additional investment in Biochemistry for growth potential. In the Gray report, Biochemistry has a total PES+ score of 6 (91 percentile) nationally with the highest score (10) in Student Demand. The report further suggested that “marketing initiatives will drive enrollment” and that “none of U of L's major competitors have a full major in Biochemistry.” With accreditation, the program would be distinct regionally as there is only one accredited program in Kentucky (B.S. Chemistry – Biochemistry track at EKU) and only eight ASBMB accredited programs in the surrounding states of OH (3), TN (3), IN (2) IL (0), and MO (0).

At the beginning of Fall 2022, B.S. Chemistry – Biochemistry Track has 19 majors and 49 intended majors for a total of 68 students. The high ratio of intended to declared majors 49:19 reflects a number of eligible, but undeclared returning students (~25) and first-year students (~25). The data also suggests that we are only retaining ~58.6% (44 of 75) students beyond the first year.

The data in the table below is based on a conservative increase in retention rate of 2.5% per year (~2 additional students per year) as result of changes in program requirements and intervention strategies along with an increase in the number of first year, intended majors of 10% per year (~3 additional per year). This would lead to a doubling of graduates to ~20 degrees/year over five years relative to our current Biochemistry track. *This estimate includes a net increase in the total number of degrees in chemistry, biology, and biochemistry.* This is not an unrealistic goal as the Biochemistry track had 17 degrees awarded as recently as AY12/13 when there was also 28 other



B.S./B.A Chemistry. Projected tuition (based on \$331/credit hour x 30 credit hours = \$9,630 per full time student).

	Year 0*	Year 1	Year 2	Year 3	Year 4	Year 5
Full-Time	69	72	77	85	94	103
Part-Time	0	0	0	0	0	0
Projected tuition revenue (\$\$)	\$685,170	\$716,036	\$769,365	\$841,629	\$930,937	\$1,027,461

\*Year 0 = AY22/23 prior to rebranding.

## VI. Market Demand

The proposed B.S. Biochemistry is a rebranding with slight alteration of the B.S. Chemistry—Biochemistry track. The track is largely populated by pre-health students, and those graduates enjoy nearly 100% success in applications to medical, dental, and pharmacy schools. Most of the remaining graduates pursue a graduate degree in biochemistry or an allied field. That general attractiveness to pre-health students and those seeking graduate degrees is anticipated to hold for B.S. Biochemistry majors. However, the graduates are well-positioned to gain immediate employment in a range of fields that utilize laboratory skills both common to all degrees offered by the Department of Chemistry (quality control, pollution monitoring, pharmaceutical/dietary supplement/cosmetics formulation) and ones specific to the biochemistry program (biomedical lab work including PCR- and antigen-based testing for diseases, forensic analysis, DNA sequencing and synthesis, and production, purification, and characterization of protein-based pharmaceuticals and components of diagnostic tests). Indeed, no recent graduates of the current track have experienced difficulty finding employment if not proceeding to professional or graduate school (the department does not carefully track the outcomes, but anecdotal information about postgraduation events is strong because of close ties established between students and particular faculty members).

Gray & Associates recommended the B.S. Biochemistry rebranding because of strong employer demand (70<sup>th</sup> percentile nationally and 81<sup>st</sup> percentile regionally for Employment; June 2022 data). The national data from Lightcast (Appendix) shows 9.98% growth from 2020–2021 for “Biochemists and Biophysicists” with median earnings of \$49.08/hr. The data for Kentucky reveals a 10.61% increase in jobs and a median pay of \$31.13/hr.

## VII. Employer Demand

It is expected that some of the students in this program will enter the workforce immediately after graduation. See Appendix A for data supporting employer demand for graduates with a B.S. in Biochemistry.

## VIII. Academic Demand

It is expected that some of the students will continue their education in graduate school or professional school. Students will be prepared to enter graduate school in Biochemistry, Biology, Chemistry, and related disciplines. These students will eventually seek employment as scientists in the public or private sectors or in academia. Students will also be prepared to enter medical, dental, or pharmacy school. These students will eventually enter these professions.

The program is a rebranding of the B.S. Chemistry – Biochemistry track degree at the University of Louisville. The B.S. Biochemistry program will replace the current track in Chemistry.

<b><u>Similar Program 1:</u></b>	
<b>Institution:</b>	Western Kentucky University
<b>Program Name:</b>	Biochemistry
<b>Comparison of Objectives/Focus/Curriculum to Similar Programs:</b> <i>Explain the differences in curriculum, focus, and/or objectives. If the proposed program curriculum does not differ substantially from existing programs, then describe potential collaborations with other institutions.</i>	The program at UofL requires more mathematics through Calculus II and chemistry including at least one semester of physical chemistry. The UofL program requires 64 credit hours in Chemistry/Biology compared to 60 credit hours at Western Kentucky. Research is an elective at Western, but the UofL program requires experiential learning through research or a co-op/internship. Additionally, the UofL program requires Biostatistics, English Scientific Writing, and Ethics that are not required at Western.
<b>Comparison of Student Populations:</b> <i>Describe how your target student population is different from those at other institutions and explain how your program reaches this new population (e.g. the proposed program is completely online while other programs are face-to-face or hybrid).</i>	Both programs are on campus programs at public universities. The UofL program will be attractive to students wanting to pursue a degree at an R1 research university and students wanting the opportunity to conduct research with faculty at or collaborating with a medical school.

<p><b>Access to Existing Programs:</b> <i>Explain how/why existing programs cannot reach your target population and/or provide evidence that existing programs do not have the capacity to meet current student demand (e.g. the number of students on enrollment waiting list).</i></p>	<p>Western Kentucky does not have a medical nor is it an R1 institution.</p>
<p><b>Feedback from Other Institutions:</b> <i>Summarize the feedback from colleagues at institutions with similar programs.</i></p>	<p>Good afternoon, Dr. Miller, Dr. Sievers,</p> <p>RE: Feedback from WKU on the UL LOI B.S. in Biochemistry New Program Proposal</p> <p>Thank you for reaching out for our feedback on your new program proposal transforming your Biochemistry track into a B.S. in Biochemistry. Faculty from Chemistry, Biology, and the Ogden Dean’s Office participated in this review. We agree that, while we are currently competing for Biochemistry students, this new program will not significantly change that dynamic. We believe competition is good and that majors are not the only factor in students’ college going decisions.</p> <p>We do believe, however, that the WKU program still prepares students quite well for both Ph.D. programs and medical school even if we don’t have a Ph.D. program, and we do have a strong relationship with the UK College of Medicine – Bowling Green Campus. We think that, to acknowledge the strengths of our program, you might consider revising your description to say that the UL program will appeal to students who want to do their undergraduate work at an R1.</p> <p>Your curriculum looks to have more requirements than ours in terms of calculus, research, and an ethics class, and seems to be more interdisciplinary than ours. We have no objections to UL offering a new program in Biochemistry and wish you the best.</p> <p>Beth Laves, Ed.D. Assistant Provost/Director for Accreditation &amp; Academic Programs</p> <p>SACSCOC Accreditation Liaison</p>

	<a href="https://www.wku.edu/sacscoc2025/">https://www.wku.edu/sacscoc2025/</a> Western Kentucky University 1906 College Heights Blvd Bowling Green, KY 42104 270.745.8985
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<b>Similar Program 1:</b>	
<b>Institution:</b>	Asbury University
<b>Program Name:</b>	Chemistry-Biochemistry
<b>Comparison of Objectives/Focus/Curriculum to Similar Programs:</b> <i>Explain the differences in curriculum, focus, and/or objectives. If the proposed program curriculum does not differ substantially from existing programs, then <u>describe potential collaborations with other institutions.</u></i>	The programs at UofL and Asbury College are similar with respect to mathematics, chemistry, and biology requirements. The UofL program requires 64 credit hours in Chemistry/Biology compared to 63 credit hours at Asbury. Both programs requires experiential learning, statistics, and ethics. Louisville also requires a scientific writing course.
<b>Comparison of Student Populations:</b> <i>Describe how your target student population is different from those at other institutions and explain how your program reaches this new population (e.g. the proposed program is completely online while other programs are face-to-face or hybrid).</i>	Georgetown College is a private Christian university that attracts a different student population than Louisville. The UofL program will be attractive to students wanting to pursue a degree at a public R1 research university and students wanting the opportunity to conduct research with faculty at or collaborating with a medical school.
<b>Access to Existing Programs:</b> <i>Explain how/why existing programs cannot reach your target population and/or provide evidence that existing programs do not have the capacity to meet</i>	Institutions are not comparable.

<p><i>current student demand (e.g. the number of students on enrollment waiting list).</i></p>	
<p><b>Feedback from Other Institutions:</b> <i>Summarize the feedback from colleagues at institutions with similar programs.</i></p>	

<p><b><u>Similar Program 1:</u></b></p>	
<p><b>Institution:</b></p>	<p>Georgetown College</p>
<p><b>Program Name:</b></p>	<p>Biochemistry</p>
<p><b>Comparison of Objectives/Focus/Curriculum to Similar Programs:</b> <i>Explain the differences in curriculum, focus, and/or objectives. If the proposed program curriculum does not differ substantially from existing programs, then <u>describe potential collaborations with other institutions.</u></i></p>	<p>The program at UofL requires more chemistry including one semester of analytical chemistry, physical chemistry laboratory, and an additional semester of biochemistry. The UofL program requires 64 credit hours in Chemistry/Biology compared to 50 credit hours at Georgetown College. The UofL program requires experiential learning through research or a co-op/internship and Biostatistics, English Scientific Writing, and Ethics that are not required at Georgetown.</p>
<p><b>Comparison of Student Populations:</b> <i>Describe how your target student population is different from those at other institutions and explain how your program reaches this new population (e.g. the proposed program is completely online while other programs are face-to-face or hybrid).</i></p>	<p>Georgetown College is a private Christian college that attracts a different student population than Louisville. The UofL program will be attractive to students wanting to pursue a degree at a public R1 research university and students wanting the opportunity to conduct research with faculty at or collaborating with a medical school.</p>
<p><b>Access to Existing Programs:</b> <i>Explain how/why existing programs cannot reach your target population and/or provide evidence that existing programs do not have the capacity to meet</i></p>	

<i>current student demand (e.g. the number of students on enrollment waiting list).</i>	
<b>Feedback from Other Institutions:</b> <i>Summarize the feedback from colleagues at institutions with similar programs.</i>	

<b><u>Similar Program 1:</u></b>	
<b>Institution:</b>	Thomas More University
<b>Program Name:</b>	Biochemistry
<b>Comparison of Objectives/Focus/Curriculum to Similar Programs:</b> <i>Explain the differences in curriculum, focus, and/or objectives. If the proposed program curriculum does not differ substantially from existing programs, then <u>describe potential collaborations with other institutions.</u></i>	The program at UofL requires more chemistry including one semester of analytical chemistry.. The UofL program requires 64 credit hours in Chemistry/Biology compared to 49 credit hours at Thomas More. Additionally, the UofL program requires Biostatistics, English Scientific Writing, and Ethics that are not required at Thomas More.
<b>Comparison of Student Populations:</b> <i>Describe how your target student population is different from those at other institutions and explain how your program reaches this new population (e.g. the proposed program is completely online while other programs are face-to-face or hybrid).</i>	Thomas More is a private Roman Catholic university that attracts a different student population than Louisville. The UofL program will be attractive to students wanting to pursue a degree at a public R1 research university and students wanting the opportunity to conduct research with faculty at or collaborating with a medical school.
<b>Access to Existing Programs:</b> <i>Explain how/why existing programs cannot reach your target population and/or provide evidence that existing programs do not have the capacity to meet</i>	Not the same types of institution.

<i>current student demand (e.g. the number of students on enrollment waiting list).</i>	
<b>Feedback from Other Institutions:</b> <i>Summarize the feedback from colleagues at institutions with similar programs.</i>	

## IX. Funding Sources

The program will require PTL support that is independent of the proposed rebranding. To meet the needs of the current B.S. Chemistry – Biochemistry track, the Chemistry department requires PTL support due to the instructor shortages within the biochemistry division of the chemistry department. Currently, Chemistry has three tenured biochemistry faculty of which two have substantial teaching loads in service courses (organic chemistry and introductory chemistry). The Chemistry PTL would assist in covering biochemistry course and/or service courses for years 1 – 3. Funding for PTL in years 1 - 3 is internal reallocation of the partial salary and fringe of a Chemistry faculty in the Biochemistry division that did not receive tenure. It is anticipated that enrollment increases will warrant hiring of a full-time Biochemistry faculty in year 4. Funds are required to update the Biochemistry teaching laboratory to introduce replace aging equipment and purchase state-of-the instrumentation. These needs are independent of the program change. Budgeted amount is based on projected tuition increases.

The rebranding of the B.S. Chemistry – Biochemistry track to a B.S. Biochemistry program will have no significant impact on current faculty workloads within the Chemistry Department. All Chemistry courses in the Biochemistry program are already been taught as part of the Biochemistry track. The Biology department is expected to see an increase in demand for BIOL 350 – Biostatistics, which is a new program requirement. Prof. Fuselier, Chair of Biology, states her department “could be creative and figure out ways to accommodate more students” (correspondence included in Appendix B). The addition of ENGL 303 and an a course on Ethics as new program requirements will also increase enrollment in English and Philosophy. Correspondence with those departments confirming their ability and willingness to accommodate Biochemistry students is provided in Appendix B.

The budgetary rationale for the rebranding of the Biochemistry track as a Biochemistry program include its small investment cost and potential for significant new revenue. Funding of the program will rely on resources already committed to the Chemistry program including faculty lines, office and instructional staff, teaching laboratory space and equipment, and GTA lines. The program requires an additional PTL, but this is not unique to the rebranding as noted above. The rebranding is expected to increase tuition revenue *through the addition of new students and increased retention* as described in Section V Student Demand. The increase in tuition revenue

will most directly benefit the Chemistry, Biology, English, and Philosophy departments. Financially, this program is very low risk with the potential for significant gains.

The marketing of the program rebranding offers the best opportunity for rapid and substantial growth. As noted above, the 2021 report by Gray & Associates for CPE recommended the creation of a Biochemistry program at UofL and noted that “marketing initiatives will drive enrollment” and that “none of U of L's major competitors have a full major in Biochemistry.” Marketing of the program would be conducted in close consultation with Admissions and focus on in-state and key out of state applicants. Out of state recruiting could focus on metro areas in states without certified Biochemistry degrees such as Chicago and St. Louis. Marketing would highlight the Biochemistry-track high medical/professional school acceptance rate and highly successful students/graduates, such as current Goldwater Scholar Afi Tagnedji and other recent graduates.

No additional expenditures are anticipated to provide faculty training and/or assistance with instructional design as no new courses are being developed.

The table below shows total projected tuition revenues based on projected tuition revenues as described in Section V Student Demand. The projected revenue over the initial five-years after the rebranding are \$4,285,427. This represents an annual increase of \$859,577 over a five-year total based on AY22/23 enrollments.

<b>Projected Revenues</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>	<b>Five-year Total</b>
General Funds (internal reallocation)	0	0	0	0	0	0
Grants or Gifts, list each one	0	0	0	0	0	0
Other revenues, tuition	\$716,036	\$769,365	\$841,629	\$930,937	\$1,027,461	\$4,285,427
increase relative to AY22/23 in italics	\$30,866	\$84,195	\$156,459	\$245,767	\$342,291	\$ 859,577
<b>Total Projected Revenues</b>	<b>\$716,036</b>	<b>\$769,365</b>	<b>\$841,629</b>	<b>\$930,937</b>	<b>\$1,027,461</b>	<b>\$4,285,427</b>

The table shows new expenses associated with the rebranding and does not include current resources that support the B.S. Chemistry – Biochemistry track. The program will require PTL support that is independent of the proposed rebranding. Funding for a PTL in years 1 – 3 (\$16,000/yr.) is necessary due to current faculty shortages in the chemistry department. It is anticipated that enrollment increases will warrant hiring of a full-time Biochemistry faculty in year 4. As noted above, these expenses are independent of the rebranding as they are needed to sustain the current Biochemistry track. They are included here to show that rebranding will assist the department to overcome faculty shortages. Funds are also included to update the



Biochemistry teaching laboratory to introduce replace aging equipment and purchase state-of-the instrumentation based on projected tuition increases.

Projected Expenses	Year 1		Year 2		Year 3		Year 4		Year 5		Five-year Total	
	#	Cost \$	#	Cost \$	#	Cost \$	#	Cost \$	#	Cost \$	#	Costs \$
Faculty Lines (full-time, adjunct or part-time faculty)	1 PTL	16,000	1 PTL	16,000	1 PTL	16,000	1 full-time	96,000	1 full-time	96,000	5	240,000
Graduate Assistant Positions												0
Library Support												0
Facilities, technology or equipment							220,000					220,000
Other (please describe below the table)*												0
<b>Total Projected Expenses</b>		<b>16,000</b>		<b>16,000</b>		<b>16,000</b>		<b>316,000</b>		<b>96,000</b>		<b>460,000</b>

### X. Online Delivery

The proposed program will not offer online degrees or certificates.

## Appendix A. Employer Demand

Type of Job	Regional Avg Wage	Regional # of openings	Regional Growth Projections (%)	State Avg Wage	State # of openings	State Growth Projections (%)	National Avg Wage	National # of openings	National Growth Projections (%)
Biological Technicians	44,020	140	7.7	43,150	550	9	48,140	84,300	9
Agriculture and Food Science Technicians*	34,908	30	-2.5	45,540 55,710	190 190	3.2 3.2	44,700	31,600	9
Clinical Laboratory Technologists and Technicians	35,405 (entry)	1,140	8.17	54,350	4,700	947	57,800	329,200	7
Forensic Science Technicians	—	—	—	50	43,870	15	61,930	17,600	11
Chemical Technicians (Chemists in regional)	46,119 (entry)	200	5	53,600†	1,040	4.5	48,990†	60,400	4
Biochemists & Biophysicists	47,309 (entry)	50	—	includes M.S. and PhD	130	6.3	includes M.S. and PhD	37,500	15

\*Agriculture Technicians and Food Science Technicians were split in the state data.

†State data appears to be for B.S.; national included Associates degrees

state values from U.S. Bureau of Labor Statistics downloaded spreadsheet for May 2021 (state\_M2021\_dl.xlsx)

state and regional growth 2019–2029 (2019-2029\_KY\_Occupational\_Outlook.xlsx; national growth 2021–2031

from the Lightcast report for the U.S.

### Target Occupations

\*Filtered by the proportion of the national workforce in these occupations with a Bachelor's degree

201,465 Jobs (2020)*	-1.5% % Change (2020-2021)*	\$59.29/hr \$123.3K/yr Median Earnings	28,126 Annual Openings*
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Occupation	2020 Jobs*	Annual Openings*	Median Earnings	Growth (2020 - 2021)*
Architectural and Engineering Managers	93,550	9,085	\$73.22/hr	-3.00%
Medical Scientists, Except Epidemiologists	32,197	3,177	\$45.76/hr	-11.84%
Natural Sciences Managers	27,544	3,988	\$66.30/hr	-1.59%
Biological Scientists, All Other	21,723	5,609	\$39.62/hr	+11.59%
Biochemists and Biophysicists	16,365	4,231	\$49.08/hr	+9.98%
Microbiologists	10,086	2,035	\$38.06/hr	-0.22%

### Job Postings Summary

1.27M Unique Postings 3.73M Total Postings	3 : 1 Posting Intensity Regional Average: 3 : 1	18 days Median Posting Duration Regional Average: 18 days
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There were 3.73M total job postings for your selection from January 2010 to December 2022, of which 1.27M were unique. These numbers give us a Posting Intensity of 3-to-1, meaning that for every 3 postings there is 1 unique job posting.

This is close to the Posting Intensity for all other occupations and companies in the region (3-to-1), indicating that they are putting average effort toward hiring for this position.

### Employer Demand Resources:

Please note the timeframe for the projections.

- [Gray Associates PES+](#) (Please contact [Leslie Harper](#) if you do not have the username and password.)
- [Bureau of Labor Statistics' Occupational Outlook Handbook](#)
- [Kentucky Center for Statistics](#)
- Kentucky, Bridging the Talent Gap Document - <https://www.bridgingthetalentgap.org/wp-content/uploads/2017/05/KY-Statewide.pdf>

Interactive website: <https://bridgingthetalentgap.org/dashboards/>

from the Lightcast report for Kentucky

### Target Occupations

\*Filtered by the proportion of the national workforce in these occupations with a Bachelor's degree

1,353 Jobs (2020)* 42% below National average*	-2.7% % Change (2020-2021)* Nation: -1.5%*	\$45.90/hr \$95.5K/yr Median Earnings Nation: \$59.29/hr; \$123.3K/yr	245 Annual Openings*
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Occupation	2020 Jobs*	Annual Openings*	Median Earnings	Growth (2020 - 2021)*	Location Quotient (2020)*
Architectural and Engineering Managers	743	133	\$60.81/hr	+2.69%	0.68
Medical Scientists, Except Epidemiologists	219	19	\$29.92/hr	-25.57%	0.59
Biological Scientists, All Other	143	34	\$29.17/hr	-0.70%	0.57
Natural Sciences Managers	125	20	\$51.68/hr	-9.60%	0.39
Biochemists and Biophysicists	66	24	\$31.13/hr	+10.61%	0.35
Microbiologists	58	15	\$28.73/hr	+8.62%	0.49

### Job Postings Summary

7,439 Unique Postings 23,430 Total Postings	3 : 1 Posting Intensity Regional Average: 3 : 1	16 days Median Posting Duration Regional Average: 16 days
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There were 23,430 total job postings for your selection from January 2010 to December 2022, of which 7,439 were unique. These numbers give us a Posting Intensity of 3-to-1, meaning that for every 3 postings there is 1 unique job posting.

This is close to the Posting Intensity for all other occupations and companies in the region (3-to-1), indicating that they are putting average effort toward hiring for this position.

## Appendix B. Support from Other Departments

**From:** [Fuselier, Linda](#)  
**To:** [Grapperhaus, Craig](#); [Rabin, Shira](#)  
**Subject:** Re: BS Biochemistry program - Biology courses  
**Date:** Monday, September 12, 2022 9:48:48 AM

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Craig: This sounds like a good change for Chem. I like the idea of including more biology courses, of course, and will work with the UG committee on the details. We have new TT and Term faculty and lots of shifting of teaching duties going on in the department right now so, I'm thinking we could be creative and figure out ways to accommodate more students. One thing to note is that we have a scientific communication class that counts as an OC cardinal core - Biol 203 - that would make sense for this program. I could imagine that we might have many students interested in double-majoring in these programs as well. Thanks for working with us; we'll be in touch.

Linda

Linda Fuselier, PhD  
Professor and Chair of Biology  
University of Louisville

**From:** [Chandler, Karen](#)  
**To:** [Grapperhaus, Craig](#)  
**Cc:** [Rabin, Andrew S](#)  
**Subject:** Re: ENGL 303 for Biochemistry students  
**Date:** Friday, September 9, 2022 5:24:40 PM

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Craig,

We would be happy to have Biochemistry students taking ENGL 303. Andrew told me that he foresees no problem or burden with the Biochemistry program using the course as a requirement.

I hope things go smoothly with the launch of the program.

Karen

**From:** [Elpidorou, Andreas](#)  
**To:** [Grapperhaus, Craig](#)  
**Subject:** Re: Ethics requirement as part of potential revision of biochemistry degree  
**Date:** Friday, September 9, 2022 1:58:29 PM

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Hi Craig,

Just spoke with my Chair. Yes, the Philosophy Department would be happy to accommodate your students. There is a chance that PHIL 325 will be renamed. But even if there's a change in the name of the course, it would still be an ethics class. Please me know if there's anything else we can do to help with your BS.

All my best,  
Andreas