**Annual Departmental Report**

***Amended for 2020-2021 Academic Year to Accommodate and Reflect Adjustments due to Pandemic***

*There are amended instructions throughout this document to reflect the special circumstances of this academic year (AY20-21) that you will find red. As an institution and as departments we have learned that we can use our creativity to deliver learning even in the most difficult of circumstances.*

**Program Information**

Program/Department: Chemistry/ Biology and Chemistry Department

Department Chair: Meledath Govindan & Michael Nosek

Department Assessment Committee Contact: Dennis Awasabisah

*This document is to be kept in the department and an electronic file is due to the AVP of Institutional Research & Planning by June 1, 2021.*

1. **Departmental Special Section for AY2021**

Department Lessons Learned and Accomplishments

In thinking through the academic year, report on how the department adapted to changes brought on by the pandemic. Reflect on actions that surprised you, on lessons learned that will help in the future, and major accomplishments.

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| --- |
| The sudden mid-semester disruption in the Spring 2020, as challenging as it was, provided the opportunity for us as a department to re-evaluate and expand our online and hybrid teaching modalities. At the end of the Spring 2020 semester, the department was already planning for the next academic year. It became apparent to us that the COVID-19 pandemic and its associated safety guidelines was a fluid situation. As a result, we sought to start preparations for our next academic year sooner rather than later. Prior to leaving for the summer break, faculty and staff got together to debrief on how they fared in their classes/duties during the disruption and the lessons they learned; what worked, and what did not work. Not only that, we shared the struggles our students faced during this period and shared how many of us helped students navigate the rather challenging period. It was clear that we had resilient students who could easily succeed when they are provided with the necessary resources and support. In planning for the 2020-2021 academic year, faculty were encouraged to think through what teaching modalities they find would help their students succeed, of course, ensuring they are following COVID-19 protocols. Only this time around, the decision to adapt a particular modality was quite easier. Each faculty member drafted their preferred teaching modalities for Fall 2020 and provided another for Spring 2021 based on different scenarios. Since many of our chemistry courses have associated labs, which can be quite challenging to deliver fully remote, faculty had to be creative in finding the best modality that would meet our course goals. For the lab sections, several of our chemistry faculty adapted the Hybrid C modality, where students alternate weekly lab days. During their lab off days, students work on online assignments or remote lab activities. As in previous pre-COVID semesters, faculty continued to enjoy camaraderie, but this time in the safe social distance of Google Meet. It was easy to reach out to a colleague for assistance. As a department, we continued to monitor our students’ progress during this period and offered to help them resolve any issues they had. With all the technology tools at our disposal, our department operated without any major issues. We can see an end to this pandemic, but we are more ready than ever as a department to adapt to any future changes or challenges that will make in-person gatherings difficult. |

1. **Program Learning Outcomes (PLOs) (Educational Objectives)**
2. **List of PLOs and the timeline for assessment.**

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| --- | --- | --- | --- | --- |
| **PLO #** | **PLO – Stated in assessable terms** | **Where are the learning outcomes for this level/program published? (please specify) Include URLs where appropriate** | **Timing of assessment (annual, semester, bi-annual, etc.)** | **When was the last assessment of the PLO completed?** |
| **1.** | Disciplinary knowledge of topics in foundational chemistry (General Chemistry and Organic Chemistry) | Program assessment plan | Annual | Spring 2019 under the old PLOs.  To have been assessed in Spring 2021. |
| **2.** | Demonstration of, and application of laboratory skills | Program assessment plan | Annual | To have been assessed in Spring 2020 |
| **3.** | Demonstration and application of the concepts of lab safety practices | Program assessment plan | Biannual | Spring 2021 |
| **4.** | Presentation of scientific information in clear and organized manner through written or oral communications | Program assessment plan | Annual | Spring 2021 |

1. **PLO Assessment** (Please report on the PLOs assessed and/or reviewed this year. Programs should be assessing at least one each year.)

Using the table below, list and briefly describe the **direct method(s)** used to collect information assessing whether students are learning the core sets of knowledge (K), skills (S) and attitudes (A) identified as essential.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PLO # (from above)** | **Assessment description (exam, observation, national standardized exam, oral presentation with rubric, etc.)** | **When assessment was administered in student program (internship, 4th year, 1st year, etc.)** | **To which students were assessments administered (all, only a sample, etc.)** | **What is the target set for the PLO? (criteria for success)** | **Reflection on the results: How was the “loop closed”?** |
| 3 | Lab Safety/ Chemical hygiene assignment | 2nd, 4th year | All students in the major | 90% of students to score >70% | Organic I (Fall 2020): Two of the three students assessed scored 100%. The third student was deficient.  Organic II (Sp 2021): Students scored a perfect score (100%)  Raw data provided in Appendix D. |
| 4 | Oral presentation assessed by rubric (Appendix B) with analysis provided in Appendix C | 4th Year | All students in the chemistry seminar capstone course | A majority of students should demonstrate a proficiency on oral presentations by attaining a score > 2 (sufficient) | The virtual modality of this presentation went great with students presenting their work over Google Meet. However, we suspect it may have impacted this PLO assessment. Data collected this AY will serve as a foundation to review our rubric on its applicability for both virtual and in-person presentations. See Appendix C. |

If applicable, use the space below to report on PLO assessment impacted by the move to remote learning.

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| PLO 1 and PLO 2 were to have been administered in Spring 2021, but were suspended due to pandemic-related issues. PLO 4 was not originally scheduled to be assessed in AY 21-22. However, due to course scheduling reasons our Chemistry Seminar Capstone course where PLO 4 is assessed was pushed to AY 20-21. The Chemistry Seminar Capstone oral presentation was held virtually due to COVID-19 restrictions. Despite the fact that this presentation was virtual, the students successfully gave their presentations via Google Meet. |

**Summary of Findings:** Briefly summarize the results of the PLO assessments reported in Section II above combined with other relevant evidence gathered and show how these are being reviewed/discussed. How are you “closing the loop”?

Please reflect on changes that the department has had to engage in given changes to teaching modality and especially capstone experiences.

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| **Reflection Prompt** | **Narrative Response** |
| **Other than GPA, what data/ evidence is used to determine that graduates have achieved the stated outcomes for the degree? (e.g., capstone course, portfolio review, licensure examination)** | The Chemistry program revised and expanded the assessed PLOs at a department retreat in the fall 2019. The PLOs were designed to be in accordance with the learning outcomes developed by the American Chemical Society (ACS), which are delineated in Appendix A. We note that we do not undergo a formal review from the ACS.  The methods of evaluation are varied and include the completion of lab safety and chemical hygiene assignment, as well as faculty assessment of a Chemistry Seminar Capstone oral presentation. Our annual student feedback survey has also recently been proposed to concurrently serve as a measure of indirect assessment on attitudes pertaining to knowledge content. |
| **Who interprets the evidence?**  **What is the process?**  **(e.g. annually by the curriculum committee)** | The department assessment committee evaluates all assessment related matters. The departmental student affairs committee manages the student feedback survey. The annual student feedback survey was not administered this year due to COVID-19 related reasons. |
| **What changes have been made as a result of using the data/evidence? (close the loop)** | This is the second year we are assessing PLO 3 and the first year we are assessing the revised PLO 4. While the COVID-19 situation impacted the assessment, we see promising evidence of meeting the objectives. We plan to continue to monitor these categories going forward. |

1. **Assessment Plan for Program/Department**
2. Insert the program or department Assessment Plan
3. Explain any changes in the assessment plan including new or revised PLOs, new assessments that the program/department plans to implement and new targets or goals set for student success.

The Assessment Committee submitted the Chemistry Plan in 2020. There have since been no changes.

1. If you do not have a plan, would you like help in developing one?

[Grab your reader’s attention with a great quote from the document or use this space to emphasize a key point. To place this text box anywhere on the page, just drag it.]

Yes

1. **Program Review Action Plan or External Accreditation Action Letter/Report**

*Annual Reflection/Follow-up on Action Plan from last Program Review or external accreditation (only complete the table that is appropriate for your program)*

* 1. **Programs that fall under Program Review:** *Program to complete its first review in 2022*
     1. Date of most recent Review: *This program has not been previously reviewed*
     2. Insert the Action Plan table from your last Program Review and give any progress towards completing the tasks or achieving targets set forth in the plan.

*While the Chemistry program itself has not yet undergone review, the below measures were developed by the Department from review of the Biology program and extends to both programs.*

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| --- | --- | --- | --- | --- | --- | --- |
| **Specific area where improvement is needed** | **Evidence to support the recommended change** | **Person(s) responsible for implementing the change** | **Timeline for implementation** | **Resources needed** | **Assessment Plan** | **Progress Made this Year** |
| Continue to address challenges in our assessment plans. |  | Assessment Committee | Ongoing | Funding for summer working groups | The committee will develop an action plan to address specific deficiencies within the assessment plan. This plan should include timeline and required resources. Resources may include funding for summer working groups. | Yes. We completed and submitted our 5-year Assessment Plan to the Office of Institutional Research & Planning. |
| Continue to participate in campus-wide initiatives to retain diverse students. |  | Student Affairs Committee | Ongoing | SSC Data.  Student Survey Data. | Utilization of embedded tutors, additional faculty training, participation on campus-wide committees aimed towards student success.  Academic, Personal wellness, and Career workshops | Yes.  In Spring 2021, the Students Affairs Committee hosted a workshop on resume and cover letter writing. We have plans to continue with this in the next academic year |
| Document active-learning and guided inquiry in courses. |  | Curriculum Committee.  Chair of the department. | Ongoing |  | The department will develop a system of documenting the use of different course delivery mechanisms and STEM best practices. | Yes. We have documented resources and other high impact practices the department used during the pandemic |
| Aligning Chemistry courses with the current LA&S program |  | Curriculum Committee | AY 2021 |  | The committee submitted proposals to allow some of our chemistry courses to be designated appropriate as defined by the new LA&S program. | Yes. Proposals are currently at the AUC. |
| Develop an equipment maintenance and replacement plan. |  | Equipment and Facilities Committee | Ongoing |  | The equipment and supply budget may have to increase depending on the equipment needed. Plan developed AY2019. Implementation began in AY2020. This action item needs to include technical staff. | Yes. The Equipment and Facilities Committee made some recommendations for purchase/repair of equipment through the Strategic funds. |
| Analyze the ever-increasing burden on the department for non-major’s courses and summer programs. |  | Chair in association with an ad-hoc committee | AY21 |  |  | Ongoing |

* + 1. If you do not have an action plan, would you like help in developing one based on your last program review and needs of the program?

Yes

[Grab your reader’s attention with a great quote from the document or use this space to emphasize a key point. To place this text box anywhere on the page, just drag it.]

* 1. **Programs with external Accreditation:**
     1. Professional, specialized, State, or programmatic accreditations currently held by the program/department.
     2. Date of most recent accreditation action by each listed agency.
     3. Date and nature of next review and type of review.

|  |  |  |
| --- | --- | --- |
| **List key issues for continuing accreditation identified in accreditation action letter or report.** | **Key performance indicators as required by agency or selected by program (licensure, board or bar pass rates; employment rates, etc.)(If required.)** | **Update on fulfilling the action letter/report or on meeting the key performance indicators.** |
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1. **Departmental Strategic Initiatives**

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| --- | --- | --- |
| **Accomplished Initiatives AY 20-21 Add more rows as needed** | **Corresponding Strategic Plan Goal & Strategy**  **Goal # followed by Strategy # ex: 1.3** | **Indicate if a Diversity, Equity and Inclusiveness (DEI) Goal** |
| **Workforce Development Programming:** Academic roadmap/Career competencies mapping (Davis Fdtn/C. Cratsley) (*Ongoing*) | 2.5 - Student-ready university - career advising |  |
| Responsive Academic Portfolio: **UG-Grad Pathways**: LECOM and Husson articulation agreements (*Ongoing*) | 2.5 - Student-ready university - career advising |  |
| Coordination and marketing of **internships and careers** with Career Center (*Ongoing*) | 2.5 - Student-ready university - career advising | **X** |
| **Applied Learning: undergraduate research.**  Especially reaching out to minority students (*Ongoing*) | 2.1 - Student-ready university - cultural shift for underrepresented students | **X** |
| **Implementation of LA&S/Gen Ed** program: Aligning Bio and Chem courses to new LA&S with AUC proposals | NA |  |
| **Inclusive Excellence for Student Success:** Grant and discussion group focused on minority students in STEM. Grant applied June 2021 (*Ongoing*) | 2.1 - Student-ready university - cultural shift for underrepresented students  2.3 - Equity and inclusion | **X** |
| **Teaching amid a pandemic:** new strategies and adaptations |  | **X?** |
| **Reverse declining enrollment.** Faculty outreach to accepted students; Virtual Open Houses, etc. (*Ongoing*) | 5.6 - Marketing |  |

|  |  |  |
| --- | --- | --- |
| **Planned Initiatives for AY 2021-22 Add more rows as needed** | **Associated Strategic Plan Goal & Strategy**  **Goal # followed by Strategy # ex: 1.3** | **Indicate if a Diversity, Equity and Inclusiveness (DEI) Goal** |
| **See all “Ongoing” initiatives above for AY’21.** |  |  |
| **Focus more on enrollment strategies.** Improve 4-year plans with career competencies and Alumni stories.  Check our website: how inviting is it? Consider another video with a tour? | 5.6 - Marketing |  |
| Coordinate **sustainability curriculum** across departments. (Initiative with Sustainability Advisory Committee) | **4.6 -**Promote environmentally sustainable values |  |

**F. Departmental Reflection:**

*Take this section to reflect on--*

1. *Initiatives that you may be considering for 22-23 academic year that you did not already capture above.*
2. *Reflect on how the department adapted to the pandemic. Reflect on actions that surprised you and on lessons learned that will help in the future.*

Please see Section A above

**Appendix A: Program Learning Objectives (PLOs)**

**PLO 1: Disciplinary knowledge**

Students should understand and be able to apply their understanding of all chemistry sub-disciplines and use appropriate laboratory skills and instrumentation to solve problems. These areas of knowledge include:

* Basic chemical concepts such as stoichiometry, states of matter, atomic structure, molecular structure and bonding, thermodynamics. Equilibria, and kinetics.
* Foundational knowledge and skills in analytical chemistry, biochemistry, inorganic chemistry, organic chemistry, and physical chemistry.
* Foundational laboratory skills including synthesis of molecules, measurement of chemical properties, determination of structures, use of modern instrumentation and computational modeling.

**PLO 2: Lab skills**

Students should be able to demonstrate and apply foundational laboratory skills. The areas of skills include:

* Basic laboratory skills such as keeping a notebook, use of electronic balances and volumetric glassware, preparation of solutions, chemical measurements using pH electrodes and spectrophotometers.
* Prepare solutions, record data correctly, and perform chemical synthesis and analysis of compounds, as well as use standard laboratory equipment and programs to solve problems.

**PLO 3: Safety**

Students should be able to demonstrate and apply their understanding of the concepts of safe lab practices, and be able to evaluate and assess safety risks associated with laboratory experiences. Students must be able to:

* Carry out responsible disposal techniques
* Comply with safety regulations
* Properly use personal protective equipment to minimize exposure to hazards
* Recognize chemical and physical hazards in laboratories, assess the risks from these hazards, know how to minimize the risks, and prepare for emergencies.
* Understand the categories of hazards associated with chemicals (health, physical, and environmental)
* Use Safety Data Sheets (SDSs) and other standard printed and online safety reference

**PLO 4: Communication skills**

Students should be able to present information in a clear and organized manner, write well-organized and concise reports in a scientifically appropriate style, and use relevant technology in their communications.

**Appendix B: Chemistry Seminar Presentation Assessment (Spring 2021)**

Presenter Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Presentation Title: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| --- | --- | --- | --- | --- |
|  | **Proficient**  3 | **Sufficient**  2 | **Deficient**  1 | **Rating**  **(1, 2, 3 or N/A)** |
| **Define problems clearly** | Identifies a creative, focused, and manageable topic that addresses potentially significant yet previously less-explored aspects of the topic. | Identifies a focused and manageable/doable topic that appropriately addresses relevant aspects of the topic. | Identifies a topic that is far too general and wide-ranging as to be manageable and doable. |  |
| **Understanding** | A detailed understanding is shown of all the underlying scientific concepts | A general understanding is shown of most of the underlying scientific concepts | Poor understanding is shown of the underlying scientific concepts |  |
| **Students present information in a clear and organized manner** | Delivery of presentation is well-organized, professional, and coherent. Images and text are clearly readable to the audience. | Delivery of presentation is organized, professional, and coherent. Images and text are mostly readable to the audience. | Delivery of presentation lacks organization or is not always coherent. Images and text not always easily read by audience. |  |
| **Presents relevant data** | Presents relevant in-depth data using clear, well organized, and easily readable figures, spectra, tables, etc. | Presents general data without emphasizing the relevant ones. Data is clear, readable, but lack some detailed information. | Data presented lacks organization. Presents mostly irrelevant data. |  |
| **Ability to retrieve information by searching the chemical literature** | At least 8 journal articles retrieved. | 5-8 journal journal articles retrieved. | <5 journal articles retrieved. |  |
| **Proper citation of others' work** | Properly cites sources in text and for images used in the presentation. Citations are shown on the slides that they are referenced. | Mostly cite sources in text or for images used in the presentation. Displays a list of all references on one slide | Does not properly cite sources in text or for images used in the presentation |  |
| **Evaluate technical articles critically** | Synthesizes in-depth information from relevant sources representing various points of view/approaches. | Presents information from relevant sources representing limited points of view/approaches. | Presents information from irrelevant sources representing limited points of view/approaches. |  |

**Appendix C. Chemistry Seminar Presentation Assessment: Summary of Results**

Three members of the Departmental Assessment Committee (two chemists and one biologist) evaluated oral presentations in the Chemistry Seminar Course on May 4, 2021. The presentation was delivered via powerpoint through the Google Meet platform due to the COVID-19 restrictions. In total, three students presented on individual semester length literature review projects on topics of their own choosing.

Seven of the eight learning outcomes, except “Proper citation of others’ work” were considered met (i.e., ranked sufficient (2.0) or better, and the seven outcomes ranked at least 1.5) within the uncertainty of the assessment, however, two of the eight outcomes scored an average of 2.0 or higher. The highest ranked learning outcomes were “Understanding" and “Present information in a clear and organized manner”. The lowest ranked learning outcome was “Proper citation of others’ work”. This outcome is critical and as such results will be passed along to the Chemistry faculty for consideration. We note that in the last PLO 4 assessment, which was an in-person presentation, “Proper citation of others’ work” ranked the highest. We believe the mode of delivery of this presentation, namely, via Google Meet may have impacted this assessment. In addition, there were four other students in the Seminar class who were unable to present their work due to the COVID-19 pandemic-related reasons.



**Figure 1.** Results of assessment of oral presentation with rubric (Appendix A)

**Appendix D - Lab Safety Assessment – Fall 2020 and Spring 2021**

**General Primer:**

1. For each lab, students were asked to read through the experiment, find ALL chemicals and equipment to be used, and asked to look up the health and safety information (and codes), as well as the chemical and physical properties of each chemical/material using the Safety Data Sheet (SDS). Students had safety training/orientation and were taught how to look up data from the SDSs.

2. In each experiment, they get full points if they provide the correct safety and health information for ALL the chemicals. They get partial credits if they do not provide the full information.

**Fall 2020 Organic Chemistry I Lab Safety Grades (Chem majors only):**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Student** | **Lab 1**  **[2pts]** | **Lab 2**  **[3pts]** | **Lab 4**  **[3pts]** | **Average %** |
| 1 | 2 | 3 | 3 | 100 |
| 2 | 2 | 3 | 3 | 100 |
| 3 | 2 | 0 | 0 | 25% |

**Spring 2021 Organic Chemistry I Lab Safety Grades (Chem majors only):**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Student** | **Lab 1**  **[5pts]** | **Lab 2**  **[2pts]** | **Lab 3**  **[2pts]** | **Lab 4**  **[2pts]** | **Average %** |
| 1 | 5 | 2 | 2 | 1 | 100 |
| 2 | 5 | 2 | 2 | 1 | 100 |

**Outcome of Assessment:**

During the Fall 2020 and Spring 2021 semester, two of the three chemistry majors that were assessed on PLO 3 obtained a perfect score, well above the 70% average bench mark. The third student who was only assessed in Fall 2020 was deficient in this PLO. We speculate that this student may have struggled due to the COVID-19 situation.

**Appendix E – Assessment Plan**

 **Programmatic Assessment Plan**

Program Name: Chemistry Created By: Assessment Committee Date: May 20, 2020

**School of Health and Natural Sciences Mission**

The mission of the School of Health and Natural Sciences is to help students develop the skills and habits of mind necessary for scientific inquiry and analysis in their professional, personal and civic lives. Faculty experts and engaged staff in the fields of biology, chemistry, earth and geographic sciences, exercise and sports science, mathematics, physics, psychological science, and nursing support students via foundational learning in the general education curriculum and mastery of content in a variety of majors. Our faculty offer classroom, laboratory, and clinical instruction as well as research opportunities in the sciences and health professions. Faculty and staff collaborate across the University and beyond to offer interdisciplinary learning opportunities.

**Department of Biology and Chemistry Mission**

The Biology and Chemistry Department believes that every student deserves a first-class education. We are educators at Fitchburg State because our personal values align with the campus values of equity and excellence. We strive to ensure that our students have the best of what we can offer them as they gain an in-depth knowledge of science that is part of a larger interdisciplinary, multicultural liberal arts and sciences education. In order to achieve our mission, we undertake to:

* Produce students who are well prepared for diverse careers or advanced study in the biological and chemical sciences or related disciplines as well as gain the skills necessary to successfully adapt to future changes within their disciplines.
* Build lasting relationships with students that will advance their professional growth by recognizing the unique needs of each individual and reflecting our passion for engagement in authentic learning experiences.
* Maintain a high level of scholarly activity in a variety of fields associated with biology, chemistry and science education.
* Serve the needs of the university and specific academic departments through our curricular offerings and involvement in the university community.
* Endeavor to demonstrate leadership as stewards of the environment.
* Provide state of the art pedagogical approaches as well as utilize appropriate equipment, technology, and resources for teaching, learning and research in the sciences and science education.
* Work to support the University’s mission of providing leadership and support for the economic, environmental, social, and cultural needs of North Central Massachusetts and the Commonwealth.

Part I: Student Learning Outcomes

**University Level**

|  |  |
| --- | --- |
| **ILP Code** | **Institutional Learning Priorities (ILPs)** |
| **ILP 1** | **Graduates have a deep understanding of the world.**  ***Accomplished through:***  **ILP 1A. Foundational Skills and Disciplinary Breadth** – Students will demonstrate attainment of the Learning Outcomes of the Liberal Arts and Sciences program.  **ILP 1B. Mastery in a Defined Body of Knowledge** – Students will attain the specialized academic objectives of their major or program.  **ILP 1C. Engagement with Campus and Community** – Students will develop personal and professional skills, goals, and ethical standards of behavior through co-curricular experiences. |
| **ILP 2** | **Graduates know how to learn and how to apply their knowledge.**  ***Accomplished through:***  **ILP 2A. Creative and Critical Thinking** – Students will use evidence and context to increase knowledge, reason ethically, assess the quality of information, solve problems, and innovate in imaginative ways.  **ILP 2B. Effective Communication** – Students will carefully consider and clearly articulate ideas for a range of audiences and purposes in written, spoken, technology-mediated, visual, or other forms of communication.  **ILP 2C. Integrative Learning** – Students will apply their breadth and depth of knowledge, skills, and experience to address complex issues. |
| **ILP 3** | **Graduates are engaged citizens who demonstrate integrity and continuous personal growth.**  ***Accomplished though:***  **ILP 3A. Respect for People and Cultures** – Students will appreciate the contributions and needs of diverse individuals and groups and understand themselves in solidarity with others locally, nationally, and globally.  **ILP 3B. Civic Participation in Wider Communities** – Students will demonstrate their ability to work within and across communities, to apply their knowledge in the service of others, and to promote social justice.  **ILP 3C. Continuous Learning and Personal Growth** – Students will approach the world with confidence and curiosity, appreciate the complex identities of themselves and others, and reflect critically on their experiences throughout life to make informed choices that advance their own well-being and that of the larger community. |

**Liberal Arts & Science Learning Outcomes (LA&S LOs)**

**General Education Curriculum**

|  |  |  |
| --- | --- | --- |
| **LO Code** | **LA&S Learning Outcomes (LA&S LOs)** | **Alignment to ELOs** |
| LA&S 1 | LA&S LO1:  Objective 1.1 |  |

**Division Learning Outcomes (DLOs)**

|  |  |  |
| --- | --- | --- |
| **LO Code** | **Division Student Learning Outcomes** | **Alignment to LA&S LOs or ELOs** |
| DIV 1 | DIV LO1:  Objective 1.1 |  |

**Department Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **LO Code** | **(Department Name) Learning Outcomes (LOs)** | **Alignment to Division/LA&S LOs or ELOs** |
|  |  |  |

**Program Learning Outcomes (PLOs)**

|  |  |  |
| --- | --- | --- |
| **LO Code** | **(Program Name) Learning Outcomes (LOs)** | **Alignment to Department/Division/LA&S LOs or ELOs** |
| PLO 1 | Disciplinary knowledge  Students should understand and be able to apply their understanding of all chemistry sub-disciplines and use appropriate laboratory skills and instrumentation to solve problems. These areas of knowledge include:   * Basic chemical concepts such as stoichiometry, states of matter, atomic structure, molecular structure and bonding, thermodynamics, equilibria, and kinetics. * Foundational knowledge and skills in analytical chemistry, biochemistry, inorganic chemistry, organic chemistry, and physical chemistry. * Foundational laboratory skills including synthesis of molecules, measurement of chemical properties, determination of structures, use of modern instrumentation and computational modeling. |  |
| PLO 2 | Lab skills  Students should be able to demonstrate and apply foundational laboratory skills. The areas of skills include:   * Basic laboratory skills such as keeping a notebook, use of electronic balances and volumetric glassware, preparation of solutions, chemical measurements using pH electrodes and spectrophotometers. * prepare solutions, record data correctly, and perform chemical synthesis and analysis of compounds, as well as use standard laboratory equipment and programs to solve problems. |  |
| PLO 3 | Safety  Students should be able to demonstrate and apply their understanding of the concepts of safe lab practices, and be able to evaluate and assess safety risks associated with laboratory experiences.  Students must be able to:   * Carry out responsible disposal techniques * Comply with safety regulations * Properly use personal protective equipment to minimize exposure to hazards * Recognize chemical and physical hazards in laboratories, assess the risks from these hazards, know how to minimize the risks, and prepare for emergencies. * Understand the categories of hazards associated with chemicals (health, physical, and environmental) * Use Safety Data Sheets (SDSs) and other standard printed and online safety reference |  |
| PLO 4 | Communication skills  Students should be able to present information in a clear and organized manner, write well-organized and concise reports in a scientifically appropriate style, and use relevant technology in their communications. |  |

Part II: Curriculum Mapping

Instructions

* Add the “required” courses in the left column starting with First Level to Upper Level.
* Add Program Learning Outcomes as a header for each column
* Add one number per cell to indicate the level at which the outcome is addressed in the course (see key below).
* Add an “A” in cells to indicate an assessment activity from the course will be used in Program Assessment.
* Focus should be only the required courses for all majors in the field of study. An additional table should be created for concentrations to map the additional learning outcomes, if necessary.

**COMMON (Program Name) CORE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | PLO 1 | PLO 2 | PLO 3 | PLO 4 |
| CHEM 1300  *G-Chem I* | 1 | 1 | 1 | 0 |
| CHEM 1400  *G-Chem II* | 1 | 1 | 1 | 0 |
| CHEM 2000  *O-Chem I* | 1 | 2 | 2A | 1 |
| CHEM 2100  *O-Chem II* | 1 | 2A | 3A | 1 |
| CHEM 2400  *Analytical* | 2 | 3A | 3 | 2 |
| CHEM 3030  *Biochem* | 2 | 0 | 0 | 2 |
| CHEM 3200  *P-Chem* | 3 | 3 | 3 | 3 |
| CHEM 3600  *Inorganic* | 3 | 0 | 0 | 3 |
| CHEM 4750  *Seminar* | 3A | 0 | 3A | 3A |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 0 | 1 | 2 | 3 | A |
| Not Addressed | Introducing | Broadening | Fulfilling | Assessed for Program |

**Key**

PLO = Program Learning Outcome

Not Addressed = PLO is not addressed within the specific course

Introducing = PLO is covered at an introductory level within the specific course

Broadening = PLO is covered in the course so as to reinforce the students’ learning of it within the specific course

Fulfilling = Demonstration of proficiency of the PLO occurs within the specific course

Assessed for Program = There will be a Direct Assessment activity to be used in Program Level Assessment in all sections of this course.

Part III: Assessment Measures, Timelines and Targets

**Direct Assessment**

Using the table below, list and briefly describe the **direct method(s)** used to collect information assessing whether students are learning the core sets of knowledge (K), skills (S) and attitudes (A) identified as essential.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PLO #** | **Assessment description (written project, oral presentation with rubric, etc.)** | **Timing of Assessment (annual, semester, bi-annual, etc.)** | **When assessment is to be administered in student program (internship, 4th year, 1st year, etc.)** | **To which students will assessments administered (all, only a sample, etc.)** | **What is the target set for the PLO? (criteria for success)** |
| 1 | Capstone exam | Annual | Junior or senior year | All students in the major | 90% of students to score > 50%  80% of students to score > 70%  Aggregate student performance in subject areas monitored. |
| 2 | Embedded exam questions | Annual | Sophomore and junior years | All students in the major | 90% of students to score > 70% |
| 3 | I. Embedded pre-lab questions  II. Chemical hygiene assignment\* | Annual | Sophomore and senior year | All students in the major | I. 90% of students to score >70%  II. 95% of students to score > 90% |
| 4 | Oral presentations | Annual | Junior/senior year | All students in the major | A majority of students should demonstrate a proficiency on oral presentations by attaining a score > 2 (sufficient) |

\*Note: I and II are independent assessments; i.e., not a pre-/post-test combination

**Indirect Assessment**

Using the table below, list and briefly describe the **indirect method(s)** used to supplement direct measures above.

* Indirect measures include, but are not limited to: student surveys, focus groups, meetings with advisory boards, employer feedback, internship feedback, alumni surveys, etc.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **PLO #** | **Assessment description (survey, focus group, interviews, etc.)** | **When assessment is to be administered** | **Who will give indirect feedback** | **Criteria for Success or Goal to be Achieved** |
| 1 | Student feedback survey | Annual | Dept. Student Affairs Committee | Qualitative indicator for PLO 1 |

Part IV: Assessment Cycle Timeline

Explanation:

* Programmatic student learning outcomes are assessed on a five-year cycle, which means each one is to be FULLY analyzed at least once in a five-year period.

Five-Year Assessment Plan

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Program Learning Outcome | Year 1  AY 20-21 | Year 2  AY 21-22 | Year 3  AY 22-23 | Year 4  AY 23-24 | Year 5  AY 24-25 |
| PLO 1 | x |  |  | x |  |
| PLO 2 | x |  | x |  |  |
| PLO 3 | x |  |  |  |  |
| PLO 4 |  | x |  |  | x |

Part V: Intended Analysis, Responsibility, and Communication

Explanation:

* Implementation of the assessment plan should be a shared responsibility--identify who was involved in developing the assessment plan
* Identify who will be involved in the analysis and evaluation of the subsequent evidence
* Identify who will be responsible for communicating results
* Identify who will be responsible for creating an action plan

The AY 2019-2020 departmental assessment committee developed this assessment plan. The data generated by the direct assessment criteria, delineated above, will be analyzed and evaluated on a rolling basis by members of the assessment committee. Members of the assessment committee and the department chair will communicate these results either at an annual retreat held before the start of the academic year and/or monthly updates at department meetings. The action plan will be completed as a component of the AY2024-2025 program review by the following departmental committees: Assessment, Curriculum, and Student Affairs

**Glossary of Terms**

**Assessment Method:** The assessment instrument(s) used to assess student learning.

* **Direct:** Linked to actual student work – i.e. written assignments, oral presentations, projects, etc.
* **Indirect:** Not actual student work – i.e. surveys, focus groups, employer feedback, etc.

**Department/Program Goals and Objectives:** Usually a combination of learning outcomes and strategic outcomes, that may or may not be based on student-centered work.

**Essential Learning Outcome (ELO):** The University-level Learning Outcomes - should be very broad. These are the specific characteristics a student should have upon graduation from the institution. Assessment from the Course, Program, Department and Divisional levels will link upward to show achievement.

**Learning Outcome (LO):** Measurable statements that indicate the specific characteristics students should exhibit in order to demonstrate achievement. The levels of Learning Outcomes are LA&S, Divisional, Department, Program and Course.

**Mission Statement:** A concise statement that explains the purpose of the division, department, or program based on the primary functions.

**Source of Assessment:** The course and student work that will provide data.

**Vision Statement:** A very concise (usually one sentence or partial sentence) statement that is “forward” thinking and describes what the Division, Department or Program strives to be.