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| **Assurance of Student Learning Report****2022-2023** |
| Ogden College of Science and Engineering | Department of Chemistry |
| Chemistry, Ref. 623 |
| Les Pesterfield, program coordinator, Department of Chemistry |
| ***Is this an online program***? [ ]  Yes [x]  No | Please make sure the Program Learning Outcomes listed match those in CourseLeaf . Indicate verification here [x]  Yes, they match! (If they don’t match, explain on this page under **Assessment Cycle)** |

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| ***Use this page to list learning outcomes, measurements, and summarize results for your program. Detailed information must be completed in the subsequent pages. Add more Outcomes as needed.*** |
| **Program Student Learning Outcome 1: Communicate Effectively in Written Form** |
| **Instrument 1** | **Laboratory reports from CHEM 451 (Physical Chemistry Lab)** |
| **Based on your results, check whether the program met the goal Student Learning Outcome 1.** | **[x]  Met** | **[ ]  Not Met** |
| **Program Student Learning Outcome 2: Interpret and Explain Data about Chemical Systems** |
| **Instrument 1** | **American Chemical Society Exam in Analytical Chemistry** |
| **Based on your results, check whether the program met the goal Student Learning Outcome 2.** | **[x]  Met** | **[ ]  Not Met** |
| **Program Student Learning Outcome 3: Describe and discuss structure-property-function relationships for a variety of molecules** |
| **Instrument 1** | **American Chemical Society Exam in Organic Chemistry** |
| **Based on your results, check whether the program met the goal Student Learning Outcome 3.** | **[ ]  Met** | **[x]  Not Met** |
| **Assessment Cycle Plan:**  |
| We plan to continue to assess the above program learning outcomes in the upcoming year. We noted a drop in the performance in assessments used in outcomes 2 and 3 corresponding to the onset of the pandemic and switch to online learning. We will therefore continue to assess these metrics for at least another year to determine if the performance returns to pre-pandemic levels. |

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| **Program Student Learning Outcome 1** |
| **Program Student Learning Outcome**  | Communicate Effectively in Written Form |
| **Measurement Instrument 1**  | **Laboratory reports from CHEM 451 (Physical Chemistry Lab)**Three writing assignments were submitted by each student with writing prompts related to laboratory experiments from the course.The instrument was assessed in a fashion consistent with the Written Communication VALUE Rubric from AAC&U. Basic parameters for *Context, Content, Conventions, Sources, and Syntax* were rated on the 1 to 4 scale. A maximum score of 20 was possible. |
| **Criteria for Student Success** | Students should score an average of 2.6 or higher over the 5 areas on the rubric. |
| **Program Success Target for this Measurement** | At least 75% of the papers will score at least an average of 2.6. | **Percent of Program Achieving Target** | 67% for assignment 1100% for assignment 2100% for assignment 3 |
| **Methods**  | The papers were evaluated using the Written Communication VALUE rubric by Dr. Jeremy Maddox. A score of 1 (benchmark) to 4 (capstone) was assigned for each category and the values were averaged. The average scores on assignment 1 ranged from 2.4 to 3.3. Scores on the second assignment ranged from 3.1 to 3.6. Scores on the third assignment ranged from 3.4 to 3.8.  |
| **Based on your results, highlight whether the program met the goal Student Learning Outcome 1.** | **[x]  Met** | **[ ]  Not Met** |
| **Results, Conclusion, and Plans for Next Assessment Cycle (Describe what worked, what didn’t, and plan going forward)** |
| The written assignments were described in the syllabus. After each assessment, the papers were returned to the students and they were given the opportunity to revise the assessments to receive points back on the assessment. Overall, the scores showed improvement with each assignment, particularly between the first two assignments. The quality of the submissions improved, and the target was achieved. We will continue to assess students’ writing quality in the upcoming year. |

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| **Program Student Learning Outcome 2** |
| **Program Student Learning Outcome**  | **Interpret and Explain Data about Chemical Systems** |
| **Measurement Instrument 1** | **American Chemical Society Exam in Analytical Chemistry**This is a nationally-normed 50-question multiple choice exam given at the conclusion of the CHEM 330 (Quantitative Analysis) course (required of all majors and minors).  |
| **Criteria for Student Success** | 50%-tile ranking or higher |
| **Program Success Target for this Measurement** | 50% of students taking the exam | **Percent of Program Achieving Target** |  54% |
| **Methods**  | Assessments were given to all students in the course |
| **Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 2.** | **[x]  Met** | **[ ]  Not Met** |
| **Results, Conclusion, and Plans for Next Assessment Cycle (Describe what worked, what didn’t, and plan going forward)** |
| It is proposed that the decrease in the percentage of students achieving the target percentile of content mastery (73% AY 20/21 to 54% AY 22/23) is a function of the student’s lack of mastery of content material from previous coursework; we note that this year’s percentage is nearly identical to last year’s (53%); since this is a sophomore/junior-level course, pandemic effects may be notable. Faculty have decided to include more review-type exercises at the beginning of the course so that students can identify their content weaknesses and review those areas early in the course. We will continue to assess this outcome again next year to look for any changes in trend as the time since the outset of the pandemic increases. |

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| **Program Student Learning Outcome 3** |
| **Program Student Learning Outcome**  | **Describe and discuss structure-property-function relationships for a variety of molecules** |
| **Measurement Instrument 1** | **American Chemical Society Exam in Organic Chemistry**This is a nationally-normed 50-question multiple choice exam given at the conclusion of the CHEM 342 (Organic Chemistry 2) course. |
| **Criteria for Student Success** | 50%-tile ranking of higher |
| **Program Success Target for this Measurement** | 50% of students taking the exam | **Percent of Program Achieving Target** | 46% |
| **Methods**  | Assessments were taken by all students in the course. |
| **Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 3.** | **[ ]  Met** | **[x]  Not Met** |
| **Results, Conclusion, and Plans for Next Assessment Cycle (Describe what worked, what didn’t, and plan going forward)** |
| It was previously proposed that the decrease in the percentage of students achieving the target percentile of content mastery (69% AY 20/21 to 39% AY 21/22) was a function of the student’s lack of mastery of content material from previous coursework. This year’s percentage (46%) is a slight improvement from last year and may be due to a return to more in-person learning over the past several semesters. Faculty have decided to include more review-type exercises at the beginning of the course so that students can identify their content weaknesses and review those areas early in the course. We will continue to assess this outcome next year to see if our results return closer to pre-pandemic levels.  |

**\*\*\* Please include Curriculum Map (below/next page) as part of this document**

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| **Program name:** | B.S. in Chemistry (Ref. 623) |   |  |  |  |  |
| **Department:** | Chemistry |   |   |  |  |  |  |
| **College:** | Ogden College of Science and Engineering |   |  |  |  |  |
| **Contact person:** | Kevin Williams |   |  |  |  |  |
| **Email:** | kevin.williams@wku.edu |   |  |  |  |  |
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| **KEY:** |  |  |  |  |  |  |  |
| **I = Introduced** |  |  |  |  |  |  |  |
| **R = Reinforced/Developed** |  |  |  |  |  |  |
| **M = Mastered** |  |  |  |  |  |  |  |
| **A = Assessed** |  |  |  |  |  |  |  |
|  |  |  | **Learning Outcomes** |  |  |  |  |
|  |  |  | **LO1:** | **LO2:** | **LO3:** | **LO4:** | **LO5** |
|   |  |  | Apply various bonding theories to describe the formation of molecules | Apply nomenclature rules to produce chemical names and formulas  | Describe the relationships between structure and chemical property | Effectively communicate findings through laboratory reports | Apply fundamental principles to predict rate and spontaneity of a reaction |
| **Course Subject** | **Number** | **Course Title** |   |   |   |   |   |
| CHEM | 120 | College Chemistry I | I |   | I |   | I |
| CHEM | 121 | College Chemistry Laboratory I |   | I | I | I |   |
| CHEM | 222 | College Chemistry II |   |   | R |   | R,A |
| CHEM | 223 | College Chemistry Laboratory II |   | R,A |   | I |   |
| CHEM  | 320 | Inorganic Chemistry I | R | R | R |   |   |
| CHEM  | 330 | Quantitative Analysis |   |   |   | R | R, A |
| CHEM | 340 | Organic Chemistry I | R | R | R |   | R |
| CHEM | 341 | Organic Chemistry Laboratory I |   |   | R | R |   |
| CHEM  | 342 | Organic Chemistry II | R,A | R | R, A |   | R |
| CHEM | 343 | Organic Chemistry Laboratory II |   |   | R | R |   |
| CHEM | 398 | Undergraduate Seminar |   |   |   |   |   |
| CHEM  | 446 | Biochemistry I |   |   | M |   | R |
| CHEM | 450 | Physical Chemistry I | M |   |   |   | M,A |
| CHEM  | 451 | Physical Chemistry Laboratory |   |   |   | M, A |   |