



## Program Assessment Report (PAR)

### Chemistry (CHM) Masters Degree

REPORT PREPARED by: McGowin, Audrey E.

ACADEMIC YEAR COVERED BY THIS REPORT: [AcademicYear]

#### I. PROGRAM LEARNING OUTCOMES

Graduates will have developed research and technical skills to become professional Master's Degree chemists or continue on to a doctoral program in chemistry. 1) Students will learn to search the scientific literature and write peer-reviewed publications. 2) Students will learn how to present their research at scientific conferences and to department faculty. 3) Students will learn how to perform chemical synthesis methods relevant their research projects. 4) Students will learn how to collect, prepare, and analyze samples to complete their research projects. 5) Students will learn to apply laboratory skills specific to their research topics, which may include gas and/or liquid chromatography, mass spectrometry, UV-Vis spectroscopy, infrared spectroscopy, nuclear magnetic resonance spectrometry, thermogravimetric analysis, and X-ray spectroscopy to their specific research projects. 6) Students become proficient in basic chemistry by taking core courses covering the four major areas of chemistry; organic, inorganic, analytical, and physical. 7) Students must develop computational methods that are current to their profession.

#### II. PROCEDURES USED FOR ASSESSMENT

##### A. Direct Assessment

1) Searching the scientific literature and writing peer-reviewed publications. Students take CHM 6900 Critical Literature Analysis and present their evaluation of peer-reviewed literature in chemistry. 2) Students prepare and defend their thesis research in CHM 8970, CHM 8980, and CHM 8990 (thesis defense). The research is evaluated by their research advisor and their thesis committee, two other research faculty. Students must pass their thesis defense. Students will learn how to present their research at scientific conferences. This is assessed by acceptance at scientific meeting and the winning of awards at meetings. 3) Students will learn how to perform chemical synthesis methods relevant their research projects. For inorganic and organic students, they will be supervised

by their research advisor as they develop the synthetic skills necessary to complete their research project. CHM 8970 and CHM 8980 MS research. Students must pass their thesis defense. 4) Students will learn how to collect, prepare, and analyze samples to complete their research projects. Students must determine if their efforts at synthesis were successful by using analytical methods to measure the amount and character of materials they have synthesized. If students are engaged in analytical or environmental research, they must be able to determine the amount of their analyte of interest in specific samples that they prepared or collected. CHM 8970 and CHM 8980 MS research. Students must pass their thesis defense. 5) Students will learn to apply laboratory skills specific to their research topics, which may include gas and/or liquid chromatography, mass spectrometry, UV-Vis spectroscopy, infrared spectroscopy, nuclear magnetic resonance spectrometry, thermogravimetric analysis, and X-ray spectroscopy to their specific research projects. CHM 8970 and CHM 8980 MS research. Students must pass their thesis defense. 6) Students become proficient in basic chemistry by taking core courses covering the four major areas of chemistry; organic, inorganic, analytical, and physical. CHM 6370 Electroanalytical Chemistry, CHM 7200 Advanced Inorganic Chemistry I, CHM 7440 Structural Concepts in Organic Chemistry, CHM 6170 Applied Chemical Spectroscopy, CHM 6350 Instrumental Analysis, CHM 6650 Physical Polymer Chemistry, CHM 7520 Thermodynamics, CHM 6610 Synthetic Polymer Chemistry. Students may earn a passing grade in all four areas. 7) Students must develop computational methods that are current to their profession. CHM 8980 and CHM 8990 thesis research is supervised by the research advisor. Students must pass their thesis defense.

## **B. Scoring of Student Work**

1) Searching the scientific literature and writing peer-reviewed publications. Students take CHM 6900 Critical Literature Analysis and present their evaluation of peer-reviewed literature in chemistry. The students took quizzes that were stored by the instructor and the science librarian. 2) Students prepare and defend their thesis research in CHM 8970, CHM 8980, and CHM 8990 (thesis defense). The research is evaluated by their research advisor and their thesis committee, two other research faculty. Students must pass their thesis defense. Students will learn how to present their research at scientific conferences and to department faculty. This is assessed by acceptance at scientific meeting and the winning of awards at meetings. Also assessed by a successful thesis defense. CHM 8970, CHM 8980, CHM 8990 (thesis defense) MS research. 3) Students will learn how to perform chemical synthesis methods relevant their research projects. For inorganic and organic students, they will be supervised by their research advisor as they develop the synthetic skills necessary to complete their research project. CHM 8970 and CHM 8980 MS research. Students must pass their thesis defense. 4) Students will learn how to collect, prepare, and analyze samples to complete their research projects. Students must determine if their efforts at synthesis were successful by using analytical methods to measure the amount and character of materials they have synthesized. If students are engaged in analytical or environmental research, they must be able to determine the amount of their analyte of interest in specific samples that they

prepared or collected. CHM 8970 and CHM 8980 MS research. Students must pass their thesis defense. 5) Students will learn to apply laboratory skills specific to their research topics, which may include gas and/or liquid chromatography, mass spectrometry, UV-Vis spectroscopy, infrared spectroscopy, nuclear magnetic resonance spectrometry, thermogravimetric analysis, and X-ray spectroscopy to their specific research projects. CHM 8970 and CHM 8980 MS research. Students must pass their thesis defense. 6) Students become proficient in basic chemistry by taking core courses covering the four major areas of chemistry; organic, inorganic, analytical, and physical. CHM 6370 Electroanalytical Chemistry, CHM 7200 Advanced Inorganic Chemistry I, CHM 7440 Structural Concepts in Organic Chemistry, CHM 6170 Applied Chemical Spectroscopy, CHM 6350 Instrumental Analysis, CHM 6650 Physical Polymer Chemistry, CHM 7520 Thermodynamics, CHM 6610 Synthetic Polymer Chemistry. Students may earn a passing grade in all four areas. Instructors prepare quizzes and exams and grade them themselves. 7) Students must develop computational methods that are current to their profession. CHM 8980 and CHM 8990 thesis research is supervised by the research advisor. Students must pass their thesis defense.

### C. Indirect Assessment

MS graduates are mailed a survey with a stamped self-addressed envelope. They are asked 6 questions and asked to rate them with points assigned for their answers "Very Well (3)", Fairly Well (2), Not Well (1), Cannot Judge (0). The following questions are asked. After each question, the learning outcome number that is assessed is listed. Each question has a "comments" area. The final question is open-ended "Any further comments or suggestions regarding the chemistry program at Wright State University." 1. Mastery of advanced chemical concepts. Outcomes 3, 4, 5, 6 2. Mastery of advanced laboratory techniques. Outcomes 3, 4, 5, 6 3. Mastery of advanced computer programs commonly used in scientific work. Outcomes 4, 5, 7 4. Ability to understand information presented in the scientific literature. Outcomes 1, 2, 5. Ability to organize and complete an appropriate written research thesis project, including all necessary laboratory and library research aspects. Outcomes 1, 2, 3, 4, 5, 6, 7 6. Ability to successfully communicate research thesis project both orally and in written form to faculty. Outcome 2 LEARNING OUTCOMES 1) Searching the scientific literature and writing peer-reviewed publications. CHM 6900 Critical Literature Analysis, students fill out an online course evaluation. 2) Students will learn how to present their research at scientific conferences and to department faculty. 3) Students will learn how to perform chemical synthesis methods relevant their research projects. 4) Students will learn how to collect, prepare, and analyze samples to complete their research projects. 5) Students will learn to apply laboratory skills specific to their research topics, which may include gas and/or liquid chromatography, mass spectrometry, UV-Vis spectroscopy, infrared spectroscopy, nuclear magnetic resonance spectrometry, thermogravimetric analysis, and X-ray spectroscopy to their specific research projects. 6) Students become proficient in basic chemistry by taking core courses covering the four major areas of chemistry; organic, inorganic, analytical, and physical. CHM 6370 Electroanalytical Chemistry, CHM 7200

Advanced Inorganic Chemistry I, CHM 7440 Structural Concepts in Organic Chemistry, CHM 6170 Applied Chemical Spectroscopy, CHM 6350 Instrumental Analysis, CHM 6650 Physical Polymer Chemistry, CHM 7520 Thermodynamics, CHM 6610 Synthetic Polymer Chemistry. 7) Students must develop computational methods that are current to their profession.

### III. ASSESSMENT RESULTS/INFORMATION:

Questions on Assessment form 1. Mastery of advanced chemical concepts. Outcomes 3, 4, 5, 6 2. Mastery of advanced laboratory techniques. Outcomes 3, 4, 5, 6 3. Mastery of advanced computer programs commonly used in scientific work. Outcomes 4, 5, 7 4. Ability to understand information presented in the scientific literature. Outcomes 1, 2, 5. Ability to organize and complete an appropriate written research thesis project, including all necessary laboratory and library research aspects. Outcomes 1, 2, 3, 4, 5, 6, 7 6. Ability to successfully communicate research thesis project both orally and in written form to faculty. Outcome 2

Average response, 3 is very well, 2 is fairly well Mean scores are presented. 1. 2.67 (3 responses) 2. 2.67 (3 responses) 3. 1.33 (3 responses) One selected "Cannot judge (0)" 4. 3.00 (3 responses) One person did not fill out the second page. 5. 3.00 (2 responses) 6. 3.00 (2 responses)

From the very limited sample set, the learning outcomes are being achieved.

### IV. ACTIONS TO IMPROVE STUDENT LEARNING

Since I am a new chair, I have not had the opportunity to share the results of the surveys with faculty and other stakeholders. It is clear that the methods for data collection must be improved. There were 6 graduates and 3 of them filled out assessment forms, so there was only a 50% of the assessment forms. The sample is so small that it is difficult to conclude much about the success of the program, except that those who filled out the forms were satisfied with their experience. The department will be using e-mail and text messaging in the future to get more information from students in the future about their experiences. This form is sent out to new graduates. It would be useful to survey graduates for several years after they graduated so see if their preceptions hold or if they have more suggestions for program improvement.

### V. SUPPORTING DOCUMENTS

Additional documentation, when provided, is stored in the internal Academic Program Assessment of Student Learning SharePoint site.