## Revised by Amanda Miller

Spring 2017

**MOHAWK VALLEY COMMUNITY COLLEGE**

**UTICA, NEW YORK**

**Department of Mathematics & Natural Science**

### COURSE OUTLINE

**I. Catalog Description**

CH246--Quantitative Analysis **C-3,P-4, Cr 5**

Prerequisite: CH141 General Chemistry 1 and CH142 General Chemistry 2 (142 may be taken as a co-requisite)

This course introduces analytical chemistry and develops the skills and perspectives necessary to solve problems. Topics include statistical analysis, analytical instruments & equipment, in depth analysis of equilibrium, gravimetry, titrimetry (back titrations, precipitation, argentiometry, etc), AAS & IR spectrophotometry. Samples are chosen to illustrate typical industrial and environmental problems. Emphasis is placed on accuracy and precision in all measurements. The final project is an independent research project culminating in an oral presentation. As time allows, field trips supplement the campus experience.

**II. Texts and Laboratory Materials**

Text: Quantitative Chemical Analysis by Daniel C. Harris, W.H. Freeman

Laboratory Supplies: Laboratory notebook, goggles, gloves, and lab coat

**III. Student Learning Outcomes**

Upon the completion of Quantitative Analysis, the students will be able to:

1. Demonstrate an ability to work in a laboratory safely and efficiently.

2. Demonstrate an ability to maintain a permanent record notebook to industry standards.

3. Demonstrate an ability to follow procedures to the letter (protocol) as well as independently develop a procedure for accurate chemical analysis.

5. Prepare solutions correctly with high precision and distinguish the difference between solutions that need precision and those that do not require precision.

6. Demonstrate the necessary calculations of analytical chemistry, including statistical analyses, utilizing modern spreadsheet operations for large data sets.

7. Clearly communicate in written and verbal reports.

8. Discuss the literature of analytical chemistry.

9. Demonstrate responsibility for their learning via a successful independent research project.

10. Explain the role and key importance of analytical chemistry to industry, environment, and medicinal chemistry.

11. Design and execute their own experimental protocol, and communicate their findings in written and oral presentations.

**IV. General Topical Outline**

Lecture topics should be chosen to correlate as closely as possible with the laboratory and to supplement and extend the practice. Individual instructors may choose to meet these and the general course objectives in different ways. The following is a recommended outline.

### Quantitative ANALYSIS LABORATORY SCHEDULE

The laboratory is where the student applies the knowledge gained from the lecture and assigned readings to actual practice. The success of the course depends directly on the laboratory experience. Lecture is designed to support and extend the laboratory. The text describes procedures in a general way. It is up to the student to make decisions as to how the work is carried out. Major emphasis is placed on accuracy and precision. A suggested laboratory sequence follows. It should be pointed out that many experiments require long waiting times. Efficient use of laboratory time requires that students be able to proceed to the next experiment in such cases. In general, a new experiment should be introduced each week and students allowed to proceed through them at their own pace.

Solutions are prepared by students in a 1 hour lab period, then utilized the following 4 hour lab period.

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|  | **Week** | **Experiment** |
|  | 1 | Check in & Intro to quant lab |
|  | 1 | Glassware calibration |
|  | 2 | Prepare NaCl & HCl solutions |
|  | 2 | Standardization of NaOH & HCl solutions |
|  | 3 | Penny Stats |
|  | 3 | Penny stats in computer lab |
|  | 4 | Determination of LDL for silver ion via AAS |
|  | 5 | Gravimetric analysis of calcium ion in unknown samples\* collected in the field |
|  | 6 | EDTA solutions prep |
|  | 6 | EDTA titration of Ca2+ and Mg2+ in seawater |
|  | 7 | Ca2+ standards prep |
|  | 7 | Calcium ion analysis via AAS |
|  | 8 | Mohr’s titration of silver nitrate |
|  | 9 | Argentometric titration of household iodine: Fajan’s Method (wrong indicator) |
|  | 10 | Argentometric titration of household iodine: Volhard titration |
|  | 11 | Which spec is best? |
|  | 11 | Quantitative analysis of diesel & biodisel by IR |
|  | 12-15 | Independent project, including literature search, proposal, method development, etc |
|  | 15 | Presentations |

\*For sampling, it is recommended that the following pamphlet be

used as a supplement to the text "Principles of Environmental

Sampling", American Chemical Society, latest edition.