UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH100 Introduction to Inorganic Chemistry
(3) Class Meeting:_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

This is a one-semester course for students preparing for technical training in natural sciences or laboratory work. The course covers the elementary principles of inorganic chemistry emphasizing nomenclature, stoichiometry, and solution chemistry. It includes three hours of lecture weekly. The lab, CH 100L, MUST be taken concurrently. Prerequisite: Completion of MA085 level II. Corequisite: CH 100L

3. COURSE CONTENT:

Measurements and calculations, matter and energy, elements, atoms, and ions, and chemical nomenclature. Reactions in aqueous solutions, chemical composition, chemical quantities, modern atomic theory, chemical bonding, gases solutions, acid and bases.

4. RATIONALE FOR OFFERING COURSE:

This course is primarily designed for the health science (nursing) and agriculture majors.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

Preparatory (high school chemistry); basic math skills such as solving algebraic problems.

6. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):

Course SLOs:

1. Define basic chemical concepts and apply in Inorganic Chemistry.
2. Apply mathematical and chemical concepts to solve simple quantitative and qualitative problems in chemistry.

3. Explain the fundamental structure of matter and how it relates to properties.
4. Identify and name simple chemical compounds
5. Write and balance simple chemical compounds.
6. Communicate chemical concepts clearly in written and oral.
7. Relate chemistry to everyday experience.
8. Interact to enhance learning chemistry.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

9. TEXTBOOK AND READINGS:

(See Instructor)

10. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

11. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

12. EVALUATION AND GRADES (SEE INSTRUCTOR):

13. COURSE POLICIES (SEE INSTRUCTOR):

14. SPECIAL NEEDS:

"If you are a student with a disability who will require a accommodation(s) to participate in this course, please contact me or the Institutional Compliance Officer privately to discuss your specific needs. You will need to provide me with documentation concerning your need for accommodation(s) from the EEO/ADA and TITLE IX Office. If you have not registered with the EEO/ADA and Title IX Office, you should do so immediately at 735-2244, (TTY) 735-2243 to coordinate your accommodation request."

15. CALENDAR OR SCHEDULE (SEE INSTRUCTOR):

16. DROP DATES:

University policy sets the drop dates. See the semester schedule of courses.

17. STUDENT WORK LOAD (SEE INSTRUCTOR):

18. SUPPLEMENTARY MATERIALS/ADDITIONAL RESOURCES (SEE INSTRUCTOR):

19. CONTACT INFORMATION FOR CLASSMATES:

Exchange contact info with at least one classmate. Contact your classmate(s) if you miss class or if you want to form a study group.

[1]**BASED ON DR. BARBARA GROSS DAVIS, UC BERKELEY MODEL "CREATING A SYLLABUS".** From the hard copy book *Tools for Teaching* by Barbara Gross Davis; Jossey-Bass Publishers: San Francisco, 1993. Linking to this book chapter from other websites is permissible. However, the contents of this chapter may not be copied, printed, or distributed in hard copy form without permission. For a more detailed explanation on each numbered section of the syllabus, please visit: http://teaching.berkeley.edu/bgd/syllabus.html.

UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH100L Introduction to Inorganic Chemistry Lab
(3) Class Meeting:_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

This is a one-semester course for students preparing for technical training in natural sciences or laboratory work. The course covers the elementary principles of inorganic chemistry emphasizing nomenclature, stoichiometry, and solution chemistry. It includes three hours of laboratory per week. The CH 100L MUST be taken concurrently with CH 100 lecture.. Prerequisite: Completion of MA085 level II. Corequisite: CH 100.

3. COURSE CONTENT:

Measurements and calculations, matter and energy, elements, atoms, and ions, and chemical nomenclature. Reactions in aqueous solutions, chemical composition, chemical quantities, modern atomic theory, chemical bonding, gases solutions, acid and bases.

4. RATIONALE FOR OFFERING COURSE:

This course is primarily designed for the health science (nursing) and agriculture majors. Students will be introduced to basic chemical measurements where basic laboratory skills will be developed.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

Preparatory (high school chemistry); basic math skills such as solving algebraic problems.

6. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):

Course SLOs:

1. Use chemical safety knowledge and skills in laboratory to conduct experiments.
2. Conduct experiment using a procedure, collect, analyze, and interpret data.
3. Communicate laboratory results clearly, in written and oral presentations.
4. Relate experimental observation to chemical concepts.
5. Apply accuracy and precision in measurements and calculations.
6. Interact and collaborate with peers in learning chemistry.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

9. TEXTBOOK AND READINGS:

(See Instructor)

10. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

11. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

12. EVALUATION AND GRADES (SEE INSTRUCTOR):

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not registered with the EEO/ADA and Title IX Office, you should do so immediately at 735-2244, (TTY) 735-2243 to coordinate your accommodation request."

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18. SUPPLEMENTARY MATERIALS/ADDITIONAL RESOURCES (SEE INSTRUCTOR):

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UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH101 Introduction to Organic Chemistry
(3) Class Meeting:_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

This organic chemistry course is tailored for students preparing for technical training in natural sciences and for those seeking a practical approach to the chemical analysis and organic synthesis. It includes three hours of lecture weekly. The lab, CH 101L, MUST be taken concurrently. Prerequisite: CH 100-100L, or consent of instructor. Co-requisite: CH 101L

3. COURSE CONTENT:

Saturated, unsaturated and aromatic hydrocarbons, alcohols, phenols, thiols, ethers and sulfides, aldehydes and ketones, carboxylic acids, carbohydrate, lipids, amines, amino acids and proteins, nucleic acids, metabolic processes.

4. RATIONALE FOR OFFERING COURSE:

This is a one-semester course tailored for nursing and agriculture majors. The course also qualifies as a general education course. It covers basic concepts of carbon chemistry and their associated properties. Topics are studied under various heading such as alkanes, alkenes, alkynes and functional groups under alcohols, carboxylic acids, amines, etc. The importance of these compounds in food, medicine, and other industries, will be discussed. It is a course that will enable students to appreciate the role chemistry play in our daily lives.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

Introduction to Inorganic Chemistry (CH 100) is a prerequisite; Basic Algebra skills expected.

6. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):

Course SLOs:

1. Identify functional groups and write name and structure of simple organic compounds.
2. Solve simple reactions of organic compounds.
3. Relate chemical and physical properties to the structure and composition of compound.
4. Identify the structure of biochemical molecules and explain their function.
5. Relate the relevance of organic chemistry to everyday life.
6. Describe basic chemical changes in the metabolic process.
7. Communicate chemical concepts clearly.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

9. TEXTBOOK AND READINGS:

(See Instructor)

10. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

11. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

12. EVALUATION AND GRADES (SEE INSTRUCTOR):

13. COURSE POLICIES (SEE INSTRUCTOR):

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15. CALENDAR OR SCHEDULE (SEE INSTRUCTOR):

16. DROP DATES:

University policy sets the drop dates. See the semester schedule of courses.

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18. SUPPLEMENTARY MATERIALS/ADDITIONAL RESOURCES (SEE INSTRUCTOR):

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UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH101L Introduction to Organic Chemistry Lab
(3) Class Meeting:_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

This organic chemistry course is tailored for students preparing for technical training in natural sciences and for those seeking a practical approach to the chemical analysis and organic synthesis. It consists of a three hour laboratory per week. CH 101L MUST be taken concurrently with CH101 lecture. Prerequisite: CH 100-100L, or consent of instructor. Co-requisite: CH 101L

3. COURSE CONTENT:

Carbon type of bonding and isomerism, saturated, unsaturated and aromatic hydrocarbons, alcohols, phenols, thiols, ethers and epoxides and sulfides, aldehydes and ketones, carboxylic acids, amines, amino acids and proteins, carbohydrates, nuclei acids.

4. RATIONALE FOR OFFERING COURSE:

This course leaves the practical skills to be gained in basic reactive and tests for organic compounds. The basic practical skills in ? isolating products and purification will be introduced.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

Introduction to Inorganic Chemistry (CH 100 & CH 100L) is a prerequisite; Basic Algebra skills expected.

6. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):

Course SLOs:

1. Apply chemical safety and knowledge in laboratory to carry out experiments.
2. Conduct experiment, collect, analyze, and interpret data.
3. Relate experimental observations to chemical concept.
4. Write laboratory reports clearly following the scientific reporting method.
5. Communicate data using standard software.
6. Present seminar using communication tools.
7. Collaborate with peers to conduct experiment and learn chemistry

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

9. TEXTBOOK AND READINGS:

(See Instructor)

10. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

11. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

12. EVALUATION AND GRADES (SEE INSTRUCTOR):

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15. CALENDAR OR SCHEDULE (SEE INSTRUCTOR):

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18. SUPPLEMENTARY MATERIALS/ADDITIONAL RESOURCES (SEE INSTRUCTOR):

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UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH102 General Chemistry
(3) Class Meeting:_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

This course is designed for science majors and minors and emphasizes an in-depth study of modern chemical principles, theories, and laws pertaining to atomic structure, nature of the chemical bond, and stoichiometric considerations of all aspects of inorganic chemistry. It includes three hours of lecture weekly. The lab, CH 102L, MUST be taken concurrently. Prerequisite: Demonstrated proficiency at the MA 161 level or concurrent enrollment in 161a. Corequisite: CH 102L

3. COURSE CONTENT:

Principal topics include measurements, atomic theory, atomic properties, the mole concept, chemical stoichiometry, molarity, precipitation, acid base and redox reactions, gases, thermochemistry, atomic and molecular structure/periodic relationships, liquids and solids/intermolecular forces.

4. RATIONALE FOR OFFERING COURSE:

This is a foundational course leading to further studies in science. It introduces the student to the scientific method and critical thinking as the means for problem solving. Atomic theory, the mole concept and chemical stoichiometry are perhaps the most fundamental ideas in chemistry. CH 102 aims to provide a sound introduction to these concepts and will illustrate the utility of these concepts in problem-solving situations in chemistry. The

problem-solving approach will help the student gain a deeper understanding of these topics and will provide a firm foundation for further university-level chemistry.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

Students should know basic algebra and preferably should have taken preparatory chemistry at the high school level. MA 161a is a prerequisite for this course.

6. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):

Course SLOs:

1. Should be able to describe a scientific method and list the essential components of scientific method.
2. Should be able to use mathematical skills to solve quantitative and qualitative problems in chemistry.
3. Should be able to explain modern atomic structure and relate to chemical properties and composition of matter.
4. Should be able to describe the bonding theories and its application to molecular and ionic compounds, and elements.
5. Name and describe the formula of compounds using the chemical nomenclature.
6. Should describe the laws governing the behavior of gases and the kinetic model for gases and use these laws for quantitative problem solving.
7. Should be able to describe and quantify the energy in chemical and physical changes.
8. Student should be able to communicate clearly through written, oral presentations.
9. Students should be able to develop good interaction skills and use this to enhance problem solving, critical thinking, communication, and personal development.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

Program SLOs[2]: See below.

7. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

9. TEXTBOOK AND READINGS:

See instructor.

10. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

11. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

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13. COURSE POLICIES (SEE INSTRUCTOR):

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15. CALENDAR OR SCHEDULE (SEE INSTRUCTOR):

16. DROP DATES:

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18. SUPPLEMENTARY MATERIALS/ADDITIONAL RESOURCES (SEE INSTRUCTOR):

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[2]Program SLOs:

BA Chemistry goals/objectives include the following:

1. **GOAL 1:** Demonstrate the knowledge of fundamental concepts of chemistry and its relevance to the scientific method and other fields in science with the following objectives:

    a. Students should be able to explain the scientific method and relate its application to chemical discoveries.

    b. Students will able to define the states and structure of matter and relate these to physical and chemical properties.

    c. Students should be able to define chemistry and state its relevance to other sciences and everyday experience.

    d. Students should be able to apply the fundamental concepts of elements and compounds and their reactivity to solve chemically based problems.

2. **GOAL 2:** Demonstrate the skills to make observations, experimentation, collect and collate data, analyze and interpret data in a safe chemical environment with the following objectives:

    a. Students will be able to independently perform accurate quantitative measurements, interpret experimental results, perform calculations on these results and draw a reasonable, accurate conclusion.

    b. Students will synthesize, isolate, purify and characterize a series of compounds using modern methods.

    c. Students will demonstrate knowledge of proper use of modern instrumental techniques.

d. Students will be able to design an experimental procedure.

e. Students will observe safe practices in the laboratory and will know how to respond in an emergency. Students will learn to gather hazardous materials information and will recognize and respond properly to potential hazards of handling chemicals and chemical waste.

3. **GOAL 3:** Demonstrate the ability to clearly articulate, formulate, and communicate scientific information using computer, written and oral communication skills with the following objectives:

   a. Students will communicate critical analysis of scientific information through written reports and laboratory notebooks.

   b. Students will effectively communicate scientific information through oral presentations.

   c. Students will use computer technology to gather, process, analyze, and present chemical data.

   d. Students will use chemical literature and computer resources to gather research information

4. **GOAL 4:** Demonstrate critical thinking, problem solving skills and the ability to use chemical knowledge and mathematical skills to identify, evaluate, analyze, synthesize, and integrate data and abstract ideas in solving problems with the following objectives:

   a. Students should be able to describe the structure & composition of matter.

   b. Students should be able to solve qualitative & quantitative problems.

   c. Students should be able to apply theoretical and mechanistic principles to the study of chemical systems using quantitative and qualitative approaches.

   d. Students should be able to explain the role of energy in determining the structure and reactivity of matter.

   e. Students should be able to apply theoretical knowledge and chemical information to industry and everyday experience.

5. **GOAL 5:** Demonstrate the knowledge and skills in advanced instrumentation, applications, interpretation, and experimental design to address scientific queries in chemistry, industry, the environment, health, and related fields with the following objectives:

a. Students should be able to use modern analytical instrumentations.

b. Students should be able to interpret data and relate these to chemical structure and properties.

c. Students should be able to relate the application of instrumentation to industries.

d. Students should be able to develop an appreciation of the wide range of instrumental methods, their applications, and limitations.

6. **GOAL 6:** Demonstrate a sense of exploration and research approach that enables students to pursue lifelong learning in chemistry with the following objectives:

   a. Students will use chemical literature and computer resources to gather research information.

   b. Students should be able to critically evaluate scientific information.

   c. Students should be able to develop research project & design experimental approach.

7. **GOAL 7:** Demonstrate interaction skills and teamwork with the following objectives:

   a. Students should be able to work cooperatively in problem solving exercise.

   b. Students should be able to exercise leadership skills in teamwork.

   c. Students should demonstrate adequate interpersonal communication skills.

UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH102L General Chemistry Lab I
(3) Class Meeting:_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

CH 102L is the laboratory portion of CH 102 and MUST be taken concurrently with CH 102. The course consists of one three-hour laboratory period per week. Corequisite: CH 102

3. COURSE CONTENT:

This course provides the students "hands-on" experience with basic techniques of laboratory work and the practical experience necessary to better understand the content presented in CH 102. Topics include measurements, stoichiometry, solution reactions, thermochemistry, gases, chemical bonding.

4. RATIONALE FOR OFFERING COURSE:

This is a foundational laboratory course leading to further exposure to "hands-on" learning experiences. It introduces the student to the fundamentals of observation and to the scientific method. Students will also develop writing skills.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

Students should know basic algebra and preferably should have taken preparatory chemistry at the high school level. MA 161a is a prerequisite and CH 102 is a co-requisite for this course.

6. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):

Course SLOs:

1. Use safety knowledge and skills to conduct experiments.
2. Conduct experiment from a given procedure, collect, analyze, and interpret data.
3. Apply precision and accuracy in measurements and calculations.
4. Relate the experimental observations to chemical concepts.
5. Solve quantitative and qualitative problems in chemistry.
6. Write clear laboratory reports using standard scientific reporting method.
7. Use standard computer technology to present and analyze data.
8. Collaborate with peers in learning chemistry.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

Program SLOs[2]: See below.

7. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

9. TEXTBOOK AND READINGS:

(See Instructor)

10. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

11. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

12. EVALUATION AND GRADES (SEE INSTRUCTOR):

13. COURSE POLICIES (SEE INSTRUCTOR):

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15. CALENDAR OR SCHEDULE (SEE INSTRUCTOR):

16. DROP DATES:

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18. SUPPLEMENTARY MATERIALS/ADDITIONAL RESOURCES (SEE INSTRUCTOR):

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[2]Program SLOs:

BA Chemistry goals/objectives include the following:

1. **GOAL 1:** Demonstrate the knowledge of fundamental concepts of chemistry and its relevance to the scientific method and other fields in science with the following objectives:

    a. Students should be able to explain the scientific method and relate its application to chemical discoveries.

    b. Students will able to define the states and structure of matter and relate these to physical and chemical properties.

    c. Students should be able to define chemistry and state its relevance to other sciences and everyday experience.

    d. Students should be able to apply the fundamental concepts of elements and compounds and their reactivity to solve chemically based problems.

2. **GOAL 2:** Demonstrate the skills to make observations, experimentation, collect and collate data, analyze and interpret data in a safe chemical environment with the following objectives:

    a. Students will be able to independently perform accurate quantitative measurements, interpret experimental results, perform calculations on these results and draw a reasonable, accurate conclusion.

    b. Students will synthesize, isolate, purify and characterize a series of compounds using modern methods.

    c. Students will demonstrate knowledge of proper use of modern instrumental techniques.

    d. Students will be able to design an experimental procedure.

    e. Students will observe safe practices in the laboratory and will know how to respond in an emergency. Students will learn to gather hazardous materials information and will recognize and respond properly to potential hazards of handling chemicals and chemical waste.

3. **GOAL 3:** Demonstrate the ability to clearly articulate, formulate, and communicate scientific information using computer, written and oral communication skills with the following objectives:

    a. Students will communicate critical analysis of scientific information through written reports and laboratory notebooks.

    b. Students will effectively communicate scientific information through oral presentations.

c. Students will use computer technology to gather, process, analyze, and present chemical data.

d. Students will use chemical literature and computer resources to gather research information

4. **GOAL 4:** Demonstrate critical thinking, problem solving skills and the ability to use chemical knowledge and mathematical skills to identify, evaluate, analyze, synthesize, and integrate data and abstract ideas in solving problems with the following objectives:

   a. Students should be able to describe the structure & composition of matter.

   b. Students should be able to solve qualitative & quantitative problems.

   c. Students should be able to apply theoretical and mechanistic principles to the study of chemical systems using quantitative and qualitative approaches.

   d. Students should be able to explain the role of energy in determining the structure and reactivity of matter.

   e. Students should be able to apply theoretical knowledge and chemical information to industry and everyday experience.

5. **GOAL 5:** Demonstrate the knowledge and skills in advanced instrumentation, applications, interpretation, and experimental design to address scientific queries in chemistry, industry, the environment, health, and related fields with the following objectives:

   a. Students should be able to use modern analytical instrumentations.

   b. Students should be able to interpret data and relate these to chemical structure and properties.

   c. Students should be able to relate the application of instrumentation to industries.

   d. Students should be able to develop an appreciation of the wide range of instrumental methods, their applications, and limitations.

6. **GOAL 6:** Demonstrate a sense of exploration and research approach that enables students to pursue lifelong learning in chemistry with the following objectives:

   a. Students will use chemical literature and computer resources to gather research information.

b. Students should be able to critically evaluate scientific information.

c. Students should be able to develop research project & design experimental approach.

7. **GOAL 7:** Demonstrate interaction skills and teamwork with the following objectives:

   a. Students should be able to work cooperatively in problem solving exercise.

   b. Students should be able to exercise leadership skills in teamwork.

   c. Students should demonstrate adequate interpersonal communication skills.

UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH103 General Chemistry II
(3) Class Meeting:_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

This course is a continuation of CH 102-102L with further study of reactions and stoichiometric problems. The periodic table is studied with emphasis on physical and chemical properties. Thermochemistry, Kinetics, Chemical Equilibrium, electrochemistry, are introduced with respect to data gathering and simple deduction. It includes three hours of lecture weekly. The lab, CH 103L, MUST be taken concurrently. Prerequisites: CH 102-102L, and MA 161a or MA 161b or MA 165 or higher level or placement at this level. (CH 100-100L may be substituted for CH 102-102L by program consent). Corequisite: CH 103L

3. COURSE CONTENT:

The following topics will be covered in CH 103; compositions and physical properties of solutions, chemical kinetics, principles of chemical equilibrium, solution equilibria (acids and bases/solubility and precipitation/complex ion formation), thermodynamics, spontaneous change and equilibrium, and electrochemistry, periodicity.

4. RATIONALE FOR OFFERING COURSE:

CH 103 is a continuation of core General Chemistry, a foundational course for the natural science majors and minors.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

CH 102 skills and MA 161a skills.

6. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):

Course SLOs:

1. Describe the chemical concepts in solution processes, equilibrium, reaction rates, acidity and basicity, entropy, electrochemistry.
2. Use the chemical concepts to solve quantitative and qualitative problems in chemistry.
3. Explain the general properties of elements in periodic table; identify periodic trends in periodic table and use this as predictive tool for chemical and physical properties for both elements and compounds.
4. Process and communicate the chemical concepts clearly.
5. Relate the chemical principles to industrial and environmental applications.
6. Communicate chemical concepts clearly both in written and oral presentations.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

Program SLOs[2]: See below.

7. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

9. TEXTBOOK AND READINGS:

(See Instructor)

10. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

11. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

12. EVALUATION AND GRADES (SEE INSTRUCTOR):

13. COURSE POLICIES (SEE INSTRUCTOR):

14. SPECIAL NEEDS:

"If you are a student with a disability who will require a accommodation(s) to participate in this course, please contact me or the Institutional Compliance Officer privately to discuss your specific needs. You will need to provide me with documentation concerning your need for accommodation(s) from the EEO/ADA and TITLE IX Office. If you have not registered with the EEO/ADA and Title IX Office, you should do so immediately at 735-2244, (TTY) 735-2243 to coordinate your accommodation request."

15. CALENDAR OR SCHEDULE (SEE INSTRUCTOR):

16. DROP DATES:

University policy sets the drop dates. See the semester schedule of courses.

17. STUDENT WORK LOAD (SEE INSTRUCTOR):

18. SUPPLEMENTARY MATERIALS/ADDITIONAL RESOURCES (SEE INSTRUCTOR):

19. CONTACT INFORMATION FOR CLASSMATES:

Exchange contact info with at least one classmate. Contact your classmate(s) if you miss class or if you want to form a study group.

[1]**BASED ON DR. BARBARA GROSS DAVIS, UC BERKELEY MODEL "CREATING A SYLLABUS".** From the hard copy book *Tools for Teaching* by Barbara Gross Davis; Jossey-Bass Publishers: San Francisco, 1993. Linking to this book chapter from other websites is permissible. However, the contents of this chapter may not be copied, printed, or distributed in hard copy form without permission. For a more detailed explanation on each numbered section of the syllabus, please visit: http://teaching.berkeley.edu/bgd/syllabus.html.

[2]Program SLOs:

BA Chemistry goals/objectives include the following:

1. **GOAL 1:** Demonstrate the knowledge of fundamental concepts of chemistry and its relevance to the scientific method and other fields in science with the following objectives:

    a. Students should be able to explain the scientific method and relate its application to chemical discoveries.

    b. Students will able to define the states and structure of matter and relate these to physical and chemical properties.

    c. Students should be able to define chemistry and state its relevance to other sciences and everyday experience.

    d. Students should be able to apply the fundamental concepts of elements and compounds and their reactivity to solve chemically based problems.

2. **GOAL 2:** Demonstrate the skills to make observations, experimentation, collect and collate data, analyze and interpret data in a safe chemical environment with the following objectives:

    a. Students will be able to independently perform accurate quantitative measurements, interpret experimental results, perform calculations on these results and draw a reasonable, accurate conclusion.

    b. Students will synthesize, isolate, purify and characterize a series of compounds using modern methods.

    c. Students will demonstrate knowledge of proper use of modern instrumental techniques.

    d. Students will be able to design an experimental procedure.

    e. Students will observe safe practices in the laboratory and will know how to respond in an emergency. Students will learn to gather hazardous materials information and will recognize and respond properly to potential hazards of handling chemicals and chemical waste.

3. **GOAL 3:** Demonstrate the ability to clearly articulate, formulate, and communicate scientific information using computer, written and oral communication skills with the following objectives:

    a. Students will communicate critical analysis of scientific information through written reports and laboratory notebooks.

    b. Students will effectively communicate scientific information through oral presentations.

c. Students will use computer technology to gather, process, analyze, and present chemical data.

d. Students will use chemical literature and computer resources to gather research information

4. **GOAL 4:** Demonstrate critical thinking, problem solving skills and the ability to use chemical knowledge and mathematical skills to identify, evaluate, analyze, synthesize, and integrate data and abstract ideas in solving problems with the following objectives:

   a. Students should be able to describe the structure & composition of matter.

   b. Students should be able to solve qualitative & quantitative problems.

   c. Students should be able to apply theoretical and mechanistic principles to the study of chemical systems using quantitative and qualitative approaches.

   d. Students should be able to explain the role of energy in determining the structure and reactivity of matter.

   e. Students should be able to apply theoretical knowledge and chemical information to industry and everyday experience.

5. **GOAL 5:** Demonstrate the knowledge and skills in advanced instrumentation, applications, interpretation, and experimental design to address scientific queries in chemistry, industry, the environment, health, and related fields with the following objectives:

   a. Students should be able to use modern analytical instrumentations.

   b. Students should be able to interpret data and relate these to chemical structure and properties.

   c. Students should be able to relate the application of instrumentation to industries.

   d. Students should be able to develop an appreciation of the wide range of instrumental methods, their applications, and limitations.

6. **GOAL 6:** Demonstrate a sense of exploration and research approach that enables students to pursue lifelong learning in chemistry with the following objectives:

   a. Students will use chemical literature and computer resources to gather research information.

b. Students should be able to critically evaluate scientific information.

c. Students should be able to develop research project & design experimental approach.

7. **GOAL 7:** Demonstrate interaction skills and teamwork with the following objectives:

   a. Students should be able to work cooperatively in problem solving exercise.

   b. Students should be able to exercise leadership skills in teamwork.

   c. Students should demonstrate adequate interpersonal communication skills.

UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH103L General Chemistry II Lab
(3) Class Meeting:_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

This is a laboratory course that complements CH 103. It covers experimental techniques in the following topics: Kinetics, chemical equilibrium, Thermochemistry, electrochemistry, and analytical chemistry. It has a three-hour of laboratory weekly. The lab, CH 103L, MUST be taken concurrently with CH 103 Lecture.

3. COURSE CONTENT:

The following topics will be covered in CH 103; compositions and physical properties of solutions, chemical kinetics, principles of chemical equilibrium, solution equilibria (acids and bases/solubility and precipitation/complex ion formation), thermodynamics, spontaneous change and equilibrium, and electrochemistry, periodicity.

4. RATIONALE FOR OFFERING COURSE:

CH 103 is a continuation of core General Chemistry, a foundational course for the natural science majors and minors.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

CH 102 skills and MA 161a skills.

6. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):

Course SLOs:

1. Use safety knowledge and skills to conduct experiments.
2. Conduct experiment from a given procedure, collect, analyze and interpret data.

3. Apply precision and accuracy in measurements and calculations.
4. Relate the experimental observations to chemical concepts.
5. Solve quantitative and qualitative problems in chemistry.
6. Write clear laboratory reports using standard scientific reporting method.
7. Use standard computer technology to present and analyze data.
8. Collaborate with peers in learning chemistry.
9. Present seminar using computer technology

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

Program SLOs[2]: See below.

7. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

9. TEXTBOOK AND READINGS:

(See Instructor)

10. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

11. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

12. EVALUATION AND GRADES (SEE INSTRUCTOR):

13. COURSE POLICIES (SEE INSTRUCTOR):

14. SPECIAL NEEDS:

"If you are a student with a disability who will require a accommodation(s) to participate in this course, please contact me or the Institutional Compliance Officer privately to discuss your specific needs. You will need to provide me with documentation concerning

your need for accommodation(s) from the EEO/ADA and TITLE IX Office. If you have not registered with the EEO/ADA and Title IX Office, you should do so immediately at 735-2244, (TTY) 735-2243 to coordinate your accommodation request."

15. CALENDAR OR SCHEDULE (SEE INSTRUCTOR):

16. DROP DATES:

University policy sets the drop dates. See the semester schedule of courses.

17. STUDENT WORK LOAD (SEE INSTRUCTOR):

18. SUPPLEMENTARY MATERIALS/ADDITIONAL RESOURCES (SEE INSTRUCTOR):

19. CONTACT INFORMATION FOR CLASSMATES:

Exchange contact info with at least one classmate. Contact your classmate(s) if you miss class or if you want to form a study group.

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[2]Program SLOs:

BA Chemistry goals/objectives include the following:

1. **GOAL 1:** Demonstrate the knowledge of fundamental concepts of chemistry and its relevance to the scientific method and other fields in science with the following objectives:

    a. Students should be able to explain the scientific method and relate its application to chemical discoveries.

b. Students will able to define the states and structure of matter and relate these to physical and chemical properties.

c. Students should be able to define chemistry and state its relevance to other sciences and everyday experience.

d. Students should be able to apply the fundamental concepts of elements and compounds and their reactivity to solve chemically based problems.

2. **GOAL 2:** Demonstrate the skills to make observations, experimentation, collect and collate data, analyze and interpret data in a safe chemical environment with the following objectives:

   a. Students will be able to independently perform accurate quantitative measurements, interpret experimental results, perform calculations on these results and draw a reasonable, accurate conclusion.

   b. Students will synthesize, isolate, purify and characterize a series of compounds using modern methods.

   c. Students will demonstrate knowledge of proper use of modern instrumental techniques.

   d. Students will be able to design an experimental procedure.

   e. Students will observe safe practices in the laboratory and will know how to respond in an emergency. Students will learn to gather hazardous materials information and will recognize and respond properly to potential hazards of handling chemicals and chemical waste.

3. **GOAL 3:** Demonstrate the ability to clearly articulate, formulate, and communicate scientific information using computer, written and oral communication skills with the following objectives:

   a. Students will communicate critical analysis of scientific information through written reports and laboratory notebooks.

   b. Students will effectively communicate scientific information through oral presentations.

   c. Students will use computer technology to gather, process, analyze, and present chemical data.

   d. Students will use chemical literature and computer resources to gather research information

4. **GOAL 4:** Demonstrate critical thinking, problem solving skills and the ability to use chemical knowledge and mathematical skills to identify, evaluate, analyze, synthesize, and integrate data and abstract ideas in solving problems with the following objectives:

    a. Students should be able to describe the structure & composition of matter.

    b. Students should be able to solve qualitative & quantitative problems.

    c. Students should be able to apply theoretical and mechanistic principles to the study of chemical systems using quantitative and qualitative approaches.

    d. Students should be able to explain the role of energy in determining the structure and reactivity of matter.

    e. Students should be able to apply theoretical knowledge and chemical information to industry and everyday experience.

5. **GOAL 5:** Demonstrate the knowledge and skills in advanced instrumentation, applications, interpretation, and experimental design to address scientific queries in chemistry, industry, the environment, health, and related fields with the following objectives:

    a. Students should be able to use modern analytical instrumentations.

    b. Students should be able to interpret data and relate these to chemical structure and properties.

    c. Students should be able to relate the application of instrumentation to industries.

    d. Students should be able to develop an appreciation of the wide range of instrumental methods, their applications, and limitations.

6. **GOAL 6:** Demonstrate a sense of exploration and research approach that enables students to pursue lifelong learning in chemistry with the following objectives:

    a. Students will use chemical literature and computer resources to gather research information.

    b. Students should be able to critically evaluate scientific information.

    c. Students should be able to develop research project & design experimental approach.

7. **GOAL 7:** Demonstrate interaction skills and teamwork with the following objectives:

    a. Students should be able to work cooperatively in problem solving exercise.

    b. Students should be able to exercise leadership skills in teamwork.

    c. Students should demonstrate adequate interpersonal communication skills.

UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH 310a-b Organic Chemistry
(3) Class Meeting:_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

This is a full-year lecture sequence covering the general principles of organic chemistry with emphasis on structure, stereochemistry, nomenclature, basic reactions and mechanisms and the occurrence and uses of main classes of compounds. This course is designed for chemistry and biology majors. Prerequisite: CH 103-103L.

3. COURSE CONTENT:

a - Fall Semester:

1. An Introduction to Structure and Bonding in Organic Compounds.
2. Covalent Bonding and Chemical Reactivity.
3. Reactions of Organic Compounds as Acids and Bases.
4. Reaction Pathways; Alkanes and Cycloalkanes.
5. Stereochemistry.
6. Nucleophilic Substitution and Elimination Reactions.
7. Alkenes.
8. Alkynes.
9. Infrared.
10. Nuclear Magnetic Resonance Spectroscopy.
11. Alcohols, Diols and Ethers

b - Spring Semester:

1. Aldehyde and Ketones. Reactions at Electrophilic Carbon Atoms.
2. Carboxylic Acids and Their Derivatives I. Nucleophilic Substitution Reactions at the Carbonyl Group.
3. Carborylic Acids and Their Derivatives II. Synthetic Transformations and Compounds of Biological Interest.
4. Enols and Enolate Anions and Nucleophiles I. Halogenation, Alkylation and Condensation Reactions.

5. Enols and Enolate Anions as Nucleophiles II. Conjugate Addition Reactions; Ylids.
6. The Chemistry of Aromatic Compounds I. Electrophilic Aromatic Substitution.
7. Free Radicals.
8. Mass Spectroscopy.
9. The Chemistry of Amines.
10. The Chemistry of Aromatic Components I. Synthetics Transformation.
11. Carbohydrates (Selected Sections).
12. Amino Acids, Peptides and Proteins (Selected Sections).
13. Research methods

4. RATIONALE FOR OFFERING COURSE:

Organic Chemistry is a required course for chemistry and biology majors. It is intended to provide basic knowledge of and proficiency in the use of nomenclature, bonding, structural theory, synthesis, reaction mechanism and identification of organic compounds. It provides basic knowledge for students to continue education for advanced degrees in chemistry, biology and in the health related science.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

This course assumes some background in general chemistry. Completion of CH103/CH103L is required.

6. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):

Course SLOs:

1. Write the correct I.U.P.A.C. or common names for alkanes, polyenes, alcohols, ethers, aldehydes and ketones, carboxylic acids and their derivatives, amines and their derivatives, carbohydrates and amino acids.
2. Based on chemical principles predict trends in physical and chemical properties including boiling point, reaction rate, optical activity, acidity, & basicity for the following compounds: polyenes, alcohols, ethers, aldehydes and ketones, carboxylic acids and their derivatives, amines and their derivatives, carbohydrates, amino acids and polymers.
3. Analyze chemical reactions related to the synthesis of polyenes, alcohols, ethers, aldehydes and ketones, carboxylic acids and their derivatives, amines and their derivatives, carbohydrates and amino acids.
4. Analyze the mechanistic pathways of the common chemical reactions of polyenes, alcohols, ethers, phenols, aldehydes and ketones, carboxylic acids and their derivatives, amines and their derivatives, carbohydrates, amino acids and polymers.
5. Combine the knowledge of reactions from all the chapters studied to synthesize compounds whose preparation requires more than one step.

6. Deduce the structure of a compound from qualitative tests and spectral data.
7. Communicate chemical concepts through written and oral presentation.
8. Interact with peers and contribute effectively to team work and learning
9. Conduct literature research and critically read summarize scientific papers.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

Program SLOs[2]: See below.

7. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

9. TEXTBOOK AND READINGS:

(See Instructor)

10. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

11. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

12. EVALUATION AND GRADES (SEE INSTRUCTOR):

13. COURSE POLICIES (SEE INSTRUCTOR):

14. SPECIAL NEEDS:

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15. CALENDAR OR SCHEDULE (SEE INSTRUCTOR):

16. DROP DATES:

University policy sets the drop dates. See the semester schedule of courses.

17. STUDENT WORK LOAD (SEE INSTRUCTOR):

18. SUPPLEMENTARY MATERIALS/ADDITIONAL RESOURCES (SEE INSTRUCTOR):

19. CONTACT INFORMATION FOR CLASSMATES:

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[2]Program SLOs:

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1. **GOAL 1:** Demonstrate the knowledge of fundamental concepts of chemistry and its relevance to the scientific method and other fields in science with the following objectives:

    a. Students should be able to explain the scientific method and relate its application to chemical discoveries.

    b. Students will able to define the states and structure of matter and relate these to physical and chemical properties.

c. Students should be able to define chemistry and state its relevance to other sciences and everyday experience.

d. Students should be able to apply the fundamental concepts of elements and compounds and their reactivity to solve chemically based problems.

2. **GOAL 2:** Demonstrate the skills to make observations, experimentation, collect and collate data, analyze and interpret data in a safe chemical environment with the following objectives:

   a. Students will be able to independently perform accurate quantitative measurements, interpret experimental results, perform calculations on these results and draw a reasonable, accurate conclusion.

   b. Students will synthesize, isolate, purify and characterize a series of compounds using modern methods.

   c. Students will demonstrate knowledge of proper use of modern instrumental techniques.

   d. Students will be able to design an experimental procedure.

   e. Students will observe safe practices in the laboratory and will know how to respond in an emergency. Students will learn to gather hazardous materials information and will recognize and respond properly to potential hazards of handling chemicals and chemical waste.

3. **GOAL 3:** Demonstrate the ability to clearly articulate, formulate, and communicate scientific information using computer, written and oral communication skills with the following objectives:

   a. Students will communicate critical analysis of scientific information through written reports and laboratory notebooks.

   b. Students will effectively communicate scientific information through oral presentations.

   c. Students will use computer technology to gather, process, analyze, and present chemical data.

   d. Students will use chemical literature and computer resources to gather research information

4. **GOAL 4:** Demonstrate critical thinking, problem solving skills and the ability to use chemical knowledge and mathematical skills to identify, evaluate, analyze,

synthesize, and integrate data and abstract ideas in solving problems with the following objectives:

a. Students should be able to describe the structure & composition of matter.

b. Students should be able to solve qualitative & quantitative problems.

c. Students should be able to apply theoretical and mechanistic principles to the study of chemical systems using quantitative and qualitative approaches.

d. Students should be able to explain the role of energy in determining the structure and reactivity of matter.

e. Students should be able to apply theoretical knowledge and chemical information to industry and everyday experience.

5. **GOAL 5:** Demonstrate the knowledge and skills in advanced instrumentation, applications, interpretation, and experimental design to address scientific queries in chemistry, industry, the environment, health, and related fields with the following objectives:

   a. Students should be able to use modern analytical instrumentations.

   b. Students should be able to interpret data and relate these to chemical structure and properties.

   c. Students should be able to relate the application of instrumentation to industries.

   d. Students should be able to develop an appreciation of the wide range of instrumental methods, their applications, and limitations.

6. **GOAL 6:** Demonstrate a sense of exploration and research approach that enables students to pursue lifelong learning in chemistry with the following objectives:

   a. Students will use chemical literature and computer resources to gather research information.

   b. Students should be able to critically evaluate scientific information.

   c. Students should be able to develop research project & design experimental approach.

7. **GOAL 7:** Demonstrate interaction skills and teamwork with the following objectives:

a. Students should be able to work cooperatively in problem solving exercise.

b. Students should be able to exercise leadership skills in teamwork.

c. Students should demonstrate adequate interpersonal communication skills.

UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH 311 Basic Laboratory Technique in Organic Chemistry
(3) Class Meeting:_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

Laboratory work in organic chemistry with emphasis on the development of manipulative skills in such techniques as distillations, reduced pressure fractionations, chromatography, and crystallizations, and constructions of apparatus utilized in the preparations, purification, identification and study of simple organic compounds. The course consists of a six hours laboratory. Co-requisite: CH 310a.

3. COURSE CONTENT:

1. Introduction
2. Laboratory Safety and Waste Disposal.
3. Crystallization. Macroscale and Microscale Crystallization and Impure Acetanilide (containing sand, charcoal, and a few traces of aniline - brief handout).
4. Melting Points and Boiling Points. Melting points of Pure Acetanilide, and Phthalic Acid.
5. Determination of Unknown with Mixed Melting Point.
6. Distillation. Macroscale and Microscale Simple Distillation. Microscale Fractional Distillation.
7. Instant Microscale Distillation.
8. Steam Distillation. Macroscale - Steam Distillation of 0-nitrophenol from p-n itrophenol.
9. Extraction. Extraction of Caffeine from Tea. Distribution Coefficient of Benzoic Acid (Microscale).
10. Sublimation of Caffeine.
11. Thin-Layer Chromatography. Separation of Food Color (green, yellow, red, blue) using paper chromatography. (Handout)
12. Column Chromatography. Microscale. Separation of two dyes: methyl orange and methyl blue. (Handout)

13. The S_N2 Reaction. Macroscale - Synthesis of 1-Bromobutane.

4. RATIONALE FOR OFFERING COURSE:

The basic laboratory technique course is a required course for chemistry and biology majors. It covers basic experimental techniques for studying organic reactions. Laboratory safety and basic chemical reactions will be covered. Students should gain deeper appreciation of concepts that are discussed in the lecture. The skills acquired will prepare students for advanced courses in chemistry and biology.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

This course requires a background in general chemistry and a concurrent enrollment in CH 310a Organic Chemistry.

5. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):

Course SLOs:

1. Apply principles of chemical safety in storage and chemical preparation or testing.
2. Identify and assemble apparatus for chemical experiment.
3. Use the laboratory procedure and conduct experiment to obtain the desired product.
4. Write clear and systematic laboratory report.
5. Participate effectively with peers in solving laboratory based problems.
6. Relate the chemical concept to experimental data.
7. Interpret spectral data.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

Program SLOs[2]: See below.

6. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

7. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

8. TEXTBOOK AND READINGS:

(See Instructor)

9. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

10. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

11. EVALUATION AND GRADES (SEE INSTRUCTOR):

12. COURSE POLICIES (SEE INSTRUCTOR):

13. SPECIAL NEEDS:

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14. CALENDAR OR SCHEDULE (SEE INSTRUCTOR):

15. DROP DATES:

University policy sets the drop dates. See the semester schedule of courses.

16. STUDENT WORK LOAD (SEE INSTRUCTOR):

17. SUPPLEMENTARY MATERIALS/ADDITIONAL RESOURCES (SEE INSTRUCTOR):

18. CONTACT INFORMATION FOR CLASSMATES:

Exchange contact info with at least one classmate. Contact your classmate(s) if you miss class or if you want to form a study group.

[1]**BASED ON DR. BARBARA GROSS DAVIS, UC BERKELEY MODEL "CREATING A SYLLABUS".** From the hard copy book *Tools for Teaching* by Barbara Gross Davis; Jossey-Bass Publishers: San Francisco, 1993. Linking to this book chapter from other websites is permissible. However, the contents of this chapter may not be copied, printed, or distributed in hard copy form without permission. For a more detailed explanation on each numbered section of the syllabus, please visit: http://teaching.berkeley.edu/bgd/syllabus.html.

[2]Program SLOs:

BA Chemistry goals/objectives include the following:

1. **GOAL 1:** Demonstrate the knowledge of fundamental concepts of chemistry and its relevance to the scientific method and other fields in science with the following objectives:

    a. Students should be able to explain the scientific method and relate its application to chemical discoveries.

    b. Students will able to define the states and structure of matter and relate these to physical and chemical properties.

    c. Students should be able to define chemistry and state its relevance to other sciences and everyday experience.

    d. Students should be able to apply the fundamental concepts of elements and compounds and their reactivity to solve chemically based problems.

2. **GOAL 2:** Demonstrate the skills to make observations, experimentation, collect and collate data, analyze and interpret data in a safe chemical environment with the following objectives:

    a. Students will be able to independently perform accurate quantitative measurements, interpret experimental results, perform calculations on these results and draw a reasonable, accurate conclusion.

    b. Students will synthesize, isolate, purify and characterize a series of compounds using modern methods.

    c. Students will demonstrate knowledge of proper use of modern instrumental techniques.

    d. Students will be able to design an experimental procedure.

    e. Students will observe safe practices in the laboratory and will know how to respond in an emergency. Students will learn to gather hazardous materials

information and will recognize and respond properly to potential hazards of handling chemicals and chemical waste.

3. **GOAL 3:** Demonstrate the ability to clearly articulate, formulate, and communicate scientific information using computer, written and oral communication skills with the following objectives:

    a. Students will communicate critical analysis of scientific information through written reports and laboratory notebooks.

    b. Students will effectively communicate scientific information through oral presentations.

    c. Students will use computer technology to gather, process, analyze, and present chemical data.

    d. Students will use chemical literature and computer resources to gather research information

4. **GOAL 4:** Demonstrate critical thinking, problem solving skills and the ability to use chemical knowledge and mathematical skills to identify, evaluate, analyze, synthesize, and integrate data and abstract ideas in solving problems with the following objectives:

    a. Students should be able to describe the structure & composition of matter.

    b. Students should be able to solve qualitative & quantitative problems.

    c. Students should be able to apply theoretical and mechanistic principles to the study of chemical systems using quantitative and qualitative approaches.

    d. Students should be able to explain the role of energy in determining the structure and reactivity of matter.

    e. Students should be able to apply theoretical knowledge and chemical information to industry and everyday experience.

5. **GOAL 5:** Demonstrate the knowledge and skills in advanced instrumentation, applications, interpretation, and experimental design to address scientific queries in chemistry, industry, the environment, health, and related fields with the following objectives:

    a. Students should be able to use modern analytical instrumentations.

    b. Students should be able to interpret data and relate these to chemical structure and properties.

c. Students should be able to relate the application of instrumentation to industries.

d. Students should be able to develop an appreciation of the wide range of instrumental methods, their applications, and limitations.

6. **GOAL 6:** Demonstrate a sense of exploration and research approach that enables students to pursue lifelong learning in chemistry with the following objectives:

   a. Students will use chemical literature and computer resources to gather research information.

   b. Students should be able to critically evaluate scientific information.

   c. Students should be able to develop research project & design experimental approach.

7. **GOAL 7:** Demonstrate interaction skills and teamwork with the following objectives:

   a. Students should be able to work cooperatively in problem solving exercise.

   b. Students should be able to exercise leadership skills in teamwork.

   c. Students should demonstrate adequate interpersonal communication skills.

UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH 312 Basic Laboratory Technique in Organic Chemistry
(3) Class Meeting:_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

This course is a continuation of CH 311 with emphasis on continued development of manipulative skills as required by preparation, purification, identification and study of more complex organic compounds. It consists of six hours of laboratory work per week. Prerequisite: CH 311and concurrent with CH 310b

3. COURSE CONTENT:

1. Oxidation; Cyclohexanone from Cyclohexanol (Macroscale); Adipic Acid from Cyclohexanone.
2. Esterification; Methyl Benzoate by Fischer Esterification (Macroscale).
3. Aldehydes and Ketones; Semicarbazones (Microscale).
4. Grignard Synthesis of Triphenylmethanol and Benzoic Acid
5. Nitration of Methyl Benzoate (Microscale, double quantities).
6. Sulfanilamide from Nitrobenzene; Sulfanilamide (Macroscale).
7. Photochemistry. The Synthesis of Benzopinacol.
8. Infrared (Discussion and demonstration).
9. Nuclear Magnetic Resonance Spectroscopy
10. Ultraviolet Spectroscopy
11. Handout: Identification of an unknown organic compound by the use of IR and NMR spectra.
12. IDGAME: An Organic Compound Identification Game. Two unknown organic compounds.
13. SQUALOR: Simulated Qualitative Organic Analysis. Two unknown organic compounds.
14. Qualitative Organic Analysis (One unknown organic compound).
15. Searching the Chemical Literature (Handout assignments).
16. Seminar

4. RATIONALE FOR OFFERING COURSE:

This course is a continuation of CH 311 and required course for chemistry and biology majors. It deals with chemical synthesis and reactions of major organic compounds. Students will apply skills gained from CH311 and develop further quantitative and qualitative skills in interpretation of multiple spectral data.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

This course requires a background of CH 311, or equivalent and concurrently taking CH 310b.

i. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):

Course SLOs:

1. Apply principles of chemical safety in the storage and laboratory manipulation of organic reagents.
2. Isolate and purify organic compounds using recrystallization, distillation, extraction and chromatography.
3. Carry out synthetic reactions using ground-glassware kits.
4. Conduct synthetic reactions in which some of the reactants are sensitive to moisture or oxygen using specialized techniques and glassware.
5. Characterize and identify compounds by measuring physical properties such as melting point, boiling point, Rf values, and functional group-specific chemical tests.
6. Identify and delineate the exact constitutional and stereochemical makeup of molecules by detailed analysis of Infrared, Ultraviolet, ^{1}H & ^{13}C Nuclear Magnetic Resonance and Mass Spectra.
7. Design the experimental set-up as well as work-up and purification procedure for a given reaction.
8. Relate the results of laboratory work to concepts of organic chemistry and report the findings and conclusions in accordance with a specified format.
9. Interact with peers to solve problems.
10. Communicate experimental data clearly through written and oral format.
11. Conduct literature research and critically evaluate scientific data.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

Program SLOs[2]: See below.

ii. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

9. TEXTBOOK AND READINGS:

(See Instructor)

10. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

11. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

12. EVALUATION AND GRADES (SEE INSTRUCTOR):

13. COURSE POLICIES (SEE INSTRUCTOR):

14. SPECIAL NEEDS:

"If you are a student with a disability who will require a accommodation(s) to participate in this course, please contact me or the Institutional Compliance Officer privately to discuss your specific needs. You will need to provide me with documentation concerning your need for accommodation(s) from the EEO/ADA and TITLE IX Office. If you have not registered with the EEO/ADA and Title IX Office, you should do so immediately at 735-2244, (TTY) 735-2243 to coordinate your accommodation request."

15. CALENDAR OR SCHEDULE (SEE INSTRUCTOR):

16. DROP DATES:

University policy sets the drop dates. See the semester schedule of courses.

17. STUDENT WORK LOAD (SEE INSTRUCTOR):

18. SUPPLEMENTARY MATERIALS/ADDITIONAL RESOURCES (SEE INSTRUCTOR):

19. CONTACT INFORMATION FOR CLASSMATES:

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[2]Program SLOs:

BA Chemistry goals/objectives include the following:

1. **GOAL 1:** Demonstrate the knowledge of fundamental concepts of chemistry and its relevance to the scientific method and other fields in science with the following objectives:

    a. Students should be able to explain the scientific method and relate its application to chemical discoveries.

    b. Students will able to define the states and structure of matter and relate these to physical and chemical properties.

    c. Students should be able to define chemistry and state its relevance to other sciences and everyday experience.

    d. Students should be able to apply the fundamental concepts of elements and compounds and their reactivity to solve chemically based problems.

2. **GOAL 2:** Demonstrate the skills to make observations, experimentation, collect and collate data, analyze and interpret data in a safe chemical environment with the following objectives:

a. Students will be able to independently perform accurate quantitative measurements, interpret experimental results, perform calculations on these results and draw a reasonable, accurate conclusion.

b. Students will synthesize, isolate, purify and characterize a series of compounds using modern methods.

c. Students will demonstrate knowledge of proper use of modern instrumental techniques.

d. Students will be able to design an experimental procedure.

e. Students will observe safe practices in the laboratory and will know how to respond in an emergency. Students will learn to gather hazardous materials information and will recognize and respond properly to potential hazards of handling chemicals and chemical waste.

3. **GOAL 3:** Demonstrate the ability to clearly articulate, formulate, and communicate scientific information using computer, written and oral communication skills with the following objectives:

   a. Students will communicate critical analysis of scientific information through written reports and laboratory notebooks.

   b. Students will effectively communicate scientific information through oral presentations.

   c. Students will use computer technology to gather, process, analyze, and present chemical data.

   d. Students will use chemical literature and computer resources to gather research information

4. **GOAL 4:** Demonstrate critical thinking, problem solving skills and the ability to use chemical knowledge and mathematical skills to identify, evaluate, analyze, synthesize, and integrate data and abstract ideas in solving problems with the following objectives:

   a. Students should be able to describe the structure & composition of matter.

   b. Students should be able to solve qualitative & quantitative problems.

   c. Students should be able to apply theoretical and mechanistic principles to the study of chemical systems using quantitative and qualitative approaches.

d. Students should be able to explain the role of energy in determining the structure and reactivity of matter.

e. Students should be able to apply theoretical knowledge and chemical information to industry and everyday experience.

5. **GOAL 5:** Demonstrate the knowledge and skills in advanced instrumentation, applications, interpretation, and experimental design to address scientific queries in chemistry, industry, the environment, health, and related fields with the following objectives:

   a. Students should be able to use modern analytical instrumentations.

   b. Students should be able to interpret data and relate these to chemical structure and properties.

   c. Students should be able to relate the application of instrumentation to industries.

   d. Students should be able to develop an appreciation of the wide range of instrumental methods, their applications, and limitations.

6. **GOAL 6:** Demonstrate a sense of exploration and research approach that enables students to pursue lifelong learning in chemistry with the following objectives:

   a. Students will use chemical literature and computer resources to gather research information.

   b. Students should be able to critically evaluate scientific information.

   c. Students should be able to develop research project & design experimental approach.

7. **GOAL 7:** Demonstrate interaction skills and teamwork with the following objectives:

   a. Students should be able to work cooperatively in problem solving exercise.

   b. Students should be able to exercise leadership skills in teamwork.

   c. Students should demonstrate adequate interpersonal communication skills.

UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH 330 Quantitative Analysis
(3) Class Meeting:_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

This course is a study of select quantitative schemes as utilized in volumetric and gravimetric analyses with emphasis upon acquiring an understanding of the basic theoretical principles involved. Some modern methods of analysis must be discussed. Laboratory emphasis is on the use of modern techniques for chemical analysis. The statistical methods for analyzing data will also be covered. It includes three hours of lecture weekly. The lab, CH 330L, MUST be taken concurrently with CH330 lecture. Prerequisites: CH 103-103L. Co-requisite: CH 330L

3. COURSE CONTENT:

The evaluation of analytical data, the solubility of precipitates, Gravimetric analysis, Titrimetric methods, theory of neutralization titrations and titration curves, precipitation reactions, complex formation titrations, electrochemistry, theory and practice of redox titration and an introduction to spectroscopic methods of analysis.

4. RATIONALE FOR OFFERING COURSE:

Quantitative analytical data are crucial to research activity in chemistry, biochemistry, biology, geology and other sciences. Hence training in quantitative analysis is an integral component of a chemist's and biologist's education.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

CH 102 and CH 103; Elementary algebra and statistics skills will be essential. Desirable math skills: Differential Calculus.

iii. **LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):**

Course SLOs:

1. Define the chemical equilibrium and its application to quantitative analysis.
2. Use statistical concepts to solve for accuracy and precision in measurements and calculations.
3. Identify the instrumentation and methodology that is applied for chemical analysis.
4. Analyses and interpret data.
5. Solve multiple equilibrium equations.
6. Demonstrate both independent and collaborative learning skills.
7. Conduct basic research through literature search and experimentation.
8. Communicate chemical concepts clearly through written and oral presentations.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

Program SLOs[2]: See below.

iv. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

20. TEXTBOOK AND READINGS:

(See Instructor)

21. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

22. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

23. EVALUATION AND GRADES (SEE INSTRUCTOR):

24. COURSE POLICIES (SEE INSTRUCTOR):

25. SPECIAL NEEDS:

"If you are a student with a disability who will require a accommodation(s) to participate in this course, please contact me or the Institutional Compliance Officer privately to discuss your specific needs. You will need to provide me with documentation concerning your need for accommodation(s) from the EEO/ADA and TITLE IX Office. If you have not registered with the EEO/ADA and Title IX Office, you should do so immediately at 735-2244, (TTY) 735-2243 to coordinate your accommodation request."

26. CALENDAR OR SCHEDULE (SEE INSTRUCTOR):

27. DROP DATES:

University policy sets the drop dates. See the semester schedule of courses.

28. STUDENT WORK LOAD (SEE INSTRUCTOR):

29. SUPPLEMENTARY MATERIALS/ADDITIONAL RESOURCES (SEE INSTRUCTOR):

30. CONTACT INFORMATION FOR CLASSMATES:

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[2]Program SLOs:

BA Chemistry goals/objectives include the following:

1. **GOAL 1:** Demonstrate the knowledge of fundamental concepts of chemistry and its relevance to the scientific method and other fields in science with the following objectives:

    a. Students should be able to explain the scientific method and relate its application to chemical discoveries.

    b. Students will able to define the states and structure of matter and relate these to physical and chemical properties.

    c. Students should be able to define chemistry and state its relevance to other sciences and everyday experience.

    d. Students should be able to apply the fundamental concepts of elements and compounds and their reactivity to solve chemically based problems.

2. **GOAL 2:** Demonstrate the skills to make observations, experimentation, collect and collate data, analyze and interpret data in a safe chemical environment with the following objectives:

    a. Students will be able to independently perform accurate quantitative measurements, interpret experimental results, perform calculations on these results and draw a reasonable, accurate conclusion.

    b. Students will synthesize, isolate, purify and characterize a series of compounds using modern methods.

    c. Students will demonstrate knowledge of proper use of modern instrumental techniques.

    d. Students will be able to design an experimental procedure.

    e. Students will observe safe practices in the laboratory and will know how to respond in an emergency. Students will learn to gather hazardous materials information and will recognize and respond properly to potential hazards of handling chemicals and chemical waste.

3. **GOAL 3:** Demonstrate the ability to clearly articulate, formulate, and communicate scientific information using computer, written and oral communication skills with the following objectives:

    a. Students will communicate critical analysis of scientific information through written reports and laboratory notebooks.

b. Students will effectively communicate scientific information through oral presentations.

c. Students will use computer technology to gather, process, analyze, and present chemical data.

d. Students will use chemical literature and computer resources to gather research information

4. **GOAL 4:** Demonstrate critical thinking, problem solving skills and the ability to use chemical knowledge and mathematical skills to identify, evaluate, analyze, synthesize, and integrate data and abstract ideas in solving problems with the following objectives:

   a. Students should be able to describe the structure & composition of matter.

   b. Students should be able to solve qualitative & quantitative problems.

   c. Students should be able to apply theoretical and mechanistic principles to the study of chemical systems using quantitative and qualitative approaches.

   d. Students should be able to explain the role of energy in determining the structure and reactivity of matter.

   e. Students should be able to apply theoretical knowledge and chemical information to industry and everyday experience.

5. **GOAL 5:** Demonstrate the knowledge and skills in advanced instrumentation, applications, interpretation, and experimental design to address scientific queries in chemistry, industry, the environment, health, and related fields with the following objectives:

   a. Students should be able to use modern analytical instrumentations.

   b. Students should be able to interpret data and relate these to chemical structure and properties.

   c. Students should be able to relate the application of instrumentation to industries.

   d. Students should be able to develop an appreciation of the wide range of instrumental methods, their applications, and limitations.

6. **GOAL 6:** Demonstrate a sense of exploration and research approach that enables students to pursue lifelong learning in chemistry with the following objectives:

a. Students will use chemical literature and computer resources to gather research information.

b. Students should be able to critically evaluate scientific information.

c. Students should be able to develop research project & design experimental approach.

7. **GOAL 7:** Demonstrate interaction skills and teamwork with the following objectives:

    a. Students should be able to work cooperatively in problem solving exercise.

    b. Students should be able to exercise leadership skills in teamwork.

    c. Students should demonstrate adequate interpersonal communication skills.

UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH 330L Quantitative Analysis Laboratory
(3) Class Meeting:_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

This course is a study of select quantitative schemes as utilized in volumetric and gravimetric analyses with emphasis upon acquiring an understanding of the basic theoretical principles involved. Laboratory emphasis is on the use of modern techniques will be utilized. The laboratory consists of a 6 hour laboratory per week. The lab, CH 330L, MUST be taken concurrently with the CH330 lecture. Prerequisites: CH 103-103L. Co-requisite: CH 330L

3. COURSE CONTENT:

The evaluation of analytical data, the solubility of precipitates, Gravimetric analysis, Titrimetric methods, theory of neutralization titrations and titration curves, precipitation reactions, complex formation titrations, electrochemistry, theory and practice of redox titration and an introduction to spectroscopic methods of analysis.

4. RATIONALE FOR OFFERING COURSE:

Quantitative analytical data are crucial to research activity in chemistry, biochemistry, biology, geology and other sciences. Hence training in quantitative analysis is an integral component of a chemist's and biologist's education.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

CH 102 and CH 103; Elementary algebra and statistics skills will be essential. Desirable math skills: Differential Calculus.

v. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):

Course SLOs:

1. Apply chemical safety knowledge and skills in laboratory.
2. Conduct experiment, analyze data, interpret data.
3. Relate the experimental observation to chemical concepts.
4. Communicate laboratory results clearly in both written and oral presentations.
5. Conduct both independent research and demonstrate adequate collaborative skills.
6. Demonstrate adequate skills in validation of quantitative data using experimental method and statistics.
7. Use computer technology to analyze and present data.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

Program SLOs[2]: See below.

vi. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

31. TEXTBOOK AND READINGS:

(See Instructor)

32. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

33. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

34. EVALUATION AND GRADES (SEE INSTRUCTOR):

35. COURSE POLICIES (SEE INSTRUCTOR):

36. SPECIAL NEEDS:

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37. CALENDAR OR SCHEDULE (SEE INSTRUCTOR):

38. DROP DATES:

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39. STUDENT WORK LOAD (SEE INSTRUCTOR):

40. SUPPLEMENTARY MATERIALS/ADDITIONAL RESOURCES (SEE INSTRUCTOR):

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c. Students should be able to define chemistry and state its relevance to other sciences and everyday experience.

d. Students should be able to apply the fundamental concepts of elements and compounds and their reactivity to solve chemically based problems.

2. **GOAL 2:** Demonstrate the skills to make observations, experimentation, collect and collate data, analyze and interpret data in a safe chemical environment with the following objectives:

   a. Students will be able to independently perform accurate quantitative measurements, interpret experimental results, perform calculations on these results and draw a reasonable, accurate conclusion.

   b. Students will synthesize, isolate, purify and characterize a series of compounds using modern methods.

   c. Students will demonstrate knowledge of proper use of modern instrumental techniques.

   d. Students will be able to design an experimental procedure.

   e. Students will observe safe practices in the laboratory and will know how to respond in an emergency. Students will learn to gather hazardous materials information and will recognize and respond properly to potential hazards of handling chemicals and chemical waste.

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   b. Students will effectively communicate scientific information through oral presentations.

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    a. Students should be able to describe the structure & composition of matter.

    b. Students should be able to solve qualitative & quantitative problems.

    c. Students should be able to apply theoretical and mechanistic principles to the study of chemical systems using quantitative and qualitative approaches.

    d. Students should be able to explain the role of energy in determining the structure and reactivity of matter.

    e. Students should be able to apply theoretical knowledge and chemical information to industry and everyday experience.

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    a. Students should be able to use modern analytical instrumentations.

    b. Students should be able to interpret data and relate these to chemical structure and properties.

    c. Students should be able to relate the application of instrumentation to industries.

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    b. Students should be able to critically evaluate scientific information.

c. Students should be able to develop research project & design experimental approach.

7. **GOAL 7:** Demonstrate interaction skills and teamwork with the following objectives:

   a. Students should be able to work cooperatively in problem solving exercise.

   b. Students should be able to exercise leadership skills in teamwork.

   c. Students should demonstrate adequate interpersonal communication skills.

UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH 392 Laboratory Teaching and Assisting
(3) Class Meeting:_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

This course provides for practical educational experience in undergraduate course laboratories. It may be taken more than once for credit. Prerequisite: Completion of course in which laboratory is offered, or of an equivalent course and consent of instructor.

3. COURSE CONTENT:

4. RATIONALE FOR OFFERING COURSE:

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

6. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):

Course SLOs:

1. Apply chemical safety knowledge and skill in the laboratory.
2. Explain the safety procedures clearly to students.
3. Evaluate preliminary data for improvement.
4. Conduct experiment, collect, analyze, and interpret data.
5. Set-up, calibrate, and operate standard laboratory instrument.

6. Prepare and analyze standards and samples with adequate reproducibility and accuracy.
7. Perform quality assurance for validating experimental measurements.
8. Communicate clearly procedures and chemical concepts.
9. Relate chemical concept to experimental data.
10. Adequate interaction skills with students, positive approachable.
11. Supervise a laboratory class.
12. Demonstrate leadership skills.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

Program SLOs[2]: See below.

7. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

9. TEXTBOOK AND READINGS:

(See instructor)

10. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

11. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

12. EVALUATION AND GRADES (SEE INSTRUCTOR):

13. COURSE POLICIES (SEE INSTRUCTOR):

14. SPECIAL NEEDS:

"If you are a student with a disability who will require a accommodation(s) to participate in this course, please contact me or the Institutional Compliance Officer privately to discuss your specific needs. You will need to provide me with documentation concerning your need for accommodation(s) from the EEO/ADA and TITLE IX Office. If you have not registered with the EEO/ADA and Title IX Office, you should do so immediately at 735-2244, (TTY) 735-2243 to coordinate your accommodation request."

15. CALENDAR OR SCHEDULE (SEE INSTRUCTOR):

16. DROP DATES:

University policy sets the drop dates. See the semester schedule of courses.

17. STUDENT WORK LOAD (SEE INSTRUCTOR):

18. SUPPLEMENTARY MATERIALS/ADDITIONAL RESOURCES (SEE INSTRUCTOR):

19. CONTACT INFORMATION FOR CLASSMATES:

Exchange contact info with at least one classmate. Contact your classmate(s) if you miss class or if you want to form a study group.

[1]**BASED ON DR. BARBARA GROSS DAVIS, UC BERKELEY MODEL "CREATING A SYLLABUS".** From the hard copy book *Tools for Teaching* by Barbara Gross Davis; Jossey-Bass Publishers: San Francisco, 1993. Linking to this book chapter from other websites is permissible. However, the contents of this chapter may not be copied, printed, or distributed in hard copy form without permission. For a more detailed explanation on each numbered section of the syllabus, please visit: http://teaching.berkeley.edu/bgd/syllabus.html.

[2]Program SLOs:

BA Chemistry goals/objectives include the following:

1. **GOAL 1:** Demonstrate the knowledge of fundamental concepts of chemistry and its relevance to the scientific method and other fields in science with the following objectives:

a. Students should be able to explain the scientific method and relate its application to chemical discoveries.

b. Students will able to define the states and structure of matter and relate these to physical and chemical properties.

c. Students should be able to define chemistry and state its relevance to other sciences and everyday experience.

d. Students should be able to apply the fundamental concepts of elements and compounds and their reactivity to solve chemically based problems.

2. **GOAL 2:** Demonstrate the skills to make observations, experimentation, collect and collate data, analyze and interpret data in a safe chemical environment with the following objectives:

   a. Students will be able to independently perform accurate quantitative measurements, interpret experimental results, perform calculations on these results and draw a reasonable, accurate conclusion.

   b. Students will synthesize, isolate, purify and characterize a series of compounds using modern methods.

   c. Students will demonstrate knowledge of proper use of modern instrumental techniques.

   d. Students will be able to design an experimental procedure.

   e. Students will observe safe practices in the laboratory and will know how to respond in an emergency. Students will learn to gather hazardous materials information and will recognize and respond properly to potential hazards of handling chemicals and chemical waste.

3. **GOAL 3:** Demonstrate the ability to clearly articulate, formulate, and communicate scientific information using computer, written and oral communication skills with the following objectives:

   a. Students will communicate critical analysis of scientific information through written reports and laboratory notebooks.

   b. Students will effectively communicate scientific information through oral presentations.

   c. Students will use computer technology to gather, process, analyze, and present chemical data.

d. Students will use chemical literature and computer resources to gather research information

4. **GOAL 4:** Demonstrate critical thinking, problem solving skills and the ability to use chemical knowledge and mathematical skills to identify, evaluate, analyze, synthesize, and integrate data and abstract ideas in solving problems with the following objectives:

    a. Students should be able to describe the structure & composition of matter.

    b. Students should be able to solve qualitative & quantitative problems.

    c. Students should be able to apply theoretical and mechanistic principles to the study of chemical systems using quantitative and qualitative approaches.

    d. Students should be able to explain the role of energy in determining the structure and reactivity of matter.

    e. Students should be able to apply theoretical knowledge and chemical information to industry and everyday experience.

5. **GOAL 5:** Demonstrate the knowledge and skills in advanced instrumentation, applications, interpretation, and experimental design to address scientific queries in chemistry, industry, the environment, health, and related fields with the following objectives:

    a. Students should be able to use modern analytical instrumentations.

    b. Students should be able to interpret data and relate these to chemical structure and properties.

    c. Students should be able to relate the application of instrumentation to industries.

    d. Students should be able to develop an appreciation of the wide range of instrumental methods, their applications, and limitations.

6. **GOAL 6:** Demonstrate a sense of exploration and research approach that enables students to pursue lifelong learning in chemistry with the following objectives:

    a. Students will use chemical literature and computer resources to gather research information.

    b. Students should be able to critically evaluate scientific information.

c. Students should be able to develop research project & design experimental approach.

7. **GOAL 7:** Demonstrate interaction skills and teamwork with the following objectives:

   a. Students should be able to work cooperatively in problem solving exercise.

   b. Students should be able to exercise leadership skills in teamwork.

   c. Students should demonstrate adequate interpersonal communication skills.

UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH 410 Instrument Methods of Analysis
(3) Class Meeting:_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

This course is a study of different instrument methods of analysis as available. Both chemical and instrumental principles will be dealt with under the major analytical methods such as Spectrochemical methods, separation methods, electrochemical methods. Emphasis is on practical utilization of instrumentation in the field of analytical chemistry. It includes three hours of lecture weekly. The lab, CH 410L, MUST be taken concurrently. Prerequisites: CH 310a-b, 311, 312, 330, and MA 161a-b or consent of program. Co-requisite: CH 410L

3. COURSE CONTENT:

Elementary electronics, microprocessors in chemical instrumentation, optical spectroscopic instrumentation, molecular fluorescence phosphorescence spectroscopy, atomic absorption, emission spectroscopy. Infrared and Raman spectroscopy, NMR, x-ray spectroscopy and electroanalytical chemistry, gas and liquid chromatography.

4. RATIONALE FOR OFFERING COURSE:

A vast array of powerful and analytical techniques, for solving analytical chemistry problems exist. Analytical techniques of interest to chemists, biologists and environmental scientists will be presented and an appreciation for modern instrument methods of analysis will be provided.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

CH 310 a-b, CH 311-2, CH 330, MA 161 a-b

vii. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT

LEARNING OUTCOMES - SLOs):

Course SLOs:

1. Define the chemical concepts used for instrumentation.
2. Describe the process of acquiring data in analytical instrument and the limitations of response based on signal to noise ratio, interference.
3. Describe types of interference and how they are minimized.
4. Use procedure to set up and calibrate and instrument and collect data.
5. Interpret data and relate it to both quantitative and qualitative information.
6. Conduct research using literature and laboratory experimentation.
7. Communicate chemical knowledge very clearly both in written and oral using computer software.
8. Critically evaluate scientific information.
9. Explain the basic principles for data collection in major in XXXXXXX.
10. Identify the specific application for each instrumentation and then its limitations.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

Program SLOs[2]: See below.

viii. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

42. TEXTBOOK AND READINGS:

(See Instructor)

43. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

44. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

45. EVALUATION AND GRADES (SEE INSTRUCTOR):

46. COURSE POLICIES (SEE INSTRUCTOR):

47. SPECIAL NEEDS:

"If you are a student with a disability who will require a accommodation(s) to participate in this course, please contact me or the Institutional Compliance Officer privately to discuss your specific needs. You will need to provide me with documentation concerning your need for accommodation(s) from the EEO/ADA and TITLE IX Office. If you have not registered with the EEO/ADA and Title IX Office, you should do so immediately at 735-2244, (TTY) 735-2243 to coordinate your accommodation request."

48. CALENDAR OR SCHEDULE (SEE INSTRUCTOR):

49. DROP DATES:

University policy sets the drop dates. See the semester schedule of courses.

50. STUDENT WORK LOAD (SEE INSTRUCTOR):

51. SUPPLEMENTARY MATERIALS/ADDITIONAL RESOURCES (SEE INSTRUCTOR):

52. CONTACT INFORMATION FOR CLASSMATES:

Exchange contact info with at least one classmate. Contact your classmate(s) if you miss class or if you want to form a study group.

[1]**BASED ON DR. BARBARA GROSS DAVIS, UC BERKELEY MODEL "CREATING A SYLLABUS".** From the hard copy book *Tools for Teaching* by Barbara Gross Davis; Jossey-Bass Publishers: San Francisco, 1993. Linking to this book chapter from other websites is permissible. However, the contents of this chapter may not be copied, printed, or distributed in hard copy form without permission. For a more detailed explanation on each numbered section of the syllabus, please visit: http://teaching.berkeley.edu/bgd/syllabus.html.

[2]Program SLOs:

BA Chemistry goals/objectives include the following:

1. **GOAL 1:** Demonstrate the knowledge of fundamental concepts of chemistry and its relevance to the scientific method and other fields in science with the following objectives:

    a. Students should be able to explain the scientific method and relate its application to chemical discoveries.

    b. Students will able to define the states and structure of matter and relate these to physical and chemical properties.

    c. Students should be able to define chemistry and state its relevance to other sciences and everyday experience.

    d. Students should be able to apply the fundamental concepts of elements and compounds and their reactivity to solve chemically based problems.

2. **GOAL 2:** Demonstrate the skills to make observations, experimentation, collect and collate data, analyze and interpret data in a safe chemical environment with the following objectives:

    a. Students will be able to independently perform accurate quantitative measurements, interpret experimental results, perform calculations on these results and draw a reasonable, accurate conclusion.

    b. Students will synthesize, isolate, purify and characterize a series of compounds using modern methods.

    c. Students will demonstrate knowledge of proper use of modern instrumental techniques.

    d. Students will be able to design an experimental procedure.

    e. Students will observe safe practices in the laboratory and will know how to respond in an emergency. Students will learn to gather hazardous materials information and will recognize and respond properly to potential hazards of handling chemicals and chemical waste.

3. **GOAL 3:** Demonstrate the ability to clearly articulate, formulate, and communicate scientific information using computer, written and oral communication skills with the following objectives:

    a. Students will communicate critical analysis of scientific information through written reports and laboratory notebooks.

    b. Students will effectively communicate scientific information through oral presentations.

c. Students will use computer technology to gather, process, analyze, and present chemical data.

d. Students will use chemical literature and computer resources to gather research information

4. **GOAL 4:** Demonstrate critical thinking, problem solving skills and the ability to use chemical knowledge and mathematical skills to identify, evaluate, analyze, synthesize, and integrate data and abstract ideas in solving problems with the following objectives:

   a. Students should be able to describe the structure & composition of matter.

   b. Students should be able to solve qualitative & quantitative problems.

   c. Students should be able to apply theoretical and mechanistic principles to the study of chemical systems using quantitative and qualitative approaches.

   d. Students should be able to explain the role of energy in determining the structure and reactivity of matter.

   e. Students should be able to apply theoretical knowledge and chemical information to industry and everyday experience.

5. **GOAL 5:** Demonstrate the knowledge and skills in advanced instrumentation, applications, interpretation, and experimental design to address scientific queries in chemistry, industry, the environment, health, and related fields with the following objectives:

   a. Students should be able to use modern analytical instrumentations.

   b. Students should be able to interpret data and relate these to chemical structure and properties.

   c. Students should be able to relate the application of instrumentation to industries.

   d. Students should be able to develop an appreciation of the wide range of instrumental methods, their applications, and limitations.

6. **GOAL 6:** Demonstrate a sense of exploration and research approach that enables students to pursue lifelong learning in chemistry with the following objectives:

   a. Students will use chemical literature and computer resources to gather research information.

b. Students should be able to critically evaluate scientific information.

c. Students should be able to develop research project & design experimental approach.

7. **GOAL 7:** Demonstrate interaction skills and teamwork with the following objectives:

   a. Students should be able to work cooperatively in problem solving exercise.

   b. Students should be able to exercise leadership skills in teamwork.

   c. Students should demonstrate adequate interpersonal communication skills.

UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH 410L Instrument Methods of Analysis Lab
(3) Class Meeting:_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

This course deals with the practical aspect of instrumental methods of analysis. Emphasis is on practical utilization of instrumentation in the field of analytical chemistry. It consists of a six hour laboratory per week. The lab, CH 410L, MUST be taken concurrently with CH410 lecture. Prerequisites: CH 310a-b, 311, 312, 330, and MA 161a-b or consent of program. Co-requisite: CH 410L

3. COURSE CONTENT:

Elementary electronics, microprocessors in chemical instrumentation, optical spectroscopic instrumentation, molecular fluorescence phosphorescence spectroscopy, atomic absorption, emission spectroscopy. Infrared and Raman spectroscopy, NMR, x-ray spectroscopy and electroanalytical chemistry

4. RATIONALE FOR OFFERING COURSE:

A vast array of powerful and analytical techniques, for solving analytical chemistry problems exist. Analytical techniques of interest to chemists, biologists and environmental scientists will be presented and an appreciation for modern instrument methods of analysis will be provided.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

CH 310 a-b, CH 311-2, CH 330, MA 161 a-b

ix. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):

Course SLOs:

1. Apply chemical safety knowledge and skills in the laboratory.
2. Conduct experiment, collect, analyze and interpret data.
3. Set up, calibrate and operate analytical instrument.
4. Prepare and analyze standards and samples with adequate reproducibility and accuracy.
5. Conduct research using literature and laboratory experimentation.
6. Communicate chemical knowledge very clearly both in written and oral using computer software.
7. Critically evaluate scientific information.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

Program SLOs[2]: See below.

x. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

53. TEXTBOOK AND READINGS:

(See Instructor)

54. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

55. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

56. EVALUATION AND GRADES (SEE INSTRUCTOR):

57. COURSE POLICIES (SEE INSTRUCTOR):

58. SPECIAL NEEDS:

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59. CALENDAR OR SCHEDULE (SEE INSTRUCTOR):

60. DROP DATES:

University policy sets the drop dates. See the semester schedule of courses.

61. STUDENT WORK LOAD (SEE INSTRUCTOR):

62. SUPPLEMENTARY MATERIALS/ADDITIONAL RESOURCES (SEE INSTRUCTOR):

63. CONTACT INFORMATION FOR CLASSMATES:

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[2]Program SLOs:

BA Chemistry goals/objectives include the following:

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b. Students will able to define the states and structure of matter and relate these to physical and chemical properties.

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d. Students should be able to apply the fundamental concepts of elements and compounds and their reactivity to solve chemically based problems.

2. **GOAL 2:** Demonstrate the skills to make observations, experimentation, collect and collate data, analyze and interpret data in a safe chemical environment with the following objectives:

   a. Students will be able to independently perform accurate quantitative measurements, interpret experimental results, perform calculations on these results and draw a reasonable, accurate conclusion.

   b. Students will synthesize, isolate, purify and characterize a series of compounds using modern methods.

   c. Students will demonstrate knowledge of proper use of modern instrumental techniques.

   d. Students will be able to design an experimental procedure.

   e. Students will observe safe practices in the laboratory and will know how to respond in an emergency. Students will learn to gather hazardous materials information and will recognize and respond properly to potential hazards of handling chemicals and chemical waste.

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   a. Students will communicate critical analysis of scientific information through written reports and laboratory notebooks.

   b. Students will effectively communicate scientific information through oral presentations.

   c. Students will use computer technology to gather, process, analyze, and present chemical data.

d. Students will use chemical literature and computer resources to gather research information

4. **GOAL 4:** Demonstrate critical thinking, problem solving skills and the ability to use chemical knowledge and mathematical skills to identify, evaluate, analyze, synthesize, and integrate data and abstract ideas in solving problems with the following objectives:

    a. Students should be able to describe the structure & composition of matter.

    b. Students should be able to solve qualitative & quantitative problems.

    c. Students should be able to apply theoretical and mechanistic principles to the study of chemical systems using quantitative and qualitative approaches.

    d. Students should be able to explain the role of energy in determining the structure and reactivity of matter.

    e. Students should be able to apply theoretical knowledge and chemical information to industry and everyday experience.

5. **GOAL 5:** Demonstrate the knowledge and skills in advanced instrumentation, applications, interpretation, and experimental design to address scientific queries in chemistry, industry, the environment, health, and related fields with the following objectives:

    a. Students should be able to use modern analytical instrumentations.

    b. Students should be able to interpret data and relate these to chemical structure and properties.

    c. Students should be able to relate the application of instrumentation to industries.

    d. Students should be able to develop an appreciation of the wide range of instrumental methods, their applications, and limitations.

6. **GOAL 6:** Demonstrate a sense of exploration and research approach that enables students to pursue lifelong learning in chemistry with the following objectives:

    a. Students will use chemical literature and computer resources to gather research information.

    b. Students should be able to critically evaluate scientific information.

c. Students should be able to develop research project & design experimental approach.

7. **GOAL 7:** Demonstrate interaction skills and teamwork with the following objectives:

   a. Students should be able to work cooperatively in problem solving exercise.

   b. Students should be able to exercise leadership skills in teamwork.

   c. Students should demonstrate adequate interpersonal communication skills.

UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH/BI 419 Biochemistry
(3) Class Meeting_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

This course covers the principles of protein chemistry and enzyme nomenclature, catalysis, kinetics and control. It includes three hours of lecture weekly. The lab, BI/CH419L, MUST be taken concurrently. Prerequisite: CH 310a, CH 311, CH 310b and CH 312 or concurrent enrollment, BI 157-157L and BI 158-158L or equivalent. Corequisite: BI/CH 419L

3. COURSE CONTENT:

Lecture:

1. A Historical Review
2. Chemical Elements and Biogeochemical Cycles
3. Water as the Solvent of Life.
4. Some Basic Aspects of the Chemistry Life.
5. Cells: Biological Units of Molecular Organization.
6. Proteins I: Amino Acid Components and Structural Features.
7. Proteins II: Determination of Amino Acid Sequences.
8. Proteins III: Structure and Function.
9. Protein IV: Enzymes.
10. B-Vitamins and Coenzymes.
11. Carbohydrates.
12. Lipids and Membranes.
13. Nucleic Acids.
14. Energy and Life.
15. Anaerobic Synthesis of ATP (Glycolysis) and Pentose Phosphate Pathway.
16. Aerobic Synthesis of ATP I: Tricarboxylic Acid Cycle.
17. Aerobic Synthesis of ATP II: Electron Transport and Oxidative Phosphorylation.

4. RATIONALE FOR OFFERING COURSE:

This is an introductory course in biochemistry. It is intended for students in any field of science or engineering who want a one-semester introduction to biochemistry but who do not intend to be a biochemistry majors. Attempts will be made to make biochemistry as clear and interesting as possible and to familiarize all science students with the major aspects of biochemistry. The students will gain practical experience in basic laboratory techniques and enzyme kinetics.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

Prerequisites are CH 310a, CH 311, CH 310b and CH 312 or concurrent enrollment.

6. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):

Course SLOs:

1. To learn the fundamental language of biochemistry, the major classes of biomolecules and the molecular logic of life.
2. To learn the structure and function of proteins and the latest methods and instrumentation used to analyze them.
3. To learn the importance of understanding the 3-D structure of proteins and the complex problem of protein folding and implications for neurodegenerative diseases.
4. To learn the structure and function of enzymes and the mechanism of enzyme catalysis and enzyme regulation in both health and disease.
5. To learn the approaches and instrumentation employed in the emerging field of Proteomics paralleling the Genomics revolution.
6. To learn the basic principles of bioenergetics.
7. To learn the fundamentals and of metabolism and its regulation.
8. To learn the cellular generation of the chemical energy required for sustaining life.
9. To learn the fundamentals of the complex balance of the physical, chemical, and biological context in which each biomolecule, reaction, or pathway operates and the relationship between structure and function.
10. To learn applications of biochemistry to problems in medicine, dentistry, agriculture, forensics, anthropology, environmental sciences, and other fields.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

Program SLOs[2]: See below.

7. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

9. TEXTBOOK AND READINGS:

(See Instructor)

10. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

11. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

12. EVALUATION AND GRADES (SEE INSTRUCTOR):

13. COURSE POLICIES (SEE INSTRUCTOR):

14. SPECIAL NEEDS:

"If you are a student with a disability who will require a accommodation(s) to participate in this course, please contact me or the Institutional Compliance Officer privately to discuss your specific needs. You will need to provide me with documentation concerning your need for accommodation(s) from the EEO/ADA and TITLE IX Office. If you have not registered with the EEO/ADA and Title IX Office, you should do so immediately at 735-2244, (TTY) 735-2243 to coordinate your accommodation request."

15. CALENDAR OR SCHEDULE (SEE INSTRUCTOR):

16. DROP DATES:

University policy sets the drop dates. See the semester schedule of courses.

17. STUDENT WORK LOAD (SEE INSTRUCTOR):

18. SUPPLEMENTARY MATERIALS/ADDITIONAL RESOURCES (SEE INSTRUCTOR):

19. CONTACT INFORMATION FOR CLASSMATES:

Exchange contact info with at least one classmate. Contact your classmate(s) if you miss class or if you want to form a study group.

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[2]Program SLOs:

BA Chemistry goals/objectives include the following:

1. **GOAL 1:** Demonstrate the knowledge of fundamental concepts of chemistry and its relevance to the scientific method and other fields in science with the following objectives:

    a. Students should be able to explain the scientific method and relate its application to chemical discoveries.

    b. Students will able to define the states and structure of matter and relate these to physical and chemical properties.

    c. Students should be able to define chemistry and state its relevance to other sciences and everyday experience.

    d. Students should be able to apply the fundamental concepts of elements and compounds and their reactivity to solve chemically based problems.

2. **GOAL 2:** Demonstrate the skills to make observations, experimentation, collect and collate data, analyze and interpret data in a safe chemical environment with the following objectives:

    a. Students will be able to independently perform accurate quantitative measurements, interpret experimental results, perform calculations on these results and draw a reasonable, accurate conclusion.

b. Students will synthesize, isolate, purify and characterize a series of compounds using modern methods.

c. Students will demonstrate knowledge of proper use of modern instrumental techniques.

d. Students will be able to design an experimental procedure.

e. Students will observe safe practices in the laboratory and will know how to respond in an emergency. Students will learn to gather hazardous materials information and will recognize and respond properly to potential hazards of handling chemicals and chemical waste.

3. **GOAL 3:** Demonstrate the ability to clearly articulate, formulate, and communicate scientific information using computer, written and oral communication skills with the following objectives:

   a. Students will communicate critical analysis of scientific information through written reports and laboratory notebooks.

   b. Students will effectively communicate scientific information through oral presentations.

   c. Students will use computer technology to gather, process, analyze, and present chemical data.

   d. Students will use chemical literature and computer resources to gather research information

4. **GOAL 4:** Demonstrate critical thinking, problem solving skills and the ability to use chemical knowledge and mathematical skills to identify, evaluate, analyze, synthesize, and integrate data and abstract ideas in solving problems with the following objectives:

   a. Students should be able to describe the structure & composition of matter.

   b. Students should be able to solve qualitative & quantitative problems.

   c. Students should be able to apply theoretical and mechanistic principles to the study of chemical systems using quantitative and qualitative approaches.

   d. Students should be able to explain the role of energy in determining the structure and reactivity of matter.

e. Students should be able to apply theoretical knowledge and chemical information to industry and everyday experience.

5. **GOAL 5:** Demonstrate the knowledge and skills in advanced instrumentation, applications, interpretation, and experimental design to address scientific queries in chemistry, industry, the environment, health, and related fields with the following objectives:

    a. Students should be able to use modern analytical instrumentations.

    b. Students should be able to interpret data and relate these to chemical structure and properties.

    c. Students should be able to relate the application of instrumentation to industries.

    d. Students should be able to develop an appreciation of the wide range of instrumental methods, their applications, and limitations.

6. **GOAL 6:** Demonstrate a sense of exploration and research approach that enables students to pursue lifelong learning in chemistry with the following objectives:

    a. Students will use chemical literature and computer resources to gather research information.

    b. Students should be able to critically evaluate scientific information.

    c. Students should be able to develop research project & design experimental approach.

7. **GOAL 7:** Demonstrate interaction skills and teamwork with the following objectives:

    a. Students should be able to work cooperatively in problem solving exercise.

    b. Students should be able to exercise leadership skills in teamwork.

    c. Students should demonstrate adequate interpersonal communication skills.

UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: BI 419L Biochemistry Lab
(3) Class Meeting_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

This course covers the principles of protein chemistry and enzyme nomenclature, catalysis, kinetics, and control. It includes three hours of lecture weekly. The lab, CH/BI 419L, MUST be taken concurrently. Prerequisite: CH 310a, CH 311, CH 310b and CH 312 or concurrent enrollment, BI 157-157L and BI158-158L or equivalent. Corequisite: CH/BI 419

CH/BI 419L is the laboratory portion of CH/BI 419 and MUST be taken concurrently. The course consists of one three- hour laboratory per week. Corequisite: CH/BI 419

3. COURSE CONTENT:

Laboratory Experiments (Handouts)

1. General Laboratory Procedures. (Record Keeping, Graphs and Numerical Results, Errors, Accuracy and Precision, Concentrations and Dilutions, Laboratory Safety)
2. Preparation of a Buffer; Measurement of pH.
3. Titration of an Unknown Amino Acid; Formal Titration.
4. Absorption Spectrum of Riboflavin.
5. Spectrophometric Methods for the Determination of Proteins.
6. Enzyme Assays and Enzyme Units: Amylase.
7. Acid-Catalyzed Hydrolysis of Sucrose.
8. Presentations of special biochemical topics by students.

4. RATIONALE FOR OFFERING COURSE:

This is an introductory course in biochemistry. It is intended for students in any field of science or engineering who want a one-semester introduction to biochemistry but who do not intend to be a biochemistry majors. Attempts will be made to make biochemistry as

clear and interesting as possible and to familiarize all science students with the major aspects of biochemistry. The students will gain practical experience in basic laboratory techniques and enzyme kinetics.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

Prerequisites are CH 310a, CH 311, CH 310b and CH 312 or concurrent enrollment.

6. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):

Course SLOs:

1. To learn the fundamentals of biochemistry laboratory science, including laboratory safety; scientific notation; significant figures in calculations; errors in experiments; accuracy *vs.* precision; international system of measurements; expressing concentrations of biochemical solutions; preparing dilutions; use of pipets and pipetman; analysis and interpretation of experimental data, and presentation of experimental data by preparing data tables, and graphs by hand and computer.
2. To perform titration experiments to learn the acid-base behavior of amino acids.
3. To conduct experiments in photometry and the use of both UV & visible spectrophotometer.
4. To perform, with the use of the Spectrophotometer, a series of experiments on enzyme kinetics and enzyme regulation & inhibition.
5. To perform experiments in *in vivo* biochemistry, integrating genetics with biochemistry in order to learn the biochemical basis and approaches that are undertaken to explain genetic processes.
6. To learn molecular biochemical approaches to purify and characterize proteins, essential to investigating cellular and organismal physiology.
7. To learn two high tech instrumentation (HPLC and GC-MS), useful for biochemical analysis.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

Program SLOs[2]: See below.

7. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

9. TEXTBOOK AND READINGS:

(See Instructor)

10. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

11. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

12. EVALUATION AND GRADES (SEE INSTRUCTOR):

13. COURSE POLICIES (SEE INSTRUCTOR):

14. SPECIAL NEEDS:

"If you are a student with a disability who will require a accommodation(s) to participate in this course, please contact me or the Institutional Compliance Officer privately to discuss your specific needs. You will need to provide me with documentation concerning your need for accommodation(s) from the EEO/ADA and TITLE IX Office. If you have not registered with the EEO/ADA and Title IX Office, you should do so immediately at 735-2244, (TTY) 735-2243 to coordinate your accommodation request."

15. CALENDAR OR SCHEDULE (SEE INSTRUCTOR):

16. DROP DATES:

University policy sets the drop dates. See the semester schedule of courses.

17. STUDENT WORK LOAD (SEE INSTRUCTOR):

18. SUPPLEMENTARY MATERIALS/ADDITIONAL RESOURCES (SEE INSTRUCTOR):

19. CONTACT INFORMATION FOR CLASSMATES:

Exchange contact info with at least one classmate. Contact your classmate(s) if you miss class or if you want to form a study group.

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[2]Program SLOs:

BA Chemistry goals/objectives include the following:

1. **GOAL 1:** Demonstrate the knowledge of fundamental concepts of chemistry and its relevance to the scientific method and other fields in science with the following objectives:

    a. Students should be able to explain the scientific method and relate its application to chemical discoveries.

    b. Students will able to define the states and structure of matter and relate these to physical and chemical properties.

    c. Students should be able to define chemistry and state its relevance to other sciences and everyday experience.

    d. Students should be able to apply the fundamental concepts of elements and compounds and their reactivity to solve chemically based problems.

2. **GOAL 2:** Demonstrate the skills to make observations, experimentation, collect and collate data, analyze and interpret data in a safe chemical environment with the following objectives:

    a. Students will be able to independently perform accurate quantitative measurements, interpret experimental results, perform calculations on these results and draw a reasonable, accurate conclusion.

    b. Students will synthesize, isolate, purify and characterize a series of compounds using modern methods.

    c. Students will demonstrate knowledge of proper use of modern instrumental techniques.

    d. Students will be able to design an experimental procedure.

e. Students will observe safe practices in the laboratory and will know how to respond in an emergency. Students will learn to gather hazardous materials information and will recognize and respond properly to potential hazards of handling chemicals and chemical waste.

3. **GOAL 3:** Demonstrate the ability to clearly articulate, formulate, and communicate scientific information using computer, written and oral communication skills with the following objectives:

    a. Students will communicate critical analysis of scientific information through written reports and laboratory notebooks.

    b. Students will effectively communicate scientific information through oral presentations.

    c. Students will use computer technology to gather, process, analyze, and present chemical data.

    d. Students will use chemical literature and computer resources to gather research information

4. **GOAL 4:** Demonstrate critical thinking, problem solving skills and the ability to use chemical knowledge and mathematical skills to identify, evaluate, analyze, synthesize, and integrate data and abstract ideas in solving problems with the following objectives:

    a. Students should be able to describe the structure & composition of matter.

    b. Students should be able to solve qualitative & quantitative problems.

    c. Students should be able to apply theoretical and mechanistic principles to the study of chemical systems using quantitative and qualitative approaches.

    d. Students should be able to explain the role of energy in determining the structure and reactivity of matter.

    e. Students should be able to apply theoretical knowledge and chemical information to industry and everyday experience.

5. **GOAL 5:** Demonstrate the knowledge and skills in advanced instrumentation, applications, interpretation, and experimental design to address scientific queries in chemistry, industry, the environment, health, and related fields with the following objectives:

    a. Students should be able to use modern analytical instrumentations.

b. Students should be able to interpret data and relate these to chemical structure and properties.

c. Students should be able to relate the application of instrumentation to industries.

d. Students should be able to develop an appreciation of the wide range of instrumental methods, their applications, and limitations.

6. **GOAL 6:** Demonstrate a sense of exploration and research approach that enables students to pursue lifelong learning in chemistry with the following objectives:

   a. Students will use chemical literature and computer resources to gather research information.

   b. Students should be able to critically evaluate scientific information.

   c. Students should be able to develop research project & design experimental approach.

7. **GOAL 7:** Demonstrate interaction skills and teamwork with the following objectives:

   a. Students should be able to work cooperatively in problem solving exercise.

   b. Students should be able to exercise leadership skills in teamwork.

   c. Students should demonstrate adequate interpersonal communication skills.

UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH 420 Nuclear Magnetic Resonance Spectroscopy
(3) Class Meeting:_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

Principles and applications of NMR spectroscopy, utilizing examples from organic, inorganic, and biological chemistry will be covered. The course will involve three hours of classroom study per week.

3. COURSE CONTENT:

Topics covered will include the theory of Nuclear Magnetic Resonance, instrumentation and techniques, chemical shifts, spin-spin and dipolar interactions, relaxation, analysis of complex spectra, structure elucidation, chemical exchange and dynamic NMR, two-dimensional NMR and selected contemporary developments in NMR Spectroscopy; may also include electron paramagnetic resonance spectroscopy.

4. RATIONALE FOR OFFERING COURSE:

NMR Spectroscopy is one of the most powerful research tools currently used in chemistry. This course aims to provides a comprehensive view of basic nuclear magnetic resonance principles and applications. This course will provide a strong foundation in NMR for students planning to pursue graduate studies in chemistry, biochemistry and medicine.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

A sound knowledge of sophomore level (one-year) organic chemistry and integral calculus will be required.

6. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):

Course SLOs:

1. Describe the principles of nuclear magnetic resonance.
2. Explain the significance of the shielding constants and proton chemical shifts.
3. Explain the origin and the effect of spin-spin coupling.
4. Analyze first order and second-order NMR spectra.
5. Outline the features of Fourier Transform NMR.
6. Explain the connection between line-broadening and rate processes – Dynamic NMR.
7. Analyze the Carbon-13 NMR spectra and recognize the trends in Carbon-13 chemical shifts.
8. Explain the two-dimensional NMR spectra and learn some multiple-pulse techniques.
9. Describe spin relaxation processes.
10. Explain high-resolution NMR spectra in the solid state and liquid crystal phase.
11. Understand NMR imaging in Medicine and biology.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

Program SLOs[2]: See below.

7. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

9. TEXTBOOK AND READINGS:

(See Instructor)

10. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

11. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

12. EVALUATION AND GRADES (SEE INSTRUCTOR):

13. COURSE POLICIES (SEE INSTRUCTOR):

14. SPECIAL NEEDS:

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15. CALENDAR OR SCHEDULE (SEE INSTRUCTOR):

16. DROP DATES:

University policy sets the drop dates. See the semester schedule of courses.

17. STUDENT WORK LOAD (SEE INSTRUCTOR):

18. SUPPLEMENTARY MATERIALS/ADDITIONAL RESOURCES (SEE INSTRUCTOR):

19. CONTACT INFORMATION FOR CLASSMATES:

Exchange contact info with at least one classmate. Contact your classmate(s) if you miss class or if you want to form a study group.

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1. **GOAL 1:** Demonstrate the knowledge of fundamental concepts of chemistry and its relevance to the scientific method and other fields in science with the following objectives:

    a. Students should be able to explain the scientific method and relate its application to chemical discoveries.

    b. Students will able to define the states and structure of matter and relate these to physical and chemical properties.

    c. Students should be able to define chemistry and state its relevance to other sciences and everyday experience.

    d. Students should be able to apply the fundamental concepts of elements and compounds and their reactivity to solve chemically based problems.

2. **GOAL 2:** Demonstrate the skills to make observations, experimentation, collect and collate data, analyze and interpret data in a safe chemical environment with the following objectives:

    a. Students will be able to independently perform accurate quantitative measurements, interpret experimental results, perform calculations on these results and draw a reasonable, accurate conclusion.

    b. Students will synthesize, isolate, purify and characterize a series of compounds using modern methods.

    c. Students will demonstrate knowledge of proper use of modern instrumental techniques.

    d. Students will be able to design an experimental procedure.

    e. Students will observe safe practices in the laboratory and will know how to respond in an emergency. Students will learn to gather hazardous materials information and will recognize and respond properly to potential hazards of handling chemicals and chemical waste.

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    a. Students will communicate critical analysis of scientific information through written reports and laboratory notebooks.

    b. Students will effectively communicate scientific information through oral presentations.

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d. Students will use chemical literature and computer resources to gather research information

4. **GOAL 4:** Demonstrate critical thinking, problem solving skills and the ability to use chemical knowledge and mathematical skills to identify, evaluate, analyze, synthesize, and integrate data and abstract ideas in solving problems with the following objectives:

   a. Students should be able to describe the structure & composition of matter.

   b. Students should be able to solve qualitative & quantitative problems.

   c. Students should be able to apply theoretical and mechanistic principles to the study of chemical systems using quantitative and qualitative approaches.

   d. Students should be able to explain the role of energy in determining the structure and reactivity of matter.

   e. Students should be able to apply theoretical knowledge and chemical information to industry and everyday experience.

5. **GOAL 5:** Demonstrate the knowledge and skills in advanced instrumentation, applications, interpretation, and experimental design to address scientific queries in chemistry, industry, the environment, health, and related fields with the following objectives:

   a. Students should be able to use modern analytical instrumentations.

   b. Students should be able to interpret data and relate these to chemical structure and properties.

   c. Students should be able to relate the application of instrumentation to industries.

   d. Students should be able to develop an appreciation of the wide range of instrumental methods, their applications, and limitations.

6. **GOAL 6:** Demonstrate a sense of exploration and research approach that enables students to pursue lifelong learning in chemistry with the following objectives:

   a. Students will use chemical literature and computer resources to gather research information.

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c. Students should be able to develop research project & design experimental approach.

7. **GOAL 7:** Demonstrate interaction skills and teamwork with the following objectives:

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   c. Students should demonstrate adequate interpersonal communication skills.

UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH 430 Inorganic Chemistry
(3) Class Meeting:_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

This course is a study of topics such as bonding models in inorganic chemistry, structure and reactivity of covalent bond, experimental determination of molecular structure, chemical forces, coordination chemistry from theoretical, structural and reaction mechanistic perspectives, chemical applications of group theory and molecular symmetry. It includes three hours of lecture per week. Prerequisites: CH 103-103L, MA 204 or consent of program.

3. COURSE CONTENT:

Bonding models in inorganic chemistry, the solid state, the covalent bond (structure and reactivity), chemical forces, acid-base chemistry, chemistry in aqueous and nonaqueous solutions, theory, structures, reactions, kinetics and mechanisms of coordination compounds. Organometallic chemistry, Inorganic chemistry in biological systems.

4. RATIONALE FOR OFFERING COURSE:

This course is a required course for chemistry majors. It builds upon periodicity and chemistry of elements in the same group in the periodic table.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

CH 103 and MA 204
Reasonable knowledge of Differential and Integral Calculus.

6. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):

Course SLOs:

1. Explain the structure of the atom.
2. Apply Symmetry and Group Theory to inorganic molecules.
3. Explain bonding models in Inorganic Chemistry as applied to (a) Ionic compounds (b) the covalent molecules.
4. Describe Solid State
5. Explain Acid-Base chemistry and chemistry in Aqueous and non-aqueous Solvents.
6. Use the properties of coordination chemistry in the context of Structure, Bonding, Spectra and magnetism, Kinetics and Mechanism.
7. Describe Organometallic chemistry, Inorganic chains, Rings, Cages and Clusters.
8. Describe the chemistry of Halogens and the Noble gases.
9. Apply Periodicity to predict properties of compounds

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

Program SLOs[2]: See below.

7. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

9. TEXTBOOK AND READINGS:

(See Instructor)

10. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

11. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

12. EVALUATION AND GRADES (SEE INSTRUCTOR):

13. COURSE POLICIES (SEE INSTRUCTOR):

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15. CALENDAR OR SCHEDULE (SEE INSTRUCTOR):

16. DROP DATES:

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17. STUDENT WORK LOAD (SEE INSTRUCTOR):

18. SUPPLEMENTARY MATERIALS/ADDITIONAL RESOURCES (SEE INSTRUCTOR):

19. CONTACT INFORMATION FOR CLASSMATES:

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[2]Program SLOs:

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    a. Students should be able to explain the scientific method and relate its application to chemical discoveries.

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    c. Students should be able to define chemistry and state its relevance to other sciences and everyday experience.

    d. Students should be able to apply the fundamental concepts of elements and compounds and their reactivity to solve chemically based problems.

2. **GOAL 2:** Demonstrate the skills to make observations, experimentation, collect and collate data, analyze and interpret data in a safe chemical environment with the following objectives:

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    b. Students will synthesize, isolate, purify and characterize a series of compounds using modern methods.

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    d. Students will be able to design an experimental procedure.

    e. Students will observe safe practices in the laboratory and will know how to respond in an emergency. Students will learn to gather hazardous materials information and will recognize and respond properly to potential hazards of handling chemicals and chemical waste.

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    a. Students will communicate critical analysis of scientific information through written reports and laboratory notebooks.

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4. **GOAL 4:** Demonstrate critical thinking, problem solving skills and the ability to use chemical knowledge and mathematical skills to identify, evaluate, analyze, synthesize, and integrate data and abstract ideas in solving problems with the following objectives:

   a. Students should be able to describe the structure & composition of matter.

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UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH 450a-b Physical Chemistry
(3) Class Meeting:_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

This is a full-year lecture sequence covering the application of physical principles to chemistry with theoretical, mathematical treatment. Laws of thermodynamics, thermochemical equilibria, ionic equilibria, phase equilibria, chemical kinetics, quantum theory, molecular structure, statistical mechanics, electrochemistry, surface chemistry and photochemistry are studied. It includes four hours lecture weekly. Prerequisites: MA 203, MA 204 or consent of program.

3. COURSE CONTENT:

Thermodynamics, chemical kinetics, quantum mechanics and spectroscopy, statistical mechanics, electrochemistry.

4. RATIONALE FOR OFFERING COURSE:

It's an integral component in the training of chemistry majors.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

MA 203 and MA 204
Reasonable knowledge of Differential and Integral Calculus.

6. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):

Course SLOs:

1. Explain advanced chemical concepts in thermodynamics, kinetics, equilibrium, quantum, ? of electrocleus by solving chemistry.

2. Organize a vast array of interconnected chemical concepts and communicate them effectively.
3. Analyze chemical information and to formulate solutions to chemical problems.
4. Identify, analyze and interpret chemical data. Develop an ability to adequately apply the chemical concepts, facts and models of chemistry to other disciplines in sciences and engineering.
5. Apply mathematical concepts, equations, and quantitative information to the solution of chemical problems.
6. Accomplish long-term retention of chemical facts and concepts.
7. Use the chemical literature and computer resources to gather research information.
8. Use computer programs to generate and analyze data.
9. Communicate chemical information clearly.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

Program SLOs[2]: See below.

7. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

9. TEXTBOOK AND READINGS:

(See Instructor)

10. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

11. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

12. EVALUATION AND GRADES (SEE INSTRUCTOR):

13. COURSE POLICIES (SEE INSTRUCTOR):

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15. CALENDAR OR SCHEDULE (SEE INSTRUCTOR):

16. DROP DATES:

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    b. Students will synthesize, isolate, purify and characterize a series of compounds using modern methods.

    c. Students will demonstrate knowledge of proper use of modern instrumental techniques.

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    b. Students will effectively communicate scientific information through oral presentations.

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b. Students should be able to critically evaluate scientific information.

c. Students should be able to develop research project & design experimental approach.

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UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH 451 Physical Chemistry I Laboratory
(3) Class Meeting:_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

This course covers the mathematical tools normally utilized in experimental physical chemistry and experimental contact with thermodynamics, chemical equilibrium, chemical kinetics and phase equilibrium. It consists of six hours of laboratory weekly.
Prerequisite: Consent of program.

3. COURSE CONTENT:

Laboratory experiments in the determination of standard enthalpy and entropy changes, standard electrode potentials, solubility product; rotation-vibration spectra of simple molecules, determination of order of reaction by spectrophotometry, reaction kinetics and molecular dynamics simulations, photochemistry and quantum yield, NMR spectral analysis by computer methods and temperature-dependent NMR spectra for the study of intramolecular rate processes.

4. RATIONALE FOR OFFERING COURSE:

To teach an array of practical skills, relevant to modern experimental physical chemistry which are essential to the training of chemists.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

CH 450-a, concurrent registration in CH 450-b, and MA 204

6. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):

Course SLOs:

1. Apply chemical safety knowledge and skill in the laboratory.
2. Conduct experiment, collect, analyze and interpret data.
3. Critically evaluate the experimental results and relate to chemical concepts.
4. Communicate laboratory results clearly and accurately.
5. Use computer to analyze data.
6. Design experimental approach for physical measurements.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

Program SLOs[2]: See below.

7. CONCEPTUAL STRUCTURE OF THE COURSE (SEE INSTRUCTOR):

8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

9. TEXTBOOK AND READINGS:

(See Instructor)

10. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

11. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

12. EVALUATION AND GRADES (SEE INSTRUCTOR):

13. COURSE POLICIES (SEE INSTRUCTOR):

14. SPECIAL NEEDS:

"If you are a student with a disability who will require a accommodation(s) to participate in this course, please contact me or the Institutional Compliance Officer privately to discuss your specific needs. You will need to provide me with documentation concerning your need for accommodation(s) from the EEO/ADA and TITLE IX Office. If you have

not registered with the EEO/ADA and Title IX Office, you should do so immediately at 735-2244, (TTY) 735-2243 to coordinate your accommodation request."

15. CALENDAR OR SCHEDULE (SEE INSTRUCTOR):

16. DROP DATES:

University policy sets the drop dates. See the semester schedule of courses.

17. STUDENT WORK LOAD (SEE INSTRUCTOR):

18. SUPPLEMENTARY MATERIALS/ADDITIONAL RESOURCES (SEE INSTRUCTOR):

19. CONTACT INFORMATION FOR CLASSMATES:

Exchange contact info with at least one classmate. Contact your classmate(s) if you miss class or if you want to form a study group.

[1]**BASED ON DR. BARBARA GROSS DAVIS, UC BERKELEY MODEL "CREATING A SYLLABUS".** From the hard copy book *Tools for Teaching* by Barbara Gross Davis; Jossey-Bass Publishers: San Francisco, 1993. Linking to this book chapter from other websites is permissible. However, the contents of this chapter may not be copied, printed, or distributed in hard copy form without permission. For a more detailed explanation on each numbered section of the syllabus, please visit: http://teaching.berkeley.edu/bgd/syllabus.html.

[2]Program SLOs:

BA Chemistry goals/objectives include the following:

1. **GOAL 1:** Demonstrate the knowledge of fundamental concepts of chemistry and its relevance to the scientific method and other fields in science with the following objectives:

    a. Students should be able to explain the scientific method and relate its application to chemical discoveries.

b. Students will able to define the states and structure of matter and relate these to physical and chemical properties.

c. Students should be able to define chemistry and state its relevance to other sciences and everyday experience.

d. Students should be able to apply the fundamental concepts of elements and compounds and their reactivity to solve chemically based problems.

2. **GOAL 2:** Demonstrate the skills to make observations, experimentation, collect and collate data, analyze and interpret data in a safe chemical environment with the following objectives:

    a. Students will be able to independently perform accurate quantitative measurements, interpret experimental results, perform calculations on these results and draw a reasonable, accurate conclusion.

    b. Students will synthesize, isolate, purify and characterize a series of compounds using modern methods.

    c. Students will demonstrate knowledge of proper use of modern instrumental techniques.

    d. Students will be able to design an experimental procedure.

    e. Students will observe safe practices in the laboratory and will know how to respond in an emergency. Students will learn to gather hazardous materials information and will recognize and respond properly to potential hazards of handling chemicals and chemical waste.

3. **GOAL 3:** Demonstrate the ability to clearly articulate, formulate, and communicate scientific information using computer, written and oral communication skills with the following objectives:

    a. Students will communicate critical analysis of scientific information through written reports and laboratory notebooks.

    b. Students will effectively communicate scientific information through oral presentations.

    c. Students will use computer technology to gather, process, analyze, and present chemical data.

    d. Students will use chemical literature and computer resources to gather research information

4. **GOAL 4:** Demonstrate critical thinking, problem solving skills and the ability to use chemical knowledge and mathematical skills to identify, evaluate, analyze, synthesize, and integrate data and abstract ideas in solving problems with the following objectives:

    a. Students should be able to describe the structure & composition of matter.

    b. Students should be able to solve qualitative & quantitative problems.

    c. Students should be able to apply theoretical and mechanistic principles to the study of chemical systems using quantitative and qualitative approaches.

    d. Students should be able to explain the role of energy in determining the structure and reactivity of matter.

    e. Students should be able to apply theoretical knowledge and chemical information to industry and everyday experience.

5. **GOAL 5:** Demonstrate the knowledge and skills in advanced instrumentation, applications, interpretation, and experimental design to address scientific queries in chemistry, industry, the environment, health, and related fields with the following objectives:

    a. Students should be able to use modern analytical instrumentations.

    b. Students should be able to interpret data and relate these to chemical structure and properties.

    c. Students should be able to relate the application of instrumentation to industries.

    d. Students should be able to develop an appreciation of the wide range of instrumental methods, their applications, and limitations.

6. **GOAL 6:** Demonstrate a sense of exploration and research approach that enables students to pursue lifelong learning in chemistry with the following objectives:

    a. Students will use chemical literature and computer resources to gather research information.

    b. Students should be able to critically evaluate scientific information.

    c. Students should be able to develop research project & design experimental approach.

7. **GOAL 7:** Demonstrate interaction skills and teamwork with the following objectives:

a. Students should be able to work cooperatively in problem solving exercise.

b. Students should be able to exercise leadership skills in teamwork.

c. Students should demonstrate adequate interpersonal communication skills.

UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION (SEE INSTRUCTOR):

(1) Semester/year:_____
(2) Course: CH 491 Seminar
(3) Class Meeting:_____
(4) Instructor:_____
(5) Office:_____
(6) Phone:_____
(7) Email:_____
(8) Fax Number:_____
(9) Office Hours:_____

2. CATALOG COURSE DESCRIPTION:

This is a course designed to familiarize the student with research or reviews and surveys of chemical literature. It may be taken more than once for credit with consent of program. Prerequisite: Upper division status and consent of program.

3. COURSE CONTENT:

Students will be taught the various techniques employed to search the chemical literature. Students will be given orientation to the UOG's chemistry acquisitions and journal collections. Students will be instructed on the techniques for making effective oral presentations.

4. RATIONALE FOR OFFERING COURSE:

To teach an important skill in the art of oral presentation that is vital to the functions of chemistry professional. This course will also help develop effective communication skill.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

Upper division status in chemistry and the ability to communicate concepts and techniques of chemistry as required.

6. LEARNING OBJECTIVES FOR STUDENTS (INTENDED STUDENT LEARNING OUTCOMES - SLOs):

Course SLOs:

7. Use the scientific publication databases to acquire *primary* journal article, e.g. Chemical Abstracts Indexes, Pub med and EBSCO.

1. To write a concise summary (with pertinent references) on specific topic in the chemical sciences.
2. Identify relevant audio, visual aids using standard computer software to accompany a presentation.
3. To deliver a clear and well organized presentation.
4. To deliver a presentation within the allotted time.
5. To review and summarize background and historical coverage to meet the needs of the audience.
6. Critically evaluate the topic, propose improvements, future work.
7. To adequately address questions from the audience in a non-defensive manner.
8. To correctly estimate the time required for each activity in the preparation of a chemistry seminar.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

Program SLOs[2]: See below.

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8. FORMAT AND ACTIVITIES IN THE COURSE (SEE INSTRUCTOR):

9. TEXTBOOK AND READINGS:

(See Instructor)

10. ADDITIONAL MATERIALS OR EQUIPMENT (SEE INSTRUCTOR):

11. ASSIGNMENTS, TERM PAPERS AND EXAMS (SEE INSTRUCTOR):

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