04-75-105 – SCIENTIFIC CULTURE

PART I: COURSE INFORMATION

College:	Technological Studies	**Department:**	Laboratory Technology
Course Title:	Scientific Culture	**Course Number:**	04-75-105
Prerequisites:	None	**Units / Hours:**	2 / 2

COURSE DESCRIPTION

The course will cover the history of science from a world prospective spanning a period from ancient times to the present. General areas covered will include the origins of science and its development and interaction with society. Specific topics will include, technology evolution and the nature of the scientists. The syllabus is subject to change over the course of the semester.

COURSE TEXTBOOK(S)

Library Reference Materials And Instructor Notes, NONE, (NONE).

RECOMMENDED TEXTS & OTHER READINGS

None.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Identify, describe, and use key concepts and disciplinary tools from the field of science and technology studies.
2. Learn how to research to write and produce a scientific article.
3. Learn how to reference research findings to avoid plagiarism.
4. Analyze and evaluate the social, cultural, and political dimensions of scientific, technological, and medical knowledge, and their uses in historical and contemporary contexts.
5. Critically assess technical, scientific, engineering, and medical knowledge.
6. Recognize and analyze how scientific, technological, engineering, and medical issues are framed in public and professional contexts.

College of Technological Studies - Kuwait
Department of Laboratory Technology

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Introduction to Library Research
2	Introduction to web search
3	Library visit.
4	How to write a scientific article.
5	Meeting (1) chose your subject
6	Meeting (2) supervision
7	Meeting (2) supervision
8	Meeting (3) reports discussion
9	Meeting (3) reports discussion
10	Meeting (4) Draft presentation
11	Meeting (4) Draft presentation
12	Submit the final report
13	Presentation, discussion and evaluation
14	Presentation, discussion and evaluation

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

04-75-110 – GENERAL CHEMISTRY

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	General Chemistry	Course Number:	04-75-110
Prerequisites:	None	Units / Hours:	3 / 4

COURSE DESCRIPTION

This course covers those chemical concepts most needed in most areas of science, emphasizes the basic principles of physical, inorganic, and organic chemistry. Topics include: atomic structure, the periodic table, chemical bonding, the states of matter, solutions, chemical equilibrium, oxidation and reduction, electrochemistry, introductory organic chemistry.

COURSE TEXTBOOK(S)

Fundamentals Of Chemistry. 5th Edition, David E. Goldberg, (McGraw-Hill).

RECOMMENDED TEXTS & OTHER READINGS

1. Principles of General Chemistry. 3rd Edition, By Martin Silberberg, ISBN10: 0073402699, ISBN13: 9780073402697, McGraw-Hill International Edition Copyright: 2013.
2. Zumdahl. Chemistry. 6th Edition, Houghton Mifflin, 2003, ISBN 10: 0618442286 / ISBN 13: 9780618442287.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Write formulae for ionic compounds and apply IUPAC rules to name compounds.
2. Perform mass calculations related to atoms and molecules
3. Employ stoichiometry to calculate solution concentrations in molarities and percentage by mass or volume
4. Be able to write formulas and name ionic compounds
5. Be able to write Lewis structures for simple molecules
6. Describe reactions using equations
7. Classify reactions and use equations for mass calculations in reactions.
8. Classify reactions as redox or non-redox and assign ON's to elements in formulas.

College of Technological Studies - Kuwait
Department of Laboratory Technology

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Fundamental concepts
2	Atomic structure and periodic law
3	Chemical bonding
4	Intermolecular and inter-atomic forces
5	First Mid-Term exam - Chemical composition formulas
6	Chemical composition formulas
7	Chemical equations
8	Chemical equations
9	Chemical equations
10	Stoichiometry - Concentration of solutions
11	Stoichiometry - Concentration of solutions
12	Stoichiometry - Concentration of solutions
13	Revision - Second Mid-Term exam
14	Second Mid-Term exam

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

04-75-112 – ANALYTICAL CHEMISTRY

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	Analytical Chemistry	Course Number:	04-75-112
Prerequisites:	04-75-110 General Chemistry 04-76-105 Math (1)	Units / Hours:	3 / 4

COURSE DESCRIPTION

This course covers the major methods of gravimetric and volumetric analysis used by analytical chemists. Topics include acid-base, complexometric, precipitation and redox titrations; elementary spectrophotometry. Theoretical and practical perspectives of chemical analysis are considered.

COURSE TEXTBOOK(S)

Fundamentals Of Analytical Chemistry, Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch, (0).

RECOMMENDED TEXTS & OTHER READINGS

Analytical Chemistry: Practice 1-, By: John H. Kennedy ,Published by Harcourt Brace College Publishers ISBN: 0030473594 .

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Treat and evaluate data and determine the types of errors.
2. Differentiate between the gravimetric and titrimetric analysis.
3. Select the proper method for determining the analysis

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Introduction :Analytical chemistry, classification of Quantitative Methods of analysis & steps in a Typical Quantitative analysis
2	Evaluation of Analytical Data: Definition of terms, Types of errors, The uses of statistics, The standard Deviation dealing with analytical data & Significant figures in analysis
3	Concentration expressions: Percent, PPm, PPb & Mole concept
4	Concentration expressions: Molarity, Normality, Formality & Activity coefficients
5	Gravimetric methods of analysis: Principles of Gravimetric analysis, Precipitation Gravimetry, Properties of precipitates and precipitating reagents, and filter ability of precipitates &Collo
6	Crystalline precipitates, Co precipitation, Drying and Ignition of precipitates, Calculation of results from gravimetric data & Applications of Gravimetric Analysis
7	Aqueous solution and Chemical Equilibria: The Equilibrium constant expressions, Applying the ion –product constant for water, Applying solubility-product constants, Applying Acid-Base dissociation constants & Buffer solutions
8	Principles of neutralization titrations: Solution and indicators for acid/base titrations, Titrating a strong acid with a strong base, Titration curves, The composition of solutions during acid/base titrations & Applications of Neutralization
9	Titration curves for complex acid/base systems: Polyfunctional acids and bases, The phosphoric acid system, The carbon dioxide carbonic acid system & Titration curves for polyfunction
10	Complex – Formation titrations: Types of complexes, Types of ligands, Stability of complexes, EDTA titration & Applications of EDTA titration
11	Precipitation titrations:Concepts of Precipitation titrations, Indicators for precipitation titrations & Application of the precipitation titration
12	Redox titrations: Introduction, Types of oxidizing agents & Types of reducing agent
13	Redox titrations: Applications of the redox titrations, Titration curves & Redox Indicators
14	Final Exam

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

04-75-121 – INORGANIC CHEMISTRY

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	Inorganic Chemistry	Course Number:	04-75-121
Prerequisites:	04-75-110 General Chemistry	Units / Hours:	3 / 4

COURSE DESCRIPTION

Theoretical:

Review of atomic theory/structure and periodic trends; models of structure and bonding, including the covalent bond (emphasizing the molecular orbital approach), ionic bond (ionic structures and defects and the metallic bond (conductors, semi-conductors, insulators, alloys); chemistry of the main group elements; introduction to transitions metal chemistry, structural distortions, color and electronic spectra of transition metal complexes.

COURSE TEXTBOOK(S)

Inorganic Chemistry., Raymond Chang, (McGraw-Hill International).

RECOMMENDED TEXTS & OTHER READINGS

Fundamentals of Chemistry, By: D.E.Goldberg, McGraw-Hill International, ISBN 0-07-110662-6.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Understand and apply the concepts of atomic structures and molecular bonding theories.
2. Differentiate between various acid/base classes and metals/nonmetals.
3. Discuss the nature & presentation of co-ordination complex compounds.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	1. Atomic Structure,chemical periodicity,and wave mechanics
2	Properties of elements: Ionization energy, electronegativity, affinity & atomic radii
3	Acids & bases: Arrhenius ,Bronsted-Lowry ,Lewis
4	Properties of strong/weak acids & bases, pH/pOH, oxyacids
5	Chemical bonding : ionic & covalent. Formal charge , oxidation number
6	Intermolecular forces: dipole-dipole, London forces, H- bonding
7	Bond theories: orbital hybridization, VSEPR theory, shapes of molecules
8	(Exam 1), Molecular orbital theory, energy level diagram
9	Chemistry & properties of representative elements: IA, IIA, IIIA, IVA, VA, VIA
10	Chemistry & properties of halogens and noble gases
11	(Exam 2), Chemistry of transition elements : properties and reactivity
12	(Exam 2), Chemistry of transition elements : properties and reactivity
13	Co-ordination chemistry
14	Ligand field theory- Sterioisomerism/ cis, trans

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

04-75-130 – ORGANIC CHEMISTRY

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	Organic Chemistry	Course Number:	04-75-130
Prerequisites:	04-75-110 General Chemistry	Units / Hours:	3 / 4

COURSE DESCRIPTION

This course covers the fundamentals of organic chemistry and includes nomenclature, structures, properties, functional groups, and basic reactions of the important classes of organic compounds. The principles of stereochemistry, reaction mechanisms and synthesis are presented.

COURSE TEXTBOOK(S)

Organic Chemistry A Brief Course, R. Atkins and F.A. Carey, (McGraw-Hill Science/Engineering/Math).

RECOMMENDED TEXTS & OTHER READINGS

1. Organic Chemistry, 8th Edition 8th Edition, by Francis A. Carey , Robert M. Giuliano, Publisher: McGraw-Hill Science/Engineering/Math; ISBN-13: 978-0077354770 , ISBN-10: 9780077354770.
2. Organic Chemistry, By: Christina A. Bailey, Philip S. Bailey, Publisher: Prentice Hall (1995), 5th Edition,ISBN-10: 0131246453, ISBN-13: 9780131246454.
3. Fundamentals of Organic Chemistry 6th Edition, By: John E. McMurry, Eric E. Simanek, Publisher: Brooks Cole; 6 edition (March 29, 2006,) ISBN-10: 9780495012030, ISBN-13: 978-0495012030.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Distinguish among the numerous classes of carbon compounds and to predict their properties and reactivity.
2. Name organic functional groups and organic compounds.
3. Understand nucleophilic substitution, elimination and radical reactions and their mechanisms.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Hybridization of Atomic Orbitals and the Geometry Shape of Molecules (Methane, Ammonia and Water molecules)
2	Alkanes: IUPAC rules for naming Alkanes, Physical and chemical properties of Alkanes , Synthesis of Alkanes, Isomerism of Alkanes, Free radical halogenation of Alkanes
3	Alkenes and Alkynes: IUPAC rules for naming Alkenes and Alkynes, Physical and chemical properties of Alkenes and Alkynes, Synthesis of Alkenes and Alkynes, Isomerism of Alkenes and Alkynes, Addition and elimination reactions of Alkenes and Alkyne
4	Alkenes and Alkynes: IUPAC rules for naming Alkenes and Alkynes, Physical and chemical properties of Alkenes and Alkynes, Synthesis of Alkenes and Alkynes,Isomerism of
5	First Mid-Term Exam
6	Aromatic Hydrocarbons:IUPAC rules for naming Benzenes, Aromaticity of Benzene, Chemistry of benzene. Electrophilic aromatic substitution:Effects of ortho-para and meta directing substituents on electrophilic aromatic substitution
7	Aromatic Hydrocarbons:IUPAC rules for naming Benzenes, Aromaticity of Benzene, Chemistry of benzene. Electrophilic aromatic substitution:Effects of ortho-para and meta directing substituents on electrophilic aromatic substitution
8	Alcohols, Phenols; IUPAC rules for naming Alcohol, Phenols , Physical and chemical properties of Alcohol, Phenols, Synthesis of Alcohol, Phenols & Reactions of Alcohol, Phenols.
9	Alcohols, Phenols; IUPAC rules for naming Alcohol, Phenols , Physical and chemical properties of Alcohol, Phenols, Synthesis of Alcohol, Phenols & Reactions of Alcohol, Phenols..
10	Aldehydes, Ketones: IUPAC rules for naming Aldehydes and Ketones, Synthesis of aldehydes and ketones, Nucleophilic addition reactions of Aldehydes and Ketones & Oxidation and Reduction of Aldehydes and Ketones
11	Aldehydes, Ketones: IUPAC rules for naming Aldehydes and Ketones, Synthesis of aldehydes and ketones, Nucleophilic addition reactions of Aldehydes and Ketones & Oxidation and Reduction of Aldehydes and Ketones
12	Second Mid-Term Exam
13	Carboxylic Acids and Ester: Properties, preparation and reactions of Carboxylic acids, Properties, preparation and reactions of Esters
14	Carboxylic Acids and Ester: Properties, preparation and reactions of Carboxylic acids, Properties, preparation and reactions of Esters

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

04-75-142 – BASIC CHEMISTRY

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	Basic Chemistry	Course Number:	04-75-142
Prerequisites:	None	Units / Hours:	3 / 4

COURSE DESCRIPTION

Theoretical:

This course covers those chemical concepts most needed in most areas of science, emphasizes the basic principles of physical and inorganic chemistry . Topics include: atomic structure, the periodic table, chemical bonding, the states of matter, solutions, chemical equilibrium, oxidation and reduction, electrochemistry.

COURSE TEXTBOOK(S)

Fundamentals Of Chemistry, David E. Goldberg, (McGraw-Hill).

RECOMMENDED TEXTS & OTHER READINGS

1. Principles of General Chemistry. 3rd Edition, By Martin Silberberg, ISBN10: 0073402699, ISBN13: 9780073402697, McGraw-Hill International Edition Copyright: 2013.
2. Zumdahl. Chemistry. 6th Edition, Houghton Mifflin, 2003, ISBN 10: 0618442286 / ISBN 13: 9780618442287.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Write formulae for ionic compounds and apply IUPAC rules to name compounds.
2. Perform mass calculations related to atoms and molecules.
3. Employ stoichiometry to calculate solution concentrations in molarities and percentage by mass or volume.
4. Be able to write formulas and name ionic compounds.
5. Be able to write Lewis structures for simple molecules.
6. Describe reactions using equations.
7. Classify reactions and use equations for mass calculations in reactions.
8. Classify reactions as redox or non-redox and assign ON's to elements in formulas.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Fundamental concepts
2	Atomic structure and periodic law
3	Chemical bonding
4	Intermolecular and inter-atomic forces
5	First Mid-Term exam - Chemical composition formulas
6	Chemical composition formulas
7	Chemical equations
8	Chemical equations
9	Chemical equations
10	Stoichiometry - Concentration of solutions
11	Stoichiometry - Concentration of solutions
12	Stoichiometry - Concentration of solutions
13	Revision - Second Mid-Term exam
14	Revision - Second Mid-Term exam

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

04-75-210 – INSTRUMENTAL ANALYSIS (1)

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	Instrumental Analysis (1)	Course Number:	04-75-210
Prerequisites:	04-75-112 Analytical Chemistry 04-30-102 Technical English	Units / Hours:	3 / 5

COURSE DESCRIPTION

Introduction of the basic principles of instrumentations and application of standard analytical methods including potentiometry, coulometer, polarography, conductometry, gas chromatography and high performance liquid chromatography.

COURSE TEXTBOOK(S)

Fundamentals Of Analytical Chemistry, Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch, (0).

RECOMMENDED TEXTS & OTHER READINGS

Principles of Instrumental Analysis 6th Edition, By: Douglas A. Skoog , F. James Holler , Stanley R. Crouch .

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Learn the basic concepts involved in voltaic and electrolytic cells.
2. Study the basic principles of potentiometric, coulometry, polarography and conductometry.
3. Learn the basic principles of chromatographic G.C. and HPLC.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Introduction to Electrochemistry: Characterizinc oxidation/reduction reactions & Electrochemical cells
2	Electrode potentials
3	Applications of standard electrode potentials: Calculating potentials of electrochemical cells, Determining standard potentials experimentally & Calculating redox equilibrium constants
4	Potentiometry: General principles, Reference electrodes & Liquid-junction potentials
5	Potentiometry: Indicator electrodes, Instruments for measuring cell potential, Direct potentiometry & Potentiometric titrations
6	Bulk Electrolysis, Electrogravimetry and Coulometry: Electrogravimetric methods, Coulometric methods, Determining the electrical charge, Characterizing coulometric methods & Coulometric titrations
7	Voltammety: Excitation signals, Voltammetric Instruments & Voltammetric Electrodes
8	Voltammety: Voltammograms & Voltammetric currents
9	Conductometry method: Conductometric titration
10	Chromatography: General description of chromatography, Classification of chromatographic methods & Elution in column chromatography
11	Chromatography:Migration Rates of solutes, Band broadening and column efficiency & Variables that affect column efficiency
12	Chromatography: Column resolution & Application of chromatography
13	Gas chromatography: Instruments for Gas-Liquid chromatography, Complete GC/MS instrument & Applications of Gas-Liquid chromatography
14	High-performance liquid chromatography: Instrumentation & Comparison of HPLC and GC

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

04-75-213 – INSTRUMENTAL ANALYSIS (2)

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	Instrumental Analysis (2)	Course Number:	04-75-213
Prerequisites:	04-75-112 Analytical Chemistry	Units / Hours:	3/ 5

COURSE DESCRIPTION

A continuation of 75-211 with the introduction and application of spectroscopic methods for the analysis of molecular structures of compounds using spectrophotometers (UV, VIS, IR). Atomic spectroscopy will be discussed in lecture.

COURSE TEXTBOOK(S)

Undergraduate Instrumental Analysis, James W. Robinson, (Marcel Dekker).

RECOMMENDED TEXTS & OTHER READINGS

1. Instrumental Analysis II Note,   PAAET, College of Technological studies, Department of laboratory technology.
2. Quantitative Chemical Analysis, By: Daniel C. Harris, WH Freeman & Co, ISBN 0716728818.
3. Introduction to Spectroscopy, By: Donald L. Pana, Gary M. Lampman, George s. kRIZ. ISBN 0030319617.
4. Instrumental Methods of Chemical Analysis, By: G. W. Ewing, 5th Edition, 1985.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Identify the types of radiation and its ranges.
2. Identify the compounds by their UV-Visible spectrum.
3. Identify the compounds from their IR spectra.
4. Explain the principles of atomic absorption.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Fundamentals of spectroscopy.
2	Fundamentals of spectroscopy.
3	Instrumentation.
4	Instrumentation.
5	Ultaviolet and visible spectrocsopy.
6	Ultaviolet and visible spectrocsopy.
7	Ultaviolet and visible spectrocsopy.
8	Infrared spectroscopy.
9	Infrared spectroscopy.
10	Infrared spectroscopy.
11	Infrared spectroscopy.
12	Atomic spectroscopy
13	Atomic absorption spectroscopy
14	Atomic absorption spectroscopy

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

College of Technological Studies - Kuwait
Department of Laboratory Technology

04-75-214 – SAMPLING

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	Sampling	Course Number:	04-75-214
Prerequisites:	None	Units / Hours:	1 / 2

COURSE DESCRIPTION

This course is concerned with different guideline techniques of sampling and sample preparations in field and laboratory.

COURSE TEXTBOOK(S)

Sampling And Sample Preparation In Field Laboratory, Pawliszyn, (Elsevier).

RECOMMENDED TEXTS & OTHER READINGS

None.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Prepare sample for chemical analysis
2. Purify chemical samples for analysis.
3. Study various ways and techniques of collecting, and preserving samples.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Fundamental of sampling: 1- Analysis of real samples. 2-Choice of analytical method. Accuracy in analysis of complex materials.
2	Practical aspect of sampling: 1- Preparing samples for analysis. Preparing laboratory samples.
3	Sampling and sample preparation for water and aqueous solution: 1- Preparing samples for analysis. Moisture in samples
4	Determining Iron in drinking water (UV-Visible spectra) , Determining nitric acid in rain water.
5	Determining sulfate in water (Gravimetric method)
6	Sampling and sample preparation for food stuff. Determining nitrite in meat (UV-Visible spectra)
7	Determining Manganese and Iron in food [Atomic Absorption Spectra (AAS)]
8	Determining Zinc in milk (AAS) Determining of Aluminum in chewing Gum (AAS)
9	Liquid-liquid extraction application. Separation of Cupper from metals in an alloy.
10	Solid phase extraction application. Determining OF Cadmium, Cupper, Lead, Nickel and Vanadium in Bolovive and fish muscles
11	Determining metals in fish livers by flamless atomic absorption spectroscopy
12	Extraction of organic from soil 1- Combustion methods for decomposing organic samples Microwave decompositions.
13	Decomposition of inorganic materials by fluxes.
14	Final Exam.

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

04-75-215 – ENVIRONMENTAL POLLUTION

PART I: COURSE INFORMATION

College:	Technological Studies	**Department:**	Laboratory Technology
Course Title:	Environmental Pollution	**Course Number:**	04-75-215
Prerequisites:	04-75-112 Analytical Chemistry	**Units / Hours:**	3 / 4

COURSE DESCRIPTION

Theoretical:

The subject matter of this course is sources, types, and effects of air and water pollutants. Students study air- and water-quality analyses and pollution control techniques. Laboratory exercises include measurement of particulates in air and chemical analysis of airborne and water pollutants.

COURSE TEXTBOOK(S)

Understanding Environmental Pollution, Marquita K. Hill, (Cambrigde).

RECOMMENDED TEXTS & OTHER READINGS

1. Understanding Our Environment- An Introduction to Environmental Chemistry and Pollution (1999) (3rd Edition), By: Harrison, R.M. , Royal Society of Chemistry, Great Britain, ISBN 0854045848
2. Environmental Chemistry, By: Peter O'Neill, London Unwin Hyman, ISBN 0-04-551085-7
3. Chemistry of the Environment, By: E.N. Ramsden, Stanley Thornes Ltd., ISBN 0 7487 24001
4. Environmental Pollution notebook (Theoretical),Prepared by Dr: Sohaila Al-Haider-2007, College of Technological Studies, Department of laboratory Technology,
5. Lab Text Book: Environmental Pollution notebook (Laboratory), Prepared by Dr: Sohaila Al-Haider-2007, College of Technological Studies, Department of laboratory Technology, Internet.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

A-   Theoretical outcome
1. Identify the sources and types of water, air, and land pollution.
2. Explore the environmental hazards problems faced around the world.
3. Determine the defection, chemical analysis and pollution control techniques for water, air and land.
4. Raise awareness of potential solutions to environmental problems within Kuwaiti society.

B-   Laboratory outcomes:
5. Determine the techniques of chemical analysis for water, air and land.
6. Explore the methods for measurement particulates in air.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Introduction and basic definitions about environmental pollution and pollutants.
2	Water Pollution: Types of water pollution.
3	Water Pollution: Problems solving.
4	Water Pollution: Causes of water pollution. (Part 1)
5	Water Pollution: Causes of water pollution. (Part 2)
6	Water Pollution: Dangers and prevention water pollution.
7	Water Pollution: Waste water treatment.
8	(Exam (1)). Air pollution: Introduction on atmospheric layers and on major air pollutants.
9	Air pollution: Air environmental hazards phenomena's.
10	Air pollution: Air pollution concentration units and problems solving.
11	Air pollution: Chemical analysis, emission control and air quality standards for air pollutants.
12	(Exam (2)). Land Pollution: Sources of land pollution.
13	Land Pollution: Landfill sites and recycling solid waste.
14	Land Pollution: Problems solving.

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

College of Technological Studies - Kuwait
Department of Laboratory Technology

04-75-219 – NUCLEAR AND RADIO CHEMISTRY

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	Nuclear And Radio Chemistry	Course Number:	04-75-219
Prerequisites:	04-75-110 General Chemistry, 04-56-113 General Physics	Units / Hours:	2 / 2

COURSE DESCRIPTION

The Atom and its Nucleus, Radioactive Decay, Nuclear Masses and Nuclear Stability, Nuclear Reactions; Interaction of Nuclear Radiation with Matter, Counters, Radiation Safety Precautions.

COURSE TEXTBOOK(S)

Essentials Of Nuclear Chemistry, Hari Jeevan Arnikar, (None).

RECOMMENDED TEXTS & OTHER READINGS

Principles of Nuclear Chemistry, By Peter A C McPherson (Belfast Metropolitan College, UK) . https://doi.org/10.1142/q0015 | February 2017 , ISBN: 978-1-78634-051-1 (softcover) GBP40.00 ISBN: 978-1-78634-053-5 (ebook) GBP32.00.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Identify and define various types of nuclear changes or processes including fission, fusion and decay reactions.
2. Use proper isotopic notation to write down and balance a nuclear reaction.
3. State and compare the differences and similarities between a nuclear change and a chemical change.
4. Recall and properly use Eintein's theory of relativity equation, $E = mc2$, to calculate the amount of energy released upon a nuclear change.
5. Define binding energy and mass defect and be able to calculate each for a given nucleus.
6. Understand and explain the concept of ionizing radiation and distinguish between the three different types of radiation.
7. Understand and explain the concept of isotopic stability including the band of stability.
8. Understand the concept of rate of change and half life in the context of nuclear decay.
9. Understand the basics of nuclear chemistry applications: nuclear power, medical treatment, isotopic labeling, and carbon dating.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Types of radioactive decay and their effect on the nucleus
2	Radioactive Decay : Definition, types of decay and formula
3	Radioactive Decay : Definition, types of decay and formula
4	Balancing nuclear equations & Predicting the product of a nuclear reaction.
5	Balancing nuclear equations & Predicting the product of a nuclear reaction.
6	First Mid-Term
7	Half-life : Calculating radioactive decay and interpreting Decay Graph
8	Half-life : Calculating radioactive decay and interpreting Decay Graph
9	Quiz, activity and discussion questions to help students grasp the concept of hal-lives
10	Mass-Energy conversion. Mass defect and nuclear binding energy
11	Second Mid-Term
12	Fusion, Fission,
13	Revision and nuclear chemistry application: Carbon Dating, medical tratment
14	Final Exam

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

04-75-231 – PHYSICAL CHEMISTRY

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	Physical Chemistry	Course Number:	04-75-231
Prerequisites:	04-75-110 General Chemistry	Units / Hours:	3 / 4

COURSE DESCRIPTION

Introduction to the physical chemistry of solids, liquids and gases; electrochemistry, chemical phase equilibrium, thermodynamics and kinetics; the application and importance of chemistry and technology in industry. Emphasizes the applications of topics associated with thermodynamics and phase equilibrium.

COURSE TEXTBOOK(S)

Introduction To Physical Chemistry, Arthur M. Lesk, (Prentice-Hall, Inc., Englewood Cliffs, N. J.).

RECOMMENDED TEXTS & OTHER READINGS

Elemental Chemical Thermodynamics, Bruce H. Mahan, W. A. Benjamin, Inc - ISBN 0-8-53-6801-9.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Concise, critical, comprehensive and systematic treatment of the fundamental aspects of classical physical chemistry.
2. Acquire basic skills in the determination of physical properties of substances
3. Have a basic understanding of how physical models explain chemical properties and reactivity.
4. Explain states of matter and how they depend on temperature and pressure as well as how they co- exist in phase equilibria.
5. Understand concepts in thermodynamics, different thermodynamic quantities such as heat and work and how they are measured, related or transformed from one to the other.
6. Sate chemical equilibrium and its relationship with thermodynamic quantities.
7. State chemical kinetics and how reaction rates are measured and represented in rate laws.
8. Gain a specialist knowledge in one or more of the following fields: quantum chemistry, spectroscopy, structural chemistry, and the dynamics and structure of macromolecular and colloidal structures.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	SI units, prefixes, base & derived units of energy, volume, temperature and pressure
2	Properties of gases
3	Gas laws: Boyle's, Charles', Dalton's, Gay-Lussac, Graham's & Van Der Waal's
4	Kinetic molecular energy
5	Properties of liquids: vapor pressure, viscosity & surface tension
6	Phase diagrams: heating & cooling curves
7	(Exam 1), Properties of solutions: types, solubility & concentration measurements
8	Colligative properties of solutions
9	First law of thermodynamics: Internal energy concept (enthalpy)
10	Second law of thermodynamics: Entropy concept
11	(Exam 2), Chemical kinetics: Rate laws of reaction & reaction order
12	Chemical kinetics: Factors affecting reaction rate
13	Chemical equilibrium: Equilibrium constants Ks & Kp
14	Chemical equilibrium: Factors affecting equilibrium constants

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

04-75-231 – PHYSICAL CHEMISTRY COURSE DESCRIPTION

04-75-252 – GLASS BLOWING

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	Glass Blowing	Course Number:	04-75-252
Prerequisites:	None	Units / Hours:	1/ 3

COURSE DESCRIPTION

A laboratory course in the manufacture, use and repair of scientific glassware. Six types of seals are constructed; a student-designed project is required.

COURSE TEXTBOOK(S)

Art Of Fire - Beginning Glassblowing Book, McKelvey, (Third Degree Press).

RECOMMENDED TEXTS & OTHER READINGS

Laboratory Scientific Glassblowing: A Practical Training Method Materials and Instructor Notes.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Will be able to identify all basic hand-tools and equipment in a glassblowing studio such as jacks, marver, bench, furnace, gloryhole, pipes, etc.
2. Will move about the studio in a safe and effective manner, i.e. personal safety requirements, holding pipes and punties, handling tools properly, gathering from a furnace, entering and exiting bench/gloryhole, working with an assistant, etc.
3. Through hands-on exercises, will gain a rudimentary understanding of the first steps in the glass-blowing process. Students will begin to develop glassblowing vernacular.
4. Analyze projects through critiques, oral presentations, and discussions.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Hot glass forming
2	Hot glass forming
3	Hot glass forming
4	Cold working techniques
5	Cold working techniques
6	Cold working techniques
7	Manipulating and combining materials
8	Manipulating and combining materials
9	Manipulating and combining materials
10	Manipulating and combining materials
11	Glass history
12	Glass history
13	Presentation sketches, 2D and 3D designs
14	Presentation sketches, 2D and 3D designs

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

04-75-270 – COMPUTER APPLICATION IN CHEMISTRY

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	Computer Application In Chemistry	Course Number:	04-75-270
Prerequisites:	04-75-110 General Chemistry, 04-75-130 Organic Chemistry	Units / Hours:	3 / 5

COURSE DESCRIPTION

Introduction to the language of BASIC, and the use of micro computing in chemistry. The topics included in the course are the Windows Operating System, numerical methods associated with chemical computations, and instruction in the use of PC-based applications programs. These applications consist of general utility (productivity) programs, chemical structure drawing programs, molecular viewing and molecular modeling programs and quantum chemistry programs. Also included in the course is an introduction to Combinatorial Chemistry and Bioinformatics.

COURSE TEXTBOOK(S)

Computers And Their Applications To Chemistry, Ramesh Kumari, (Narosa).

RECOMMENDED TEXTS & OTHER READINGS

None.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Elaborate computer applications in chemistry education
2. Use the computer to solve problems in Chemistry,
3. Attain an ability to software for the representation of molecular structures using specialized packages such as CHEMDRAW, SCIFINDER, …..
4. Attain an ability to apply design and development principles in the construction of software System of varying complexity
5. Describe chemical experiment
6. Discusses data and represent it using computer
7. Write a scientific report digitally

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Installation of software used during the course
2	-Reviewing software programs (Microsoft Word&Excel)
3	Reviewing software programs (PowerPoint & Teams)
4	Drawing chemical structures usingCHEMDRAW
5	Mid Term 1
6	Writing chemical equations
7	Writing a Scientific Report
8	Learning ASTM & other programs and applications
9	Learning ASTM & other programs and applications
10	Molecular Representation
11	Mid Term II
12	SCIFINDER
13	Internet research
14	Final Exam

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

04-75-272 – SAFETY IN CHEMICAL LABORATORIES

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	Safety In Chemical Laboratories	Course Number:	04-75-272
Prerequisites:	None	Units / Hours:	2 / 2

COURSE DESCRIPTION

This course serves as a comprehensive introduction to the field of environmental health science. How to recognize and counter laboratory hazards, including flammable, explosive, and toxic compounds. The course emphasis the roles and responsibilities of industrial chemists. Industrial hygiene and safety. Industrial chemical processes, their waste products, their environmental effects, and the treatment of pollutants.

COURSE TEXTBOOK(S)

Laboratory Safety For Chemistry Students, Prof. Robert H. Hill Jr., David C. Finster, (Wiley).

RECOMMENDED TEXTS & OTHER READINGS

Laboratory Saftey Handbook. By FENS Laboratory Saftey Team. First Edition 2016- (c) Sabenci University.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Follow safety instructions carefully.
2. Become familiar with safety equipment.
3. Have a good knowledge of emergency procedures.
4. Recognize hazards associated with chemicals.
5. Know the MSDS for every chemical he works with.
6. Responsible for safety in the Laboratory.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Introduction Safety Rules Responsibility for Safety
2	Safety Practices, Personal Protective Equipment and Facilities
3	Working Safely with Chemicals (Part 1)
4	Working Safely with Chemicals (Part 2)
5	MSDS and Labeling Systems
6	Types and Causes of accidents
7	Types and Causes of accidents
8	Mid Term I
9	Introduction to First Aids
10	Introduction to Fire Protection
11	Field Visit (Training)
12	General Practice and Chemicals Storage
13	General Practice and Chemicals Disposal
14	Final Exam

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

04-75-312 – APPLIED ANALYTICAL CHEMISTRY

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	Applied Analytical Chemistry	Course Number:	04-75-312
Prerequisites:	04-75-112 Analytical Chemistry	Units / Hours:	3/ 4

COURSE DESCRIPTION

An introduction to advanced techniques and instrumentation used in modern inorganic chemistry, materials science, physical and analytical chemistry. The emphasis will be on synthetic methods and spectroscopic techniques for structure determination and material characterization, and chemical process technology.

COURSE TEXTBOOK(S)

Quantitative Chemical Analysis, Daniel C. Harris, (WH Freeman & Co).

RECOMMENDED TEXTS & OTHER READINGS

Quantitative Analysis; Gravimetric, Volumetric and Instrumental, Larry Wilson Mohican Publishing, 2000, ISBN 0923231218.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Specifically understand the principles and applications of quantitative and qualitative analytical chemistry.
2. Describe and compare a range of analytical chemistry methods and explain the underlying theoretical principles.
3. Explain the broad role of chemists in quality control and assessment of experimental measurements and tasks. 4- Employ a variety of analytical and instrumental methods to prepare, separate and quantify samples from various matrices.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Introduction, basic review of analytical concepts, solutions and concentrations, stoichiometry.
2	Objectives of chemical sampling and samples preparation.
3	Experimental error and calibrations.
4	Acid-base equilibria (mono, di and polyprotic)
5	Exam 1, Volumetric/titrimetric analysis
6	Gravimetric methods of food, water and inorganic materials analysis.
7	Solubility, Ionic strength and activity coefficients
8	Buffers
9	Introduction to Electrochemistry.
10	Electrode potentials and electrochemical measurements.
11	Exam 2, Redox titrations and potentiometry.
12	Spectrophotometric Analysis of organic and inorganic materials.
13	Selected topic from field training course.
14	Review, catch-up and final exam.

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

404-75-315 – LITERATURE SURVEY & PROJECTS

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	Literature Survey & Projects	Course Number:	04-75-315
Prerequisites:	04-75-110 General Chemistry, 04-30-102 English Language (1)	Units / Hours:	3/ 4

COURSE DESCRIPTION

An individual research project that includes training in advanced laboratory skills, and the use of online searching techniques under the direction of a member of the faculty. Students are required to research and to communicate the results, utilizing the chemical literature, record keeping, writing reports and proposals and techniques of oral communication. Students are required to submit a written report. perform experiments including important applied chemistry procedures. Projects promote quantitative and interpretive skills as well as teamwork in a multidisciplinary environment.

COURSE TEXTBOOK(S)

Library Reference Materials, Instructor Notes And Electronic Database.

RECOMMENDED TEXTS & OTHER READINGS

Internet.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Access library materials using an online catalog and electronic databases.
2. Access and use information from a variety of sources and in various formats.
3. Develop and implement a research strategy.
4. Evaluate print and non-print sources.
5. Communicate an understanding of the information gathered.
6. Select a research topic and write an effective research statement.
7. Distinguish between popular and scholarly works.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Introduction to Library Research
2	How to find chemical information.
3	How to write a chemical scientific article.
4	Meeting (1) chose your subject.
5	Meeting (2) supervision
6	Library visit
7	Meeting (3) Show us your initial plane for your paper.
8	Mid Term I
9	Meeting (4) supervision
10	Meeting (5) supervision
11	Writing first draft
12	Writing first draft
13	Submit the final work
14	Final (Paper Presentation & Evaluation)

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

04-75-331 – APPLIED ORGANIC CHEMISTRY

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	Applied Organic Chemistry	Course Number:	04-75-331
Prerequisites:	04-75-130 Organic Chemistry	Units / Hours:	3 / 4

COURSE DESCRIPTION

Theoretical:
Introduction to spectroscopic characteristics or organic compounds; continued classification of 'reaction types' exhibited by organic molecules; chemistry of carbonyl compounds; 56ects of aromatic chemistry, heterocycles, nitrogen compounds, polymers, and biologically important molecules.

COURSE TEXTBOOK(S)

Organic Chemistry, Bruice, Paula Yurkanis, (prentice -HLI,Inc. Simon & Schuster/ A Viacom Company).

RECOMMENDED TEXTS & OTHER READINGS

Organic Chemistry , Christina A. Bailey, Philip S. Bailey.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Describe the stereochemical relationships between different carbonyl compounds.
2. Rationalize and predict reactions of aromatic heterocycles with electrophilic reagents.
3. Develop a basic understanding of the reaction mechanisms involved in polymer synthesis

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Introduction to structure and bonding
2	Major classes of organic reactions
3	Reactions of Alkyl Halides: Nucleophilic Substitutions and Eliminations
4	Reactions of Alkyl Halides: Nucleophilic Substitutions and Eliminations
5	Reactions of Alkyl Halides: Nucleophilic Substitutions and Eliminations
6	Chemistry of carbonyl compounds & Mid 1
7	Benzene and Aromaticity
8	Chemistry of Benzene: Electrophilic Aromatic Substitution reactions and mechanisms
9	Substituent Effects in electrophilic aromatic Substitution
10	Heterocycles
11	Heterocycles & Mid2
12	Polymer
13	Spectroscopic characteristics
14	Spectroscopic characteristics

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

04-75-333 – PETROL AND PETROCHEMISTRY

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	Petrol And Petrochemistry	Course Number:	04-75-333
Prerequisites:	04-75-130 Organic Chemistry	Units / Hours:	3 / 4

COURSE DESCRIPTION

Theoretical:Petroleum refining, catalytic and thermal petrochemical processes, soaps and detergents, specialty chemicals, are presented at the industrial level. Production of petrochemicals such as ethylene, methanol, and ammonia from natural gas. Catalytic and thermal processes for production of light petroleum products from heavier derivatives.Pre-requisite: 75-130.

COURSE TEXTBOOK(S)

Chemistry Of Petrochemical Processes, By Sami Matar, Lewis Frederic Hatch, (Gulf Professional Publishing)

RECOMMENDED TEXTS & OTHER READINGS

Handbook of Petroleum Refining Proces. By Robert A. Meyers, Meyers Robert. Published by Mcgraw-hill Professional Publishing. Sep. 2003.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Understanding the main chemical processes of the petrochemical and petroleum refining industry.
2. Gain a general knowledge about conversion of petrochemicals, synthesis of polymers, and catalysis reactions.
3. Familiar with the common safety and health hazards in the oil/petrochemical industry.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Introduction of petroleum chemistry
2	Composition of Petroleum
3	The Properties of Petroleum
4	Quality of Petroleum Products
5	Crude Oil Assay & Refinery Processing
6	Heavy Oil Chemistry
7	Mid Term I
8	Thermal Cracking
9	Catalytic Cracking
10	Hydrocracking
11	Catalytic Hydrotreating
12	Catalytic Reforming
13	Revision
14	Mid-Term II

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

04-75-399 – FIELD TRAINING

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	Field Training	Course Number:	04-75-399
Prerequisites:	04-75-213 Instrumental Analysis (2) 04-30-162 Writing Technical Report	Units / Hours:	4/ 16

COURSE DESCRIPTION

Theoretical:

The college offers a wide variety of undergraduate courses, and because these are taught in modules, students have a great deal of flexibility in choosing to study the different fields of Chemistry, which interest them most. As well as scientific content, the courses emphasize team-building, problem-solving and communication skills, and many recent successful graduates pursue careers in business and industry. Students receive individual support, and combined with good teaching, this produces a very high percentage of successful graduates.

COURSE TEXTBOOK(S)

Class Notes.

RECOMMENDED TEXTS & OTHER READINGS

None.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Practice on different advanced techniques.
2. Basic laboratory skills, especially in analytical techniques for product analysis
3. Math and statistical skills for complex experimental design and analysis
4. Teamwork and interpersonal skills, to work with large, interdisciplinary teams
5. Negotiating and the ability to balance competing needs of product quality, ease of production, and cost
6. Ability to analyze experimental results, draw conclusions, and propose logical next steps to reach corporate goals
7. Written and oral communication skills, including the ability to communicate clearly with other chemists and scientists, as well as non-scientists.
8. Ability to work in a fast-paced environment, and manage multiple, changing priorities simultaneously.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Training in the field & report writing
2	Training in the field & report writing
3	Training in the field & report writing
4	Training in the field & report writing
5	Training in the field & report writing
6	Training in the field & report writing
7	Training in the field & report writing
8	Training in the field & report writing
9	Training in the field & report writing
10	Training in the field & report writing
11	Training in the field & report writing
12	Training in the field & report writing
13	Presentation and discussion
14	Presentation and discussion

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

04-76-105 – MATHEMATICS (1)

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	Mathematics (1)	Course Number:	04-76-105
Prerequisites:	None	Units / Hours:	3 / 3

COURSE DESCRIPTION

This course prepares the students for the use of calculus. It emphasizes techniques of problem solving using algebraic concepts. The major topics include: fundamental concepts of algebra and analytic trigonometry; solving equations and inequalities; the graphs of basic functions of one variable and their inverses; solving systems of linear equations using Cramer's rule.

COURSE TEXTBOOK(S)

Precalculus, John W. Coburn, (McGraw-Hill).

RECOMMENDED TEXTS & OTHER READINGS

None.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Simplify expressions involving exponents and perform basic operations with radical expressions. Convert between radical and exponential forms.
2. Solve linear equations as well as absolute value equations. Find the solutions of the inequalities and write it in interval notation. Solve quadratic equations using the quadratic formula. Perform basic operations with polynomials and factor completely.
3. Use long division to divide polynomials and understand the Factor and Remainder theorems.
4. Analyze and interpret the behavior and characteristics of functions, including polynomial, exponential, logarithmic, trigonometric, inverse trigonometric.
5. Evaluate logarithms, simplify logarithmic expressions, and use the properties of logarithms to solve logarithmic equations.
6. Graph quadratic functions identifying the vertex, intercepts, axis of symmetry, and can use the graph for solving quadratic equations.
7. Understand the concept of a relation and a function and the meaning of their domain and range. Identify the algebra of functions, composite functions, and inverse functions.
8. Calculate the value of trigonometric functions and solve the triangles using the laws of sines and cosines.
9. Add and multiply matrices. Expand determinants and solve systems of linear Equations, Using Cramer's Rule.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Algebra - Real Numbers - Coordinate Lines - Exponents and Radicals
2	Polynomials and Algebraic Expressions - Manipulation of Algebraic Expressions - Complex Numbers
3	Linear Equations
4	Quadratic Equations
5	Linear Inequalities - Exam 1
6	Definition of functions - Graphs of Functions
7	Composite and Inverse Functions - Quadratic Functions
8	Exponential Functions - Logarithmic Functions
9	Fundamental Trigonometric Identities- Inverse Trigonometric Functions
10	Trigonometric Equations- Trigonometric Equations
11	The Law of Sines - The Law of Cosines
12	Systems of Linear Equations- Matrices
13	The Algebra of Matrices- Some Special Matrices- Determinants
14	Solving Systems of linear Equations, Using Cramer's Rule- Exam 2

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

College of Technological Studies - Kuwait
Department of Laboratory Technology

04-76-106 – MATHEMATICS (2)

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	Mathematics (2)	Course Number:	04-76-106
Prerequisites:	04-76-106 Mathematics (1)	Units / Hours:	3 / 3

COURSE DESCRIPTION

This course emphasizes the study of calculus with analytic geometry. It covers the following topics: three-dimensional coordinate systems, vectors, dot and cross products; limits and continuity; basic rules for differentiating functions; indefinite and definite integrals of functions; numerical integration. Applications include simple maximum and minimum problems, area between curves and work done by a force.

COURSE TEXTBOOK(S)

Technical Calculus With Analytic Geometry, by Peter Kuhfittig, (Brooks/Cole).

RECOMMENDED TEXTS & OTHER READINGS

None.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Knowledge of the analytical geometry in two and three dimensions and its applications.
2. Apply distance and midpoint formulas for solving geometric problems algebraically.
3. Evaluate the dot and cross product of two vectors, equation of lines in space and planes.
4. Recognize and graph equations of circles and can identify the center and radius of a circle given the standard equation or the general equation of a circle.
5. Compute the average rate of change of a function between two points. Perform limits by way of tables and graphs.
6. Evaluate limits algebraically by means of substitution, factoring. Determine the existence of limits at real numbers.
7. Use rules of limits to determine whether a function is continuous at a point.
8. Find the total derivatives of functions. Apply the chain rule to find derivatives of functions raised to a power, exponential functions, and logarithmic functions.
9. Identify maximum or minimum values of a function and find local extrema.
10. Write the equation of the tangent line at a given point. Solve applied problems involving derivatives.
11. Knowledge of basic rules and laws and integration properties.
12. Perform definite and indefinite integrals using techniques including change of variables, integration by parts, and the Integral Table.

13. Use integrals to formulate and solve application problems in science and engineering.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Three-Dimensional Coordinate Systems - Distance Formula and Segment Midpoint - Vectors
2	The Dot Product - The Cross Product
3	Lines and Half Planes - Circles and Ellipses - Plane Curves and Parametric Equations
4	Average Rate of Change - Instantaneous Rate of Change
5	The Concept of Limit - Limits of Functions - Properties of Limits - Computation of Limits
6	Limits Involving Infinity- Continuity -Exam1
7	The Derivative of a Function - Derivatives of Basic Functions
8	Rules of Differentiation - Implicit Differentiation
9	The Mean Value Theorem - Root Finding (Newton's Method)
10	Higher Order Derivatives- Minimum and Maximum Values of a Function
11	Antiderivatives (The Indefinite Integral)
12	Integrals of Basic Functions - Rules of Integration
13	The Definite Integral - The Fundamental Theorem of Calculus
14	Applications (Area between Curves, and Work Done by a Force) - Numerical Integration (Simpson's Rule) - Exam2

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

College of Technological Studies - Kuwait
Department of Laboratory Technology

04-76-151 – PRINCIPLES OF PROBABILITY AND STATISTICS

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	Principles Of Probability And Statistics	Course Number:	04-76-151
Prerequisites:	04-76-105 Mathematics (1)	Units / Hours:	2 / 2

COURSE DESCRIPTION

This course covers basic concepts of probability and descriptive statistics. Population, sampling, general frequency, measures of central tendency, and measures of dispersion are explored. Other topics covered include classical probability, empirical probability, probability distributions, Poisson approximation to the binomial distribution and normal approximation to the binomial distribution.

COURSE TEXTBOOK(S)

Introduction To Statistics, David Lane, Rice University, (David Lane).

RECOMMENDED TEXTS & OTHER READINGS

None.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Use graphical and numerical techniques to study patterns.
2. Interpret information from graphical and numerical displays.
3. Simulate probability distributions including binomial and geometric.
4. Simulate sampling distributions.
5. Use the normal probability distribution to solve problems.

College of Technological Studies - Kuwait
Department of Laboratory Technology

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Population - Sampling - General Frequency - Distributions.
2	Histograms - Polygons - Pie Charts
3	Frequency Curves - Cumulative Frequency Distributions
4	Measures of Central Tendency: Mean, Median and Mode
5	Measures of Dispersion: Variance and Standard Deviation
6	Review Problems and Exam 1
7	Events - Mutually Exclusive Events - Classical Probability
8	Empirical Probability
9	The Addition Law - Independent Events
10	Conditional Probability
11	Probability Distributions: Binomial - Poisson - Normal
12	Poisson Approximation to the Binomial Distribution
13	Normal Approximation to the Binomial Distribution
14	Review Problems and Exam 2

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			

College of Technological Studies - Kuwait
Department of Laboratory Technology

04-76-156 – ADVANCED MATHEMATICS

PART I: COURSE INFORMATION

College:	Technological Studies	Department:	Laboratory Technology
Course Title:	Advanced Mathematics	Course Number:	04-76-156
Prerequisites:	04-76-106 Mathematics (1)	Units / Hours:	3 / 3

COURSE DESCRIPTION

This course prepares the students for the use of calculus. It covers the following topics: complex algebra, power and roots of complex numbers, functions of several variables, partial differentiation, vectors operations and properties, solutions of differential equations, including homogenous differential equations and first order linear differential equations, second order linear homogenous differential equation, initial value and boundary value problem.

COURSE TEXTBOOK(S)

Calculus: Early Transcendentals, Eighth Edition, James Stewart, (Brooks/Cole).

RECOMMENDED TEXTS & OTHER READINGS

None.

PART II: COURSE OBJECTIVES

Upon completion of this course, the student should be able to do the following:

1. Perform the graphical representation of the complex numbers, Evaluate the powers and roots of complex numbers.
2. Recognize functions of several variables, Identify the partial differentiation of several variable functions.
3. Understand the concept of vectors, and vectors field, Perform vector operation.
4. Knowledge the definitions of differential equations, Evaluate the solution of differential equations using the separation of variables, calculate the solution of first-order differential equations.
5. use the general solution together with a pair of initial or boundary conditions to obtain, when possible, a particular solution of a linear constant-coefficient second-order differential equation.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Definition of complex numbers-Graphical representation
2	Polar form
3	Powers and roots of complex number
4	Review Problems and Exam 1
5	Functions of several variable-Partial derivatives
6	Increments and differentials
7	Vectors operations and properties
8	Vector Field
9	Definition and solution of differential equations
10	Separable differential equations-Homogenous differential equations
11	Exact differential equations-First order linear differential equations
12	Review Problems and Exam 2
13	Second Order Linear Homogenous Differential Equation
14	Initial Value and Boundary Value Problem

PART IV: GRADING

GRADING SCALE

Final grades in this course will be based on the following scale:

Final mark	Letter	Symbol	Final mark	Letter	Symbol
95-100	Distinction	A	90-94	Low Distinction	A-
87-89	High Very Good	B+	83-86	Very Good	B
80-82	Low Very Good	B-	75-79	High Good	C+
70-74	Good	C	66-96	Low Good	C-
63-65	High Satisfactory	D+	60-62	Low Satisfactory	D
0-59	Fail	F			