04-76-B101 – MATHEMATICS (1)

PART I: COURSE INFORMATION

College:	Technological Studies	**Department:**	Laboratory Technology
Course Title:	Mathematics (1)	**Course Number:**	04-76-B101
Prerequisites:	Pass Aptitude Test	**Units / Hours:**	3 / 3

COURSE DESCRIPTION

Elementary analytic geometry; functions of one variable, various types of functions, algebra of functions, limits of functions, continuity of functions; the definition of the derivative, techniques of differentiation, differentials, related rates; applications of differentiation, Newton's method, maximum and minimum values, curve sketching, optimization problems; anti-derivatives, indefinite integrals, the definite integral.

COURSE TEXTBOOK(S)

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

RECOMMENDED TEXTS & OTHER READINGS

Calculus, James Stewart, (Brooks/Cole).

PART II: COURSE OBJECTIVES

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

1. Parameterize curves, evaluate distances, identify and sketch basic conic sections, classify the quadratic equations.
2. Learn the general concepts of function and their different types: polynomials, rational, exponential, logarithmic and trigonometric functions and their applications in applied problems.
3. Learn the concepts of the derivative and its underlying concepts such as limits and continuity.
4. Learn how to calculate derivative for various types of functions using definition and rules.
5. Learn about various applications of the derivative in real world problems.
6. Learn about anti-derivative, the indefinite integral and the basic integration formulas.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Introduction to analytic geometry
2	Basic concepts of functions, limits and continuity
3	The definition of the derivative, derivative of polynomials, rate of change
4	Differentiation formulas; higher order derivatives
5	Implicit differentiation
6	Derivatives of trigonometric functions
7	Inverse trigonometric functions and their derivatives
8	Derivatives of exponential and logarithmic functions
9	L' Hospital's rule; Newton's method
10	The first-derivative test and the second derivative test; curves sketching
11	Related rates; linear approximations and differentials
12	Maximum and minimum values
13	Optimization problems
14	Antiderivatives, the definite and indefinite integrals (basic formulas)

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-B102 – MATHEMATICS (2)

PART I: COURSE INFORMATION

College:	Technological Studies	**Department:**	Laboratory Technology
Course Title:	Mathematics (2)	**Course Number:**	04-76-B102
Prerequisites:	04-76-B101 Mathematics (1)	**Units / Hours:**	3/ 3

COURSE DESCRIPTION

Definite integrals and the fundamental theorem of calculus, applications of definite integrals to find area and volume; techniques of integration, integration by parts, logarithmic and exponential functions, inverse trigonometric and hyperbolic functions; improper integrals; numerical integration; three dimensional spaces and partial derivatives, infinite series and applications.

COURSE TEXTBOOK(S)

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

RECOMMENDED TEXTS & OTHER READINGS

Calculus, James Stewart, (Brooks/Cole).

PART II: COURSE OBJECTIVES

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

1. Use the concepts of definite integrals to solve problems involving areas and volumes, and other applications.
2. Use substitution, integration by parts, trigonometric substitution, partial fractions, and tables of anti-derivatives to evaluate definite and indefinite integrals.
3. Define an improper integral and apply the concepts of limits, convergence, and divergence to evaluate some classes of improper integrals.
4. Learn the general concepts of functions of several variables and calculate partial derivatives and total derivative.
5. Use Taylor's and MacLaurin's series to represent functions and to integrate functions not integrable by conventional methods.
6. Use the concept of polar coordinates to find areas, lengths of curves.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	The area problem, the definite integral, the fundamental theorem of calculus
2	Area between curves
3	Improper integrals, numerical integration
4	Means and root mean squares
5	Volumes by disk and washer methods
6	Volumes by shell method
7	Integration techniques, the general power formula
8	Integration by substitution, integration by parts
9	Integration by trigonometric substitution
10	Integration of rational functions by partial fractions
11	The logarithmic and exponential forms
12	Three-dimensional space, partial derivatives
13	Infinite series, tests for convergence, power series
14	Taylor's and Maclaurin series, computation with series

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-B201 – APPLIED MATHEMATICS FOR ENGINEERS (1)

PART I: COURSE INFORMATION

College:	Technological Studies	**Department:**	Laboratory Technology
Course Title:	Applied Mathematics For Engineers (1)	**Course Number:**	04-76-B201
Prerequisites:	04-76-B102 Mathematics (2)	**Units / Hours:**	3 / 3

COURSE DESCRIPTION

Ordinary differential equations, definitions and terminology ; solution methods of first order ordinary differential equations; solution methods for second order ordinary differential equations with constant coefficients; the Laplace transform and its inverse; Solution of system of linear differential equations by Laplace transform; series solutions of ordinary differential equations with variable coefficients; use numerical methods to solve differential equations.

COURSE TEXTBOOK(S)

Elementary Differential Equations, E.D. Rainville, P.E. Bedient, R.E. Bedient, (Prentice Hall Inc.).

RECOMMENDED TEXTS & OTHER READINGS

1. Fundamentals of Differential equations , R.K.Nagle, E.B. Saff, A.D. Snider, Addison-Wesley.
2. Ordinary Differential Equations: With Applications, Bernard J. Rice, Jerry D. Strange.

PART II: COURSE OBJECTIVES

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

1. Classify differential equations by order, linearity, and homogeneity
2. Solve first order differential equation by direct integration and by separation of variables
3. Solve homogeneous 1st order equations and exact 1st order equations
4. Solve 1st order linear differential equations
5. Solve second order linear equations with constant coefficients using the auxiliary equation
6. Use the method of undetermined coefficients to solve 2nd order equations
7. Use power series to solve differential equations
8. Use Laplace transforms and their inverses to solve differential equations
9. Solve systems of linear differential equations using the Laplace transform
10. Use numerical methods to solve differential equations
11. model real-life applications using differential equations a model real-life applications using differential
12. equations and analyze problems in engineering including problems related to heating and cooling, electronic circuits,.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Basic concepts of ordinary differential equations; first order differential equations
2	Separable and homogeneous first order equations
3	Exact equations and linear first order differential equations
4	Initial value problems; applications of 1st order differential equations
5	Second-order equations with constant coefficients
6	Homogeneous 2nd order equations and auxiliary equations
7	Nonhomogeneous differential equations; the superposition principle
8	Initial and boundary value problems; applications of 2nd order differential equations
9	The Laplace transform; its basic properties
10	Inverse Laplace transform; partial fractions
11	Solution of linear equations by Laplace transform
12	Solving linear systems with Laplace
13	Series solution of 2nd order equations with variable coefficients
14	Use numerical methods to solve differential equations

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-B202 – APPLIED MATHEMATICS FOR ENGINEERS (2)

PART I: COURSE INFORMATION

College:	Technological Studies	**Department:**	Laboratory Technology
Course Title:	Applied Mathematics For Engineers (2)	**Course Number:**	04-76-B202
Prerequisites:	04-76-B201 Applied Mathematics For Engineers (1)	**Units / Hours:**	3 / 3

COURSE DESCRIPTION

This course contains topics selected from (1) linear algebra: Vector spaces, linear systems of equations, matrix operations and linear transformations, elementary row operation and reduced row echelon form, eigenvalues and eigenvectors and matrix diagonalization. (2) Complex variables: Arithmetic of complex numbers, complex functions, differentiability and integrability of functions, Cauchy formula and residue theorem. (3) Probability and statistics: the concept of probability and its properties, probability distributions, descriptive statistics and computation of statistical measure, linear regression and correlation.

COURSE TEXTBOOK(S)

Introductory Linear Algebra: An Applied First Course, B. Kolman, D. Hill, (Pearson)

RECOMMENDED TEXTS & OTHER READINGS

1. Applied Statistics and probability for engineers, D. Montgomery, G. Runger, Wiley.
2. A first course in complex analysis with applications, Dennis G. Zill, Patrick D. Shanahan, Jones and Bartlett Publishers, Inc.

PART II: COURSE OBJECTIVES

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

1. Solve systems of linear equations using multiple methods, including rref and matrix inversion.
2. Carry out matrix operations, including inverses and determinants.
3. Demonstrate understanding of the concepts of vector space, linear independence, span, and basis.
4. Determine eigenvalues and eigenvectors and solve eigenvalue problems.
5. Determine the inner and the cross products and angle between vectors, and some volumes in 3D.
6. Perform basic mathematical operations with complex numbers in Cartesian and polar forms;
7. Determine continuity/differentiability/analyticity of a function and find the derivative of a function.
8. Work with complex functions (polynomials, reciprocals, trigonometric, etc) of single complex variable.
9. Understand the basic concepts of probability and statistics and use the normal distribution curve to calculate appropriate areas.
10. Calculate and apply measures of location and measures of dispersion and calculate confidence interval for a population parameter for single sample.
11. Compute and interpret the results of Bivariate Regression and Correlation Analysis.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Vectors in the 2D and 3D-Space, the Dot and the Cross Product with applications
2	Matrices, special matrices, operation on matrices
3	Elementary row operations, reduced row echelon form (rref)
4	Solving homogeneous and nonhomogeneous systems of equations by rref
5	Matrix inverses, determinants and linear transformations
6	Eigenvalues and eigenvectors and diagonalization
7	Complex numbers, various representations and arithmetic operations
8	Complex functions: polynomials, exponential and trigonometric
9	Differentiability and the Cauchy-Riemann equations
10	The complex integration; the Cauchy's integral formula and the residue theorem
11	Introduction to probability; sample spaces and events; laws of probability
12	Random variables and probability distribution; the normal distribution
13	Presentation of statistical data, measures of central tendency (mean, median, mode and standard deviation)
14	Simple linear regression and correlation

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			

04-56-B105 – PHYSICS (1) LABORATORY

PART I: COURSE INFORMATION

College:	Technological Studies	**Department:**	Laboratory Technology
Course Title:	Physics (1) Laboratory	**Course Number:**	04-56-B105
Prerequisites: **Co-requisites:**	None 04-56-C101 Physics (1)	**Units / Hours:**	1 / 2

COURSE DESCRIPTION

Introduction to physics laboratory, experiments covering :fine measurements, Vernier caliper, micrometer, density of regular shapes, density of irregular shapes (Archimedes' principle), acceleration due to gravity (free fall setup), Newton's second law (air track), conservation of mechanical energy (air track), conservation law of momentum (air track), Hooke's law, acceleration due to gravity (simple pendulum), atmospheric and absolute pressure, force table, vectors analysis.

COURSE TEXTBOOK(S)

Physics Laboratory Experiments, Jerry D. Wilson, Cecilia A. Hernández-Hall, (Cengage Learning).

RECOMMENDED TEXTS & OTHER READINGS

Physics. Principles with Applications. Douglas C. Giancoli. Pearson Education Limited. 7th edition (2016).

PART II: COURSE OBJECTIVES

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

1. The student will be able to use Vernier caliper and micrometer to carry out fine measurements.
2. The student will learn how to determine the density of regular shapes.
3. The student will learn how to determine the density of irregular shapes (Archimedes' principle).
4. The student will be able to determine acceleration due to gravity using free fall setup.
5. The student will be able to use air track to verify Newton's second law
6. The student will be able to use air track to verify conservation law of mechanical energy.
7. The student will be able to use air track to verify conservation law of momentum.
8. The student will learn how to determine Hooke's constant.
9. The student will be able to use simple pendulum to determine acceleration due to gravity.
10. The student will be able to distinguish between atmospheric and absolute pressure.
11. The student will be able to resolve vectors and determine vectors resultant.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Introduction to physics laboratory
2	Fine measurements (Vernier caliper)
3	Fine measurements (micrometer)
4	Density of regular shapes
5	Archimedes' principle
6	Air track (Newton's second law)
7	Air track (conservation law of mechanical energy)
8	Air track (conservation law of momentum)
9	Conservation law of kinetic energy
10	Simple pendulum
11	Hooke's law
12	Atmospheric and absolute pressure
13	Force table
14	Vector analysis

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			

04-56-B151 – PHYSICS (2)

PART I: COURSE INFORMATION

College:	Technological Studies	**Department:**	Laboratory Technology
Course Title:	Physics (2)	**Course Number:**	04-56-B151
Prerequisites:	04-56-C101 Physics (1), 04-56-B105 Physics (1) Laboratory	**Units / Hours:**	3 / 3
Co-requisites:	04-56-B155 Physics (2) Laboratory		

COURSE DESCRIPTION

Electric Charge, insulators and conductors, electroscope, Coulombs law, the electric field, electric flux, Gauss's law, electric potential, potential difference, potential energy, capacitance and capacitors, electric current, Ohm's law, resistance, resistivity, resistors in series, resistors in parallel, combined electric circuits, electric power, Kirchhoff's laws, magnetic field, magnetic force on electrical charge, motion of a particle in magnetic field, magnetic force on wire carrying current, force between two parallel wires, Ampere's law, Biot-Savart law.

COURSE TEXTBOOK(S)

Physics: Principles With Applications, Douglas C. Giancoli, (Pearson Education Limited).

RECOMMENDED TEXTS & OTHER READINGS

Electricity and Magnetism. Purcell, Edward M.; Morin, David J (Cambridge University Press, 2013).

PART II: COURSE OBJECTIVES

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

1. The student will demonstrate a good understanding of electrostatic and electric current.
2. The student will demonstrate an ability to manipulate and solve for the electric force equation and its application.
3. The student will demonstrate an ability to apply Coulomb's law and Gauss's law including their different applications
4. The student will demonstrate a good understanding of the concept of electric potential difference and potential energy.
5. The student will be able to understand the electric current, Ohm's law, and Kirchhoff's law.
6. The student will distinguish between resistors in series and parallel and be able to analyze combined circuits.
7. The student will distinguish between resistors and capacitors in electrical circuits.
8. The student will learn the basics of magnetism
9. The student will understand the magnetic force on charge as well as on wire carrying current.
10. The student will be able to apply Ampere's law and Biot-Savart law including their applications.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Electric Charge- Insulators and Conductors
2	Coulomb's Law
3	Electric Field
4	Gauss's law
5	Electric Potential
6	Capacitance and Capacitors
7	Electric Current & Ohm's Law
8	Kirchhoff's Laws
9	Electric Energy
10	Combined Circuits (Series and Parallel Connections)
11	Magnets and Magnetic Field
12	Magnetic Force
13	Ampere's law
14	Biot-Savart law

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			

04-56-B155 – PHYSICS (2) LABORATORY

PART I: COURSE INFORMATION

College:	Technological Studies	**Department:**	Laboratory Technology
Course Title:	Physics (2) Laboratory	**Course Number:**	04-56-B155
Prerequisites:	04-56-C101 Physics (1) , 04-56-B105 Physics (1) Laboratory	**Units / Hours:**	1 / 2
Co-requisites:	04-56-B151 Physics (2)		

COURSE DESCRIPTION

Electric Charge, Coulomb's law, definition of electric field, electric field intensity, electric field variation with distance, electric field variation with electric potential, capacitance of a capacitor, capacitors in series, capacitors in parallel, spherical capacitor, parallel plate capacitor, dielectric constant of different materials, resistance of a conductor, Ohm's law, series resistances connections, parallel resistances connections, equivalent resistance of a combined circuit, magnetic field, magnetic field intensity, magnetic force on a charged particle, magnetic force on a wire currying current, Biot–Savart Law, Force Between parallel wires carrying current, magnetic field of a solenoid, magnetic field of a toroid.

COURSE TEXTBOOK(S)

Practical Physics (Electricity, Magnetism And Electronics), Anchal Srivastava & R. K. Shukla, (NEW AGE INTERNATIONAL (P) LIMITED).

RECOMMENDED TEXTS & OTHER READINGS

None.

PART II: COURSE OBJECTIVES

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

1. Distinguish between conductors, insulators, semiconductors, and superconductors.
2. Identify that Coulomb's law applied to particles and objects.
3. Explain how to measure the electric field at any given point around the charged conducting sphere.
4. How to measure the capacitance of a spherical conductor.
5. Determine the capacitance of parallel plate capacitor.
6. measure the Dielectric constant using parallel plate capacitor.
7. Verifying Ohm's law for a conductor.
8. Applying Ohm's law for series, parallel and combination of resistances.
9. Measure the magnetic field strength of different current loops.
10. Verify the Biot–Savart law of the magnetic field in a wire.
11. Measure the strength and the distribution of the magnetic field in a solenoid.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Introduction to electricity & magnetism laboratory
2	Coulomb's field of spherical conductor (non-uniform field).
3	Law distance of Coulomb field of metal sphere
4	Variation of electric field of parallel plate capacitor with distance
5	Variation of electric field of parallel plate capacitor with electric potential
6	Dielectric constant for different materials.
7	Capacitance of metal spheres and of a spherical capacitor
8	Capacitance of parallel plate capacitor
9	Ohm's Law
10	Unknown Resistance in combination of series & parallel resistors
11	Biot-Savart' law for magnetic field strength for different number of turns
12	Biot - Savart' law for magnetic field strength for different loop size
13	Magnetic field of a solenoid
14	Magnetic field of a toroid

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			

04-56-C101 – PHYSICS (1)

PART I: COURSE INFORMATION

College:	Technological Studies	**Department:**	Laboratory Technology
Course Title:	Physics (1)	**Course Number:**	04-56-C101
Prerequisites: **Co-requisites:**	None 04-56-B105 Physics (1) Laboratory	**Units / Hours:**	3 / 3

COURSE DESCRIPTION

Units and dimensions, vectors, kinematics in one dimension, free fall, kinematics in two dimensions, the projectile motion, Newtons laws of motion, applications on Newtons laws, the motion in an inclined plane, work and energy, conservation of mechanical energy, mechanical properties of matter, the elastic modulus, linear momentum, the center of mass, the rotational motion, moment of inertia, hydrostatics, pressure, The buoyant force and Archimedes principle, hydrodynamics, the flew rate and continuity equation, Bernoulli equation.

COURSE TEXTBOOK(S)

Physics: Principles With Applications, Douglas C. Giancoli, (Pearson Education Limited).

RECOMMENDED TEXTS & OTHER READINGS

Physics for Scientists and Engineers. Raymond A. Serway, John W. Jewett. Brooks Cole.

PART II: COURSE OBJECTIVES

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

1. The student will be able to understand the concept of units and dimensions and solve problems for this section.
2. The student will demonstrate graphically the resultant of two vectors.
3. The student will be able to distinguish between the kinematics in one dimension and the rotational motion.
4. The student will be able to understand the concept of work and energy.
5. The student will be able to distinguish between the hydrostatics and hydrodynamics.
6. The student will be able to calculate and solve problems of different subjects.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Units and dimensions
2	Vectors
3	Kinematics in one dimension, free fall
4	Kinematics in two dimensions, the projectile motion
5	Newtons laws of motion, applications on Newtons laws
6	Motion in an inclined plane
7	Work and energy, Conservation of mechanical energy
8	Mechanical properties of matter
9	Elastic modulus
10	Linear momentum, the center of mass
11	Rotational motion, moment of inertia
12	Hydrostatics, pressure
13	Buoyant force and Archimedes principle
14	Hydrodynamics, the flew rate and continuity equation, Bernoulli equation

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-B105 – GENERAL CHEMISTRY LAB

PART I: COURSE INFORMATION

College:	Technological Studies	**Department:**	Laboratory Technology
Course Title:	General Chemistry Lab	**Course Number:**	04-75-B105
Co-requisites:	04-75-C101 General Chemistry	**Units / Hours:**	1/2

COURSE DESCRIPTION

The first week will serve the purpose to induce the formation of groups and to assure that students attain the basic laboratory techniques necessary to successfully complete the series of experiments that follow after the first week of the semester. This series of experiments will review concepts in preparation of solutions, acid base titration, redox titration, reactivity, mechanism of reaction and experimental techniques to predict the empirical formula, limiting reagent and water of hydration.

COURSE TEXTBOOK(S)

Principles Of General Chemistry, Martin Silberberg, (McGraw-Hill International).

RECOMMENDED TEXTS & OTHER READINGS

None.

PART II: COURSE OBJECTIVES

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

1. Students gain a thorough experience with fundamental laboratory skills. These skills include learning how to weigh samples, use volumetric glassware, prepare solutions, and perform dilutions.
2. Employ appropriate and safe laboratory techniques to perform experiments, in collaboration with lab partners.
3. Employ volumetric techniques to prepare and standardize volumetric solutions.
4. Investigate and understand how conservation of energy and matter is expressed in chemical formulas and balanced equations.
5. Investigate and understand that quantities in a chemical reaction are based on molar relationships.
6. Familiar with finding evidence of chemical change (color change, precipitate formation, temperature change, gas evolution, etc.)
7. Report the results of the laboratory experiments both on report sheets and in a laboratory notebook, performing quantitative calculations, and interpreting the results.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Introduction to course, lab safety.
2	Factors affecting the rate of a reaction a) Concentration b) Temperature
3	Factors affecting the rate of a reaction a) Concentration b) Temperature
4	Preparation of Standard solutions
5	Standardization of a solution using a primary standard
6	Determination of concentration by acid-base titration, including a weak acid or weak base
7	Determination of concentration by acid-base titration, including a weak acid or weak base
8	Determination of concentration by oxidation-reduction titration
9	Determination of the percentage of water in a hydrate
10	Determination of rate of reaction of Magnesium with dilute hydrochloric acid
11	Type of reactions: single and double replacement reaction
12	Empirical formula experiment
13	Limiting Reagent experiment
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-B152 – LAB OF ORGANIC CHEMISTRY

PART I: COURSE INFORMATION

College:	Technological Studies	**Department:**	Laboratory Technology
Course Title:	Lab of Organic Chemistry	**Course Number:**	04-75-B152
Prerequisites:	04-75-C101 General Chemistry, 04-75-B105 General Chemistry Lab	**Units / Hours:**	1/ 2
Corequisite:	04-75-C151 Organic Chemistry		

COURSE DESCRIPTION

This practical course provides laboratory experiments investigate the principles of Organic Chemistry including purification methods and identification techniques.

COURSE TEXTBOOK(S)

Experimental Organic Chemistry: A Miniscale And Microscale Approach, Robert C. Atkins, Francis A Carey, (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. Purify and separate organic samples.
2. Identify different classes of organic compounds.
3. Identify the presence of various functional groups.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Introduction of safety precautions and purification techniques.
2	Introduction of safety precautions and purification techniques.
3	Experiment 1: Melting point measurement.
4	Experiment 2: Recrystallization Technique
5	Experiment 3: Distillation Technique
6	Experiment 4: Extraction Technique
7	Mid-term exam
8	Experiment 5: Identification of Hydrocarbons
9	Experiment 6: Identification of alcohols and phenols
10	Experiment 6: Identification of alcohols and phenols
11	Experiment 7: Identification of Aldehydes and Ketones
12	Experiment 8: Identification of Acids and Esters
13	Experiment 9: Identification of Amines and Amides
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-B241 – ANALYTICAL CHEMISTRY

PART I: COURSE INFORMATION

College:	Technological Studies	**Department:**	Laboratory Technology
Course Title:	Analytical Chemistry	**Course Number:**	04-75-B241
Prerequisites: **Corequisite:**	04-75-C101 General Chemistry 04-75-B242 Analytical Chemistry Lab	**Units / Hours:**	3 /3

COURSE DESCRIPTION

Chemical equilibrium; gravimetric analysis; titration; electrochemistry; spectroscopy and separations; instrumental methods of chemical analysis; evaluation of analytical data.

COURSE TEXTBOOK(S)

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

RECOMMENDED TEXTS & OTHER READINGS

1. Quantitative Analysis 6th edition. By Underwood. ISBN-13: 978-0137471553, ISBN-10: 0137471556.
2. Quantitative Analysis: Gravimetric, Volumetric & Instrumental. By: Larry Wilson, Mohicon Publishing, 2000. ISBN: 0923231218.

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. understand the underlying theoretical basis of analytical techniques including titration and gravimetric analysis, equilibrium solubility and electro analysis;
3. be able to select the appropriate analytical methods to evaluate a sample;
4. critically evaluate data from a variety of analytical chemistry techniques and apply knowledge of the statistical analysis of data;
5. have developed the skills required to work as a member of a group;
6. be aware of current developments in the field of analytical chemistry.

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Introduction of Analytical chemistry classification of Quantitative Methods of analysis steps in a Typical Quantitative analysis Evaluation of Analytical Data Definition of terms Types of errors Concentration expressions
2	Concentration expressions Molarity, Normality, Formality, Activity coefficients Practice exercises on concentration
3	Gravimetric methods of analysis Principles of Gravimetric analysis Precipitation Gravimetry, Properties of precipitates and precipitating reagents Drying and Ignition of precipitates Practice exercises on Gravimetric Analysis Practice exercises on Gravim
4	Principles of neutralization titrations Solution and indicators for acid/base titrations Titrating a strong acid with a strong base The composition of solutions during acid/base titrations, titration curves Practice exercises on Neutralization titrations
5	Titration curves for complex acid/base systems Titration Curve of Polyfunctional acids and bases Practice exercises on Gravimetric and titrimetric; Mid Term I
6	Complex – Formation titrations Types of complexes EDTA titration Practice exercises on EDTA titration , Precipitation titrations
7	Redox titrations Types of oxidizing agents and reducing agent Titration curves, Redox Indicators Practice exercises on Redox titration
8	Aqueous Solution and chemical equilibria , Appling the ion-product constant for water , Applying solubility-product constants, Applying Acid-Base dissociation constants
9	Solubility Product Constants, Ksp expressions: Calculating Molar Solubility Given the Ksp Calculating Ksp's from solubility data Calculating the solubility of an ionic compound in pure water from its Ksp Calculating the solubility product given the mo
10	Calculating the solubility of an ionic compound in a solution that contains a common ion Determination whether a precipitate will or will not form when two solutions are combined; Mid Term II
11	Electrolysis : Amps, Time, Coulombs, Faradays, and Moles of Electrons Laws of Electrolysis, Uses of Electrolysis Practice exercises on : Electrolysis
12	Instrumental methods General principles of spectrometers. Analytical application of visible absorption spectroscopy Application on Instrumental methods.
13	Revision
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-B242 – ANALYTICAL CHEMISTRY LABORATORY

PART I: COURSE INFORMATION

College:	Technological Studies	**Department:**	Laboratory Technology
Course Title:	Analytical Chemistry Laboratory	**Course Number:**	04-75-B242
Prerequisites: **Corequisite:**	04-75-C101 General Chemistry 04-75-B241 Analytical Chemistry	**Units / Hours:**	1 / 2

COURSE DESCRIPTION

Laboratory experiments investigates the principles of analytical chemistry.

COURSE TEXTBOOK(S)

Analytical Chemistry: A Chemist And Laboratory Technician's Toolkit 1st Edition, Bryan M. Ham , Aihui MaHam, (Wiley).

RECOMMENDED TEXTS & OTHER READINGS

Analytical Chemistry: Practice. 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. understand the proper use of analytical glassware and associated lab equipment,
2. use statistics to analyze experimental data,
3. understand the chemical principles behind various analytical methods including gravimetric analysis, titrations (acid-base, precipitation, redox and complexometric), electrochemistry.
4. understand the basic principles .

PART III: OUTLINE OF TOPICS AND SEQUENCE

Week #	Topic
1	Gravimetry Analysis: Gravimetric Analysis of a Metal Carbonate Gravimetric Analysis of Chloride
2	Gravimetry Analysis: Determination of Sulfate in a Soluble Sample Determination of Nickel in a Soluble Sample
3	Titrimetric Analysis: Neutralization Titrations – Preparation and Standardization of HCl and NaOH Analysis of Weak Acids - Selection of Proper Indicator(s) –
4	Titrimetric Analysis: Analysis of Mixtures of Weak and Strong Acids – Determination of Acetic Acid in Commercial Vinegar
5	Acid-Base Titration: Determination of NaOH, NaHCO3 and Na2CO3 alone
6	Mid Term
7	Precipitation Titrations: Determination of Chloride by Mohr Method
8	Precipitation Titrations: Analysis of chloride mixtures (MgCl2 and NaCl mixture)
9	Precipitation Titrations: Determination of Chloride by Fajans Method
10	Oxidation-Reduction Titrations (Permanganometry): Preparation and Standardization of KMnO4 – Determination of Iron
11	Complexometric titration: Titration of Zn(II) with EDTA Determination of Magnesium by Direct Titration
12	Back Titration: Determination of Calcium in egg shell by Displacement Titration
13	Solubility product: Determination of solubility product constant
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-C101 – GENERAL CHEMISTRY

PART I: COURSE INFORMATION

College:	Technological Studies	**Department:**	Laboratory Technology
Course Title:	General Chemistry	**Course Number:**	04-75-C101
Prerequisites: **Co-requisites:**	None 04-75-B105 General Chemistry Laboratory	**Units / Hours:**	3 / 3

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, David E. Goldberg, (McGraw-Hill International).

RECOMMENDED TEXTS & OTHER READINGS

None.

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
6	Chemical composition formulas
7	Chemical equations
8	Chemical equations
9	Stoichiometry
10	Concentration of solutions
11	electrochemistry
12	introduction to organic chemistry
13	Revision
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-C151 – ORGANIC CHEMISTRY

PART I: COURSE INFORMATION

College:	Technological Studies	**Department:**	Laboratory Technology
Course Title:	Organic Chemistry	**Course Number:**	04-75-C151
Prerequisites:	04-75-C101 General Chemistry,	**Units / Hours:**	3 /3
Corequisite:	04-75-B152 Organic Chemistry Lab		

COURSE DESCRIPTION

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

None.

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 Alkenes and Alkynes & Addition and elimination reactions of Alkenes and Alkyne
5	First Mid-Term Exam
6	Aromatic Hydrocarbons : IUPAC rules for naming Benzenes & Aromaticity of Benzene
7	Aromatic Hydrocarbons · IUPAC rules for naming Benzenes & Aromaticity of Benzene
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 Esters: Properties, preparation and reactions of Carboxylic acids, Properties, preparation and reactions of Esters
14	Carboxylic Acids and Esters: 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			