LINCOLN
AMERICAN UNIVERSITY
SCHOOL OF MEDICINE

SHARDA
UNIVERSITY
Beyond Boundaries

PRE-MEDICAL PROGRAM
CURRICULUM

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TABLE OF CONTENTS

1.0 INTRODUCTION TO GENERAL CHEMISTRY

1.1 Course Description

This course is the first semester of two-semesters of chemistry, standard first-year college chemistry course. It introduces the fields of physical, analytical, inorganic, and organic chemistry. Topics to be discussed include atomic structure, chemical bonding, common types of reactions, stoichiometry, thermochemistry, and the properties of gases, liquids, and solids.

1.2 Course Objectives

Upon completion of this course, the student will be able to:

Sl. No.	Course Accomplishments
1	Write balanced chemical equations, including net ionic equations.
2	Apply dimensional analysis and demonstrate a working knowledge of metric units including those for mass (g), length (m), area (m2), volume (L & m3), energy (J), quantity (moles) and concentration (M) as well as metric prefixes and abbreviations such as kilo, micro, nano, etc.
3	Describe basic separation techniques such as filtration, chromatography, and distillation.

Sl. No.	Course Accomplishments
4	Describe the quantum mechanical model of the atom and perform calculations using the Bohr model.
5	Write electronic configurations for the various elements.
6	Describe the regions of the electromagnetic spectrum such as IR, UV, etc.
7	Use both the IUPAC and common names (Stock Notation) to write the names of inorganic compounds, given their formula. Also, students should be able to write the correct formula of a compound, given its name.
8	Identify common organic functional groups and apply basic IUPAC rules of organic nomenclature.
9	Calculate enthalpies of reaction from bond energies, from standard heats of formation, and calorimetric data.
10	Demonstrate a basic understanding of the first law of thermodynamics, state functions, and fundamental definitions such as "system," "state," "surroundings," etc.

1.3 Methods of Instruction

Lab, Lectures, and Discussion.

1.4 Course Content

Week	Topics for Study
1	• Units of measurement, significant figures, and dimensional analysis. • Atomic structure and the periodic table.
2	Naming ionic compounds, acids and bases, and simple covalent compounds.
3	Stoichiometry.
4	Reactions in aqueous solution and introduction to oxidation-reduction reactions.
5	The behavior of gases.
6	Revision and Midterm Examination.
7	Thermochemistry.
8	Electronic structure of atoms and periodicity.
9	Ionic bonding and ionic compounds.
10	Covalent bonding, molecules, and molecular shapes.
11	Molecular orbital theory and Valence Bond theory.

Week	Topics for Study
12	Intermolecular forces and properties of liquids and solids.
13	Introduction to organic chemistry.
14	Revision and Examination.

1.5 Textbooks

Sl. No.	Textbook
1	Chemistry, 9th, Zumdahl&Zumdahl, Houghton Mifflin © 2014, ISBN: 978-1-13361109-7.
2	Chemistry: A Molecular Approach, 2nd edition, Tro, Prentice hall © 2011, ISBN: 0-3216517.
3	Chemistry, 4th edition, Jones & Atkins, W.H. Freeman © 2000, ISBN: 0-716-73595-4.
4	General Chemistry, fourth, McQuarrie, D.A., Rock, P.A., Gallogly, E.B., University Science Books © 2011, ISBN: 978-1-891389.

2.0 ORGANIC CHEMISTRY

2.1 Course Description

This course is a systematic introduction to the chemistry of carbon compounds. It encompasses theory and reactions of hydrocarbons and functional group derivatives. Included are bonding and structure, nomenclature, stereochemistry, synthesis, mechanism, and spectroscopic analysis. The laboratory work focuses on techniques of synthesis, isolation, purification, and analysis.

2.2 Course Objectives

Upon completion of this course, the student will be able to:

Sl. No.	Course Accomplishments
1	Name, and draw structures from names, compounds of the following functional groups: alkanes, alkenes, alkynes, halides, alcohols, ethers, amines, and compounds containing more than one of these functional groups using IUPAC rules.
2	Draw Lewis structural formulas, Kekule structural formulas, skeletal structural formulas, perspective structural formulas, Newman projection formulas, and Fisher projection formulas for organic compounds.

Sl. No.	Course Accomplishments
3	Identify relationships among structures that are constitutional isomers, stereoisomers, and/ or conformational isomers.
4	Evaluate the relative stabilities of various conformations of cyclic and acyclic organic molecules.
5	Recognize the presence of chiral features in molecules and evaluate optical activity. Designate the relative configuration of a stereocenter as R or S.
6	Identify cis and trans isomers. Designate the configuration of a double bond as E or Z.
7	Compare the physical properties of compounds listed in number 1.
8	Predict the products of reactions of compounds belonging to the various functional groups described in this course (see course content).
9	Write the mechanisms for the reactions in the above objective.
10	Deduce reaction mechanisms from experimental evidence.
11	Use curved arrow notation to show electron movement in the steps of a reaction mechanism.

2.3 Methods of Instruction

Lab, Lectures, and Discussion.

2.4 Course Content

Week	Topics for Study
1	Review of Pertinent Chemistry Topics—Bonding, Molecular Structure, Kinetics, Equilibrium, and Acid-Base Chemistry.
2	Introduction to Organic Compounds—Functional Groups, Nomenclature, Reaction Concepts.
3 & 4	Alkenes and Their Reactions.
5	Stereochemistry.
6 & 7	Spectroscopy—Infrared Spectroscopy, Mass Spectrometry, Nuclear Magnetic Resonance Spectroscopy, Ultraviolet-Visible Spectroscopy.
8	Review Midterm Examination.
9 & 10	Electron Delocalization and Resonance.
11	Reactions of Dienes.

Week	Topics for Study
12	Aromaticity.
13	Nucleophilic Substitution and Elimination Reactions, of Alkyl Halides.
14	Revision and Examination.

2.5 Textbooks

Sl. No.	Textbook
1	Organic Chemistry, 2nd, Klein, D, Wiley © 2014.
2	Organic Chemistry, 7th, Bruice, P.Y., Pearson Education, Inc © 2014, ISBN: 1269-40677-9.
3	Techniques in Organic Chemistry, 3rd, Mohrig, Hammond, and Schatz, W.H. Freeman, and Company © 2010, ISBN: 1-4292-1956-4.
4	Modern Projects and Experiments in Organic Chemistry, SMC Custom, Mohrig, Hammond, Schatz, and Morril, W.H. Freeman and Company © 2012, ISBN: 14641-3292-5 5. MasteringChemistry NewDesign. Pearson Education, Inc., 2013 Ed.

3.0 BIOLOGY-1

3.1 Course Description

This course is an introduction to the study of the life sciences, its scientific methodologies, and technological developments and applications. This course will provide the students with a better understanding and appreciation of the attributes of life and its structure and functions. Becoming more aware of the biological sciences enables one to make informed decisions into contemporary biomedical problems and issues in our society.

3.2 Course Objectives

Upon completion of this course, the student will be able to:

Sl. No.	Course Accomplishments
1	Understand how science works through the explicit examination of scientific concepts, methods, and the underlying principles that govern scientific practice.
2	Examine the scientific paradigms that shape scientific inquiry, with attention to their historical development and change.
3	Experience hands-on scientific experimentation through laboratory exercises.
4	Practice problem-solving using quantitative methods, statistical analyses, and computer data manipulations where appropriate.

Sl. No.	Course Accomplishments
5	See relationships between scientific thinking and similar analytical models in other fields.
6	Understand how the sciences replicate, control variables, explain the error and build explanatory models through successive experimentation.
7	Analyze and evaluate the "classic texts" of science, which would include. Among others, a familiarity with the significance of such thinkers as Copernicus, Galileo, Darwin, Marie Curie, and Einstein.
8	Develop a respect for the finite resources of our planet, responsible use of technology, the limits of humane research, and the fragile wonders of the natural world.

3.3 Methods of Instruction

Lab, Lectures, and Discussion.

3.4 Course Content

Week	Topics for Study
1-4	The chemistry of water and its importance, the biochemistry of sugars, fats, proteins, and nucleic 8.
5-6	Prokaryotic and eukaryotic cell size, functional anatomy of organelles, membranes and solute transport, a comparison of plant and animal cells.
7	Revision and Midterm Exam.
8-9	Thermodynamics, enzymes, nutrients, metabolic inhibitors, and ATP production.
10	Respiration, fermentation, and photosynthesis.
11-12	Mendelian genetics, molecular genetics.
13	Mechanisms of evolution.
14	Revision and examination.

3.5 Textbooks

Sl. No.	Textbook
1	Campbell, N., Biology (Menlo Park, CA: Benjamin-Cummings, 2006), 8th Ed.
2	Sackheim, G. Introduction to Chemistry for Biology Students (Redwood City, CA: Benjamin Cummings, 2008). 9th Ed.

4.0 BIOLOGY-2

4.1 Course Description

This course introduces the principles and concepts of biology. Emphasis is on basic biological chemistry, cell structure and function, metabolism and energy transformation, genetics, evolution, classification, and other related topics. Upon completion, students should be able to demonstrate an understanding of life at the molecular and cellular levels. Laboratory exercises reinforce lecture topics and include microscopy techniques.

4.2 Course Objectives

After completion of this course, the student will be able to demonstrate basic knowledge in each of the following:

Sl. No.	Course Accomplishments
1	Characteristics of living organisms.
2	Basic differentiating characteristics of the five kingdoms. c. Chemical composition of living matter.
3	Structural characteristics of prokaryotic and eukaryotic cells.
4	Mechanisms of membrane transport.
5	Basic concepts of bioenergetics, photosynthesis, and cellular respiration.
6	Mechanisms and function of cellular reproduction.
7	Mendelian genetics and genetic change.
8	Role of nucleic acids in the cell.
9	Mechanisms of protein synthesis and regulation of gene expression.
10	Basic concepts in biotechnology.
11	Basic events in the origin of life. m. Basic concepts of variation, natural selection, and speciation.

4.3 Methods of Instruction

Lab, Lectures, and Discussion.

4.4 Course Content

Week	Topics for Study
1	Introduction to living organisms: A. Characteristics of life. B. The five kingdoms.
2	Chemical composition of cells: A. Organization of matter. B. Bonding between atoms. C. Water and its properties. D. Acids, bases, and salts. E. Biological molecules.

Week	Topics for Study
3	Cell structure and function: A. Cell theory. B. Comparison of prokaryotic and eukaryotic cells. C. Comparison of autotrophs and heterotrophs. D. Composition and function of cell structures. E. Cell membranes and membranous organelles. F. Comparison of plant and animal cells.
4	Cellular transport: A. Structure of cell membrane. B. Diffusion and osmosis. C. Facilitated and active transport. D. Pinocytosis and phagocytosis.
5 & 6	Bioenergetics: A. Metabolism. B. Enzymes. C. Energy and ATP. D. Hydrogen and electron carriers.

Week	Topics for Study
7	Revision and Midterm Examination.
8	Cellular respiration: A. Fermentation and anaerobic respiration. B. Aerobic respiration.
9	Photosynthesis: A. Nature of light. B. Pigments. C. Chloroplast structure. D. Light-dependent reactions. E. Light independent reactions.
10	Cellular reproduction: A. Prokaryotic cell reproduction. B. Eukaryotic cell reproduction. C. Stages of mitosis. D. Stages of meiosis.
11	Genetics:

Week	Topics for Study
	A. Mendelian genetics. B. Incomplete dominance. C. Sex linkage. D. Mutations and genetic change. Protein synthesis: A. Structure of DNA and its replication. B. Structure of RNA and the genetic. C. Protein synthesis. D. Chemical basis of mutation.
12	Origin of life and evolution: A. Formation of earth. B. Origin of heterotrophs and autotrophs. C. Rise of eukaryotes. D. Origin of multicellularity. E. Natural selection. F. Variation and speciation.
13	Biotechnology:

Week	Topics for Study
	A. Basic techniques in biotechnology. B. Formation of Genetically Modified Organisms (GMOs). C. Prospects for the use of this technology.
14	Revision and Examination.

4.5 Textbooks

Sl. No.	Textbook
1	Mader, S. S. Biology. 10th ed., McGraw-Hill Higher Education, 2010. Lab Packet (Laboratory Exercises). Durham Technical Community College.

5.0 INTRODUCTION TO GENERAL PHYSICS

5.1 Course Description

This is the first of an algebra-based two-semester sequence in classical physics. Topics include one and two-dimensional kinematics; forces; Newton's Laws; circular motion; energy; momentum; torque; temperature; and heat. Emphasis is on problem-solving. Laboratory experiments are included in this course.

5.2 Course Objectives

Upon completion of this course, the student will be able to:

Sl. No.	Course Accomplishments
1	State the fundamental laws and principles of mechanics and heat;
2	Find the resultant vector of two or more vectors using algebraic and graphical methods;
3	Use the kinematic equations to solve problems involving constant acceleration;
4	Use newton's laws to solve problems;
5	Recognize the conditions for which the laws of conservation of mechanical energy are valid;
6	Use the conservation of momentum to solve problems involving collision;
7	Solve problems involving torque and rigid bodies;
8	Draw free-body diagrams and use the diagrams to solve physical problems;
9	Use algebra and trigonometry to solve physical problems in mechanics and heat;
10	Make physical measurements and record data accurately;

5.3 Methods of Instruction

Lab, Lectures, and Discussion.

5.4 Course Content

Week	Topics for Study
1	Measurement: A. Uncertainty. B. Significant figures. C. Units and standards. D. International System of Units (S.I. Units). E. Unit conversions. F. Dimensions and dimensional analysis.
2	Kinematics in One Dimension: A. Reference frames. B. Position, distance, and displacement. C. Average speed and average velocity. D. Instantaneous velocity. E. Acceleration.

Week	Topics for Study
3	Kinematics in Two Dimensions: A. Vectors and scalars. B. Adding and subtracting vectors Graphically and Algebraically. C. Multiplication of vectors and scalars. D. Projectile motion. E. Relative velocity.
4	Newton's Laws of Motion: A. Force and mass. B. Newton's First Law of Motion. C. Newton's Second Law of Motion. D. Newton's Third Law of Motion. E. Types of forces: ▪ Weight: The force of gravity; ▪ The normal force; and ▪ Friction. F. Free-body diagrams. G. Problems involving friction, the normal force, and weight.
5	Circular Motion and Gravitation:

Week	Topics for Study
	A. Uniform circular motion. B. Banked and unbanked curves. C. Non-Uniform circular motion. D. Newton's Law of Universal Gravitation. E. Geophysical applications of Newton's Law of Universal Gravitation. F. Satellites and weightlessness.
6	Revision and Midterm Examination.
7-8	Work and Energy: A. Work done by: ▪ Constant forces; and ▪ Varying forces. B. Kinetic energy. C. The Work-Kinetic Energy Theorem. D. Potential energy. E. Conservative and non-conservative forces. F. Mechanical energy. G. Conservation of mechanical energy. H. Conservation of energy with dissipative forces. I. Power.

Week	Topics for Study
9	Momentum and Force: A. Conservation of momentum. B. Impulse and collisions. C. Conservation of momentum during collisions: ▪ Elastic collisions; and ▪ Inelastic collision. D. Centre of mass.
10	Rotational Motion: A. Angular velocity and angular acceleration. B. Rotational kinematics equations of motion. C. Torque and rotational inertia. D. Rotational kinetic energy. E. Angular momentum and its conservation.
11	Temperature and Heat: A. Types of thermometers. B. Zeroth Law of Thermodynamics. C. Thermal expansion in solids. D. Heat as energy transfer.

Week	Topics for Study
	E. Internal energy. F. Specific heat. G. Latent heat. H. Calorimetry. I. Conduction, convection, and radiation.
12-13	Laboratory Reports: A. Making Measurements. B. Analyzing Data. C. Graphs.
14	Revision and Examination.

5.5 Textbooks

Sl. No.	Textbook
1	Giancoli, D. (2014). Physics: Principles with Applications (7th Ed.).
2	Boston, MA: Pearson. SUPPLEMENTARY READINGS/MATERIALS Cutnell, J. D. & Johnson, K. W. (2012). Physics (9th Ed.).

Sl. No.	Textbook
3	Hoboken, NJ: John Wiley and Sons. Serway, R. &Vuille, C. (2012). College Physics (9th ed.). Boston, MA: Brooks/Cole, Cengage Learning.

6.0 PHYSICS-2

6.1 Course Description

This is the second of an algebra-based two-semester sequence in classical physics. Topics include oscillations; waves; electricity and magnetism; optics and modern physics. Emphasis is on problem-solving. Laboratory experiments are included in this course.

6.2 Course Objectives

Upon completion of this course, the student will be able to:

Sl. No.	Course Accomplishments
1	State the fundamental laws and principles of oscillations; waves; electricity and magnetism; optics and modern physics.
2	Define and recognize the physical quantities used to describe oscillations and waves.

Sl. No.	Course Accomplishments
3	Construct ray diagrams for lenses and mirrors.
4	Explain the operation of optical instruments using geometrical optics.
5	Determine the electric field and potential energy for discrete charge distributions.
6	Describe the operations and applications of capacitors.
7	Analyze simple dc circuits.
8	Apply ampere's law to determine the magnetic field strength.
9	Apply Faraday's and Lenz's laws of electromagnetic induction.
10	Discuss the wave-particle duality of light and matter.
11	Describe radioactive decay processes and solve related problems.
12	Make physical measurements and record data accurately.
13	Plot graphs of experimental data accurately using appropriate scales.
14	Derive physical information from the slope and intercepts of the graph of experimental data.

6.3 Methods of Instruction

Lab, Lectures, and Discussion.

6.4 Course Content

Week	Topics for Study
1	Vibratory Motion: A. Elasticity and plasticity B. Hooke's Law ▪ Force in spring; and ▪ The potential energy of stretched or compressed spring. C. Simple Harmonic Motion (SHM): ▪ Conditions for SHM; ▪ Parameters and description of SHM; ▪ Mass-spring system; and ▪ The Simple Pendulum. D. Forced vibrations. E. Damped vibratory motion: ▪ Critically damped; ▪ Overdamped; and ▪ Underdamped

Week	Topics for Study
2	Wave Motion: A. Characteristics of traveling waves: ▪ Wave parameters; and ▪ Description of motion. B. Types of waves: ▪ Transverse waves; and ▪ Longitudinal waves. C. Wave behavior: ▪ Reflection; ▪ Refraction; ▪ Diffraction; and ▪ Interference. D. Standing waves and resonance.
3	Sound: A. Representation of sound waves: ▪ Pressure; and ▪ Displacement. B. Sound intensity C. Characterization of sound and sound wave properties i. Timbre ii. Pitch iii. Loudness

Week	Topics for Study
	D. Interference and beats E. Doppler effect F. Applications of sound waves: ▪ Ultrasonics; and ▪ Shock waves.
4	Geometric Optics: A. Evidence for rectilinear propagation of light: ▪ Formation of shadows; and ▪ Pinhole camera B. Measurement of the speed of light. C. The Law of Reflection and Mirror Images. D. The Law of Refraction. E. Thin lenses: ▪ Graphical construction of images; ▪ Lateral magnification; and ▪ Thin lens equation. F. Optical instruments: ▪ Combinations of lenses; ▪ The human eye; ▪ Camera; ▪ Simple magnifier;

Week	Topics for Study
	▪ Refractive telescope; and ▪ Microscope.
5	Revision and Midterm Examination.
6	Wave Aspects of Light: A. Huygen's Principle: ▪ Relation to wavefront; and ▪ Explanation of reflection and refraction. B. Dispersion: ▪ Spectrum; ▪ Rainbows; ▪ Diamonds; and ▪ Chromatic aberration. C. Diffraction. D. Young's experiment and interference of light. E. Limit of resolution of the microscope.
7	Electric Charges and Fields: A. Static electricity: ▪ The electroscope;

Week	Topics for Study
	▪ Charging by induction; ▪ Positive and negative charges; and ▪ Insulators and conductors. B. Coulomb's Law. C. The electrical field: ▪ Lines of force; and ▪ Electric fields and conductors.
8	Electrical Potential and Capacitors: A. Electrical potential energy B. Definition of potential C. Relationship between potential and electric field D. Capacitors: ▪ Definition of capacitance; ▪ Parallel plate capacitor; ▪ Dielectrics; and ▪ Energy stored in a capacitor.
9	Electric Current: A. The voltaic cell, batteries of cells, electromotive force (emf). B. Ampere's definition.

Week	Topics for Study
	C. Ohm's Law: ▪ Ohmic conductors; and ▪ Resistivity D. Direct Current (DC) Circuits: ▪ Resistors in series; ▪ Resistors in parallel; and ▪ Combination resistive circuits. E. Wheatstone Bridge and Potentiometer. F. Alternating Current (AC).
10	Magnetism: A. Magnetic materials. B. Magnetic fields: ▪ Magnetic field intensity; ▪ Straight long current-carrying wire; ▪ Current loop; ▪ Solenoid; and ▪ The magnetic field of wire carrying an electrical current. C. Magnetic forces: ▪ Force on a current-carrying wire; ▪ Definition of magnetic field strength; ▪ Force between long parallel current-carrying wires; and

Week	Topics for Study
	▪ Force on a moving charge. D. Galvanometers, ammeters and voltmeters. E. DC Motors. Electromagnetic Induction: A. Induced emf: ▪ Magnetic flux; ▪ Faraday's Law; and ▪ Lenz's Law. B. in a moving conductor. C. AC and DC generators. D. Mutual inductance and self-inductance. E. Transformers.
11	Modern Physics: A. Black body radiation and Planck's hypothesis. B. The photoelectric effect i. Photons ii. Einstein's explanation. C. Atomic spectra and the Bohr atom. D. De Broglie's Hypothesis: ▪ Wave-particle duality; and ▪ Introduction to wave mechanics.

Week	Topics for Study
12	Nuclear Physics: A. The nuclear atom: ▪ Geiger-Marsden experiment; and ▪ Rutherford's explanation. B. Binding energy and mass defect. C. Radioactivity: ▪ Segrè chart; ▪ Alpha decay; ▪ Beta-decay; and ▪ Gamma radiation. D. Energy released during radioactive decay. E. Rate of decay. F. Nuclear fission and fusion.
13	Laboratory Reports: A. Making Measurements. B. Analyzing Data. C. Graphs.
14	Revision and examination.

6.5 Textbooks

Sl. No.	Textbook
1	Giancoli, D. (2014). Physics: Principles with Applications (7th Ed.).
2	Boston, MA: Pearson. SUPPLEMENTARY READINGS/MATERIALS Cutnell, J. D. & Johnson, K. W. (2012). Physics (9th Ed.).
3	Hoboken, NJ: John Wiley and Sons. Serway, R. &Vuille, C. (2012). College Physics (9th Ed.).

7.0 STATISTICS

7.1 Course Description

This is an introductory course in statistics with applications to business and economics. Students are introduced to the analysis and interpretation of data using fundamental statistical techniques.

7.2 Course Objectives

Upon completion of this course, the student will be able to:

Sl. No.	Course Accomplishments
1	Explain the nature and scope of statistics.
2	Apply statistical procedures and techniques to organize and summarise data.
3	Utilize probability theories to analyze discrete and continuous random variables.
4	Conduct hypothesis tests to analyze data.
5	Apply regression and correlation analysis to analyze data.
6	Demonstrate the use of statistical software to manipulate raw data.

7.3 Methods of Instruction

Lab, Lectures, and Discussion.

7.4 Course Content

Week	Topics for Study
1	Data and Scope of Statistics: A. Role.

Week	Topics for Study
	B. Methods of data collection: ▪ Surveys; and ▪ Experimental studies. C. Types of data: ▪ Qualitative; and ▪ Quantitative.
2	Organizing and Summarizing Data: A. Graphical descriptions: ▪ Bar chart; ▪ Pie chart; ▪ Dot plot; ▪ Histogram; ▪ Box-Whisker Plot; and ▪ Stem and leaf. B. Numerical descriptive measures: ▪ Central tendency; and ▪ Variability. C. Measures of distribution and relative frequencies. D. Measures of association between two variables.
3	Elementary Probability Concepts and Applications:

Week	Topics for Study
	A. Classical and empirical theory: ▪ Counting rules; ▪ Addition law; ▪ Multiplication law; and ▪ Conditional probability. B. Contingency table of joint and marginal probability.
4	Discrete Random Variables: A. Uniform probability distribution. B. Binomial probability distribution. C. Poisson probability distribution. D. Hypergeometric distribution.
5	Continuous Random Variables: A. Uniform probability distribution. B. Exponential distribution. C. Normal probability distribution. D. Central Limit Theorem. E. Normal approximation to Binomial.

Week	Topics for Study
6	Sampling Distribution: A. Finite and infinite population. B. Mean. C. Proportions. D. Properties of estimators: ▪ Unbiased; ▪ Efficiency; and ▪ Consistency.
7	Revision and Midterm Examination.
8	Statistical Inference: A. Point estimates. B. Interval estimates for mean with infinite and finite population: ▪ Population variance known; and ▪ Population variance unknown. C. Sample size determination
9	Hypothesis Testing: A. Type I and Type II errors. B. One-tailed testing of a mean:

Week	Topics for Study
	▪ Population variance known; and ▪ Population variance unknown. C. Two-tailed testing of a mean: ▪ Population variance known; and ▪ Population variance unknown. D. Power of a test. E. Methods of hypothesis testing: ▪ Critical value approach; ▪ P-value approach; ▪ Critical mean approach; and ▪ Confidence interval approach.
10	Simple Linear Regression and Correlation: A. Scatter diagram. B. Relationship between variables. C. Assumptions and model development. D. Estimation and hypothesis testing of the regression line. E. Correlation analysis.
11-14	Revision and Examination.

7.5 Textbooks

Sl. No.	Textbook
1	Anderson D., Sweeney D., Williams T., Camm J., &Cochram J. (2012). Statistics for business and economics (12th ed.). Mason, OH: South-Western Cengage Learning. SUPPLEMENTARY READINGS/MATERIALS Aczel, A., & Sounderpandian, J. (2012).
2	Mason, OH: South-Western Cengage Learning. Brenson, M., & Levine, D. (2011). Basic statistics (11th ed.).
3	Upper Saddle River, NJ: Prentice-Hall. McLave J., & Benson, G. (2005). Statistics for business and economics (11th Ed.).
4	San Francisco, CA: Dellen Publishing Company. Mendenhall, W., &Sincich, T. (2002). A second course in Basic statistics (7th ed.). Upper Saddle River, NJ: Prentice-Hall. Stephan, L., & Berenson, K. (2010). Statistics for managers (6th Ed.).
5	Upper Saddle River, NJ: Prentice-Hall. Weirs, R. (2005). Introduction to biostatistics statistics (6th Ed.). Mason, OH: South-Western Cengage Learn

8.0 ENGLISH-1

8.1 Course Description

English-1 focuses on fundamental reading, thinking, and writing skills. Students read for literal and implied meanings and produce a variety of texts that develop one central idea in keeping with the conventions of Standard English.

8.2 Course Objectives

Upon completion of this course, the student will be able to:

Sl. No.	Course Accomplishments
1	Read and comprehend a variety of print material.
2	Distinguish between main ideas and supporting details.
3	Distinguish between literal and figurative and inferential and explicit meanings.
4	Summarize texts.
5	Apply conventions of spelling, punctuation, capitalization, and grammar.
6	Generate, organize, develop and present ideas.
7	Write essays using a variety of methods of development.

8.3 Methods of Instruction

Lectures and Discussion.

8.4 Course Content

Week	Topics for Study
1-4	Reading: A. Strategies: ▪ Annotating; ▪ Questioning; ▪ Connecting ideas; ▪ Summarizing; and ▪ Evaluating. B. Comprehending: ▪ Word meaning (prefixes, suffixes, denotation, connotation); ▪ Main ideas and supporting details; ▪ Literal and figurative language; ▪ Explicit and implicit meaning; ▪ Facts and opinions; and ▪ Purpose and audience.

Week	Topics for Study
5-8	Writing: A. Pre-writing: ▪ Brainstorming; ▪ Mapping; ▪ Clustering; ▪ Freewriting; ▪ Question-posing; and ▪ Discussing. B. Organizing: ▪ Focus; ▪ Purpose and audience; ▪ Introductions; ▪ Thesis Statements; ▪ Topic Sentences; ▪ Supporting Details; and ▪ Conclusions. C. Methods of Development: ▪ Cause/ Effect; ▪ Comparison/ Contrast; ▪ Advantages/ Disadvantages; and ▪ Problem/ Solution.

Week	Topics for Study
	D. Drafting: ▪ Writing; ▪ Revising; and ▪ Rewriting. E. Editing: ▪ Grammar; ▪ Punctuation; ▪ Spelling; and ▪ Sentence Structure.
9	Revision and Midterm Exam.
10-13	Grammar and Mechanics: A. Agreement: ▪ Subject/ verb; and ▪ Noun/ pronoun antecedent. B. Cases of Pronouns. C. Past participles. D. Adjectival phrases. E. Verb Tenses. F. Punctuation: ▪ Comma;

Week	Topics for Study
	▪ Colon; ▪ Semi-colon; and ▪ Apostrophe. G. Spelling: ▪ Rules; ▪ Words often confused; ▪ Capitalization; and ▪ Abbreviations. H. Sentences: ▪ Fragments; and ▪ Run-ons.
14	Revision and Examination.

8.5 Textbooks

Sl. No.	Textbook
1	A college dictionary (e.g., Webster's Collegiate Dictionary or Oxford Concise Dictionary).
2	Booklet of Readings Scarry, Sandra, and John Scarry.

Sl. No.	Textbook
3	The Writer's Workplace with Readings. 5 th Ed. Fort Worth: Harcourt, 2005 Print.

9.0 ENGLISH-2

9.1 Course Description

In this course, students develop thinking, reading and expository writing skills. Emphasis is on clear and coherent expression and competence in the use of grammatical and mechanical conventions. Attention is paid to enhancing students' understanding, interpretation, and analysis of texts.

9.2 Course Objectives

Upon completion of this course, the student will be able to:

Sl. No.	Course Accomplishments
1	Evaluate print and non-print material to determine meaning, purpose, and audience.
2	Summarize and respond to various types of material.
3	Distinguish between literal and figurative levels of meaning.

Sl. No.	Course Accomplishments
4	Use pre-writing strategies to produce written texts.
5	Generate, organize, develop, and express ideas.
6	Write expository and summary-response essays.
7	Use a wide range of vocabulary.
8	Apply conventions of spelling, punctuation, capitalization, syntax, and grammar.

9.3 Methods of Instruction

Lectures and Discussion.

9.4 Course Content

Week	Topics for Study
1-4	Reading: A. Strategies: ▪ Annotating;

Week	Topics for Study
	▪ Questioning; ▪ Connecting ideas; ▪ Analyzing (sentence by sentence; paragraph by paragraph); ▪ Summarising; ▪ Evaluating; ▪ Outlining; ▪ Paraphrasing; and ▪ Using context clues and knowledge of prefixes, suffixes, and roots to determine word meanings. B. Comprehension: ▪ Word meaning; ▪ Main idea and supporting detail; ▪ Facts and opinions; ▪ Explicit and implied meanings; ▪ Purpose and audience; ▪ Point of view, development, and organization; and ▪ Figurative.
5	Abbreviation and Number.
6	Revision and Midterm Examination.
7-11	Writing:

Week	Topics for Study
	A. Pre-writing: ▪ Brainstorming; ▪ Branching; ▪ Freewriting; ▪ Outlining/ planning; ▪ Discussing; and ▪ Gathering relevant information. B. Organizing: ▪ Focus; ▪ Purpose and audience; ▪ Introductions; ▪ Thesis Statements; ▪ Topic sentences; ▪ Supporting details; ▪ Transitions; and ▪ Conclusions. C. Methods of Development: ▪ Illustration/ examples; ▪ Comparison/ contrast; ▪ Classification; ▪ Definition; and

Week	Topics for Study
	▪ Summary/ response. D. Drafting: ▪ Writing; ▪ Peer reviewing; ▪ Revising; and ▪ Rewriting. E. Editing: ▪ Grammar; ▪ Punctuation; ▪ Spelling; ▪ Word choice; and ▪ Sentence structure (syntax).
12-13	Grammar and Mechanics: A. Parts of Speech; B. Verbs: ▪ Regular and irregular; ▪ Past, present, and future tenses; and ▪ Participles. C. Agreement: ▪ Subject/ verb; and ▪ Pronoun/ antecedent.

Week	Topics for Study
	D. Sentences: ▪ Fragments; and ▪ Run-ons. E. Dangling and misplaced modifiers.
14	Revision and Examination.

9.5 Textbooks

Sl. No.	Textbook
1	Per English-1 course and books recommended during the course.

10.0 MATHEMATICS-1 (ALGEBRA)

10.1 Course Description

With the aid of technology, students study fundamental algebraic concepts and graphical analysis of functions.

10.2 Course Objectives

Upon completion of this course, the student will be able to:

Sl. No.	Course Accomplishments
1	Solve linear, quadratic, radical, absolute-value equations and inequalities.
2	Determine the equations of lines and circles and sketch their graphs.
3	Compose, graph, and perform operations on functions.
4	Solve exponential and logarithmic equations.
5	Model real-world problems with linear, quadratic, exponential, and logarithmic functions.
6	Demonstrate proficiency in the use of a graphing calculator and educational software.

10.3 Methods of Instruction

Lectures and Discussion.

10.4 Course Content

Week	Topics for Study
1	Fundamental Concepts: A. Real numbers: ▪ Classification; ▪ The real number line; and ▪ Properties. B. Polynomials: ▪ Factorization; ▪ Operations; and ▪ Long and synthetic division. C. Rational expressions: ▪ Simplification; and ▪ Operations. D. Roots and rational exponents. E. Complex numbers.
2	Equations: A. Linear. B. Quadratic. C. Solution of polynomial equations by factoring.

Week	Topics for Study
	D. Rational. E. Complex Solutions. F. Other types: ▪ Radical; ▪ Quadratic-form; and ▪ Absolute value.
3	Inequalities: A. Linear. B. Quadratic. C. Polynomial. D. Rational. E. Absolute value.
4-10	Coordinate Geometry: A. Distance and midpoint formulae. B. Intercepts and symmetry. C. Lines. D. Circles. Relations and Functions:

Week	Topics for Study
	A. Distinguishing characteristics. B. Graphs and the vertical line test. C. Properties: ▪ Domain and range; ▪ Even and odd; ▪ Monotonicity; and ▪ Extreme values. D. Operations: ▪ Addition; ▪ Subtraction; ▪ Multiplication; ▪ Division; ▪ Composition; and ▪ Inversion. E. Features of special functions: ▪ Constant; ▪ Identity; ▪ Square; ▪ Cube; ▪ Square root; ▪ Cube root;

Week	Topics for Study
	▪ Reciprocal; ▪ Absolute Value; ▪ Rational; and ▪ Piecewise defined. F. Transformations: ▪ Shifts; ▪ Stretches; ▪ Compressions; and ▪ Reflections. G. Linear and Quadratics: ▪ Properties and graphs; and ▪ Models.
11	Revision and Midterm Exam.
12	Polynomial Functions: A. Power functions. B. Zeros: ▪ Real; and ▪ Complex. C. Properties and graphs.

Week	Topics for Study
13	Rational Functions: A. Domain B. Asymptotes: ▪ Vertical; ▪ Horizontal; and ▪ Oblique. C. Graphs Exponential and Logarithmic Functions: ▪ Properties and graphs; and ▪ Equations
14	Revision.

10.5 Textbooks

Sl. No.	Textbook
1	Sullivan, M. & Sullivan, M. (2013). Algebra & trigonometry enhanced with graphing utilities. (6th Ed.). New Jersey: Upper Saddle River, Pearson.
2	Stewart, J., Redlin, L., & Watson, S. (2011). Algebra and trigonometry (3rd ed.). Pacific Grove: CA: Brooks/ Cole Publishers.

Sl. No.	Textbook
3	Stewart, J., Redlin, L., & Watson, S (2011). Precalculus Mathematics for calculus. (6th ed.). Pacific Grove, CA: Brooks/Cole Publishers.

11.0 HISTORY OF MEDICINE AND INTRODUCTION TO MEDICAL TERMINOLOGY

11.1 Course Description

This course is a survey of the history of medicine and health care, particularly in Western societies (Europe and North America), from antiquity to the present. Its general organization focuses on major topics rather than being chronologically based.

11.2 Course Objectives

Upon completion of this course, the student will be able to:

Sl. No.	Course Accomplishments
1	Sketch in thematic blocks main subject lines pertinent to the evolution and status of modern medicine and health care in its cultural context.
2	Examine the ways in which the body, health, and disease were conceptualized in the past, and to situate the major shifts in medical knowledge and practice in the context of broader historical changes in Western societies.

Sl. No.	Course Accomplishments
3	Examine the changing role of “the healer” and the “patient” over time and in differing cultural and social contexts.
4	Track the evolution of some of the major institutional and societal frameworks of medicine and health care – embodied in areas of medical education, life science research, and hospital design and health care provision.
5	Analyze the ways in which human societies and their healers interacted in the face of medical challenges, both in differing times and parallel cultural evolutions.

11.3 Methods of Instruction

Lectures and Discussion.

11.4 Course Content

Week	Topics for Study
1	After an introduction to some major themes, objectives, and sources of the history of medicine, it presents various pre-Modern areas of medicine by discussing topics from Ancient Medicine, such as the “Hippocratic Oath,” Renaissance Medicine and Science, or the History of Anatomy since the time of the Greeks.

Week	Topics for Study
2	Modern medicine in their genealogy: the elder patient, the revolution in scientific and laboratory medicine, the rise of pathology and genetic approaches, public health, human reproduction, and the development of medical specialization.
3	Historical and contemporary issues of Complementary & Alternative Medicine (CAM) to discuss this "parallel system," present since the Medieval Ages, and its opposition to laboratory-based medicine.
4	Important modern influences are scrutinized, such as the "Flexner Report," new social movements, and the present economic context of medicine. This part ends with an outlook on History and the Future of Medicine.
5	Heroes, Rogues, and Charlatans," in which the students present their own small group interactions with source material and medical writings featuring, for example, "Great Doctors," "Founders," "cutting-edge technologies," "social and scientific breakthroughs," as well as "medical malefactors," "charlatans," "outsiders," or "economic crooks", thus questioning traditional positivistic or Whiggish trends in the historiography of medicine and science.
6	Revision and Examination.

11.5 Textbooks

Sl. No.	Textbook
1	The Western Medical Tradition 800 BC to 1800 AD, eds. L. I. Conrad, M. Never & V. Nutton (Cambridge: Cambridge University Press, 1995).
2	2. Medicine Transformed. Health, Disease, and Society in Europe 1800-1930, ed. D. Brunton (Manchester: Manchester University Press, 2004).
3	3. Companion Encyclopaedia of the History of Medicine (paperback), eds. W.F. Bynum & R.S. Porter (London, New York: Routledge, 1996)

12.0 MEDICAL TERMINOLOGY (HISTORY OF MEDICINE AND INTRODUCTION TO MEDICAL TERMINOLOGY CONTINUED)

12.1 Course Description

This course introduces prefixes, suffixes, and word roots used in the language of medicine. Topics include medical vocabulary and the terms that relate to the anatomy, physiology, pathological conditions, and treatment of selected systems. Upon completion, students should be able to pronounce, spell, and define medical terms as related to selected body systems and their pathological disorders.

12.2 Course Objectives

Upon completion of this course, the student will be able to:

Sl. No.	Course Accomplishments
1	Identify the four-word elements used to build medical words.
2	Divide medical words into their component parts.
3	Apply the basic rules to define and build medical words.
4	Link combining forms and word roots to suffixes.
5	Identify adjective, noun, and diminutive suffixes.
6	Define common prefixes used in medical terminology.
7	Define and identify the planes of the body.
8	Identify the cavities, quadrants, and regions of the body.
9	Describe the functional relationship between body systems.
10	Use the Internet for research of the whole body and healthcare systems terminology.

12.3 Methods of Instruction

Lectures and Discussion.

12.4 Course Content

Week	Topics for Study
1	Medical Word Elements: A. Word Roots. B. Combining Forms. C. Suffixes. D. Prefixes.
2	Basic Guidelines: A. Defining Medical Words. B. Building Medical Words.
3	Pronunciation Guidelines.
4	Suffix Linking and Suffix Types: A. Surgical and Diagnostic. B. Pathological and Related Suffixes.

Week	Topics for Study
	C. Grammatical Suffixes. D. Plural Suffixes.
5	Prefix Linking and Prefix Types: A. Prefixes of Position. B. Number, Measurement, and Direction. C. Common Prefixes.
6	Levels of Organization: A. Cell; and B. Cell Membrane and Cytoplasm.
7	Anatomical Position: A. Planes of the Body. B. Body Cavities. C. Abdominopelvic Quadrants and Regions.
8	Integumentary System: A. Anatomy and Physiology Key Terms.

Week	Topics for Study
	B. Accessory Organs of the Skin. C. Pathology. D. Medical, Surgical, and Diagnostic Procedures.
9	Digestive System.
10	Medical Word Elements Pathology: A. Peptic Ulcer Disease. B. Ulcerative Colitis. C. Intestinal Obstruction. D. Diverticulosis.
11	Diseases and Conditions and related Pharmacology.
12	Respiratory System: A. Pathology: ▪ Chronic Obstructive Pulmonary Disease; ▪ Asthma; ▪ Chronic Bronchitis; ▪ Emphysema; ▪ Cystic Fibrosis Acute Respiratory Distress Syndrome; and

Week	Topics for Study
	▪ Oncology. B. Diseases and Conditions: Medical, Surgical, and Diagnostic Procedures.
13	Cardiovascular System: A. Objectives: Anatomy and Physiology. B. Medical Word Elements Pathology. C. Diseases and Conditions: ▪ Medical and Surgical; ▪ Diagnostic Procedures; and ▪ Pharmacology.
14	Revision and Examination.

12.5 Textbooks

Sl. No.	Textbook
1	Gylys, Barbara A. and Wedding, Mary Ellen. Medical Terminology Systems A Body Systems Approach. Seventh Edition.
2	F.A. Davis Company, 2013.

Sl. No.	Textbook
3	Suggested References: ▪ Health-Related Websites: www.MedicalLanguageLab.com. ▪ 3. Stedman's Medical Dictionary. 27th/ 28th Ed. ▪ Taber's Cyclopedia Medical dictionary. 21 Ed.

13.0 INTRODUCTORY TO MEDICAL MICROBIOLOGY AND IMMUNOLOGY

13.1 Course Description

This course helps students develop an understanding of different branches of microbiology and immunology. Topics covered in this course include the study of various infections, how the immune system fights back the infections, and basic concepts of critical infectious diseases.

13.2 Course Objectives

Upon completion of this course, the student will have:

Sl. No.	Course Accomplishments
1	A general understanding of the different types of disease-causing pathogens and how they try to evade the body's immune system.

Sl. No.	Course Accomplishments
2	A basic understanding of the different ways in which the immune system fights microbial disease.
3	Understanding of the basic concepts underlying many important health issues, including AIDS, vaccines, and the proper use of antibiotics.

13.3 Methods of Instruction

Lab, Lectures, and Discussion.

13.4 Course Content

Week	Topics for Study
1	Introduction to the Immune System: Introduction, cells of the immune system, location of the immune system. Innate Responses: Introduction, Anatomical and Physiological Barriers, Innate Immunity, the inflammatory response that occurs after infection by microorganisms, The Complement (C') System.
2	Components of the Adaptive Immune System: What they are and how they work. Adaptive Immunity: An Overview, MHC proteins, Antigen Processing and Presentation, T Cell Development, T Cell Activation, Costimulatory Properties of Antigen-presenting Cells, Activation of T Helper Cells, Activation of Cytotoxic T

Week	Topics for Study
	Cells, B Cell Development, B Cell Activation, Antibodies, Antibody Structure, Antibody Synthesis, Structure and Function of Secreted Antibodies, Primary and Secondary Adaptive Immune Responses, Active and Passive Immunity.
3	Unwanted Immune responses, Hypersensitivity, and Graft rejection.
4-5	Disorders of the Immune System: Autoimmunity, Immunodeficiency diseases, AIDS, Preventing and treating AIDS, Current Treatments for Persons with AIDS. Topic Antibodies as Tools in Medicine and Biology: Medical uses of antibodies, Making monoclonal antibodies, ELISA, Blood typing, Immunofluorescence, Analyzing cells by FACS.
6	Revision and Midterm Examination.
7-8	Introduction to Bacterial Diseases Introduction, Concepts and Terminology, The Normal Flora, Biofilms, Host Defence Mechanisms, Therapy and Prevention of Bacterial Diseases, Isolation and Identification of Bacterial Pathogens, Epidemiology and the Spread of Disease, and Introduction to Pathogenesis.
9	Virulence Mechanisms of Pathogenic Bacteria: Bacterial Adherence, Avoidance of Phagocytosis, Toxins, Intracellular Existence, Regulation of virulence genes. Bioterrorism.

Week	Topics for Study
10-11	Viruses: Molecular diversity, properties, and pathogenicity. What is a Virus? Why Study Viruses?, Virus Structure, The Virus Replication Cycle, Classification of Animal Viruses, Cultivating Animal Viruses in the Laboratory, Pathogenesis of Viral Infections, Vaccine Production.
12-13	Specific Virus Families: Picornavirus (Poliovirus) [structure, replication, pathogenesis, vaccines], Ortho-myxovirus (Influenza) [structure, replication cycle, pathogenesis, antigenic variation, vaccines, antivirals], Retrovirus (HIV) [structure, replication cycle, pathogenesis, antigenic variation, vaccines, antivirals].
14	Revision and Examination.

13.5 Textbooks

Sl. No.	Textbook
1	Supplementary readings or materials as recommended during course.

14.0 INTRODUCTION TO BIOCHEMISTRY

14.1 Course Description

This course is an introduction to cellular chemistry and covers such topics as the structure and function of biological molecules, including nucleic acids, enzymes, and other proteins, carbohydrates, lipids, and vitamins. Also, the course provides an introduction to metabolic pathways and bioenergetics, including glycolysis, fermentation and respiration, oxidation of fatty acids, and photo.

14.2 Course Objectives

Upon completion of this course, the student will be able to:

Sl. No.	Course Accomplishments
1	Recognize how the Standard Free Energy (G0) and Free Energy (G) of a reaction or pathway influence the direction of metabolism.
2	Describe what enzymes are and how they allow for metabolism and its regulation.
3	Explain how ATP is synthesized via glycolysis, the TCA cycle, and mitochondrial electron transport.

Sl. No.	Course Accomplishments
4	Compare the energetic inputs and outputs of mitochondrial electron transport and photosynthetic electron transport.
5	Compare the processes of fatty acid oxidation and fatty acid synthesis.
6	Describe how amino acids are synthesized and degraded.
7	Describe how nucleotides and deoxynucleotides are synthesized and degraded.
8	Search, retrieve, evaluate, and synthesize information.
9	Communicate scientific knowledge and results effectively.
10	Demonstrate an ability to work collaboratively.

14.3 Methods of Instruction

Lab, Lectures, and Discussion.

14.4 Course Content

Week	Topics for Study
1	Introduction and Review of Chemistry.

Week	Topics for Study
2	Thermodynamics, Reactions, and Pathways.
3	Enzymes Regulation of Metabolism.
4-5	Glycolysis, the TCA cycle, Mitochondrial Electron Transport, and ATP Synthesis.
6	Regulation of Glycolysis and ATP Synthesis.
7	Revision and Midterm Examination.
8	Photosynthetic Electron Transport and the Calvin Cycle.
9	Lipid Chemistry and Fatty Acid Oxidation.
10	Lipid Synthesis.
11	Amino Acid Chemistry.
12-13	Nucleic Acid Chemistry.
14	Revision and Examination.

14.5 Textbooks

Sl. No.	Textbook
1	Nelson, D, and M Cox. Lehninger: Principles of biochemistry. 6th ed. New York: W.H. Freeman and Company, 2012. Type: Textbook, ISBN: 978-1-4292-3414-6.

15.0 ANATOMY AND PHYSIOLOGY

15.1 Course Description

This course provides a basic study of the structure and function of the human body. Topics include a basic study of the body systems as well as an introduction to homeostasis, cells, tissues, nutrition, acid-base balance, and electrolytes. Upon completion, students should be able to demonstrate a basic understanding of the fundamental principles of anatomy and physiology and their interrelationships. Laboratory exercises include specific organ dissections and observations of physiology.

15.2 Course Objectives

Upon completion of this course, the student will demonstrate basic knowledge in the following:

Sl. No.	Course Accomplishments
1	Basic anatomical characteristics in each of the organ systems.
2	Basic functional characteristics in each of the organ systems.
3	The homeostatic and functional interrelationship between the organ systems.

15.3 Methods of Instruction

Lab, Lectures, and Discussion.

15.4 Course Content

Week	Topics for Study
1	Introduction terminology: A. Anatomical positions. B. Directional planes. C. Body cavities. Cells: A. Structure and function.

Week	Topics for Study
	B. Transport. C. Mitosis and meiosis.
2	Primary tissues: A. Epithelial tissues. B. Connective tissues, cartilage, and bone. C. Glands: exocrine versus endocrine. D. Muscle tissues. E. Nervous tissues.
3	Integumentary system: A. Dermis and epidermis. B. Functions of the integumentary system. Skeletal system: A. Bone development and growth. B. Axial and appendicular skeletal bones. C. Articulations. Muscular system:

Week	Topics for Study
	A. Characteristics of smooth, cardiac, and skeletal muscles. B. Physiology of muscular contraction. C. Neuromuscular junction and chemo transmission. D. Types of movement.
4	Nervous system: A. Mechanics of neural impulse; reflex arcs. B. Synaptic Chemo transmission. C. Central nervous system: ▪ Structure and function of the brain; and ▪ Structure and function of the spinal cord. D. Peripheral nervous system: ▪ Cranial nerves; ▪ Spinal nerves; and ▪ Neurosensory and neuromotor pathways. E. Autonomic nervous system: ▪ Sympathetic division; and ▪ Parasympathetic division. Sensory organs:

Week	Topics for Study
	A. Types of receptors. B. Eye. C. Ear.
5	Endocrine system: A. Hypothalamus: negative feedback mechanisms. B. Pituitary hormones. C. Thyroid and parathyroid functions. D. Adrenal cortical and medullary hormones. E. Gonadal hormones. F. Pancreatic hormones.
6	Cardiovascular system: A. Cardiac structure and function. B. Systemic and pulmonary circulations. C. Blood and lymph. D. Cardiac control and vasomotor reflex mechanisms. E. Lymphatic system and reticuloendothelial system.
7	Revision and Midterm Examination.

Week	Topics for Study
8	Immunity: A. Innate immunity. B. Adaptive immunity. C. Acquired immunity.
9	Respiratory system: A. Pulmonary anatomy. B. Ventilation, diffusion, perfusion, and gas transport. C. Neural and chemical regulation.
10	Digestive system: A. Anatomy of the gastrointestinal tract. B. Physiology of digestion and absorption. C. Accessory digestive organs. D. Metabolism of carbohydrates, lipids, and proteins. E. Vitamins, minerals, and nutrition.
11	Excretory system: A. Nephron and renal anatomy.

Week	Topics for Study
	B. Urine formation and regulation: glomerular filtration, tubular reabsorption, and tubular secretion.
12	Homeostasis of body fluids: A. Regulation of fluid balance. B. Regulation of electrolyte balance. C. Regulation of pH - respiratory and urinary compensation.
13	Reproductive systems and embryology: A. Male reproductive system. B. Female reproductive system. C. Embryonic and fetal development. D. Genetics.
14	Revision and examination.

15.5 Textbooks

Sl. No.	Textbook
1	Seeley, R. R., Stephens, T. D., and Tate, P. Essentials of Anatomy and Physiology. 7th Ed. New York: McGraw-Hill Higher Education, 2007. 2. Patton, K. T. Laboratory Manual to Accompany Essentials of Anatomy and Physiology. 7th ed. New York: McGraw-Hill Higher Education, 2007.

16.0 INTRODUCTION TO NEUROSCIENCE

16.1 Course Description

This course begins with the study of nerve cells: their structure, the propagation of nerve impulses and transfer of information between nerve cells, the effect of drugs on this process, and the development of nerve cells into the brain and spinal cord. We then move to the sensory systems such as olfaction, hearing, and vision and discuss how physical energy such as light is converted into neural signals, where these signals travel in the brain, and how they are processed. Next, we study the control of voluntary movement. Finally, we cover the neurochemical bases of brain diseases and those systems which control motivation, emotion, learning, and memory.

16.2 Course Objectives

This course seeks to:

Sl. No.	Course Accomplishments
1	Provide a systematic introduction to the mammalian nervous system, emphasizing the structural and functional organization of the human brain.
2	Expose students to the field of neuroscience.

16.3 Methods of Instruction

Lab, Lectures, and Discussion.

16.4 Course Content

Week	Topics for Study
1	Neuroanatomy: Introducing the Human Brain.
2	Neuroanatomy: Surface Anatomy of the Human CNS.
3	Neural Signaling: Electrical Excitability and Signal Propagation.
4	Neural Signaling: Synaptic Transmission and Synaptic Plasticity.
5	Sensory Systems: General Principles and Somatic Sensation.

Week	Topics for Study
6	Movement and Motor Control: Understanding the Paradigm of Eye Movements.
7	Sensory Systems: Audition, Vestibular Sensation, and the Chemical Senses.
8	Revision and Midterm Examination.
9	Movement and Motor Control: Lower and Upper Motor Neurons.
10	Movement and Motor Control: Modulation of Movement.
11	The Changing Brain: The Brain Across the Lifespan.
12	Complex Brain Functions: Associational Cortex.
13	Brain Functions: Sleep, Emotion, and Addiction.
14	Revision and Examination.

16.5 Textbooks

Sl. No.	Textbook
1	Bear, Mark F., Barry W. Connors, and Michael A. Paradiso. Neuroscience: Exploring the Brain, 3rd Ed. Baltimore, MD: Lippincott Williams & Wilkins, 2006. ISBN: 9780781760034. [Preview in Google Books.]

Lincoln American University
8A & 8B, Water & Barrack Street,
Kingston, Guyana
1800-843-9595 | +91 92058 90239
info@laumed.org | www.laumed.org

Sharda University Campus
Plot No. 32-34, Knowledge Park III,
Greater Noida, Uttar Pradesh 201310
+91-120-4060210 | +91-120-4060211
www.sharda.ac.in | www.sharda.ac.in