BACHELOR'S DEGREE

IN

NUTRITIONAL SCIENCES

(B.Sc.)

“Curriculum”

Title: BACHELOR'S DEGREE IN LIFE SCIENCES

Degree: **B.Sc.**

Introduction

The ongoing B.Sc. Life Sciences course was introduced by the International Campus of TUMS only for International students. The life sciences comprise the fields of science that involve the scientific study of living organisms – such as microorganisms, plants, animals, and human beings. Life Sciences course is designed for students who are committed to studying the biological sciences, but have not yet decided on the area in which they want to specialize. They can then make that decision from a position of greater knowledge at the end of the course. The combination of units taken will enable the students to transfer to most of biological and biomedical sciences courses.

Life Sciences in the world

Norwegian University of Life Sciences

University of Aberdeen College of Life Sciences and Medicine

Estonian University of Life Sciences

Life Sciences Colleges in India

Czech University of Life Sciences Prague

University of Cambridge, UK

ETH Zurich Switzerland

Wageningen University Netherland

Luis Pasture Institute in Paris

Cape Town in South Africa

Definition

Nutritional science is a branch of medical sciences that aims to improve the health and wellbeing of the individuals and community to achieve sustainable development in food products and nutrition systems. The program is designed for students who wish to delve more deeply into nutritional sciences and related research. Graduates of Nutritional Sciences (B.Sc) will have the ability to work in the fields of education, research, consultancy services

to individuals and community and could also participate in food and nutrition program planning and policy making.

In this B.Sc. level the student learns both the rudimentary and application aspects, which includes the investigation and analysis of the requirement along with the skills in dietetics. Job opportunities are wide in the field of nutrition both in public and private sector.

The aim of the courses

- To develop basic counseling skills as dietitian.
- To get proper training in the field of food service management
- To focus on the food science discipline and trained to work at food industry.
- To teach various food processing techniques to start small scale food industry as entrepreneur
- To improve human health and promote healthier societies by training future professional nutritionists.

Program Vision and Mission

We are committed to excellence, education, collaboration and professionalism. We strive to continuously improve our programs. We strive to enhance dietetic practice in IRAN through excellence in teaching and training of the dietitians of tomorrow.

The terms and conditions of admission to the course

Applying to Tehran University of Medical Sciences is online and electronically.

All the applicants should have Higher Secondary Certificate (HSC). Proficiency in written and speaking English. The students should provide a motivation letter. After applying, application will be carefully reviewed at the Office of Admissions.

Educational strategies, methods and techniques

The education strategy in TUMS is based on SPICES model. (Student centered, problem based, integrated, community oriented, electiveness, systematic). The principles and

methods used for instruction by teachers are to achieve the desired learning or memorization by students. These strategies are determined partly on subject matter to be taught and partly by the nature of the learner. Furthermore, problem solving method, lectures, virtual teaching, and team based learning and is used.

Student assessment

Students should take part in exams in the end of each semester, for each course separately. Some lectures may decide to take an additional exam in the mid-term. An examination is an assessment intended to measure students' knowledge and skill. There are different methods of examination for theory subjects such as Multiple Choice Questions (MCQ), short answer questions, matching. For practical examination Objective Structured Practical Exam (OSPE) is performed.

Number and type of credits and table of the courses

Life Science education in general is a three and half year's course.

Total Number of Credits: 124 credits

General courses: 18 credits

Basic courses: 22 credits

Special courses: 66 credits

Field Internship: 18 credits

One credit is equal to:

- 17 hours Theory

  or

- 34 hours Practical

Core credits

Core credits					
NO	**Subject**	**Number of credits**			**Total credits**
		Credit (theory)	**Credit (practical)**	**prerequisite**	
1	Zoology	2	1	-	3
2	Botany	2	1	-	3
3	General Chemistry	2	1	-	3
4	General Biology	3	-	-	3
5	General Mathematics	2	-	-	2
6	General Physics	2	1	-	3
7	General Anatomy & Embryology	3	1	-	4
8	Organic Chemistry	3	1	General Chemistry	4
9	Biochemistry I	3	1	General Biology	4
10	Biophysics	2	-	General physics	2
11	Cell & Molecular Biology	4	1	General Biology	5
12	Biostatistics	2	1	-	3
13	Biochemistry II	3	1	Biochemistry I	4
14	Microbiology	4	1	Zoology	5
15	Basic Human Histology	3	1	General Anatomy	4
16	Physiology I	3	1	Biochemistry I General Anatomy	4
17	Laboratory Animals	0.5	0.5	-	1
18	Physiology II	3	1	Physiology I	4

19	Parasitology & Mycology	4	1	Zoology	5
20	Haematology	2	1	Physiology I	3
21	Psychology	2	-	-	2
22	Immunology	3	1	Physiology I	4
23	Genetics	3	1	Cell & Molecular Biology	4
24	Medical Terminology	2	-	General English	2
25	Sociology	2	-	-	2
26	Ecology	2	-	Zoology & Botany	2
27	Information Technology	1	1	-	2
28	Research Techniques	2	-	-	2
29	Epidemiology	2	-	Biostatistics	2
30	Nutrition Sciences	2	-	Biochemistry	2
31	Fundamental Pathology	3	1	Basic human Histology, Embryology, Genetics, Microbiology, Parasitology	4
32	Fundamental Pharmacology	3	-	Biochemistry	3
33	Seminar	1	-		1
Total		**80.5**	**20.5**		**101**

General credits

General credits					
NO	**Subject**	**Number of credits**			**Total credits**
		Credit (theory)	**Credit (practical)**	**prerequisite**	
34	Introduction to Religion I	2	-	-	2
35	Introduction to Religion II	2	-	Introduction to Religion I	2
36	Divine Ethics	2	-	-	2
37	Divine Texts	2	-	-	2
38	Islamic Revolution	2	-	-	2
39	General English	3	-	-	3
40	Persian Language	3	-	-	3
41	Physical Training I	-	1	-	1
42	Physical Training II	-	1	PT I	1
Total		**16**	**2**		**18**

Elective credits

Elective credits			
NO	subject	Number of credits	
		Credit (theory)	Credit (practical)
43	Molecular Genetics	2	-
44	Population Genetics	2	-
45	Metabolic Disorders	2	-
46	Hormones	2	-
47	Neuroanatomy	2	-
48	Neurophysiology	2	-
49	Neuropharmacology	2	-
50	Neurodegenerative Disorders	2	-
51	Comparative Embryology	2	-
52	Comparative Histology	2	-
53	Advanced Physiology	4	1
54	Anatomy of upper & Lower limbs	1	1
55	Anatomy of Trunk	3	1
56	Anatomy of Head & Neck	2	1

Completions of all General and Core credits are mandatory.

13 credits of elective should be taken by students

Title of the course: BACHELOR'S DEGREE IN LIFE SCIENCES
Number of Credits: 132 credits

Type of course: Theory – Practical

Principal objectives of the course:

To engage in education and research that can contribute to society at both community and international levels, provide experiences for the development of expertise and ethics, and enrich humanity with relatively broader knowledge and deeper expertise in the next generation.

Curriculum

Zoology

No. of Credits: 2 Theory, 1 Practical **Code No.: 01**

Perquisites: -

General description: An introduction to the study of animal life. The mechanisms of digestion, circulation, osmoregulation, excretion, locomotion, nerve action and reproduction in representative animals are discussed. The chemical and cellular mechanisms involved in the transmission of inheritance are studied. Representative animal phyla including both invertebrates and vertebrates are studied from the viewpoint of systematics and structural characters. The laboratory and field activities provide an overview of an introduction to the study of animal life.

References:

1. Mary J. Cuthrie; General Zoology, Last Edition
2. J.C. P. Hickman, L.S. Roberts and A. Larson, "Integrated Principles of zoology", McGraw-Hill., 2010.

Botany

No. of Credits: 2 Theory, 1 Practical **Code No.: 02**

Perquisites: -

General description: This course integrates fundamental and applied aspects of plant ecology, focusing on the roles of functional traits, physiological mechanisms, life history strategies, biotic constraints, and interactions in influencing plant distribution and abundance. Specific topics include physiological ecology, growth and allocation patterns, influence of biotic and trophic interactions [pollinators, pathogens, herbivores, competitors, mutualists, decomposers] on the structure and function of plant communities, and effects of global environmental change. Laboratories will include study of structure of plant cells, tissues, and organs. Microscopic study of plant structure.

References:

1. Wilhelm Nultsch; General Botany, Last Edition
2. D.F.Cutler,"Plant Anatomy:AnApplied Approach", Blackwell Publishers, 2008

General Biology

No. of Credits: 3 Theory **Code No.: 04**

Perquisites: -

General description: This course is the study of life and living organisms. General biology courses encompass many aspects of the science, such as ecology, genetics, paleontology, physiology and zoology. Free, non-credit online courses usually have no prerequisites. ... Topics include cell biology, human disease and genetics

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References:

1. Mortimer, CE.; General Chemistry, Last Edition
2. Morrison, R.T. Boyd, R.N; Organic Chemistry, Last Edition

General Mathematics

No. of Credits: 2 Theory **Code No.: 04**

Perquisites:

General description: This option focuses on mathematical techniques used in the physical sciences. Subjects covered include vector calculus, vector algebra, matrices, complex numbers, ordinary and partial differential equations, elementary probability theory and computing techniques.

This also includes: Polynomials, exponential and logarithm, trigonometric functions, coordinates and analytical plane geometry, conic sections, applications using differentiation, mathematical induction, inequalities, linear equations and matrices.

References:

1. George B. Johnson and Susan R. Singer; Understanding Biology, Last Edition
2. Jane Reece, Neil Campbell, Eric J. Simon,; Campbell Biology , Last Edition

General Mathematics

No. of Credits: 2 Theory **Code No.: 05**

Perquisites:

General description: This option focuses on mathematical techniques used in the physical sciences. Subjects covered include vector calculus, vector algebra, matrices, complex numbers, ordinary and partial differential equations, elementary probability theory and computing techniques.

This also includes: Polynomials, exponential and logarithm, trigonometric functions, coordinates and analytical plane geometry, conic sections, applications using differentiation, mathematical induction, inequalities, linear equations and matrices.

References:

1. H. S. Bear; Understanding Calculus, Last Edition
2. E. Batschelet; Introduction to Mathematics for Life Scientists, Last Edition

General Physics

No. of Credits: 2 Theory, 1 Practical **Code No.: 06**

Perquisites: -

General description: Students will learn basis of physics, i.e. mechanics (motion, force and energy), gravitation, fluid and oscillation. (Introductions, Kinematics in One Dimension, Kinematics in Two Dimensions; Vectors, Newton's Laws of Motion, Circular Motion; Gravitation, work and Energy, Linear Momentum, Rotational Motion, Static Equilibrium, Fluid, Oscillation and Wave, Sound, Temperature and Kinetic Theory,).

For General Laboratory Physics: Introduction to Data Studio and One-Dimensional Motion Velocity and Acceleration, Force, Mass, and Acceleration, Gravitational and Passive Forces, Work and Energy, Conservation of Energy, Buoyant Forces, Collisions and Momentum, Rotational Inertia, Harmonic Motion and the Pendulum, Standing Waves and Resonance Heat Capacity.

References:

1. D.G. Simpson; General Physics, Last Edition
2. Jearl Walker ; Fundamentals of Physics Extended, 10th Edition

General Anatomy & Embryology

No. of Credits: 3 Theory, 1 Practical **Code No.: 07**

Perquisites: -

General description: This course presents a systemic approach to the study of the human anatomy and also focuses on stages of human embryogenesis to present the fundamental molecular and cellular mechanisms that underlie normal differentiation and morphogenesis The following basic and important topics are taught to the students:

Introduction to anatomy, anatomy history, skeletal, muscular, nervous, circulatory, etc. In the end of this course the students should be able to explain different parts of human body**.** The laboratory component of the course generally parallels and reinforces lecture concepts through the use of anatomical models and the presence of students in the dissection hall. The students will learn different parts of human body.

Topics in embryology portion include introduction to embryology, gametogenesis (spermatogenesis and oogenesis), ovulation and fertilization, etc. Students gain experience in the methods of analysis of developmental stages through hands-on laboratory work and demonstrations.

References:

1. Leslie P. Gartner; (color atlas and text of histology), Last Edition
2. Drake R. L.; Gray's Anatomy for students
3. Lippincott Williams & Wilkins; Langman's Medical Embryology, Last Edition
4. Larsen's Human Embryology 5th Edition Gary Schoenwolf Steven Bleyl Philip Brauer Philippa Francis-West, 2015

Organic Chemistry

No. of Credits: 3 Theory, 1 Practical **Code No.: 08**

Perquisites: General Chemistry

General description: Structure and properties of organic molecules, structure and stereochemistry of alkanes, the study of chemical reactions, stereochemistry, and alkyl halides: nucleophilic substitution and elimination, structure and synthesis of alkenes, reactions of alkenes, conjugated systems and orbital symmetry, aromatic compounds, reactions of aromatic compounds.

For laboratory introducing the variety of fundamental laboratory techniques applicable to the study, separation, purification, preparation and simple reactions of organic compounds.

References:

1. Morrison, R.T. Boyd, R.N; Organic Chemistry
2. Bacon, J.D.; Caserio, M.C.; Basic Principles of Organic Chemistry
3. Ege, S.N.; Organic Chemistry
4. Wade, L.G.; Organic chemistry

The systematic identification of organic compound

Biochemistry I

No. of Credits: 3 Theory, 1 Practical **Code No.: 09**

Perquisites: General biology

General description: This course explores the roles of essential biological molecules with a focus on the fundamental biochemical concepts of carbohydrates, proteins and nucleic acid structures, their properties and function in relation to their biological role. The course presents the principles that determine the structure of biological macro molecules and discusses how structure enables function with emphasis on membrane structure and components involved in cell communication. The biochemical basis of genetic inheritance and protein expression as well as the chemical and thermodynamic principles underlying biochemical reactions and the relationship of enzyme structure to catalysis and regulation are also discussed.

The course covers biochemistry laboratory routine tests of urine, serum and other body liquids.

References:

1. Lehninger; principles of biochemistry, Last Edition
2. J.M. Berg, J.L. Tymoczko, L. Stryer, "Biochemistry", 7th Edition, W.H. Freeman, New York, 2010.

Biophysics

No of Credit: 2 Theory **Code No.: 10**

Perquisites: General physics

General description: The emphasis of the course is on physics concepts and their application to relevant problems in the biological sciences rather than on the more theoretical or mathematical development of the concepts. It includes a study of forces and equilibrium, mechanical stress, energy, fluids, heat and DC electricity. It entails practical problem solving.

References:

1. M. Volkenstein; General Biophysics, Last Edition
2. Kramer; Physical and life Science, Last Edition

Cell and Molecular Biology

No. of Credits: 4 Theory, 1 Practical **Code No.: 11**

Perquisites: General Biology

General description: Molecular Biology is the investigation at the molecular level of all aspects of cells and tissues from simple systems in bacteria to more complex systems in plants and mammals. It has been responsible for spectacular successes in the treatment of disease caused either by bacteria and viruses on the one hand, or inborn genetic errors on the other. Molecular Biology is central to current investigations to understand the genetic basis of human disease and pathology. In this course we will examine many different areas of cellular biology including: the synthesis and function of macromolecules such as DNA, RNA, and proteins; control of gene expression; membrane and organelle structure and function; bioenergetics; and cellular communication.

References:

1. Lodish; molecular cell biology, Last Edition
2. B. Lewin, "Gene IX", Pearson Prentice Hall, 2009.

Biostatistics

No. of Credits: 2 Theory, 1 Practical **Code No.: 12**

Perquisites: -

General description: The course will introduce students to statistical methods with emphasis on the application of statistical ideas and methods for designing and interpreting biological experiments and comparative data. Students will be taught the use of SPSS, including the creation of variables and data sets, how to conduct statistical analyses, and interpretation of data outputs. The format of the course will be lectures and practical using EXCEL and the SPSS software.

References:

1. Kazem Mohammad, Malek Afzali; Statistical Methods and Health Indicators, Last Edition

2. Bultun; Pharmaceutical Statistics, Last Edition

Biochemistry II

No. of Credits: 3 Theory, 1 Practical **Code No.: 13**

Perquisites: Biochemistry I

General description: Students gain a deeper understanding of the links between physical and organic chemistry and biology. The fundamental concepts related to the central energy requirements and metabolism as well as the basic chemical properties and pathways that underlie metabolic processes are discussed. Emphasis is placed on how these pathways are integrated and regulated in the context of bioenergetics to maintain cell and whole body homeostasis in health and disease states. Students develop a good understanding of the most important recent developments and applications of biochemistry principles in targeting key molecules for therapeutic interventions. They also develop laboratory skills and critical thinking to study biochemical techniques.

References:

1. Harper; Illustrated biochemistry, Last Edition
2. D.L. Nelson, M.M. Cox, "Leninger Principles of Biochemistry", 5th Edition, W.H. Freeman, 2008.

Microbiology

No. of Credits: 4 Theory, 1 Practical **Code No.: 14**

Perquisites: Zoology

General description: The course provides an overview of the basic biology and biochemistry of normal microorganism flora and of infectious microorganisms (bacteria, viruses) causing human diseases. Students will learn about the mechanisms of infection, virulence, how microorganisms and host evade and overcome one another's offensive and defensive mechanisms, and about the uses, misuses, advantages and limitations of antimicrobial drugs.

Students will gain experience of basic microbiology laboratory techniques that are used to grow and identify such microorganisms through hands-on laboratory exercises. Upon completion, students should be able to demonstrate knowledge and skills including microscopy, aseptic technique, staining, culture methods, and identification of microorganisms.

References:

1. Jawetz Microbiology; Last Edition
2. K.P. Talaro, "Fundations inMicrobiology", 7th Edition, McGraw Hill Company, 2009

Basic Human Histology

No. of Credits: 3 Theory, 1 Practical **Code No.: 15**

Perquisites: General Anatomy

General description: This course summarizes the general structure and the major functions of the tissues of human body. It explains development and growth of different body tissues. It outlines the structure and function of the cell and major types of tissue. It identifies and describe the microscopic structure of the epithelial, connective, heart, cardiovascular, lymphatic, respiratory, muscles and skeletal, digestive, digestive glands, cartilage, joints, eye, ear, endocrine, nervous system, central nervous system, blood and blood supply, respiratory, male and female reproductive organs, skin .and urinary body systems. It shows the relationship between the structure and functions of the above body systems.

In practical sessions students observe the microscopic structure of tissues and different body systems under light microscope and should be able to differentiate under the microscope.

References:

1.Junqueira histology Basic Histology (Textbook of Histology), Last Edition

2. Leslie P. Gartner; (color atlas and text of histology), Last Edition

Physiology I

No. of Credits: 3 Theory, 1 Practical **Code No.: 16**

Perquisites: General Biology, General Anatomy

General description: This course will help the students to describe the action potential of a neuron and understand the physiological role of nerve impulse conduction. Explain how a skeletal muscle contracts, how fatigue muscle is formed, homeostasis and maintaining physiological function. Also how the cardiovascular system regulates the blood flowing through the tissues. Explaining the altered functions in the cardiovascular and pulmonary systems affecting the body. Describe the roles of blood in homeostasis and immune defense. Explain how the pulmonary system and the blood transport oxygen to and carbon dioxide from tissues.

References:

1. Guyton, A.C., & Hall, G.E.; Textbook of Medical Physiology, Last Edition
2. R.H. Berne and M.N. Levy, "Principles of Physiology", 6th Edition, Mosby Company, 2008.

Laboratory Animals

No of Credit: 0.5 Theory 0.5 Practical **Code No.: 17**

Perquisites: -

General description: This course aims to instill the major principles of the study of laboratory animals and their utilization for teaching and research. This will include developing a scientific understanding of the applications and limitations of various laboratory animal species in addition to practical experience in animal handling and other procedures. Topics will include animal handling, breeding, feeding, maintenance, minor interceptions and minor surgical procedures. Species studied will include mice, rats, guinea pigs and rabbits**.**

References:

1. Lynn Anderson, Glen Otto; Laboratory Animal Medicine

Physiology II

No. of Credits: 3 Theory,1 Practical **Code No.: 18**

Perquisites: Physiology 1

General description: This course describes the processes by which the kidneys regulate the body fluid volume and its composition. It explains how the gastrointestinal system carries out the digestion and absorption of ingested food. It identifies the roles of various hormones and understands how their secretions are regulated. The function of the motor center, cerebral cortex and limbic system of the central nervous system. It describes the special senses, the eyes and ears, performing their function. Furthermore, it describes how some of the altered function in the kidneys, gastrointestinal, endocrine and central nervous system affect the body. It explains the general principles as to how all the tissues and organs work together to maintain homeostasis.

References:

1. Guyton, A.C., & Hall, G.E.; Textbook of Medical Physiology
1. E.R. Kandel, J.H. Schwartz and T.M. Jessell, "Principlesof Neural Science", 4th Edition, McGraw-Hill., 2000

Parasitology and Mycology

No. of Credits: 4 Theory, 1 Practical **Code No.: 19**

Perquisites: Zoology

General description: This course provides core training in the theoretical and practical aspects of medical parasitology, covering the protozoan and metazoan parasites of humans and the vectors which transmit them and fungi on the biology and epidemiology of them. A detailed knowledge and understanding of the biology, life cycles, pathogenesis, and diagnosis of parasitic infections in humans and their relevance for human health and control and knowledge and understanding of the biology and strategies for control of the vectors and intermediate hosts of human parasites is explained. General classification and characteristics of pathogenic fungi are also presented. For practical, laboratory techniques and microscopic identification of parasite, arthropods and fungi stages are taught.

References:

1. Markell and Voge's; Medical Parasitology, Last Edition
2. Essentials of Clinical Mycology, Editors:Carol A. Kauffman, Peter G. Pappas, Jack D. Sobel, William E. Dismukes , Last Edition
3. Evans; Medical Mycology, Last Edition

Hematology

No of Credit: 2 Theory 1 Practical **Code No.: 20**

Perquisites: Physiology 1

General description: This course provides an introduction to hematology, an area of general pathology that is concerned with diseases that affect the blood, such as blood clotting disorders, anaemias, lymphomas, leukaemias, thrombosis, coagulation disorders and haemoglobinopathies. Blood transfusion and bone marrow transplantation also will be discussed during the course.

Competencies in haematological techniques conducted in pathology laboratories including, complete blood count, blood grouping, blood films, differential count, staining methods for microscopy, and coagulation tests will be assessed.

References:

1. McKenzie; Textbook of Heamatology , Last Edition
2. Hoffbrand; Essential Heamatology , Last Edition
3. Wolff; Atlas of Heamatology , Last Edition
4. Dacie & Lewis; Practical Heamatology , Last Edition

Psychology

No. of Credits: 2 Theory **Code No.: 21**

Perquisites: -

General description: This course entails survey of topics in experimental and clinical psychology, including physiological bases of behavior, sensation, perception, learning, memory, human development, social processes, personality, and abnormal.
Knowing the basic principles of psychology, different sense and thought process.

Reference:

1. Ellyson Steve; General Psychology of Learning, Last Edition
2. Psychology: Themes and Variations, Wayne Weiten , Last Edition

Immunology

No. of Credits: 3 Theory, 1 Practical **Code No.: 22**

Perquisites: Physiology 1

General description: This course introduces students to the theoretical knowledge in cellular and molecular immunology in greater depth. Students learn about the development of the immune system, the components of the immune defense and the apparatus, functions and regulation of the cellular and humoral immune defenses in health and disease. Immunogenetics, transplantation immunology, immune tolerance, immune hypersensitivity; autoimmunity and immune diseases are special topic presented in this course. Students also learn about the use of immunological methods in diagnostics and biochemical analysis.

Laboratory diagnostics and detection for laboratory students familiar with different routine methods and also electrophoresis and gel diffusions.

References:

1. Abul K Abbas, Andrew H. Lichtman; Cellular and Molecular Immunology,Last Edition
2. C. Janeway, " Janeway's Immunobiology", 7th Edition, Garland Science, 2008

Genetics

No. of Credits: 3 Theory, 1 Practical **Code No.: 23**

Perquisites: Cell and Molecular Biology

General description: Beginning with an overview of the principles of inheritance such as cell division and Mendelian genetics, exploring the foundations and frontiers of modern human genetics, with an emphasis on understanding and evaluating new discoveries. Descending to the molecular level, investigate how genetic information is encoded in DNA and how mutations affect gene function. These molecular foundations are used to explore the science and social impact of genetic technology. Laboratory projects emphasize the diverse methods that scientists employ to study heredity.

References:

1. Emery's; Human Genetics, Last Edition
2. E.J. Gardner, "Principals of genetics", John Wiley and Sons, 2011

Medical Terminology

No. of Credits: 2 Theory **Code No.: 24**

Perquisites: General English

General description: This course provides a unique educational program to improve the student's medical vocabulary. The course includes medical and scientific content information; which students encounter in other health professional courses. Emphasis is placed on prefixes, suffixes, and building and analyzing medical terms.

References:

1. Barbara Janson Cohen, Ann Depetris; Medical Terminology, an illustrated guide, Last Edition
2. Quick Medical Terminology: A Self-Teaching Guide 5th Edition , Shirley Soltesz Steiner, Natalie Pate Capps

Sociology

No. of Credits: 2 Theory **Code No.: 25**

Perquisites: -

General description: This course is an introductory study of the foundations of Sociology and will make a sincere effort to reclaim chance to think in a spherical, interdisciplinary manner. The declared purpose is to awaken the Sociological imagination and spark the creative energies of critical intelligence in order to first understand, then explain and/or intervene in social processes.

The students are expected to familiarize themselves with the rich corpus of sociological theory and practice that will enable them to make sense of the plight, the dilemmas and the possibilities of the global modernity in which they live.

References:

1. Gerhard Lenski; Studying Human Societies, Last Edition
2. Anthony Giddens; Sociology, Last Edition
3. Daniel Beats; Cultural Anthropology, Last Edition
4. Rosamond Bilington; Culture and Society, Last Edition

Ecology

No. of Credits: 2 Theory **Code No.: 26**

Perquisites: -

General description: This is a basic subject in ecology where students get exposed to the fundamental ecological principles with reference to ecosystem organization at individual, population and community levels with regard to the flow of energy and materials and to the regulation of distribution and abundance of organisms. The course covers productivity, food and energy dynamics, community structure and stability, exploitation, structural adaptation and functional adjustments, population growth and other physiological factors affecting the distribution of organisms and degree of fitness in the environment.

References:

1. Colinvaux, P. A.; Ecology, Last Edition
2. Krebs, C. J.; Ecology, Last Edition
3. Odum, E.P.; Fundamentals of Ecology, Last Edition,
4. Ricklefs, R.E.; Ecology, Last Edition

Information Technology

No. of Credits: 1 Theory, 1 Practical **Code No.: 27**

Perquisites: -

General description: This course offers students practical knowledge and insight in Information Technology (IT) projects through management principles and case studies. The focus is on the role of IT and the value creation brought by IT. It gives the overview of information systems used in health care industry; processes used in the acquisition, application and evaluation of software and hardware systems along with effective use and capturing of data.

References:

1. Jill Lambert, Taylor & Francis; Finding Information in Science, Technology and Medicine, Last Edition
2. Krzysztof Zieli'nski et al.; Information Technology Solutions for Healthcare, Last Edition

Research Techniques

No of Credit: 2 Theory **Code No.: 28**

Perquisites: -

General description: This research preparedness course will review and reinforce student learning on the research process and enable students to produce a research proposal ready for implementation. In a series of modules, the course focuses on specific aspects of doing research including: literature searching and critical appraisal; reference management; framing the research question and determining research approaches; and ethical issues. Students will develop competence in assessing the validity of the published literature, determining the gaps in the evidence and developing a feasible study design that complies with the principles underpinning responsible research practice.

References:

1. C.R. Kothari; Research Methodology, Methods & Techniques, Last Edition
2. **Eve Mitleton-Kelly, Alexandros Paraskevas, Christopher Day, Handbook of Research Methods in Complexity Science , Last Edition**

Epidemiology

No. of Credits: 2 Theory, 1 Practical **Code No.: 29**

Perquisites: Biostatistics

General description: Epidemiology is the study of the distribution and determinants of health and disease in human populations. This course will introduce students to the basic principles of epidemiological study design, analysis, and interpretation. The course will draw on topics in epidemiology for lectures, discussions, readings and assignments. Research articles from epidemiology as well as other social science disciplines will be utilized to offer students multiple perspectives on epidemiology.

References:

1. Gordis L., W.B.; Epidemiology, Last Edition
2. Wolfgang, **Pigeot,** Iris , Handbook of Epidemiology **, Last Edition**

Nutrition Sciences

No. of Credits: 2 Theory **Code No.: 30**

Perquisites: Biochemistry

General description: This course presents the unifying concepts of the science of nutrition and the basis of the relationships of the nutrients, diet and health. The course provides an integrated overview of the physiological requirements and functions of protein, energy and the major vitamins and minerals that are determinants of health and diseases in human populations and the metabolic interrelationships among nutrients which maintain homeostasis in humans.

Students through case paradigms discussed during lectures, learn to decision making regarding food choices and nutritional issues and about guidelines and policies regarding nutrition and health through the life cycle.

References

1. Martin Eastwood; Principles of Human Nutrition. Last Edition
2. Carolyn D. Berdanier , Johanna T. Dwyer , David Heber , **Handbook of Nutrition and Food, Third Edition ,** Last Edition

Fundamental Pathology

No of Credit: 3 Theory, 1 Practical **Code No.: 31**

Perquisites: Histology, Embryology, Genetics, Microbiology, Parasitology

General description: In this course, the basic pathological processes are reviewed and the students will look in more depth and at a wider variety of common pathological conditions than in biology of disease. General topics covered include the nature and causes of cell injury and death; adaptive cellular changes; inflammation, healing and repair, thrombosis, embolism and infarction and neoplasia. More detailed attention is given to cardiovascular, pulmonary and gastrointestinal diseases and common cancers and the pathology is correlated with major clinical symptoms and signs.

For practical, students examine macroscopic and microscopic specimens illustrating the pathology covered in lectures.

References:

1. Robbins; Basic Pathology, Last Edition
2. Emanuel Rubin; Howard M. Reisner, Essentials of Rubin's Pathology, Last Edition

Fundamental Pharmacology

No of Credit: 3 Theory **Code No.: 32**

Perquisites: Biochemistry

General description: This course examines the fundamentals of pharmacology as a science. Special topics will include the drug discovery/development process, environmental issues in human drugs, and the use of herbal medications as pharmaceutical products.

Students will learn the fundamentals of Pharmacokinetics, Pharmacodynamics, toxicology. and drug development. Students will be able to describe the major mechanisms that control pharmacokinetics and pharmacodynamics.

A series of laboratory exercises, and presentations which introduce students to some of the basic approaches used in pharmacology such as drug metabolism, toxicology and antibiotics.

References:

1. Bertram G.K Wtzung; Basic and Clinical Pharmacology. Last Edition
2. H.P Rang/ M.M. DALE; Pharmacology. Last Edition

Seminar

No of Credit: 1 Theory **Code No.: 33**

Perquisites: -

General description: It has the function of bringing together small groups for recurring meetings, focusing each time on some particular subject, in which everyone present is requested to participate. It is essentially a place where assigned readings are discussed, questions can be raised and debates can be conducted.

Introduction to Religion I

No. of Credits: 2 Theory **Code No.: 34**

Perquisites: -

General description: First reviewing the preliminary discussion of generalities and definitions such as religion and its definition or law and its definition, prophets and their holy books. In addition, history of religions such as Judaism, Christianity and Islam will be discussed. Finally, it provides a brief overview of the content of these religions, issues such as the concept of God, the Day of Judgment, the monotheism (توحید), justice (عدل), Prophecy (نبوت), divine leadership (امامت), and the Day of Judgment (معاد) holy books and predictions about the final prophet.

References: -

Introduction to Religion II

No. of Credits: 2 Theory **Code No.: 35**

Perquisites: Introduction to Religion I

General description: The main objective for this course is to provide the students with the knowledge about religions to determine the necessity of religion. Then they would be able to describe the nature and history of religion and make comparison between the religions and review the impact of religions on civilization. Also to understand the meaning of Prophecy, the necessity of prophecy and understand the purposes of what messengers said, review of revelation and understand the miracle and infallibility. Moreover, the course emphases on challenging the students for describeing the role of religion in worldly life and backgrounds and the factors that explain the formation of secularism and understanding the meaning of leadership and authority and infallibility of the Imams to explain the reason for the installation. Topics of this course include religion & theology, the prophecy, Imamat, velayat-e faqih and absence of Imam Vali-e Asr.

References: -

Divine Ethics

No. of Credits: 2 Theory **Code No.: 36**

Perquisites: -

General description: This course is designed to familiarize students with the principles and concepts of Divine ethics in the field of moral virtues and vices, virtues and in order to avoid Moral vices. The belief that what's moral and what's immoral is commanded by the divine the theory asserts that what is moral is determined by what God commands, and that for a person to be moral is to follow his commands. Followers of both monotheistic and polytheistic religions in ancient and modern times have often accepted the importance of God's commands in establishing morality.

The theory asserts that good actions are morally good as a result of their being commanded by God, and many religious believers subscribe to some form of divine command theory.

Divine Texts

No. of Credits: 2 Theory **Code No.: 37**

Perquisites: -

General description: Acquaintance with ancient conceptions of the divine in various contexts. This course serves as an introduction to the revelation of God and our response of faith. We explore the transmission of revelation and the dynamism of the adventure of faith. This course promotes personal reflection and holistic formation in participants.

Islamic Revolution

No. of Credits: 2 Theory **Code No.: 38**

Perquisites: -

General description: This course explores the making of the Iranian Revolution of 1978-79 and the subsequent establishment of the Islamic Republic. Framed in a comparative perspective, it explains the cultural and political peculiarities that shaped the Islamist outcome of the Revolution This course provides an in depth introduction to the modern history of Iran with a focus on the cultural and political factors that culminated in the 1979 revolution.

General English

No. of Credits: 3 Theory **Code No.: 39**

Perquisites: -

General description: The General English course focuses on accuracy and fluency with an integrated skills and strategy-based curriculum that aims at developing the four language skills—listening, speaking, reading, and writing. The course also focuses on improving pronunciation and increasing vocabulary. Participants are placed in one of the following stages based on their placement test results: beginner, elementary, pre-intermediate, intermediate, and pre-advanced.

References:

1. Sabouri Kashani, Ahmad; General English, Last Edition
2. Raymond Murphy ,Grammar in Use Intermediate with Answers , Last Edition

Persian Language

No. of Credits: 3 Theory **Code No.: 40**

Perquisites: -

General description: The Persian (Farsi) Language Program aims to develop skills in the five areas of reading, listening, speaking, writing, and culture. This course offers a proficiency-based curriculum based on an eclectic communicative approach which introduces students to both colloquial and formal Persian from the beginning.

References:

1. Khazheni Sara Beygom & et al; Persian Language, Last Edition
2. سعید صفری ,سلام فارسی , Last Edition

Physical Training I

No. of Credits: 1 Practical **Code No.: 41**

Perquisites: -

General description: Explore the amazing capacity of your body to move and adapt within your everyday world. Students learn how body systems respond to the stress of acute exercise and adapt to chronic exercise training, how cardiovascular system adapts to optimize oxygen delivery and utilization, how muscles generate force and hypertrophy in response to training, and how metabolic/biochemical pathways are regulated to support the increased energy demand of exercise. Also theory discussion on the causes of fatigue and muscle soreness, and on what limits human performance.

Physical Training II

No. of Credits: 1 Practical **Code No.: 42**

Perquisites: Physical Training I

General description: Building on the skills of Physical Training 1, students will continue to participate in activities to improve cardiovascular abilities, muscle strength and endurance, and increase flexibility and balance. Assessment of physical fitness levels will be completed through health-related fitness component testing including timed runs, shuttle runs, push-ups, curl ups, flexion and chin ups.

Elective courses

Molecular Genetics

No of Credit: 2 Theory **Code No.: 43**

Perquisites: Genetics

General description: This course will provide students with the knowledge about understanding the molecular basis for transcription, translation, replication and gene regulation and other topics in molecular genetics for both prokaryotes and eukaryotes. Also to understand the underlying theoretical principles of the scientific methods and approaches of molecular genetics. The students will acquire an appreciation for the impact of molecular genetics (particularly of human) in physiology, evolution and disease.

References:

1. Thompson & Thompson; Genetics in Medicine, Last Edition
2. Bruce Alberts, Molecular Biology of the Cell, 4th edition, Last Edition

Population Genetics

No of Credit: 2 Theory **Code No.: 44**

Perquisites: Epidemiology & Genetics

General description: This course will study the various factors that affect gene flow and frequency within a population. Theories of selection, neutrality, drift, hitchhiking, recombination, mutation, isolation, in-breeding, and selfish genetic elements will be taught along with statistical tests and experimental methods for detecting these forces.

References:

1. Daniel L. Hartl, Andrew G. Clark; Principles of population Genetics, Last Edition
2. Matthew Hamilton ,Population Genetics , Last Edition

Metabolic disorders

No of Credit: 2 Theory **Code No.: 45**

Perquisites: Biochemistry

General description: This course will provide students with the knowledge about the molecular and cell biological mechanisms underlying the pathophysiology of many monogenetic and acquired (multifactorial) disorders like type 2 diabetes, metabolic syndrome or cardiovascular diseases. In addition, disturbed metabolism plays a role in the progression of many other diseases like cancer and various types of neurodegenerative disorders like Parkinson. In this course the impact of disturbed metabolism on onset and progression of these diseases.

References:

1. Christopher D. Byme, Sarah H. Wild; The metabolic syndrome, Last Edition
2. Hoffmann, Georg F., Zschocke, Johannes, Nyhan, William L. Inherited Metabolic Diseases, Last Edition

Hormones

No of Credit: 2 Theory **Code No.: 46**

Perquisites: Biochemistry and Physiology

General description: This course is designed to provide students with a broad understanding of human endocrinology. Course topics will include the various classes of hormones, sources and synthesis of hormones, receptors and target tissues, mechanisms of action and regulation, and methods used in endocrinology. Details of classical endocrine systems will be explored.

References:

1. Lehninger; principles of biochemistry, Last edition
2. Harper's Illustrated Biochemistry, Last edition

Neuroanatomy

No of Credit: 2 Theory **Code No.: 47**

Perquisites: General Anatomy

General description: This course introduces the student to the normal structure and function of the nervous system and its divisions. The students will be taught about the structure and function of the nervous system. The course describes the structure and function of a neuron, the structures of the brain and their functions, the role of the spinal cord and its relationship to peripheral nerves, a reflex, compares the divisions of the autonomic nervous system and their distinct roles in homeostasis, differentiate the cranial nerves and their functions, explains pain and its role in massage, analyze the results of a neurological examination to achieve clinical outcomes.

References:

1**,** Richard S. Snell, Clinical Neuroanatomy**,** Last Edition

2. Maria A. Patestas, Leslie P. Gartner A Textbook of Neuroanatomy , Last Edition

Neurophysiology

No of Credit: 2 Theory **Code No.: 48**

Perquisites: General Anatomy, Physiology

General description: This course will examine the nervous system from a functional perspective. The goal is to understand how ion channels and other components of nerve cells give rise to electrical excitability and synaptic function, and how those properties are then used for coding information and higher order function in the nervous system.

References:

1. Kerry R. Mills; Oxford textbook of clinical neurophysiology, Last edition
2. D. A. Vasilenko , Neurophysiology , Last edition

Neuropharmacology

No of Credit: 2 Theory **Code No.: 49**

Perquisites: General Anatomy, Pharmacology

General description: This course will provide students with both knowledge and conceptual understanding of the use and action of various classes of drugs in the treatment of different human diseases affecting the brain and also help students to develop an appreciation of the need for further research to identify new drug targets for more effective therapies.

References:

1. Mervyn J. Eadie, John H. Tyrer; General principles of clinical Neuropharmacology, Last Edition
2. Stephen D. Silberstein, Essential Neuropharmacology, Last Edition

Neurodegenerative Disorders

No of Credit: 2 Theory **Code No.: 50**

Perquisites: General Anatomy, Pathology

General description: This course will familiarize students with advances in our understanding of the clinical features and pathogenesis of a wide range of neurodegenerative diseases, including Alzheimer's disease and other dementias, prion diseases, Parkinson's disease and atypical parkinsonism, neurodegenerative ataxias, motor neuron diseases, degenerative diseases with chorea, iron and copper disorders, and mitochondrial diseases. Students will analyze original research reports on a range of proposed pathological cellular processes that may represent steps in cell death pathways leading to neuron loss seen in these diseases. Significant emphasis will be placed on the fast-expanding field exploring genetic contributions to neurodegenerative disease, as identification of genetic mutations pathogenic for familial neurodegenerative diseases has been a major driving force in neurodegenerative research and has pointed researchers towards essential molecular process that may underlie these disorders. Strategies for therapeutic intervention in the management, prevention, and cure of neurodegenerative diseases will be addressed.

References:

1. M. Flint Beal; Neurodegenerative diseases: neurobiology Pathogenesis and Therapeutics, Last Edition
2. Orla Hardiman Neurodegenerative Disorders: A Clinical Guide 2nd ed. 2016

Comparative Embryology

No of Credit: 2 Theory **Code No.: 51**

Perquisites: General Anatomy

General description: The primary goal of this course is to develop an intuitive understanding of embryological processes using humans as a model system. The comparative embryology noted the different ways that animals are born and producing egg, cell division patterns by which embryos are formed, epigenesist and preformation, the primary germ layers, early organs and focus on embryology (tissue level processes) using human as a model.

References:

1. Olin E. Nelsen; Comparative embryology of the vertebrates, Last Edition
2. Nelsen OE. Comparative embryology of the vertebrates, Last Edition

Comparative Histology

No of Credit: 2 Theory **Code No.: 52**

Perquisites: Basic Human Histology

General description: The use and translation of animal models of human disease requires a strong understanding of the anatomy, physiology and pathobiology of each specific model. This presentation will provide an overview highlighting key species differences in the liver, gastrointestinal tract, kidney, reproductive tract, central nervous system, and skin of commonly utilized laboratory animal models using an organ system approach. A step-wise correlation of gross anatomic, light microscopic (H&E), and ultrastructural morphology will give the attendees an appreciation of the biological complexity as species-related systemic differences are characterized. The presentation will conclude with a discussion on commonly encountered spontaneous "background" lesions in key laboratory animal species (e.g., chronic progressive nephropathy in rodents) as well as several examples of unusual test article-related lesions encountered in non-clinical drug development. The session will provide a solid overview that will allow the attendees to confidently work with these animal models.

References:

1. Piper Treuting, Suzanne Dintzis; Comparative anatomy and histology, Last Edition
2. Andrew, Warren ,Textbook of Comparative Histology,Last Edition

Advanced Physiology

No of Credit: 4 Theory, 1 Practical **Code No.: 53**

Perquisites: Physiology I, II

General description: Provides a study of human physiology for students entering health-oriented fields. Emphasizes the study of the function of cells, the nervous, muscular, circulatory, respiratory, urinary, digestive and endocrine systems, and their homeostatic mechanisms and system interaction.

Laboratory exercises on clinically relevant measurement of human function.

References:

1. Guyton, A.C., & Hall, G.E.; Textbook of Medical Physiology, Last Edition
2. **Human Physiology, Lauralee Sherwood , Last Edition**

Anatomy of Upper and Lower Limb

No of Credit: 1 Theory, 1 Practical **Code No.: 54**

Perquisites: General Anatomy

General description: This course aims to give you a solid grounding in the gross anatomical structure and function of the upper and lower limbs. It develops a knowledge and understanding of the gross anatomy of the limbs.

Also deepen the understanding of systematic, developmental and topographical anatomy and developing skills in dissection and in the preparation of prosecutions of the limbs.

References:

1. Drake R. L Vogel , Micheal , Gray's Anatomy for students , Last Edition
2. Richard S. Snell , Clinical Anatomy, Derek Mitchell , Anatomy and Cell Biology, Last Edition

Anatomy of Trunk

No of Credit: 3 Theory, 1 Practical **Code No.: 55**

Perquisites: General Anatomy

General description: The Applied Anatomy of the Thorax and Abdomen course aims to provide students with a comprehensive understanding of the anatomical aspects that form the basis of common surgical approaches and procedures in the thorax and abdomen. It employs dissection of the human body as a core activity. It involves the study of the thorax, including the thoracic wall, mediastinum, heart and coronary vessels, trachea, lungs and pleura; and the abdomen including abdominal wall, peritoneum, liver, pancreas, gastrointestinal tract, urinary system, male and female reproductive organs, nerves and blood vessels.

Clinical scenarios, for example, appendicitis, cholecystectomy, peptic ulcer, coronary bypass, pericardiocentesis, central venous line insertion, vagotomy, ligation of uterine tube, hysterectomy, vasectomy and inguinal herniorraphy will be used to emphasise the applied anatomy of thorax and abdomen.

References:

1. Drake R. L ,Vogel , Micheal .; Gray's Anatomy for students
2. Richard S. Snell , Clinical Anatomy, Derake Michell

Anatomy of Head and Neck

No of Credit: 2 Theory, 1 practical **Code No.: 56**

Perquisites: General Anatomy

General description: This course will assist learners in gaining foundation knowledge regarding the anatomy and physiology of the head and neck region. The focus is directed to oral embryology and histology to better understand the relationship of tissues and how they are adapted to functional needs. Also to facilitate an understanding of oral and para-oral structures, their development and their variations within normal. For Practical student learning bones, muscles, nerves, glands, blood supply and lymphatic drainage of the head and neck.

References:

1. Drake R. L.; Gray's Anatomy for students