

University of Samarra
جامعة سامراء
كلية العلوم التطبيقية



First Cycle – Bachelor's Degree (B.Sc.) - pathological analyses
بكالوريوس – تحليلات مرضية



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1. Overview

This catalogue is about the courses (modules) given by the program of pathological analyses to gain the Bachelor of Science degree. The program delivers (45) Modules with (6000) total student workload hours and 240 total ECTS. The module delivery is based on the Bologna Process.

نظرة عامه

يتناول هذا الدليل المواد الدراسية التي يقدمها برنامج التحليلات المرضية للحصول على درجة بكالوريوس العلوم. يقدم البرنامج (45) مادة دراسية، على سبيل المثال، مع (٦٠٠٠) إجمالي ساعات حمل الطالب و ٢٤٠ إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

2. Undergraduate Courses 2023-2024

Module 1

Code	Course/Module Title	ECTS	Semester
Path-121	Principle of pathological analysis	7	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	96
Description			
<p>The course is primarily concerning the diagnosis of disease. It involves the examination of tissues, organs, bodily fluids, and autopsies in order to study and diagnose disease.</p> <p>Pathological analysis concerns the analysis of blood, urine and tissue samples to examine and diagnose disease. Examples of the information clinical pathology laboratories may provide include blood count, blood clotting and electrolyte results. A clinical pathologist is usually trained in microbiology, hematology or blood banking, but not at the same expert level as someone who specializes in one of these fields.</p>			

This module is also concerned with the study and diagnosis of illness through microscopic analysis of samples from body fluids, tissues organs and sometimes the entire body or autopsy. Factors that may be examined include the cell appearance, anatomical and chemical signatures within cells.

Module 2

Code	Course/Module Title	ECTS	Semester
Path-112	Human cytology	7	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	96
Description			
<p>This course includes study and examination of body fluids and tissues are at the cellular level in order to screen for and diagnose disease and aid treatment decisions. It also will study how cells look, form and function.</p> <p>Cytology is the exam of a single cell type, as often found in fluid specimens. It's mainly used to diagnose or screen for cancer. It's also used to screen for fetal abnormalities to diagnose infectious organisms, and in other screening and diagnostic areas.</p> <p>Cytology is a common method for determining a diagnosis in the medical world. Cytology tests use small amounts of bodily tissue or fluid in order to examine certain types of cells. Healthcare providers can use cytology tests for almost all areas of your body.</p>			

Module 3

Code	Course/Module Title	ECTS	Semester
Path-113	Analytical chemistry	5	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	64	61
Description			
<p>Analytical chemistry deals with the composition and structure of matter. In other</p>			

words, it is the art and science of determining what matter is and how much of it exists.

Analytical chemistry studies and uses instruments and methods to separate, identify, and quantify matter. In practice, separation, identification or quantification may constitute the entire analysis or be combined with another method. Separation isolates analytes. Qualitative analysis identifies analytes, while quantitative analysis determines the numerical amount or concentration. Analytical chemistry consists of classical, wet chemical methods and modern, instrumental methods. Classical qualitative methods use separations such as precipitation, extraction, and distillation. Identification may be based on differences in color, odor, melting point, boiling point, solubility, radioactivity or reactivity. Classical quantitative analysis uses mass or volume changes to quantify amount. Instrumental methods may be used to separate samples using chromatography, electrophoresis or field flow fractionation.

Module 4

Code	Course/Module Title	ECTS	Semester
Path-114	Occupational laboratory safety I	3	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	48	27
Description			
<p>The Laboratory Safety program deals with safety and compliance in all research and teaching laboratory spaces to reduce the risk of injury and exposure, decrease the risk of property loss, lessen the likelihood of lost research, and minimize environmental damage.</p> <p>Laboratory safety practices include appropriate facilities and equipment, adequate training, personal protective equipment, chemical management, standard operating procedures, waste handling, signage, proper laboratory practices and safe working conditions. Laboratory safety helps protect the community of students, faculty, staff and visitors, and includes oversight for compliance and safety, training and outreach, institutional support for incident response, building design, and collaboration with committees.</p>			

Module 5

Code	Course/Module Title	ECTS	Semester
Sci-101	Computer	4	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	64	36
Description			
<p>Computer science is the study of computation, information, and automation. Computer science spans theoretical disciplines (such as algorithms, theory of computation, and information theory) to applied disciplines (including the design and implementation of hardware and software such as Microsoft word, microsoft excel).</p>			

Module 6

Code	Course/Module Title	ECTS	Semester
Uni-101	English Language	4	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2		63	37
Description			
<p>This section includes a description of the module, 100-150 words</p>			

Module 7

Code	Course/Module Title	ECTS	Semester
Path-121	Principle of Pathological analysis	7	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	96
Description			
<p>Principles pathological analysis – scientific study of the Interested in studying</p>			

laboratory analysis in humans. It is to identify between tests according the samples type.to understand of introduction for pathological analysis, understand of complete blood count, understand of blood groups and Rh system, understand of kidney function tests. and to understand of liver function tests. Indicative content includes the following.

1-Liver function test ALB ,GOT,GPT,ALP,GGT,BLOOD UREA ,creatinine , uric acid ,electrolyte, lipid profile ,c-reactive protein ,cardiac function ,pancreatic function ,diabetes profile ,thyroid function ,reproductive hormones

2-practical laboratory test are Liver function test ALB,GOT, GPT, ALP, GGT, BLOOD UREA ,creatinine, uric acid ,electrolyte, lipid profile ,c-reactive protein ,cardiac function ,pancreatic function ,diabetes profile ,thyroid function ,reproductive hormones

Module 8

Code	Course/Module Title	ECTS	Semester
Path-122	Human anatomy	7	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	96
Description			
Human anatomy – scientific study of the morphology of the adult human. It is subdivided into gross anatomy and microscopic anatomy. Gross anatomy (also called topographical anatomy, regional anatomy, or anthropotomy) is the study of anatomical structures that can be seen by unaided vision. Microscopic anatomy is the study of minute anatomical structures and the international standard for anatomical nomenclature.			

Module 9

Code	Course/Module Title	ECTS	Semester
Path-123	Medical physics	5	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
4	1	64	61
Description			
<p>Medical physics deals with the application of the concepts and methods of physics to the prevention, diagnosis and treatment of human diseases with a specific goal of improving human health and well-being. Since, medical physics has been included as a health profession according to International Standard Classification of Occupation of the International Labour Organization.</p> <p>Although medical physics may sometimes also be referred to as biomedical physics, medical biophysics, applied physics in medicine, physics applications in medical science, radiological physics or hospital radio-physics, a "medical physicist" is specifically a health professional</p>			

Module 10

Code	Course/Module Title	ECTS	Semester
Path-124	Statistics	4	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	63	37
Description			
<p>This section includes a description of the module, 100-150 words</p>			

Module 11

Code	Course/Module Title	ECTS	Semester
Uni-103	Human Rights & Freedom & democracy	3	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	48	27
Description			
This section includes a description of the module, 100-150 words			

Module 12

Code	Course/Module Title	ECTS	Semester
Uni-102	Arabic Language	4	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2		63	37
Description			
This section includes a description of the module, 100-150 words			

Module 13

Code	Course/Module Title	ECTS	Semester
Path-211	human histology	6	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
Histology, also known as microscopic anatomy or microanatomy, is the branch of biology that studies the microscopic anatomy of biological tissues. Histology			

is the microscopic counterpart to gross anatomy, which looks at larger structures visible without a microscope. Although one may divide microscopic anatomy into organology, the study of organs, histology, the study of tissues, and cytology, the study of cells, modern usage places all of these topics under the field of histology. In medicine, histopathology is the branch of histology that includes the microscopic identification and study of diseased tissue. In the field of paleontology, the term paleohistology refers to the histology of fossil organisms.

Module 14

Code	Course/Module Title	ECTS	Semester
Path-212	pathogenic bacteriology	6	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
<p>This module is about pathogenic bacteria which are bacteria that can cause disease. This module focuses on the bacteria that are pathogenic to humans. Most species of bacteria are harmless and are often beneficial but others can cause infectious diseases. The number of these pathogenic species in humans is estimated to be fewer than a hundred. By contrast, several thousand species are part of the gut flora present in the digestive tract. The human body is continually exposed to many species of bacteria, including beneficial commensals, which grow on the skin and mucous membranes, and saprophytes, which grow mainly in the soil and in decaying matter. The blood and tissue fluids contain nutrients sufficient to sustain the growth of many bacteria. The body has defence mechanisms that enable it to resist microbial invasion of its tissues and give it a natural immunity or innate resistance against many microorganisms.</p>			

Module 15

Code	Course/Module Title	ECTS	Semester
Path-213	medical virology	6	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71

Description
Virology is the scientific study of biological viruses. It is a subfield of microbiology that focuses on their detection, structure, classification and evolution, their methods of infection and exploitation of host cells for reproduction, their interaction with host organism physiology and immunity, the diseases they cause, the techniques to isolate and culture them, and their use in research and therapy.

Module 16

Code	Course/Module Title	ECTS	Semester
Path-214	principles of physiology	6	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
Physiology is the science of life. It is the branch of biology that aims to understand the mechanisms of living things, from the basis of cell function at the ionic and molecular level to the integrated behavior of the whole body and the influence of the external environment. Research in physiology helps us to understand how the body works in health and how it responds and adapts to the challenges of everyday life; it also helps us to determine what goes wrong in disease, facilitating the development of new treatments and guidelines for maintaining human and animal health. The emphasis on integrating molecular, cellular, systems and whole body function is what distinguishes physiology from the other life sciences.			

Module 17

Code	Course/Module Title	ECTS	Semester
Path-215	parasitic protozoa	6	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71

Description

The course is about the study of protozoa parasites, their hosts, and the relationship between them. The scope of this module is not determined by the organism or environment in question but by their way of life. This means it forms a synthesis of other disciplines, and draws on techniques from fields such as cell biology, bioinformatics, biochemistry, molecular biology, immunology, genetics, evolution and ecology. The module focuses on parasites that infect humans, the diseases caused by them, clinical picture and the response generated by humans against them. It is also concerned with the various methods of their diagnosis, treatment and finally their prevention.

Module 18

Code	Course/Module Title	ECTS	Semester
Path-221	tissue culture & Histological Preparations	5	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	64	61

Description

This course deals with:

- 1- Tissue culture, a method of biological research in which fragments of tissue from an animal or plant are transferred to an artificial environment in which they can continue to survive and function. The cultured tissue may consist of a single cell, a population of cells, or a whole or part of an organ. Cells in culture may multiply; change size, form, or function; exhibit specialized activity (muscle cells, for example, may contract); or interact with other cells.
- 2- Histological Preparations is the microscopic study of tissues and organs through sectioning, staining, and examining those sections under a microscope. Often called microscopic anatomy and histochemistry, histology allows for the visualization of tissue structure and characteristic changes the tissue may have undergone. Because of this, it is utilized in medical diagnosis, scientific study, autopsy, and forensic investigation. Once the tissue sample has undergone fixation, processing, embedding, sectioning, and staining, it can undergo analysis through microscopy and the findings interpreted by a pathologist. The histological stains chosen for a given

specimen depends on the investigational question at hand. Advanced interpretation of the histology slide combined with a patient's medical history can make an invaluable impact on the treatment course and prognosis.

Module 19

Code	Course/Module Title	ECTS	Semester
Path-222	medical mycology	5	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	64	61
Description			
<p>Mycology is the branch of biology concerned with the study of fungi, including their genetic and biochemical properties, their taxonomy and their use to humans, including as a source for tinder, traditional medicine, food, and entheogens, as well as their dangers, such as toxicity or infection.</p> <p>Mycology branches into the field of phytopathology, the study of plant diseases, and the two disciplines remain closely related because the vast majority of plant pathogens are fungi.</p>			

Module 20

Code	Course/Module Title	ECTS	Semester
Path-223	principles of immunology	5	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	64	61
Description			
<p>Immunology is a branch of medicine and biology that covers the medical study of immune systems in all organisms. Immunology measures, uses charts and differentiate in context in medicine the studies of immunity on cell and molecular level, and the immune system as part of the physiological level as its functioning is of major importance. In the different states of both health, occurring symptoms and diseases; the functioning of the immune system and immunological</p>			

responses such as autoimmune diseases, allergic hypersensitivities, or in some cases malfunctioning of immune system as for example in immunological disorders or in immune deficiency, and the specific transplant rejection.

Module 21

Code	Course/Module Title	ECTS	Semester
Path-224	medical physiology	5	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	64	61
Description			
<p>Physiology is the study of how the human body works. It describes the chemistry and physics behind basic body functions, from how molecules behave in cells to how systems of organs work together. It helps us understand what happens in a healthy body in everyday life and what goes wrong when someone gets sick. Physiology is important because it is the foundation upon which we build our knowledge of what "life" is, how to treat disease, and how to cope with stresses imposed upon our bodies by different environments. Physiological studies of normal biological function provide the basis for understanding the abnormal function seen in animal and human disease (pathophysiology) and for developing new methods for treating those diseases.</p>			

Module 22

Code	Course/Module Title	ECTS	Semester
Path-225	parasitic helminths	5	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	46
Description			
<p>The module deals with helminths which are worm-like parasites. It concerns the clinically relevant groups and classifications which are separated according to their general external shape and the host organ they inhabit. The course study both hermaphroditic and bisexual species. The course provides knowledge about</p>			

definitive classification which is based on the external and internal morphology of egg, larval, and adult stages.

Module 23

Code	Course/Module Title	ECTS	Semester
Path-226	biochemistry	5	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	64	61
Description			
<p>Biochemistry or biological chemistry is the study of chemical processes within and relating to living organisms. A sub-discipline of both chemistry and biology, biochemistry may be divided into three fields: structural biology, enzymology and metabolism. Biochemistry has become successful at explaining living processes through these three disciplines. Almost all areas of the life sciences are being uncovered and developed through biochemical methodology and research. Biochemistry focuses on understanding the chemical basis which allows biological molecules to give rise to the processes that occur within living cells and between cells, in turn relating greatly to the understanding of tissues and organs, as well as organism structure and function. Biochemistry is closely related to molecular biology, which is the study of the molecular mechanisms of biological phenomena.</p>			

Module 24

Code	Course/Module Title	ECTS	Semester
Path-311	infectious diseases	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
<p>This modules deals with infections and how the spread. Infections are invasion of tissues by pathogens, their multiplication, and the reaction of host tissues to the infectious agent and the toxins they produce. An infectious disease, also</p>			

known as a transmissible disease or communicable disease, is an illness resulting from an infection.

Infections can be caused by a wide range of pathogens, most prominently bacteria and viruses. Hosts can fight infections using their immune systems. Mammalian hosts react to infections with an innate response, often involving inflammation, followed by an adaptive response.

Module 25

Code	Course/Module Title	ECTS	Semester
Path-312	clinical immunology	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
<p>This field are involved in the study, diagnosis and management of patients with diseases resulting from disordered immune systems, and conditions in which immunological treatment forms an important part of therapy and/or prevention. Immunology is a clinical and laboratory discipline and most immunologists have a dual role as both a pathologist in the laboratory and a clinician. Staff who work in Immunology help to treat diseases like AIDS and cancers, including leukaemia, as well as allergies such as hay fever, by using complex and sophisticated molecular techniques.</p>			

Module 26

Code	Course/Module Title	ECTS	Semester
Path-313	medical molecular biology	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
<p>Molecular biology is the branch of biology that seeks to understand the molecular basis of biological activity in and between cells, including biomolecular synthesis, modification, mechanisms, and interactions.</p>			

The study of chemical and physical structure of biological macromolecules is known as molecular biology.

Molecular biology was first described as an approach focused on the underpinnings of biological phenomena - uncovering the structures of biological molecules as well as their interactions, and how these interactions explain observations of classical biology.

The course also deals with application of molecular approaches (at the level of DNA and RNA) to understand protein function and regulation in normal and abnormal cellular responses.

Module 27

Code	Course/Module Title	ECTS	Semester
Path-314	pathological analyses	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71

Description

A branch of medical science primarily concerning the cause, origin, and nature of disease. It involves the examination of tissues, organs, bodily fluids, and autopsies in order to study and diagnose disease. concerns the analysis of blood, urine and tissue samples to examine and diagnose disease. Examples of the information clinical pathology laboratories may provide include blood count, blood clotting and electrolyte results. A clinical pathologist is usually trained in microbiology, hematology or blood banking, but not at the same expert level as someone who specializes in one of these fields.

A clinical pathologist may come across problems that demand specific expertise, at which point they would need to consult a more specialized colleague. Clinical pathologists play a similar role to that of general pathologists, although they would not be involved in anatomical pathology.

Module 28

Code	Course/Module Title	ECTS	Semester
Path-315	microbial diagnosis	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71

Description
<p>This modules includes:</p> <p><i>Direct Examination and Techniques:</i> Direct examination of specimens reveals gross pathology. Microscopy may identify microorganisms. Immunofluorescence, immuno-peroxidase staining, and other immunoassays may detect specific microbial antigens. Genetic probes identify genus- or species-specific DNA or RNA sequences.</p> <p><i>Culture:</i> Isolation of infectious agents frequently requires specialized media. Nonselective (noninhibitory) media permit the growth of many microorganisms. Selective media contain inhibitory substances that permit the isolation of specific types of microorganisms.</p> <p><i>Microbial Identification:</i> Colony and cellular morphology may permit preliminary identification. Growth characteristics under various conditions, utilization of carbohydrates and other substrates, enzymatic activity, immunoassays, and genetic probes are also used.</p> <p><i>Serodiagnosis:</i> A high or rising titer of specific IgG antibodies or the presence of specific IgM antibodies may suggest or confirm a diagnosis.</p>

Module 29

Code	Course/Module Title	ECTS	Semester
Path-321	research methodology	4	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2		48	52
Description			
<p>Research methodology is the specific procedures or techniques used to identify, select, process, and analyze information about a topic. In a research paper, the methodology section allows the reader to critically evaluate a study's overall validity and reliability. The methodology section answers two main questions: How was the data collected or generated. How was it analyzed.</p>			

Module 30

Code	Course/Module Title	ECTS	Semester
Path-322	medical genetics	6	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
<p>Medical genetics is the branch of medicine that involves the diagnosis and management of hereditary disorders. Medical genetics differs from human genetics in that human genetics is a field of scientific research that may or may not apply to medicine, while medical genetics refers to the application of genetics to medical care. For example, research on the causes and inheritance of genetic disorders would be considered within both human genetics and medical genetics, while the diagnosis, management, and counselling people with genetic disorders would be considered part of medical genetics.</p>			

Module 31

Code	Course/Module Title	ECTS	Semester
Path-323	enzymology	6	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
<p>Enzymology is the study of enzymes, their kinetics, structure, and function, as well as their relation to each other.</p> <p>In the diagram on the right, hexokinase is displayed as an opaque surface with a pronounced open binding cleft next to an unbound substrate and the same enzyme with more closed cleft that surrounds the bound substrate. The enzyme changes shape by induced fit upon substrate binding to form an enzyme-substrate complex.</p> <p>The study of enzymes and their functions includes:</p> <ul style="list-style-type: none">• The molecular structure (primary, secondary, tertiary, and quaternary)• Protein properties (isoelectric point, electrophoretic mobility, pH, temperature, stability, and spectroscopic properties)			

- Kinetics: specificity, speed, and reversibility
- Thermodynamic properties: activation of free energy and entropy
- Active site: including the number of available sites, the molecular nature of the site, and the mechanism of catalysis
- Biological properties (location in the cell/ compartment(s), isoenzyme forms, and metabolic implications of the reaction carried out)

Module 32

Code	Course/Module Title	ECTS	Semester
Path-324	Antibiotics	7	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	94	81
Description			
<p>This module provides knowledge about antibiotics which are types of antimicrobial substances active against bacteria. It is the most important type of antibacterial agent for fighting bacterial infections, and antibiotic medications are widely used in the treatment and prevention of such infections. They may either kill or inhibit the growth of bacteria. A limited number of antibiotics also possess antiprotozoal activity.</p>			

Module 33

Code	Course/Module Title	ECTS	Semester
Path-325	hematology	7	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	94	81
Description			
<p>Hematology is the branch of medicine concerned with the study of the cause, prognosis, treatment, and prevention of diseases related to blood. It involves treating diseases that affect the production of blood and its components, such as blood cells, hemoglobin, blood proteins, bone marrow, platelets, blood vessels, spleen, and the mechanism of coagulation. Such diseases might include hemophilia, sickle cell anemia, blood clots (thrombus), other bleeding</p>			

disorders, and blood cancers such as leukemia, multiple myeloma, and lymphoma. The laboratory analysis of blood is frequently performed by a medical technologist or medical laboratory scientist.

Module 34

Code	Course/Module Title	ECTS	Semester
Path-411	blood diseases	6	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
<p>This course covers Hematologic diseases which are disorders which primarily affect the blood & blood-forming organs. Hematologic diseases include rare genetic disorders, anemia, sickle cell disease & complications from chemotherapy or transfusions.</p>			

Module 35

Code	Course/Module Title	ECTS	Semester
Path-412	clinical chemistry	6	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
<p>Clinical chemistry (also known as chemical pathology, clinical biochemistry or medical biochemistry) is a division in medical laboratory sciences focusing on qualitative tests of important compounds, referred to as analytes or markers, in bodily fluids and tissues using analytical techniques and specialized instruments. This interdisciplinary field includes knowledge from medicine, biology, chemistry, biomedical engineering, informatics, and an applied form of biochemistry (not to be confused with medicinal chemistry, which involves basic research for drug development).</p>			

Module 36

Code	Course/Module Title	ECTS	Semester
Path-413	medical biotechnology	6	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
<p>Medical biotechnology is a branch of medicine that uses living cells and cell materials to research and then produce pharmaceutical and diagnosing products. These products help treat and prevent diseases. Medical biotechnology is making huge advancements and helping millions of people.</p> <p>Some of the most recent uses of biological tech is work in genetic testing, drug treatments, and artificial tissue growth. With the many advancements in medical biotechnology, there are new concerns that arise. From funding to ethics, there are many things to determine and regulate when it comes to this fast-paced industry. Learn about the many technical biology advancements and the concerns surrounding them.</p>			

Module 37

Code	Course/Module Title	ECTS	Semester
Path-414	toxicology	6	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
<p>Toxicology is a scientific discipline, overlapping with biology, chemistry, pharmacology, and medicine, that involves the study of the adverse effects of chemical substances on living organisms and the practice of diagnosing and treating exposures to toxins and toxicants. The relationship between dose and its effects on the exposed organism is of high significance in toxicology. Factors that influence chemical toxicity include the dosage, duration of exposure (whether it is acute or chronic), route of exposure, species, age, sex, and environment. Toxicology seek to understand how harmful agents—including pathogens and chemicals—interact with the environment and damage humans and animals.</p>			

Module 38

Code	Course/Module Title	ECTS	Semester
Sc-path426	Research Project	3	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
	2	32	43
Description			
This section includes a description of the module, 100-150 words			

Module 39

Code	Course/Module Title	ECTS	Semester
Sc-path425	option 1	3	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	48	27
Description			
This section includes a description of the module, 100-150 words			

Module 40

Code	Course/Module Title	ECTS	Semester
Sc-path421	endocrinology	6	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
Endocrinology is a branch of biology and medicine dealing with the endocrine system, its diseases, and its specific secretions known as hormones. It is also concerned with the integration of developmental events proliferation, growth, and differentiation, and the psychological or behavioral activities of metabolism, growth and development, tissue function, sleep, digestion, respiration, excretion, mood, stress, lactation, movement, reproduction, and sensory perception caused			

by hormones. Endocrinology is the study of the endocrine system in the human body. This is a system of glands which secrete hormones. Hormones are chemicals that affect the actions of different organ systems in the body.

Module 41

Code	Course/Module Title	ECTS	Semester
Sc-path422	pathology	6	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
<p>Pathology is the study of the causes and effects of disease or injury. Pathology also study disease in general, incorporating a wide range of biology research fields and medical practices. pathology addresses components of disease: cause, mechanisms of development (pathogenesis), structural alterations of cells (morphologic changes), and the consequences of changes (clinical manifestations).^[3] In common medical practice, general pathology is mostly concerned with analyzing known clinical abnormalities that are markers or precursors for both infectious and non-infectious disease, and is conducted by experts in one of two major specialties, anatomical pathology and clinical pathology. Further divisions in specialty exist on the basis of the involved sample types (comparing, for example, cytopathology, hematopathology, and histopathology), organs (as in renal pathology), and physiological systems (oral pathology), as well as on the basis of the focus of the examination (as with forensic pathology).</p>			

Module 42

Code	Course/Module Title	ECTS	Semester
Sc-path423	genetic engineering	6	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
<p>This section includes a description of the module, 100-150 words</p>			

Module 43

Code	Course/Module Title	ECTS	Semester
Sc-path424	epidemiology	6	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
<p>Epidemiology is the study and analysis of the distribution patterns and determinants of health and disease conditions in a defined population. identifying risk factors for disease and targets for preventive healthcare. Epidemiologists help with study design, collection, and statistical analysis of data, amend interpretation and dissemination of results (including peer review and occasional systematic review). Epidemiology has helped develop methodology used in clinical research, public health studies, and, to a lesser extent, basic research in the biological sciences.</p> <p>Major areas of epidemiological study include disease causation, transmission, outbreak investigation, disease surveillance, environmental epidemiology, forensic epidemiology, occupational epidemiology, screening, biomonitoring, and comparisons of treatment effects such as in clinical trials.</p>			

Module 44

Code	Course/Module Title	ECTS	Semester
Sc-path426	Research Project	3	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	32	43
Description			
This section includes a description of the module, 100-150 words			

Module 45

Code	Course/Module Title	ECTS	Semester
Sc-path425	option 2	3	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	48	27
Description			
This section includes a description of the module, 100-150 words			

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