

## MEDICAL SCIENCES IN THE FIELD OF SCIENCE AND TECHNOLOGY OF PHYSICAL ACTIVITIES AND SPORTS

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### Abstract:

The aim of this research is to shed light on the reality of medical sciences in the field of science and technology of physical activities and sports, the history of the emergence and development of these sciences throughout different ages and civilizations. Our study delves into the sections of these medical sciences, their various specializations, branches, and the methods of acquiring scientific knowledge of these module. We also highlight the importance of relying on practical methods and using modern technology in teaching these module. Furthermore, we discuss the module associated with them, which are taught in institutes of science and technology of physical activities and sports.

**Keywords:** Medical Sciences; The Field of Science and Technology of Physical Activities and Sports; Anatomy; Physiology; Biochemistry.

### 1-Introduction:

Medical sciences are a science in and of itself and the art of treatment that deals with human beings, their diseases, injuries, and various treatment methods. Medical sciences also focus on the causes and conditions that lead to illness and methods of prevention. They are applied sciences that rely on laboratory, clinical, and anatomical

experiments. Medical sciences play a prominent role in the field of sports, as one of the most important features of sports is its close connection to the developments and foundations of medical sciences. Medical sciences in institutes of science and technology of physical activities and sports are not limited to anatomy, physiology, and biochemistry. They also include module related to medical sciences such as sports injuries, first aid, biomechanics, and others. These sciences have developed to encompass other health professions such as nutrition, psychology, personal health, and other measures. Medical sciences are considered fundamental in the field of science and technologies of physical activity and sports, focusing on the health of athletes and their musculoskeletal system, and helping to understand the effects of physical activities and sports exercises on an individual's vital organs. They are also one of the key areas that have contributed to the development of sports training methods.

Due to the close connection between sports and the developments and foundations of medical sciences, there has been a growing interest in medical sciences and related module through the modification of pedagogical programs, the organization of national and international conferences, study days, and workshops to exchange experiences, learn about the latest developments, and compare and disseminate research results. All of this is aimed at preparing and training highly qualified graduates. Given the interplay between medical sciences and physical activities and sports, and the scarcity and absence of studies addressing medical sciences in the field of science and technologies of physical activity and sports, we have conducted this study. We do not claim to fully comprehend all aspects of this subject, but rather it is our attempt to shed light, even partially, on this topic. In this theoretical study, we have addressed the following points:

- The concept, importance, and objectives of medical sciences in the field of sports are discussed.
- Medical sciences in the field of physical activities and sports include anatomy, physiology, and biochemistry.
- The module associated with medical sciences in the field of physical activities and sports are also addressed.

## **2- Medical Sciences:**

### **2-1- Concept of Medical Sciences:**

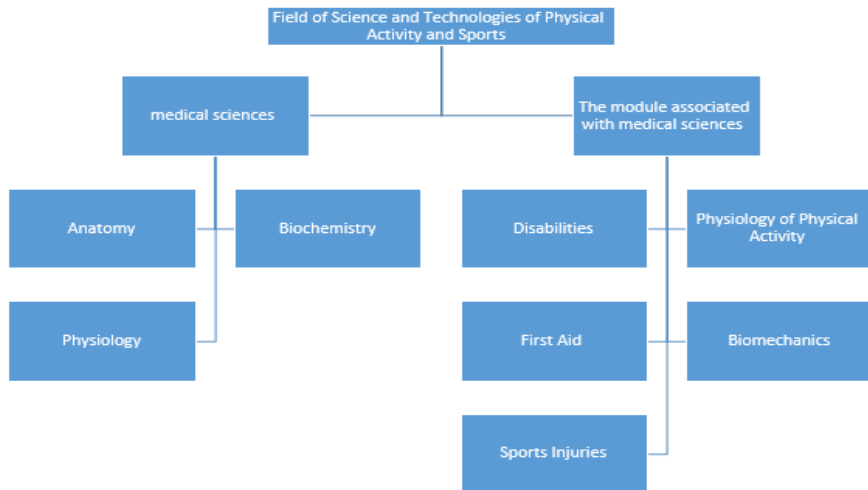
The term "Medical Sciences" is originally composed of two words, the word "medical" derived from medicine, which is considered the treatment of the body and mind (Ibn Manzur, Year of publication unknown: 2656), and the word "sciences," which is the plural of knowledge, considered the opposite of ignorance. Science is a methodological approach that studies data and information, formulates hypotheses to interpret them, tests the hypotheses based on experimentation rather than guesswork, all in pursuit of knowledge.

Medical Sciences are those sciences that concern human health, including related fields such as animal and plant science, pharmacology, anesthesia, and surgery. These sciences have come together with the field of medicine to protect humans from various diseases and epidemics that threaten their existence (Ragheb, 2009: 04).

Procedurally, Medical Sciences represent the medical module taught in the field of science and technologies of physical activity and sports, including anatomy, physiology, and biochemistry. These aim to provide students with knowledge, skills, and information contributing to their scientific, cognitive, skill-based, and emotional development.

The following figure illustrates Medical Sciences and the associated module in the field of science and technologies of physical activity and sports:

figure (1): Medical sciences and related module in the field of Science and Technologies of Physical Activity and Sports



Source: The Researchers (2023)

## 2-2- The importance of medical sciences in the field of science and technologies of physical activity and sports:

- Familiarity with the various sciences related to physical activities and sports.
- Medical sciences develop and enhance students' ideas towards the field of science and technologies of physical activity and sports.
- Knowledge of many specific terms, details, and essential elements in medical sciences.
- Awareness of all the latest developments in the field of science and technologies of physical activity and sports.
- Understanding the human body parts, organs, various systems, and their interrelationships.
- Recognition of cells, tissues, different body systems, and their functions.
- Study of the chemical reactions that occur inside the cell, specifically anabolism, catabolism, and metabolism.
- Easy comprehension and assimilation of the science of biomechanics.
- Focus on sports injuries, their causes, prevention methods, identification, types, and their anatomical, physiological, and mechanical aspects.

- Familiarity with technical procedures or initial assistance provided to individuals or groups in the event of various serious physical injuries.
- Medical sciences help students recognize disabilities (auditory, visual, mental, and motor) that lead to non-adaptation to reality and society.

### **2-3- The goals of medical sciences in field of science and technologies of physical activity and sports:**

- The ability to identify the interrelationships between various medical sciences.
- The student's capability to develop themselves through studies, journals, knowledge, and information related to the field of science and technologies of physical activity and sports.
- The ability to identify the muscles used in performing sports movements.
- The capability to measure and evaluate the efficiency of the musculoskeletal system and adapt training and teaching programs according to these results.
- The capability to measure and evaluate the efficiency of the respiratory system and regulate training and teaching programs according to these results.
- Assisting the student in evaluating the functional status of the nervous system and proper training planning to avoid neurological stress.
- Assisting the student in identifying the primary sources of energy for sports and physical activities, distinguishing between non-aerobic and aerobic energy sources, and attempting to adapt them to the type of physical activity.
- Assisting the student in identifying sports injuries, their forms, types, and locations through scientific, anatomical, physiological, and mechanical methods.
- The ability of the student to intervene and provide first aid to a person in the event of a sports injury.
- Assisting the student in developing a motor rehabilitation program according to the type and degree of the injury.

- The capability to adapt sports activities that help reduce and eliminate chronic diseases (such as asthma and diabetes) and some bad habits (such as smoking and physical inactivity).
- Developing special programs for individuals with special needs (disabilities) to meet the requirements of life, participate in various life activities, and integrate them into society.
- Conducting anthropometric measurements.
- Developing athletes' capabilities to achieve record numbers.
- Providing healthcare for athletes and active individuals in any sports field through medical care, nutritional programs, regular examinations, and providing advice and guidance.
- Ensuring the safe participation of athletes during various physical and sports activities or for participation in competitions.

### **3- Medical sciences in the field of science and technologies of physical activity and sports:**

#### **3-1- Anatomy:**

##### **3-1-1- The history of anatomy:**

Anatomy is considered one of the morphological sciences, whose origin can be traced back to the biological sciences, which study the formation of the parts of living organisms, including humans. It is one of the oldest fundamental sciences that was relied upon by some civilizations, as did the ancient Egyptians long ago in dealing with their dead by mummifying their bodies in anticipation of resurrection (Al-Shafie and others, year of publication unknown: 06). In Alexandria, specifically at the beginning of the third century BC, the first practical documentation of the process of anatomy on the human body was conducted, indicating that it is the oldest science in medicine, as anatomists explored this science by dissecting animals (Al-Nabwani, 2019).

However, we owe many ideas and discoveries regarding the science of anatomy to the Greeks, as Aristotle and Hippocrates were among the greats of ancient times in the field of anatomy. Galen was the greatest physician and anatomist in ancient times, and his work formed the basis of European anatomy for a thousand years, all based on animal dissections that were applied to humans (Le Vay, 2015: 06). In the

Middle Ages, after the fall of the Roman Empire, the study of anatomy declined in Christian Europe, but it flourished in the Islamic and Arab world, where Muslim and Arab scientists and Doctors contributed significantly to the development of anatomy. Ibn Sina, Ibn Azhar, and Ibn al-Nafis are among the most famous of these Doctors. In contemporary times, modern anatomy emerged, with one of its most famous figures being Leonardo da Vinci. He conducted numerous detailed and precise anatomical dissections. Andreas Vesalius, a prominent figure in the field, further developed anatomy through his detailed descriptions of observations during human cadaver dissections, as well as by disproving over 200 errors in Galen's anatomical works (Al Nabwani, 2019).

Anatomy is considered one of the oldest medical sciences, originating in ancient Egypt. The first human body dissection took place in the 3rd century BC, and the science evolved through the contributions of the Greeks, who provided numerous ideas and discoveries in the field. Since the beginning of the 16th century, anatomy has rapidly evolved to its current state.

### **3-1-2- Anatomy Definition:**

Anatomy is a field of the biological sciences concerned with identifying and describing the structures of living organisms. (The Editors of Encyclopaedia Britannica, Year of publication unknown)

Anatomy is the identification and description of the structures of living organisms. It is a branch of biology and medicine, where anatomy is considered a key to medical practice and various health fields. (Yvette, 2020)

The word "anatomy" means dissecting the body to examine its parts, and the knowledge acquired in this way is essentially regional in that one gains knowledge of each part of the body, such as the arm or leg. However, there is also a systematic aspect in which the body is considered to be composed of several coordinated systems, such as the nervous system. (le vay, 2015: 04)

Anatomy in the field of science and technologies of physical activity and sports is concerned with describing and identifying the structure of the human body in terms of bones, joints, muscles, tissues, and

other parts and organs of the human body. Sports movements require precise and accurate observation of the anatomical characteristics of athletes.

### **3-1-3- Anatomy Branches:**

(Al-Shafie and others, year of publication unknown: 06) Anatomy is divided into:

- Regional Anatomy: which focuses on the organs and systems of the human body and the relationships between them.
- Systemic Anatomy: which applies anatomical knowledge to various branches of medicine, such as surgery or the diagnosis of different diseases.
- Surface Anatomy: which identifies internal body parts through distinctive surface markings, useful for understanding the normal position of various organs.
- Comparative Anatomy: which studies the similarities between the organs and systems of different animals and compares them to those of humans.

In addition, there is another section known as Sports Anatomy, which focuses on the functional performance of the human body parts during physical activity.

### **3-1-4- Ways of acquiring anatomical knowledge:** (le vay, 2015: 05)

- Anatomy: involves dissecting and examining body tissues, which can be done on either living or deceased bodies.
- Microscopic examination: this method uses microscopes to study cells and tissues.
- Surface examination: this method deals with internal body parts that are visible through surface signs, such as muscle swelling and hardness during contraction, pulse of arteries, vein pathways, and bone protrusions.
- Endoscopy: is a non-surgical anatomical method involving the insertion of imaging tools into cavities such as the abdomen or joints, to gather information and data.
- Ultrasound: a imaging method using sound waves to capture images of internal body parts with limited detail.

- Radiography: a imaging examination using X-rays to visualize solid body parts that are not easily visible, and is not relied upon for imaging soft organs in the body.
- Computed Tomography (CT): this method uses X-rays to capture a series of images taken from different angles around the body by modern scanners, and these images are sent to a computer to create two-dimensional sectional slices.
- Magnetic Resonance Imaging (MRI): a imaging examination using magnetic fields and high-frequency radio waves to create detailed images of organs and tissues inside the body.

In the field of sports, movements, exercises, and sports activities require precise and accurate observation of the anatomical characteristics of athletes. As for the field of science and technologies of physical activity and sports, students acquire anatomical knowledge theoretically through a limited pedagogical program tailored to the study of physical activities and sports.

### **3-1-5- The pedagogical program for the science of anatomy in the field of science and technologies of physical activity and sports:**

Students of science and technologies of physical activity and sports receive lessons in the science of anatomy, which is considered a fundamental educational unit in the first semester of the first year of the common foundational education for bachelor's degrees. The total hourly volume of the course is estimated at 42 hours over 14 weeks, divided into:

- 21 hours for lessons or lectures with a weekly hourly volume of 1 hour and 30 minutes.
- 21 hours for guided activities with a weekly hourly volume of 1 hour and 30 minutes. (Ministry of Higher Education and Scientific Research, Official Newsletter, 2013: Decision No. 494)

### **3-1-6- Objectives of the science of anatomy in the field of science and technologies of physical activity and sports:**

- Providing students with the essential theoretical knowledge related to the science of anatomy and elevating their cognitive level.
- Identifying the parts of the human body, its organs, and its various systems and their interrelationships.

- Enabling students to understand other sciences such as sports injuries, first aid, sports nutrition, etc., in order to rely fundamentally on the science of anatomy in these fields.
- Enabling students to identify the organs involved in performing sports movements.

### **3-2- Physiology:**

#### **3-2-1- History of Physiology:**

The earliest studies in the field of physiology date back to ancient Egypt and Greek civilization, specifically during the time of Hippocrates, known as the father of medicine, and Aristotle, who established the principles of organ function in Greek civilization (le vay, 2015: 192). Galen was also instrumental in experimental testing of bodily functions and is considered the first founder of experimental organ function. Arab contributions also played a role in the development of physiology science, with notable figures such as Ibn Sina and Ibn al-Nafis.

Every science begins with simple experiments and observations, gradually growing over time. The Renaissance period was particularly significant for physiological research, with Andreas Vesalius reviving modern studies through his influential anatomical works (Gregory, 2021). This period also emphasized the importance of observation and experimentation, rejecting ancient teachings (le vay, 2015: 192).

Knowledge of physiology greatly expanded in the 19th century, especially with the establishment of the American Physiological Society and the emergence of cell theory in 1838 by Matthias Schleiden and Theodor Schwann. This theory states that organisms are composed of units called cells (Gregory, 2021). Subsequently, the discoveries of Claude Bernard emphasized the importance of organ function in medicine and contributed to the discovery of the internal environment theory of the cell.

In the 20th century, there were numerous significant advancements, including the study of the ultrasonic structure of cells under the electron microscope and its relation to function, positron emission tomography imaging for studying metabolic processes and blood circulation, particularly in the brain after injecting radioactive

isotopes, and the genetic factors revealed through human genome decoding (le vay, 2015, p194).

The first discoveries related to the physiology of physical activities and sports date back to 1922, when the British scientist Archibald Hill discovered the maximum capacity for oxygen uptake and the temporary oxygen deficiency resulting from exercise. Hill and Otto Meyerhof introduced several concepts related to muscle energy consumption. All of these concepts, ideas, and discoveries have contributed in one way or another to the development of sports training and physical activities in general.

### **3-2-2- Definition of the Science of Organ Functions:**

Physiology, or the science of organ functions, is the scientific study of the functions of all body organs, how these functions are regulated, the functional interdependence between each organ and other organs, the factors affecting the performance of body organs, and their adaptation to various body exposures. (Taha, year of publication unknown: 05)

Physiology, or the science of organ functions, examines the activities of living matter at the level of the whole organism, its organs, the cellular level, or its components, meaning the study of living systems that are constantly changing from one moment to another, thus addressing the study of the meaning of life. (Al-Alouji, 2014: 16)

The science of physiology is the dynamic study of life, describing the vital functions of living organisms, their organs, cells, and molecules. It is considered the mother of many biological sciences, having given rise to the specializations of biochemistry, biophysics, and neuroscience. (Emile and others, 2017: 43)

The science of organ functions, or general physiology, in the field of science and technologies of physical activity and sports, studies the functions of various body systems and the changes that occur during physical activities or sports exercises.

### **3-2-3- Branches and Specializations of the Science of Organ Functions:**

- Human Physiology: This branch is concerned with studying the organs, parts, and functions of the human body.

- Cell Physiology: which states that all living organisms are composed of cells or groups of cells, which are considered structural and functional units (Al-Alooji, 2014: 18), and this branch studies the activities of the tissue or organ's constituent cell.
- Comparative Physiology: is a branch that investigates the different methods followed by humans and animals in performing a specific function such as obtaining oxygen, food, excreting waste, and other vital activities.
- General Physiology: This branch includes the plant and animal organ functions, and recognizes the different means by which living organisms perform their multiple functions, but emphasizes the unity of the laws governing living matter. (Al-Alooji, 2014: 18)
- Physiological Psychology: Responsible for studying the structures, elements, and biological processes related to mental life and normal or pathological behavior. (Gregory, 2021)
- Physical Activities and Sports Physiology: It is the science that investigates the response of the body's organs to physical activities and sports exercises and their adaptation.

### **The methods and devices that help in studying the science of Physiology:**

The science of physiology focuses on studying the function as opposed to the structure, unlike the science of anatomy, which focuses on studying the structure. The study of anatomy relies on observation and accurate description of the part to be studied in the body, while the science of physiology relies on conducting experiments. It is considered an experimental science, meaning that it does not study a specific organ just by looking at it, but rather by exposing it to different conditions, observing the results, interpreting them, and documenting them.

Since the task of physiology is complex and requires special skills to conduct experiments and interpret results, it requires many electronic and mechanical devices and equipment.

Some of the most important of these devices are (Al-Alooji, 2014: 20-21):

- Microscopes: devices for magnifying small details that cannot be seen with the naked eye, with various levels of effectiveness, development, and magnification of objects.
- Histological chemistry: concerned with studying the natural distribution of enzymes and other substances in different areas of tissue sections or cells through the application of some chemical techniques.
- Study of the solar spectrum: studying the amount of material absorption of visible light.
- Radioactive isotopes: considered one of the greatest modern discoveries, and their use has revolutionized biological sciences.
- Cell parts separation: achieved by suspending them in a solution and then separating them using a centrifuge for further study.

As for institutes and departments of science and technologies of physical activity and sports, students receive lessons in organ functions through traditional education taught in lectures and guided practical sessions. This teaching method does not consider the individual differences among students, nor does it provide a practical and applied aspect to the lecture topic. It is also dull and unexciting. Therefore, it is necessary to rely on computers and mobile devices that allow us to examine and identify the desired organs and parts from all angles through 3D anatomical software, in addition to wax and plastic models, which contribute to improving the educational level of students and affect their excitement and motivation for learning, researching, and acquiring knowledge.

### **3-2-5- The pedagogical program for the science of physiology in the field of science and technologies of physical activity and sports:**

Students of science and technologies of physical activity and sports receive lessons in general physiology, which is considered a fundamental teaching unit in the second semester of the first year of the common foundational education for bachelor's degrees. The total workload for the course is 42 hours over 14 weeks, divided into:

21 hours for lessons or lectures, with a weekly workload of 1 hour and 30 minutes.

21 hours for guided activities, with a weekly workload of 1 hour and 30 minutes. (Ministry of Higher Education and Scientific Research, Official Bulletin, 2013: Decision No. 494)

### **3-2-6- Objectives of the science of physiology in the field of science and technologies of physical activity and sports:**

- Understanding the cells, tissues, different body organs, and their functions.
- Understanding the mechanism of respiration and pulse.
- Identifying the types of muscle tissue, tendons, ligaments, their mechanisms, functions, and the factors affecting them.
- Identifying the types of bones and joints, their mechanisms, functions, and the factors affecting them.
- Understanding the functional connection between each body organ and other organs, and the functional adaptation of these organs during physical activities and sports exercises.

### **3-3- Biochemistry:**

#### **3-3-1- History of Biochemistry:**

Biochemistry as a distinct scientific discipline began between 1650 and 1780, reaching its peak with Antoine Laurent Lavoisier, known as the father of modern chemistry (Elmer, Year of publication unknown). The term "biochemistry" is derived from "bio" meaning life and "chemistry," and was first recorded in English in 1848 (OED online, 2015). In 1877, Felix Hoppe-Seyler used the term "Biochemie" in the introduction of the first issue of the *Zeitschrift für Physiologische Chemie* as a synonym for physiological chemistry, calling for the establishment of institutes for its study (Horst and others, 1988: 116). During the 19th century, Louis Pasteur demonstrated that some diseases result from infection with different types of bacteria and fermenting yeasts, utilizing chemistry to study these microorganisms. In 1877, Pasteur classified yeast as enzymes (Charles, 2021).

The study of biochemistry focuses on the chemical processes within living organisms, involving the discovery and understanding of the complex components of life. Notable discoveries in the twentieth century include the arrangement of the three components of nucleotide by Russian physician Phoebus Levene in 1919 (BioExplorer, 2023), as

well as the discovery of ribose and deoxyribose as components of carbohydrates in DNA (BioExplorer, 2023). Additionally, Hans Krebs discovered chemical reactions involved in the conversion of glucose and oxygen into water, carbon dioxide, and energy during cellular respiration, leading to the naming of the cycle after him (BioExplorer, 2023).

In 1953, Chargaff created a three-dimensional model of DNA, leading to the proposal of DNA replication (BioExplorer, 2023). Subsequent progress in biochemistry has included detailed mapping of atom arrangement in certain enzymes and clarification of mechanisms regulating metabolism, including the partial action of hormones (Elmer, Year of publication unknown).

The practice of biochemistry in the field of physical activities and sports is considered crucial in modern science, with Professor Don MacLaren being a prominent figure in this area. His book on biochemistry in physical and sports activities provides a strong understanding of key aspects, particularly related to structural muscle, its function, contributing substances, energy provision, consumption, and production, as well as energy storage or what is known as metabolism. Furthermore, it explores how metabolism is affected during physical activities and sports exercises. With the proliferation and evolution of research laboratories today, there has been a diversification of discoveries, new ideas, and concepts, leading to the advancement of Physical Activities and Sports Sciences.

### **3-3-2- Biochemistry Definition:**

Biochemistry can be defined as the chemical basis of life. Since the cell is considered the structural unit of living systems, biochemistry can also be described as the study of the chemical components of living cells and the reactions and processes they undergo. (Murray and others, 2016: 44).

(Al-Muzaffar, 2009: 15) defined it as the science that investigates the chemical and physical properties of cell components, the general characteristics of the life systems practiced by these components. In addition, biochemistry accurately explains the nature of these systems within the cell.

Biochemistry is a branch of medical sciences that specializes in studying the chemical composition of the cell and focuses on the processes that occur at the cellular level. It is concerned with various living organisms, simple and complex, and is studied in laboratories to understand how cells communicate and interact with each other. It also aims to understand various processes related to construction, degradation, and energy production. In the sports field, biochemistry is primarily concerned with the metabolic process during physical activities or exercises, understanding energy forms and sources, distinguishing between aerobic and anaerobic sources. It also focuses on the anatomical structure of skeletal muscles, determining their mechanism of action, various chemical reactions occurring within these muscles, and attempting to adapt to exercise intensity, duration, and the necessary nutrition to resist fatigue and training requirements to achieve the best performance and reach the highest levels.

### **3-3-3- Branches and Specializations of Biochemistry:**

Biochemistry is divided into various branches and specializations based on the method of division, including: (Al-Muzaffar, 2009: 18)

A- Division based on the study method:

- Descriptive Biochemistry: focuses on studying the components of the cell in terms of type and quantity.
- Dynamic Biochemistry: which focuses on studying the chemical reactions that occur inside the cell, such as the process of metabolism and energy production.

B- Division based on the type of living organism:

- Plant Biochemistry: focuses on studying the chemical characteristics of plants, their chemical content, and the various reactions that occur within the cells.
- Animal Biochemistry: deals with studying the various chemical reactions in the animal body.
- Microscopic Biochemistry: focuses on studying simple single-celled organisms such as bacteria and viruses.
- Comparative Biochemistry: includes all the chemical relationships between different life forms inside primitive nucleus-free cells up to true nucleus-containing cells.

- Clinical Biochemistry: which focuses on the human organism, is one of the branches of biochemistry that generally deals with the analysis of body fluids.

### **3-3-4- The pedagogical program of biochemistry in the field of science and technologies of physical activity and sports:**

Students of sports science and physical education receive lessons in biochemistry, which is considered a fundamental teaching unit in the first semester of the first year of the common basic education for bachelor's degrees. The total hourly volume of the course is estimated at 42 hours over 14 weeks, divided into:

- 21 hours for lessons or lectures with a weekly hourly volume of 1 hour and 30 minutes.
- 21 hours for guided activities with a weekly hourly volume of 1 hour and 30 minutes. (Ministry of Higher Education and Scientific Research, Official Bulletin, 2013: Decision No. 494)

### **3-3-5- Objectives of biochemistry in the field of science and technologies of physical activity and sports:**

- Acquiring the student's most important theoretical knowledge related to the specialization of biochemistry.
- Studying the cells and molecules that make up living organisms, and in more detail, studying the overall anatomical structure of skeletal muscles, listing the main subcellular components of muscle fibers and determining their location and function, as well as studying the chemical reactions that occur inside the cell, specifically anabolic reactions, catabolic reactions, and metabolic processes.
- Enabling the student to identify the main sources of energy for sports and physical activities, and to distinguish between non-aerobic and aerobic energy sources.
- Understanding the chemical changes that occur in an individual during rest or physical activity, and attempting to adapt them to the type of physical activity.

**4-The module related to medical sciences in the field of science and technologies of physical activity and sports:** (Ministry of Higher Education and Scientific Research, Official Gazette, 2013: Decision No. 494)

Medical sciences in the field of science and technologies of physical activity and sports are not limited to anatomy, physiology, and biochemistry. These sciences have expanded to include health and wellness professions, as well as dynamic analysis such as sports injuries, first aid, and biomechanics, among other specializations. This expansion aims to improve athletes' performance and elevate them to the highest level. For institutes and departments of physical activity and sports sciences, various standards and sub-materials related to medical sciences are taught, including:

#### 4-1- Biomechanics:

Biomechanics has been defined by the American Society of Biomechanics as the application of mechanics laws and principles to living organisms, applying these laws at several levels from the molecular level to the level of organs and tissues (Hamill and others, 2009: 05).

Biomechanics is concerned with studying the forces that affect living organisms, leading to movement or stillness of bodies, changes in their size, structure, or shape. It also involves studying and analyzing human kinetic performance based on physical laws, physiological factors, and anatomy to find solutions to mechanical problems, develop kinetic performance, and consequently establish proper training and educational programs for coaches and teachers.

#### 4-2- Physiology of Physical Activity:

Physiology of physical activity is an important field that studies the functional changes that occur in the human body due to physical activities or exercises.

Effort physiology is a subfield of physiology that aims to explore the direct and long-term effects caused by physical activities or exercises on the functions of muscles, organs, and different body systems, as athletes' bodies undergo many functional changes due to physical effort (Sameea, 2008: 11).

#### 4-3- Sports Injuries and First Aid:

Sports injuries are damage or impairment, whether accompanied or not by tissue dislocation, resulting from an external or internal impact

that may lead to physiological changes and total or partial tissue dysfunction (Marniss, 2020: 02).

First aid is a set of technical procedures or initial assistance provided to individuals or groups in the event of various physical injuries, with the aim of saving the injured person's life or reducing injury complications (Marniss, 2020: 16).

#### 4-4- Hearing and Visual Impairments:

Hearing impairment refers to auditory problems ranging in severity from mild to profound, known as mild to severe hearing loss or deafness, associated with a physiological defect affecting the auditory system. Hearing loss affects linguistic, cognitive, academic, and social characteristics, among others (Al-Qamash, 2013: 113).

Visual impairment is relatively rare compared to other disability categories, indicating a blind person who can only read or write using Braille. Visually impaired individuals require modifications in educational materials, teaching methods, and the school environment (Al-Qamash, 2013: 130).

#### 4-5- Intellectual and Physical Disabilities:

Intellectual or cognitive impairment refers to limitations in a person's ability to learn at a certain age, potentially leading to deficiencies in mental functions such as communication, social relationships, personal care, academic aspects, and various life skills (CDC, 2022).

As for physical disabilities, they include individuals unable to perform their physical and motor functions normally to an extent requiring special medical, psychological, and educational services. Here, disability refers to any injury, whether mild or severe, affecting the central nervous system, skeletal structure, muscles, or health (Nouri Al-Qamash, 2013: 79).

Engaging in physical and sports activities is of utmost importance for people with disabilities, serving therapeutic, physical, social, and rehabilitative purposes (El Tayeb, 2011: 101).

### **Conclusion:**

The field of medicine and medical sciences has always had close ties to sports, exercises, and physical activities. Educational programs in institutes of physical activities and sports sciences usually include the

study of anatomy, physiology, biomechanics, biochemistry, first aid, and other module related to medical sciences, due to their importance in the sports field. Medical sciences in the field of physical activities and sports sciences involve understanding the components of the human body or the athlete and describing them through anatomy, studying the functions of its various parts, known as organ functions, as well as understanding the quantitative and qualitative structure of this human being or athlete and the interactions that take place between its parts, known as biochemistry.

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