**Al-Nahrain University**

**College of Medicine**

**Department of Human Anatomy**

**Course Title & Code: Medical biology (ANTBio-12).**

**Grade:first year**

**Semester: second / 2024-2025**

**Coordinator: Shatha Mahmood hasan**

**Total Hours: Theory (15)week 15 week Practical**

**Hours/week: Theory (2) Practical (3)**

**Credits: theory /2 practical / 1.5**

**1.learning objectives**

The course of cytogenetics is designed to enable the student to:

1 Understanding the basis of genetics and medical inheritance.

2. Study the basic information about the human genome and techniques used in genetic studies of chromosomes

3. understanding how the gene expression

4.study the Genetic diseases and cancer

5-the course also includes some types of lower organisms and correlates them with disease

The course is designed to enable the student to

1. Medical genetics: Study in cytogenetics and medical genetics, basic information about the Human genome, the gene expression, abnormalities, chromosomes, mendelian inheritance, techniques used in genetic studies

2. The content of pathogenic lower organism lectures serves as an aid for lower organisms, those which are of interest to medical students, and Correlate the lower organisms with disease

**2. Instructional and Learning methods and tools**

* The syllabus is given to students in (2) hours of theoretical lectures, and (3) hours of practical sessions in the week.
* The lab sessions are given principally through lectures followed by practical application of the corresponding method. Also, study some types of lower organisms.
* The learning methods used in the lectures are power points and videos.
* The practical sessions include various subjectsrelated to theoretical sessions.

the methods of learning used in the practical session are power points, videos, Prepared stained slides, andlaboratory exercises

The theoretical lectures and the practical session involved dividing the class into four groups, about 76 students in each, two lectures/per week, and 3 hours of practical laboratory sessions/ per week.

 **Theory:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.** | **Topics** | **Description and aim** | **Hours** |  |
| 1 | Introduction to cytogenetics | “Studying cytogenetics means examining the structure, function, and behavior of chromosomes to understand genetic diseases, abnormalities, and heredity. Cytogenetics combines genetics and cell biology to analyze chromosomes using techniques such as karyotyping, fluorescence in situ hybridization (FISH), and comparative genomic hybridization (CGH). | 1 | **أ.م.شذى محمود** |
| 2 | Patterns of Chromosome Inheritance | Studying **Patterns of Chromosome Inheritance** means understanding how chromosomes are passed from parents to offspring and how genetic traits and disorders are inherited. This involves analyzing **chromosomal behavior during meiosis, inheritance patterns, and abnormalities** that affect genetic traits and diseases.Mendelian Inheritance & Chromosome, Autosomal Inheritance | 1 | **أ.م.شذى محمود** |
| 3 | Chromosomes structure  | * Definition of a chromosome
* Importance of chromosomal structure in genetics and cell function
* Chemical Composition of Chromosomes
 | 1 | **أ.د.قاسم شرهان** |
| 4 | Chromosomes structure  | * Chromosome Classification
* Functional Aspects of Chromosomes
 | 1 | **أ.د.قاسم شرهان** |
| 5 | Chromosome Inheritance abnormalities  | * To know the way how the chromosome inheritance occur
* To know the pathological mechanism of abnormal inheritance
 | 1 | **أ.د.ثائر محمود** |
| 6 | Chromosome Inheritance abnormalities  | * Learn the types of abnormal chromosomal disorder
* Know the patterns of chromosomal inheritance, example
 | 1 | **أ.د.ثائر محمود** |
| 7 | Inheritance of Genetic Disorders  | Studying the inheritance of genetic disorders involves understanding how genetic diseases are passed from one generation to another, the role of mutations in genes or chromosomes, and the biological mechanisms that lead to inherited conditions. This field combines genetics, molecular biology, and medical research to analyze the causes, patterns, and risks associated with inherited disorders. Modes of Inheritance | 1 | **أ.م.شذى محمود** |
| 8 | Sex-Linked Inheritance | * Definition of sex-linked inheritance
* Role of sex chromosomes (X and Y) in inheritance
* Difference between autosomal and sex-linked inheritance

Types of Sex-Linked InheritanceX-Linked Inheritance* X-linked recessive inheritance
* X-linked dominant inheritance
 | 1 | **أ.د.قاسم شرهان** |
| 9 | Midterm Exam Theory  |  | 1 |  |
| 10 | Midterm Exam practical |  | 1 |  |
| 11 | Cell cycle regulation I | Describe the internal and external factors that influence the cell cycle controlSystem | 1 | **أ.م.شذى محمود** |
| 12 | Cell cycle regulation 1I | Explain how the abnormal cell division of cancerous cells escapes normal cellcycle controls | 1 | **أ.م.شذى محمود** |
| 13 | DNA Biology | describe the structure of DNA as a polymer composed of many nucleotides joined by phosphodiester bonds forming a sugar-phosphate backbone | 1 | **أ.د.حيدر عبد الرسول** |
| 14 | RNA Structure& Function | RNA molecules perform a variety of roles in the cell but are mainly involved in the process of protein synthesis (translation) and its regulation, and describe the similarities and differences between RNA and DNA | 1 | **أ.د.حيدر عبد الرسول** |
| 15 | DNA Replication | **Molecular Mechanisms** .**Replication Origins** – organisms.**Regulation of Replication****Errors and DNA Damage** – **Biotechnological Applications** – like PCR (polymerase chain reaction) for genetic research, forensic science, and medical diagnostics | 1 | **أ.د.حيدر عبد الرسول** |
| 16 | Gene Expression I | This lesson describes the steps involved in a cell as DNA sequence information is read to make RNA and RNA is read to make proteins. A gene will only control a trait in an organism when the gene is expressed | 1 | **أ.م.شذى محمود** |
| 17 | Gene Expression II | Describe the basic mechanics of translation, including the roles of ribosomes, tRNAs, and amino acids. | 1 | **أ.م .شذى محمود** |
| 18 | Mitochondrial DNA | * Definition of mitochondrial DNA (mtDNA)
* Differences between nuclear DNA and mitochondrial DNA
* Structure and Composition of mtDNA
* Unique Features of mtDNA
* Mitochondrial Inheritance Patterns
 | 1 | **أ.د. قاسم شرهان** |
| ]19 | **mtDNA Mutations and Associated Diseases** | * Point mutations and deletions in mtDNA
* Diseases caused by mtDNA mutations
* Applications of Mitochondrial DNA Research
 | 1 | **أ.د.قاسم شرهان** |
| 20 | Cancer (Overview of cancer) | **Overview of cancer** * Definition of cancer
* Historical perspective on cancer research
* Global burden and statistics
* Characteristics of Cancer Cells
* Types of Cancer
* Hallmarks of Cancer
 | 1 | **أ.د. قاسم شرهان** |
| 21 | Causes and Prevention of Cancer | * Genetic factors
* Causes and Risk Factors of Cancer
* Environmental factors
* Lifestyle factors
* Primary Prevention (Risk Factor Reduction)
 | 1 | **أ.د. قاسم شرهان** |
| 22 | Diagnosis of Cancer | Diagnostic MethodsImaging techniques (CT, MRI, PET scans)Biopsy and histopathologyBlood tests (tumor markers)Molecular and genetic testing | 1 | **أ.د. قاسم شرهان** |
| 23 | Stem cells I  |  In this lesson, students will be able tostate where stem cells are found,describe the function of stem cells in the human | 1 | **أ.د. حيدرعبدالرسول** |
| 24 | Stem cells II | Study the potential benefits and risks of using stem cells in medicine | 1 | **أ.د. حيدرعبدالرسول** |
| 25 | Protozoa II |  Study protozoa to provide students with knowledge concerning biological, epidemiological andecological aspects of parasites causing diseases in humans.· To enable students to understand the pathogenesis, clinical presentations andcomplications of parasitic diseases | 1 | **أ.د.قاسم شرهان** |
| 26 | Platyhelminthes II |  | 1 | **أ.د.قاسم شرهان** |
| 27 | Overview |  | 1 |  |
| 28 | Overview |  | 1 |  |
| Total |  |  |  |

 Practical:

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Topics |  | Hours |
| 1 | Human inherited characteristic analysis  | **أ.م.شذى محمود** |  |
| 2 | Micro techniques(blood group typing) | **م.م. نور كاظم** | 3 |
| 3 | Study types and shapes of chromosomes)karyotype) | **ا.د.قاسم شرهان** | 3 |
| **4** | Clinical features of certain chromosomal abnormalities | **أ.د.ثائر محمود** | **3** |
| **5** | Inheritance related to sex | **أ.د.قاسم شرهان** | **3** |
| **6** | Midterm exam |  | **3** |
| **7** |  Method of DNA Extraction | أ**.د.حيدر عبد الرسول** | **3** |
| **8** | Features of cancer cells | **أ.د.قاسم شرهان** | **3** |
| **9** | Site of stem cells in the body | **أ.د. حيدرعبدالرسول** | **3** |
| **10** | Protozoa II | **أ. د.قاسم شرهان.** | **3** |
| **11** | Platyhelminthes II | **أ. د.قاسم شرهان** | **3** |
| **12** | **Overview** |  | **3** |
| **13** | **Overview** |  | **3** |
|  |  |  |  |

**Student assessment:**

The minimum requirement for a student to pass is to achieve at least 50% of the total 100 marks assigned for the course.

The marks are distributed as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Mid-term Theory | Mid-term Practical | Quiz | total |
| 15% | 10% | 5% | 30% |
| Final Practical | Final Theory | total |
| 20% | 50% | 70% |

Students who fail the cut-off mark mustard are required to re-sit for a second trial examination similar to the final one.

**Books and references:**

1-Molecular biology of the cell, Bruce Albert.2002

2-Elements of Medical genetics, Alan E, H. Emery, sixth edition, London 1983

3-EMERY’S Elements of Medical Genetics.

Peter D. Turnpenny, Sian Ellard,14th EDITION