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 **Department of Biology**

**College of Education**

**Salahaddin University**

**Subject: Practical Genetics**

**Course Book – (Year: 3)**

 **Lecturer's name: MSc.Shyan Rasheed Abubaker**

 **Academic Year: 2021/2022**

**Course Book**

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| **1. Course name** | **Practical Genetics** |
| **2. Lecturer in charge** | **MSc.shayan rasheed abubaker** |
| **3. Department/ College** | **Biology Dept./ College of Education** |
| **4. Contact** | **e-mail: Shayan.Abubaker@su.edu.krd** |
| **5. Time (in hours) per week**  |  **Practical genetics 9 hours.( 3groups).**  |
| **6. Office hours** | **PhD student(one day at university)** |
| **7. Course code** | **-** |
| **8. Teacher's academic profile**  | I was awarded M.Sc.in 2013 in the field of  genetics in biology Dep. college of Science , Salahaddin University- Erbil, Iraq. Tissue culture and cell line, Human genetics ,Molecular genetics, and cytogenetics are my interest area of expertise. Now Im PhD student in biology department of my college. **The researches published that are :- -**2 research I was published**Teaching:-**Practical Genetics and Practical Ecology**.****Scientific conferences and training courses in which I participated are:-**1-Teaching Method training 2013.2- Computer training 2008.3-End note work shop 2013, biology Dep.4.bioinformatics training(2021) |
| **9. Keywords** | Practical Genetics, academic profile, course book |
| **10. Course overview:**  Genetics is that branch of science that aim to understand how the traits( characters) were transmitted from parents (father and mother) to off springs. Also to understand how different types of genetics disease was developed and to explain what is the genetic material. Its ultimate objective is to explain all the characters, and all the things related to the composition of genetic material ( Deoxyribo nucleic acid-DNA) , their replication, transcription and translation to functional proteins( Hormones, enzymes and ect...).Geneticists examine a wide variety of inherited traits, from the ability to bear large numbers of fruit in trees, to eye colour in [mammals](http://www.wisegeek.com/what-are-mammals.htm). Genetics is a major cornerstone of the larger field of [biology](http://www.wisegeek.com/what-is-biology.htm). People who study genetics do so in a wide variety of situations, from research laboratories to pharmaceutical companies, and new breakthroughs in this field are consistently being made. This course will involve study the mendelian genetics, modification of mendellion lows( non – mendelian genetics), what is genes , alleles, genotype , phenotype , pedigree analysis and composition of genetic material study of chromosome ,karyotyping ,chromosomal abnormalities, cell division ,sex chromatin study ,different genetics diseases in human and modern techniques which used in genetics. This course will involve also examination of permanent slides ,preparation of slides in lab, preparation of material that used for chromosomal study using laboratory animals( mice , rats) ,isolation of genomic DNA in both plant and animal cells( onion, spleen,) In the first half of the 20 th century , genetics become more closely linked with Molecular biology, cell biology, biochemistry and made more extensive use of such molecular methods as( Isolation of genomic DNA, polymerase chain reaction, gel electrophoresis and DNA sequencing), those methods enable scientists to conduct research at the cellular, sub cellular and molecular levels and obtain fundamentally new data on the mechanisms regularity the entire complete of the life. |
| **11. Course objective:**Genetics are important science in biology because when we are study genetics we understanding how the genetic characters and genetic disorders are transmitted from generation to generation. Some of the main objectives in this course should be as follow :1. Student learn about the genetic material DNA, the structure ,composition ,number of chromosome in living organisms, and how the gene is expressed.
2. Student learn how the information in DNA can transfer from generation to generation.
3. Studying the genetic diseases and the mutated genes that cause the diseases.
4. Studying mutations in chromosome and in germ cells.
5. Using laboratory animals such as mice, rat, frog for preparation of chromosomes and sperm.
6. Understanding the basic principles of genetics, the new techniques in genetics to improvement the live.
7. To developed critical thinking skills by reviewing journal articles and planning and conducting experiments related to course topics.
8. To developed and enhance communication skills through a variety writing assignments. This course provides an introduction to basic principles of genetic material, inheritant patterns, the structure of chromosome.

By the end of the semester , we should all have a good basic idea of how genes work , what is genetic code and what is modern genetics means.  |
| **12. Student's obligation**Class attendance is taken on a daily basis. Students are expected to attend all classes. The official college attendance policy is followed. Attendance in each class is counted from the first day the student is eligible to attend the class as given on the students assessment sheet” admit to class” registration card or student change notice.   |
| **13. Forms of teaching**Power point presentation for head titles, summary, definitions, classification of materials and any other illustrations will be used to reach the objectives of the course. There will be classroom discussions and the lecture will give enough back ground, translate and solve. Supplementary reading will be required from scientific books. Slide preparation in lab. there are life teaching videos that related with our lectures will be shown to the students |
| **14. Assessment scheme**Approximately 3 unit examinations will be given during the course. Each exam will consist of examine the slide ,definition , fill blanks, draw and lable and what is the pointed part .The semester grade is based on the average score of two lecture exams, the final exam and lab activity.1. Two monthly theoretical examinations(1)=65 %
2. Attendance= 3%
3. Laboratory examination(1)= 35%.
4. Comprehensive final examination (100% theoretical)
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| **15. Student learning outcome:**Each student will :-* Demonstrate understanding of the composition of genetic material, chromosome and genes.
* Demonstrate understanding of the main function of genes.
* Demonstrate understanding of the mutation in genes .
* Demonstrate understanding of what is mendelian lows meain.
* Demonstrate understanding of what is the modification of mendelian low.
* Demonstrate understanding how pedigree chart for any type of genetic diseases was drowning.
* Demonstrate understanding of the mechanism of action of genes and genetic code.
* Demonstrate understanding of how genes are work.
* Demonstrate understanding of what is cell division, cell cycle and check points.
* Demonstrate understanding of how use animals in genetic experiments .
* Demonstrate understanding of the major effects of mutation on the cell function.
* Demonstrate understanding of how to prepare slides from different organisms to examine chromosomes.
* Demonstrate understanding of how use different chemicals, stains in lab.
* Demonstrate understanding of what is modern techniques in genetic now today.
* Demonstrate detailed understanding of how chromosomes were prepared from ( human peripheral blood , bone marrow in laboratory mice, Allium cepa root tip, salivary gland of drosophila melanogaster- larva)
* Demonstrate understanding of how sex chromatin were prepared from ( blood smear, bucal cavity, hair root)
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| **16. Course Reading List and References‌:**▪ Key references: Sulaiman, K. M. 2015. Practical genetics for 3 rd class Biology students.▪ Useful references: -* William S. Kluge and Michael R. Cummings, Concepts of Genetics", 5ld ed .2012.
* Jeffrey M. Becker. Biotechnology ,A laboratory course,2d edition 2008.
* Jack J.Pasternale, university of waterloo, Canada. An introduction to human molecular genetics,2d edition 2005.
* Helen M.Kingston , ABC of Clinical genetics ,3d edition uk,2002.

▪ Magazines and review (internet):Genetics, chromosomes, mutations.molecular biology.  |
| **17. The Topics: Practical topics** |  |
| Weeks |  Topics | Time for group 2,D and E |
| 1 | Concept for Genetics terms , Chromosome composition. Types of chromosome according to centromere position , Chromosome Numbers .Karyotype of chromosomes ,Examination of slides represent human chromosomes |  |
| 2 | An introduction to Mundelein genetics, solve of practice examples about Mendel experiments |  |
| 3 | Study of mendelian traits, dominance .co dominance.& study of sex linked traits. |  |
| 4 | Study of pedigree analysis and their examples ,Part .1. |  |
| 5 | Study of pedigree analysis and their examples ,Part .2 |  |
| 6 | Cell Division , Mitosis cell Division ,Cell cycle ,Examination of slids to view mitosis stages. |  |
| 7 | Preparation of mitosis stages and chromosomes from Allium cepa (root tip)by sqashing method. |  |
| 8 | Using of Drosophila Melanogaster in Genetic Research, Classification:Life cycle of *D. melanogaster,* Why use *Drosophila*? Similarity to humans. |  |
| 9 | Cell Division, Meiosis cell division study the characteristic of each stage, spermatogenesis and Oogenesis study, Examination of slides to view meiosis  |  |
| 10 | Preparation of meiosis cell division and chromosomes in Rosa sp. |  |
| 11 | Central Exam .2 |  |
| 12 | Study of sex chromatin (Bar bodies) in human cells. |  |
| 13 | Study of Dermatoglyphics ,Types of derm lines according to calton classification |  |
| 14 | Study of mutation .Types of mutations, Structural changes of chromosomes |  |
| 15 | Numerical changes of chromosomes, study of polyploidy in plants. |  |
| 16 | Isolation of Genomic DNA by rupturing onion cells, DNA precipitation. |  |
| 17 | Mitochondria and human diseases ,Preparation of mitochondria from buccal cavity |  |
| 18 | Extraction of DNA from spleen |  |
| 19 | Preparation of chromosomes from the bone marrow of laboratory mice to view the chromosomes abnormalities. |  |
| 20 | Study of cancer,causes , oncogenes, Examination of some slides on different types of cancer  |  |
| 21 | Study of leukemia in human ,Examination of slides to view of abnormal WBCs. |  |
| 22 |  Monthly examination 2 |  |
| 23 | Study of thalassimia in human ,preparation of slides to examination of abnormal RBCs. |  |
| 24 | Study of Sickle cell anemia in human ,Examination of slides to view of abnormal RBCs. |  |
| 25 | Chloroplast DNA isolation |  |
| 26 | Study of DNA finger print. Procedure, Detection |  |
| 27 | Study of Gel electrophoresis ,Run, Material used . |  |
| **18. Practical Topics (If there is any);-** **Written above .** |  |
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| **19. Examinations:*****1. Compositional:*** What is low of segregation? Answer:During the formation of gametes (eggs or sperm), the two alleles responsible for a trait separate from each other. Alleles for a trait are then "recombined" at fertilization, producing the genotype for the traits of the offspring.***2.******True or false type of exams:******1-*** Monohybrid cross - cross involving a single trait e.g. flower color .2- Somatic mutation : Happen in somatic cells ,are transmitted to next generation.3- Point mutation(base substitution) : occurred when a single base pair of agene is changed Answer:- 1 and 3 true while 2 was false.2- Somatic mutation : Happen in somatic cells ,are not transmitted to next generation***3. Multiple choices:***1-Normal females possess two X chromosomes, and in any given cell one chromosome will be active ,designated as: a-Xa b- Xi c- Xn2-Transversion : which means:a - pyrimidin →Purine b- Purine→Purine- c- Purine →pyrimidin Answer:1( a) ,2(c).4**.Fill blanks:**1- Mitochondrial DNA was with out ---------protein.2- A pair of genes located on chromosome 16 arm P ,controls the production of --------- sub unit of hemoglobin.**Answer**:1- Histon, 2- α.sub unit. **Draw and lable** 1. Draw a cell at metaphase stag e of mitosis division.
2. 2-Draw metacentric chromosome.
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| **20. Extra notes:** |
| **21. Peer review پێداچوونه‌وه‌ی هاوه‌ڵ**  |