

**Department of Animal Resources**

**College of Agricultural Engineering Sciences**

**University of Salahaddin–Erbil**

**Subject: (Advanced Animal Breeding)**

**Course Book – Diplomo**

**Lecturer's name: Assist .Prof. Dr. Mohammed sulaiman**

**Academic Year: 2023/2024**

Course Book

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| **1. Course name** | **Adv. Animal Breeding** |
| **2. Lecturer in charge** | **Dr. Mohammed S.Abdullah (Assist. Prof.)** |
| **3. Department/ College** | **Department of Animal Resources\ Agricultural Engineering Sciences** |
| **4. Contact** | **E-mail:** **mohammed.abdullah@su.edu.krd****Tel: 0750 4686486** |
| **5. Time (in hours) per week** | **Theory: 2 hours per week**  |
| **6. Office hours** |  |
| **7. Course code** |  |
| **8. Teacher's academic profile** | **B.ch. In animal production -2001****M.sc. In poultry breeding -2007****Ph.D in Poultry Breeding -2020** |
| **9. Keywords** | **Animal genetics, breeding, Mendelian, recombinant, chi square, dihybrid, chromosome, DNA, genes, population****genetics, inbreeding, crossbreeding, heritability, repeatability, genetic correlation, selection.** |
| 1. **Course overview:**
	* The science of animal breeding and genetic improvement is defined as the application of the principles of genetics and biometry to improve the efficiency of production in farm animals. These principles were applied to change animal populations thousands of years before the sciences of genetics and biometry were formally established.
	* The purpose of animal breeding is not only to genetically improve individual animals- once an individual is conceived, it is too late to change the genotype of that animal- but to improve animal populations, to improve future generations of animals. In order to this task, breeders bring two basic tools: selection and mating. Both involve decision-making. In selection, it is decided which individuals become parents, how many offspring they may produce, and how long they remain in the breeding population. In mating, it is decided which of the males we have selected will be bred to which of the females we have selected.
	* Environment plays an important part in breeding. So a favourable condition should
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| be created in respect of housing, feeding and general care. Pedigree breeding is an important practice wherein efficiency of mating can be measured and the selection and mating operations modified to ensure improvement but this is possible only in well-established farms, requiring lot of technical expertise, and accurate mating and breeding rewards.* Genetic improvement usually depends on the aim of breeding program, so the breeders should keep in his mind breeding goals or plans and try confirming them. The different goals of breeders from place to place and from environment to environment are the causes of existing different breeds within the same type, and different lines within the same breed.
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| 1. **Course objective:**
	* To understand the principles of animal breeding and genetics and their application in the improvement of animals and how the animal was reproduced genetically.
	* To applied the statistics parameters on the animal breeding.
	* To have Knowledge about:
* The population genetics include gene frequency and its factors effecting.
* The selection methods and its types and how genetic selection is used to improve populations and understanding how production traits are used in genetic selection.
* The animal mating systems and its calculation.
* The genetic and phenotypic parameters such as h2, R and G. correlations.
* How to improve animals breeds performance genetically according to the genetic programs by selection and different mating systems to get commercial crossbreeds

with superior productivity performance (hybrids). |
| 1. **Student's obligation**
	* Students obligated to attend the lectures because absence will have direct effect on their learnings
	* Students will be divided into groups in order to share their knowledge and utilize from each other.
	* Students will be assessed individually and within the groups
	* Students will be obligated to participate in activities, presentations, reports, and tasks individually and in groups.
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| 1. **Forms of teaching**
	* Laptop, data show, PowerPoint, whiteboard, Video sections, laboratory
	* Participating students to speak and discuss.
	* Participating students in group and individual activities and tasks, presentations, and writing reports
	* PowerPoint file with reading list will be printed and given to students
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| 1. **Assessment scheme**
	* First semester **(40 degrees)** these five degrees will be distributed to theory quizzes, practical quizzes, student activities (tasks, seminars, and reports)
	* Midterm exam **(10 degrees)**
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| 1. **Student learning outcome:**

This course is designed to provide students with basic breeding programs using genetic bases with advance introduction into selection, genetic correlation, hybridization, mating systems, population genetics and heritability estimation. At the end of the course, the student should be able to:* 1. Recognize the mendelian, recombination, population and molecular genetics.
	2. Estimation of heritability and genetic correlation.
	3. Determine the best selection method for poultry breeding strategy.
	4. Know how genes inherited and linked with others to produce a new hybrid.
	5. Imagine how it may the breeding strategy improve animal stocks.
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| 1. **Course Reading List and References:**
	* Poultry Genetics, Breeding and Biotechnology*.* CABI Publishing. 44 Brattle Street 4th Floor Cambridge, MA 02138. Edited by W.M. Muir & S.E. Aggrey (2002), USA.
	* Introduction to quantitative genetics. 4th edition Longman House, London. Falconer, D.S. (1997).
	* Incorporating Molecular Information in breeding programs: Applications and Limitations. In: Poultry Genetics, Breeding and Biotechnology. Editor, W.M. Muir and S.E. Aggrey. CABI Publishing (2003).
	* - Population Genetics Models of Local Ancestry – Gravel. S., S. (2012). "". ***Genetics*** 1202

(2): 4811. [arXiv](http://en.wikipedia.org/wiki/ArXiv):[1202.4811.](http://arxiv.org/abs/1202.4811) [Bibcode](http://en.wikipedia.org/wiki/Bibcode)[:2012arXiv1202.4811G.](http://adsabs.harvard.edu/abs/2012arXiv1202.4811G)[doi](http://en.wikipedia.org/wiki/Digital_object_identifier)[:10.1534/genetics.112.139808](http://dx.doi.org/10.1534/genetics.112.139808). |
| **17. The Topics:** |  |
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| 1- Fresher week |
| 2- Introduction to Genetics & course book |
| 3- Mendelian genetics and probability |
| 4- Chi-square test and pedigree analysis |

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| 5- Chromosomes |
| 6- Recombination and linkage analysis |
| 7- DNA |
| 8- Mutations |
| 9- Transcription and RNA processing |
| 10- Genetic code & Translation |
| 11- Recombinant DNA |
| 12- Introduction to Animal breeding / (**Midterm Exam**) |
| 13- principles of selection, types of selection and selection procedures |
| 14- Breeding value estimation & population genetics |
| 15- Breeding methods (inbreeding& crossbreeding) |
| 16- Selection indexes in the animal breeding |
| 17- Principles of breeding programmes |
| 18- Biological basics of animal fertility, milk, meat and egg production |
| **18. Practical Topics (If there is any)** |  |
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| 1- Fresher week |
| 2- Introduction to Genetics & course book |
| 3- Mendelian – **Cell & glossary** |
| 4- **Chi-square test** |
| 5- Chromosomes – **Gene action** |

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| 6- Recombination and linkage analysis - **Monohybrid** |
| 7- DNA - **Dihybrid** |
| 8- Mutations **– Dihybrid F2** |
| 9- Introduction to Animal breeding  |
| 10- principles of selection, types of selection and **selection procedures** |
| 11- **Breeding value estimation** & population genetics |
| 12- Breeding methods **(inbreeding**& crossbreeding) |
| 13- Selection **indexes** in the animal breeding |
| 14- Principles of breeding programmes - **heritability** |
| 15- Biological basics of animal **fertility**, **milk**, **meat and egg production** |
| 1. **Examinations:**
	1. **True and False**

In this type of questions students will distinguish between true and false sentences and they will also correct the false sentencesEx.: 1- Heterosis coming from inbreeding. - (false) Heterosis coming from outbreeding* 1. **Multiple choices**

In this type of questions students will choose the correct answer between the multiple choices.Ex.: 1- Heterosis coming from (inbreeding, **outbreeding** , line-breeding , inbred lines)* 1. **Blanks**

In this type of questions students will fill the blanks in with the appropriate word or phrase Ex.: 1- Heterosis coming from ……………… - (outbreeding)* 1. **Definitions**

In this type of questions students will define the main terms of the subject Ex.: 1- Define the following terms: 1- crossbreeding**Crossbreeding**: is crossing between two breeds have not any relationship (relatives). |

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| 1. **Listing**

In this type of questions students will be asked to list the main points within the subjectEx.: list the following: 1- Methods of breeding?- Inbreeding - Line-breeding - Outbreeding - Crossbreeding1. **Brief explanations**

In this type of questions students will be asked to explain some topics in brief Ex.: Explain in brief the selection types (methods)?1. **Detailed Explanations**

In this type of questions students will be asked to explain some topics in details Ex.: Explain selection index.1. **Drawing / Diagrams**

In this type of questions students will be asked to draw the DNA structure (for example) or diagram the scheme of breeding programs in practical exams. |
| **20. Extra notes:**Here the lecturer shall write any note or comment that is not covered in this template andhe/she wishes to enrich the course book with his/her valuable remarks. |
| **review Peer 21.**This course book has to be reviewed and signed by a peer. The peer approves the contents of your course book by writing few sentences in this section.*(A peer is person who has enough knowledge about the subject you are teaching, he/she has to be a professor, assistant professor, a lecturer or an expert in the field of your subject).* |