**UNIVERSITY OF SARGODHA**

**DEPARTMENT PLANT BREEDING & GENETICS**

COURSE OUTLINE SPRING 2020

Course Title: Introductory Plant Breeding

Course Code: PBG-202

Credit Hours: 3(2-1)

Instructor: Mr. Muhammad Shehzad

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DESCRIPTION AND OBJECTIVES

To enable the student understand

1. Basis of plant breeding

2. Reproductive mechanisms in major crops

3. Application of genetic principles in crop improvement

4. Breeding methods in self and cross pollinated crops

INTENDED LEARNING OUTCOMES

The purpose of this course is to teach the students of B.Sc. (Hons.) Agriculture Basis of plant breeding, Reproductive mechanisms in major crops, Application of genetic principles in crop improvement, Breeding methods in self and cross pollinated crops

COURSE CONTENTS

*Theory:*

1. Introduction to plant breeding and its role in crop improvement.
2. Reproductive systems in major crop plants.
3. Genetic variation and its exploitation, creation of variation through genetic recombination, mutation and heteroploidy.
4. Breeding self-pollinated crops: introduction, mass selection, pure line selection; hybridization, pedigree method, bulk method and backcross techniques.
5. Breeding cross-pollinated crops: introduction, mass selection, recurrent selection, development and evaluation of inbred lines, development of hybrids, synthetic and composite populations.
6. Breeding colonaly propagated crops.
7. New trends in plant breeding.

*Practical:*

1. Descriptive study of floral biology, scientific names, chromosome number and ploidy level of important field crops.
2. Selfing and crossing techniques in major crops.
3. List of approved varieties in major field crops.
4. Field visits of different research organizations.

READINGS

1. Khan, M.A and M. Ahmad. 2008. Plant Breeding. Daya Publishing House, New Dehli, India.
2. Sleper, D.A and J.M. Poehlman.2006. Breeding Field Crops. 5th ed. Iowa State University Press, Ames, USA.
3. Chahal, G.S. and S.S Gosal. 2003. Principles and Procedures of Plant Breeding. Narosa Publishing House New Dehli India.
4. Singh, B.D. 2003. Plant breeding: Principles and Methods. Kalyani Publisher, New Dehli India
5. Singh, P. 2003. Essentials of Plant breeding.Kalyani Publisher, New Dehli India.
6. Sadaqat, H. A., I. A. Khan and T. M. Khan. 2007. Introductory Plant Breeding. 2nd ed. Study aid foundation for education, University of Agriculture, Faisalabad

COURSE SCHEDULE

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| **Week** | Topics and Readings | Books with Page No. |
| 1 | Distribution of teaching schedule and discussion about the course contents. |  |
| 1 | The concept of plant breeding, Role of plant breeding in crop improvement | Book 6; Chapter 1 Pg 1-3, Book 2; Chapter 1 Pg 3-4, 8-10, |
| 1 (P) | Flower and various parts of typical flower | Book 6; Chapter 1 Pg 3-4  Book 2; Chapter 1: 10-16, |
| 2 | Reproductive systems in major crop plants | Book 4; Chapter 4 Pg 58-62, |
| 2 | Strategy of plant breeding | ,Book 6; Chapter 1 Pg 3, Book 2; Chapter 4-6. |
| 2(P) | Structural modifications in flowers | Book 4; Chapter 2 Pg 8-11  Book 5; Chapter 2 Pg 23-26 |
| 3 | Variation and its types | Book 6; Chapter 2 Pg 5-7, Book 2; Chapter 3: 85-86. |
| 3 | Sources of hereditary variation | Book 6; Chapter 2 Pg 8-10,Book 2; Chapter 5- 6, |
| 3(P) | Mode of pollination in flowers | Book 4; Chapter 2 Pg 11-14  Book 5; Chapter 2 Pg 31-35 |
| 4 | Artificial creation of variability Hybridization | Book 6; Chapter 3 Pg 12-13  Book 4; Chapter 33: 732-761, |
| 4 | Mutation | Book 6; Chapter 3 Pg 13-18  Book 4; Chapter 33: 742-749 |
| 4(P) | Chromosome number of important crop plants | Book 4; Chapter 2 Pg 13-15 |
| 5 | Heteroploidy | , Book 6; Chapter 3 Pg 18-24, Book 4; Chapter 33: 750-760, |
| 5 | Aneuploidy | , Book 6; Chapter 3 Pg 18-24, Book 4; Chapter 33: 750-760, |
| 5(P) | Chromosome number of important crop plants | Book 4; Chapter 2 Pg 13-15 |
| 6 | Genetic Engineering | Book 6; Chapter 3 Pg 24-28, Book 2; Chapter 5, Pg 96-99. |
| 6 | Somaclonal Variation | , Book 6; Chapter 3 Pg 29-31, Book 2; Chapter 5: 99-104. |
| 6(P) | Selfing and crossing techniques in Barley |  |
| 7 | Variety/ Cultivar | Book 6; Chapter 4 Pg 32-36, |
| 7 | Breeding self-pollinated crops: introduction, Mass selection method, | Book 6; Chapter 4 Pg 32-36, |
| 7(P) | Selfing and crossing techniques in Barley (Field Demonstration) |  |
| 8 | Pure line selection | Book 6; Chapter 5 Pg 37-42  Book 4; Chapter 32 :698-731, |
| 8 | Course discussion |  |
| 8(P) | Selfing and crossing techniques in Cotton |  |
| 9 | Selection methods after Hybridization pedigree method, | Book 6; Chapter 6 Pg 45-49, Book 4; Chapter 14-15: 255-269, |
| 9 | Selection methods after Hybridization, Bulk method | , Book 6; Chapter 6 Pg 48-49, Book 4; Chapter 15: 261-266. |
| 9(P) | Field Crossing |  |
| 10 | Single seed Descent Method, Double haploid method | Book 6; Chapter 6 Pg 51-62 Book 4; Chapter 16-17 Pg 270-301 |
| 10 | Backcross method | Book 6; Chapter 6 Pg 51-62 Book 4; Chapter 16-17 Pg 270-301 |
| 10(P) | Selfing and crossing techniques in Oats |  |
| 11 | Multiline Breeding and Variety Blend | Book 4; Chapter 5 Pg 44-45  Book 5; Chapter 5 Pg 110-111 |
| 11 | Breeding cross-pollinated crops: introduction | Book 6; Chapter 6 Pg 59-62, Book 4; Chapter 18-305-308, |
| 11(P) | Selfing and crossing techniques in Sorghum |  |
| 12 | Mass and recurrent selection | Book 6; Chapter 7,Pg 45-46,63  Book4: Chapter21 |
| 12 | Half Sib and Full Sib selection | Book 6; Chapter 7Pg 45-49  Book4: Chapter21: 367-395. |
| 12(P) | Selfing and crossing techniques in rice |  |
| 13 | Development and evaluation of inbred lines | Book4: Chapter22: 400-406, |
| 13 | Development of hybrids | Book4: Chapter22: 406-410,. |
| 13(P) | FIELD CROSS |  |
| 14 | Development of synthetic variety, | Book 6; Chapter 7,Pg 63-77, Book4: Chapter22: 425-433 |
| 14 | Synthetic and composite populations | Book 6; Chapter 7,Pg 63-77,  Book4: Chapter22: 425-433. |
| 14(P) | Selfing and crossing techniques in maize and millets (Field Demonstration) |  |
| 15 | Breeding Clonally Propagated Crops, | Book 6; Chapter 8 Pg 78-81, |
| 15 | Biotechnology and plant breeding | , Book 4: 789-846 |
| 15(P) | Synchronization of Flowering |  |
| 16 | Course Discussion |  |
| 16 | Course Discussion |  |
| 16(P) | Group Discussion |  |

RESEARCH PROJECT /PRACTICALS /LABS /ASSIGNMENTS

Students will perform Selfing and crossing of field crops in practical

Assignments will be preparation of Models regarding Breeding Methods in self and cross pollinated crops

ASSESSMENT CRITERIA

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| **Sessional**  (Attendance & Punctuality, Quizzes, Assignment etc) | **Midterm** | **FinaI term** | **Practical** | **Total** |
| **8** | **12** | **20** | **20** | **60** |