INSTITUTE	**FACULTY OF AGRICULTURE**
PROGRAM	**BACHELOR OF SCIENCE (Hons.) AGRICULTURE**
SEMESTER	**3**
COURSE TITLE	**FUNDAMENTALS OF PLANT BREEDING**
COURSE CODE	**16AS0307**
COURSE CREDITS	**3**

Objective:

1 To examines principles of plant breeding in self- and cross-pollinated crops.
2 To provide basic knowledge about plant breeding techniques required to develop new varieties.
3 To familiarize students with concepts like mutation breeding, polyploidy breeding, pre-breeding, wide hybridization.
4 To develop high yield producing hybrids and varieties.

Course Outcomes: After completion of this course, student will be able to:

1 Students will be able to know basic plant breeding for developing new varieties.
2 Students will understand the basic techniques utilized in plant breeding for developing new hybrids and varieties.
3 Students will be able to know different types of breeding techniques i.e mutation breeding/ polyploidy/ wide hybridization/ asexual etc.
4 Students will know how to develop insects pest and disease resistance varieties.

Pre-requisite of course: To familiar students about development of hybrids and varieties.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
2	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Historical development, concept, nature and role of plant breeding, major achievements.** Historical development, concept, nature and role of plant breeding, major achievements.	1
2	**Domestication, acclimatization, introduction and Centre of origin/diversity.** Domestication, acclimatization, introduction and Centre of origin/diversity.	1

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Contents : Unit	Topics	Contact Hours
3	**Self- incompatibility and male sterility- genetic consequences and cultivar options.** Self- incompatibility and male sterility- genetic consequences and cultivar options.	2
4	**Genetic basis and breeding methods in self- pollinated crops- mass selection and pure line selection, hybridization techniques and handling of segregating population (pedigree, bulk, SSD and back cross methods); Multiline concept; Genetic basis and methods of breeding cross-pollinated crops; Heterosis and inbreeding depression. Development of inbred lines and hybrids, composite and synthetic varieties.** Genetic basis and breeding methods in self- pollinated crops- mass selection and pure line selection, hybridization techniques and handling of segregating population (pedigree, bulk, SSD and back cross methods); Multiline concept; Genetic basis and methods of breeding cross-pollinated crops; Heterosis and inbreeding depression. Development of inbred lines and hybrids, composite and synthetic varieties.	7
5	**Breeding methods in asexually propagated crops-clonal selection and hybridization; Wide hybridization and pre-breeding** Breeding methods in asexually propagated crops-clonal selection and hybridization; Wide hybridization and pre-breeding	2
6	**Polyploidy in relation to plant breeding; Mutation breeding-methods and uses; Breeding for important biotic and abiotic stresses.** Polyploidy in relation to plant breeding; Mutation breeding-methods and uses; Breeding for important biotic and abiotic stresses.	4
Total Hours		**17**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Plant Breeder's kit** Plant Breeder's kit	2
2	**Study of germplasm of various crops (plant genetic resources, gene pool and its conservation)** Study of germplasm of various crops (plant genetic resources, gene pool and its conservation)	2
3	**Mode of pollination; To work out the mode of pollination in a given crop and extent of natural out crossing; Consequences of inbreeding on genetic structure of resulting populations** Mode of pollination; To work out the mode of pollination in a given crop and extent of natural out crossing; Consequences of inbreeding on genetic structure of resulting populations	2

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
4	**Emasculation and hybridization techniques in self and cross pollinated Genetics and Plant crops** Emasculation and hybridization techniques in self and cross pollinated Genetics and Plant crops	2
5	**Concepts of population genetics and Hardy-Weinberg Law** Concepts of population genetics and Hardy-Weinberg Law	2
6	**Estimation of heterosis and inbreeding depression** Estimation of heterosis and inbreeding depression	2
7	**Methods of calculating mean, range, variance, standard deviation** Methods of calculating mean, range, variance, standard deviation	2
8	**Designs used in plant breeding experiments and Analysis of Randomized Block Design** Designs used in plant breeding experiments and Analysis of Randomized Block Design	2
9	**Component of genetic variation- heritability and genetic advance** Component of genetic variation- heritability and genetic advance	2
10	**Prediction of performance of double cross hybrids** Prediction of performance of double cross hybrids	2
Total Hours		**20**

Textbook :

1 NA, NA, NA, NA

References:

1 Essentials of Plant Breeding, Essentials of Plant Breeding, Phundan Singh, Kalyani Publishers, 2014

2 Plant Breeding: Principles and Methods, Plant Breeding: Principles and Methods, Singh, B.D., Kalyani Publishers, 2015

3 Plant Breeding Theory and Techniques, Plant Breeding Theory and Techniques, Gupta, S. K., Wiley India Pvt. Ltd., 2010

4 Principles of Plant Breeding, Principles of Plant Breeding, Allard, R.W., John Wiley and Sons, 2010

5 Principles and Practice of Plant Breeding, Principles and Practice of Plant Breeding, Sharma, J.R., Tata McGraw Hill, Publishing Company Ltd., 1994

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation

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Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking
25.00	25.00	20.00	10.00	10.00	10.00

Instructional Method:

1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board may also use any of tools such as demonstration, role play, quiz, brain storming, MOOCs etc.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

4 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

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