

Syllabus for B.Sc. (Hons) Agriculture Year – II (Sem. IV)

Subject Code: 16AS0417

Subject Short Name: GPB. 4.2

Subject Name: Basics of Plant Breeding

Objective:

1. To examine 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

Credits Earned: 3 Credits (2+1)

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

- Know basic plant breeding for developing new varieties.
- Understand the basic techniques utilized in plant breeding for developing new hybrids and varieties.
- Know different types of breeding techniques i.e., mutation breeding/ polyploidy/ wide hybridization/ asexual etc.
- Know how to develop insect pest and disease resistance varieties

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	Mid Sem (M)	Progressive Assessment (PA)	Viva (V)	Term work (TW)	
2	0	2	3	40	20	20	10	10	100

Theory Content:

Unit	Topics	Contact Hours
1	Historical development, concept, nature and role of plant breeding, major achievements.	2

2	Genetics in relation to plant breeding, modes of reproduction and apomixes.	1
3	Domestication, acclimatization, introduction and Centre of origin/diversity.	1
4	Self- incompatibility and male sterility- genetic consequences and cultivar options.	2
5	Components of Genetic variation. Heritability and genetic advance. Pre-breeding and Universal Plant Breeder's equation	2
6	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.	4
7	Genetic basis and methods of breeding cross-pollinated crops; Heterosis and inbreeding depression. Development of inbred lines and hybrids, composite and synthetic varieties.	4
8	Breeding methods in asexually propagated crops-clonal selection and hybridization; Wide hybridization and pre-breeding	2
9	Polyploidy in relation to plant breeding; Mutation breeding methods and uses; Breeding for important biotic and abiotic stresses.	4
10	Concepts of population genetics and Hardy-Weinberg Law	1
11	Participatory plant breeding. Variety Release and notification. Intellectual Property Rights, Patenting, Plant Breeders and Farmer's Rights	1
	Total	24

Practical Content:

Unit	Topics	Contact Hours
1	Plant Breeder's kit	2

2	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	2
4	Emasculation and hybridization techniques in self and cross pollinated crops	2
5	Concepts of population genetics and Hardy-Weinberg Law	2
6	Estimation of heterosis and inbreeding depression	2
7	Methods of calculating mean, range, variance, standard deviation	2
8	Designs used in plant breeding experiments and Analysis of Randomized Block Design	2
9	Component of genetic variation- heritability and genetic advance	2
10	Prediction of performance of double cross hybrids	2
11	Maintenance of breeding records and data collection	2
12	Screening tests for biotic and abiotic stresses	2
	Total	24

Reference Books:

- Essentials of Plant Breeding, Essentials of Plant Breeding, Phundan Singh, Kalyani Publishers, 2014
- Plant Breeding: Principles and Methods, Plant Breeding: Principles and Methods, Singh, B.D., Kalyani Publishers, 2015
- Plant Breeding Theory and Techniques, Plant Breeding Theory and Techniques, Gupta, S. K., Wiley India Pvt. Ltd., 2010
- Principles of Plant Breeding, Principles of Plant Breeding, Allard, R.W., John Wiley and Sons, 2010
- 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 per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
25%	25%	20%	10%	10%	10%

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 white 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 class-rooms.
3. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory/ field.
4. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.