PARVATHANENI BRAHMAYYA
SIDDHARTHA COLLEGE OF ARTS & SCIENCE
Autonomous
Siddhartha Nagar, Vijayawada–520010
Re-accredited at 'A+' by the NAAC

Course Code				**23BOMAL233**			
Title of the Course				**PLANT BREEDING**			
Offered to: (Programme/s)				**B.Sc Hons Botany**			
L	**4**	**T**	**0**	**P**	**0**	**C**	**3**
Year of Introduction:	**2024-25**			**Semester:**			**3**
Course Category:	**MAJOR**			**Course Relates to:**	**GLOBAL**		
Year of Revision:	**NA**			**Percentage:**	**NA**		
Type of the Course:				**SKILL DEVELOPMENT**			
Crosscutting Issues of the Course :				**NA**			
Pre-requisites, if any				**KNOWLEDGE OF AT +2 LEVEL**			

Course Description:

Genetic manipulation in plants has underpinned improvements in productivity and has enhanced sustainability of farming systems worldwide. As well, plant genetic diversity is fundamental to understand adaptation in natural systems. This course introduces the fundamental concepts of plant breeding and plant adaptation that are applicable to agricultural and natural systems. Extensive industry engagement is also undertaken as part of the course curriculum where students connect with industry leaders in the plant breeding discipline, whether in broad-acre cropping or horticulture. The topics covered include: genetic diversity in relation to adaptation, productivity, pest and disease resistance and end-use quality; strategies for setting breeding objectives and maximising selection and improvement of key traits; breeding methodologies for self or cross pollinated plants.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	To learn the objectives of plant breeding along with reproductive methods in plants.
2	To learn the scope of plant breeding along with reproductive methods in plants.

3	To understand the breeding methods in plant for production of new varieties
4	To have a comprehensive knowledge on tools in plant breeding.
5	To have a comprehensive knowledge on techniques in plant breeding.

Course Outcomes

At the end of the course, the student will be able to…

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Compare and contrast the methods of reproduction and also pollination mechanisms.	**K2**	**2**	**1**
CO2	Design appropriate pollination method for a given crop plant.	**K6**	**2**	**1**
CO3	Recommend the best possible breeding method for a crop species.	**K5**	**2**	**1**
CO4	Propose the steps for production of hybrid varieties of crop plants.	**K6**	**2**	**1**
CO5	Apply molecular techniques to develop a tailored plant variety.	**K3**	**2**	**1**

CO-PO MATRIX									
CO NO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**
CO1		**2**						**2**	
CO2		**3**						**3**	
CO3		**3**						**3**	
CO4		**3**						**3**	
CO5		**2**						**2**	

Course Structure:

Unit – 1: [Basic Concepts of Plant Breeding] (12Hrs)

1. Definition, aim, objectives and scope of plant breeding; concepts in plant breeding: genetic variation, heritability, and selection.

2. Advantages and disadvantages of asexual and sexual reproduction; apomixis: definition,types and significance.

3. A brief account of self and cross-pollination, their genetic consequences and

significance;classification of crop plants based on mode of pollination and mode of reproduction.

Examples/Applications/Case Studies:

Case Study- Making a report on effect on salt stress on plant breeding.

Exercises/Projects:

Project- Written assessment on reproduction and pollination mechanisms in plants.

Evaluation method: Awarding grade based on writing appropriate points in a descriptive way.

Specific Resources:

https://youtu.be/NaRkGTRDiLQ

Unit – 2: [Contrivances for Cross Pollination] (12Hrs)

1. Self-incompatibility in plants – Definition, heteromorphic and homomorphic systems; exploitation of self-incompatibility in hybrid production.
2. Male sterility- Genetic, cytoplasmic and cytoplasmic-genetic, utilization in plant breeding.
3. Domestication of plants, centres of origin of crop plants.

Examples/Applications/Case Studies:

Case Study- Report on pollen from fields of fiber.

Exercises/Projects:

Project- Collection of scientific literature on contrivances in plants to promote cross fertilization.

Evaluation method: Quality and organization of the report in a systematic way with datacollected and analysis made.

Specific Resources:

https://youtu.be/zlM5C6tXvYs

Unit – 3: [Breeding Method in Plant] (12Hrs)

1. Plant introduction – types, objectives, plant introduction agencies in India, procedure, meritsand demerits; germplasm collections, genetic erosion, gene sanctuaries.
2. Selection – natural and artificial selection – basic principles of selection.
3. Self-pollinated crops: pure line selection method – procedure, advantages and disadvantages,achievements.
4. Vegetatively propagated crops: Clonal selection - procedure, advantages and disadvantages,achievements.

Examples/Applications/Case Studies:

Case Study- Assignment of yield testing.

Exercises/Projects:

Project 1- Hands on activity of selection procedure for a given crop plant.

Evaluation method: Assessment of understanding and applying appropriate selection procedure.

Specific Resources:

https://youtu.be/JPtaseBgU3k?list=PLE4QPzlkt9Kx6Wqw1NQITNbkb2L_fG7gg

Unit – 4: [Breeding Methods in Cross Pollinated Plants] (12Hrs)

1. Hybridization – objectives, types, procedure, advantages and disadvantages, achievements.

2. Cross-pollinated crops: back cross method - procedure, advantages and disadvantages,achievements.

3. Heterosis: definition, genetic bases of heterosis – dominance, over dominance and epistasishypotheses; physiological bases of heterosis – commercial utilization.

4. Synthetics and composites – production procedures – merits, demerits and achievements.

Examples/Applications/Case Studies:

Case Study- An overview of pedigree method

Exercises/Projects:

Project- Field trip to an agriculture or a horticulture research station to learn hybridization techniques.

Evaluation method: Active participation and learning skills on production of hybrid plants.

Specific Resources:

https://youtu.be/Pz-D2EoZbD0

Unit – 5: [Modern Methods in Plant Breeding] (12Hrs)

1. Mutation breeding: spontaneous and induced mutations- characteristic features of mutations- procedure of mutation breeding-applications-advantages, limitatins and achievements.

2. Polyploidy breeding: auto-polyploids and allopolyploids- applications in crop improvement and limitations.

3. DNA markers and their applications in plant breeding: RFLP, SSR AND SNP.

4. Marker Assisted Selection (MAS) and its applications in plant breeding.

Examples/Applications/Case Studies:

Case Study- Study of maize cultivation by modern methods

Exercises/Projects:

Project- Case studies of modern applications of molecular techniques in crop improvement.

Evaluation method: Based on a rubric with specified criteria and performance levels of the learner.

Specific Resources:

https://youtu.be/3WlqbuQPzyg

Text Books:

1. Singh, B. D. (2001) Plant breeding: Principles and methods. Kalyani Publishers, New Delhi,India.

References:

1. Acquaah, G. 2012. Principles of plant genetics and breeding, 2nd ed. Wiley-Blackwell,Ames, Iowa, USA.
2. Allard, R. W. 1999. Principles of plant breeding. John Wiley & Sons, New York, USA.

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SEMESTER -END QUESTION PAPER STRUCTURE

Course Code & Title of the Course:	**23BOMAL233 PLANT BREEDING**
Offered to:	**B.Sc Hons Botany**
Category:	**SEMESTER: 3**
Max. Marks	**70**
Max.Time	**3 Hrs**

Section A: Short Answer Questions (20 Marks)

Answer All questions. Each question carries 4 Marks.

Q1 (a) Explain about apomixis and its types. K2

OR

(b) Explain heritability in crop improvement. K2

Q2 (a) Explain in brief about male sterility in plant breeding. K2

OR

(b) Explain centres of origin of crop plants. K2

Q3 (a) Describe germplasm collection. K1

OR

(b) Describe the procedure of clonal selection. K1

Q4 (a) Discuss the emasculation methods in plant breeding. K2

OR

(b) Describe briefly dominance hypothesis. K2

Q5 (a) Explain the polyploidy breeding in crop improvement. K2

OR

(b) Discuss about marker assisted selection and its applications. K2

Section B: Long Answer Questions (50 Marks)

Answer All questions. Each question carries 10 Marks.

Q6 (a) Explain the aim, objectives and scope of plant breeding. K2

OR

(b) Discuss the characteristics of crop plants based on reproduction. K2

Q7 (a) Describe about cytoplasmic genetic male sterility. K1

OR

(b) Describe exploitation of self-incompatibility in hybrid production. K1

Q8 (a) Explain the procedure, merits and demerits of plant introduction. K2

OR

(b) Explain pure line selection methods. K2

Q9 (a) Describe the procedure, advantages, disadvantages and achievements of hybridization. K1

OR

(b) Describe about genetic basis of heterosis. K1

Q10 (a) Explain the procedure of mutation breeding. K2

OR

(b) Describe the DNA markers and their applications in plant breeding. K2

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