



RAFFLES
UNIVERSITY

TEACHING PLAN: Crop improvement-II (Rabi)

Faculty Name: - Dr. N. Moses

SCHOOL: (SOAS) SCHOOL OF AGRICULTURAL SCIENCES		ACADEMIC SESSION: 2023-2024		FOR STUDENTS' BATCH: 3 rd year 6 th semester		
1	Course No.	AGN-T-302				
2	Course Title	Crop improvement-II (Rabi)				
3	Credits	2				
4	Learning Hours		Contact Hours	72		
			Assessment	9		
			Guided Study	9		
			Total hours	90		
5	Course Objective	1. The course will focus on providing an overview of the recent trend on crop improvement 2. Remember the evolutionary history of important field crops along with their centre of origin, its wild species and wild relatives that can be utilized in crop improvement 3. Develop the understanding of germplasm conservation, utilization, and centre of origin of various rabi field crops, genetics of qualitative and quantitative characters, and their inheritance 4. Apply breeding procedures and objectives in different crops important for the development of improved varieties 5. Make able to differentiate seed production technology in different classes of rabi field crop				
6	Course Outcomes	1. Learner learn importance of wild relative to produce new varieties of rabi crop 2. Learner learns gene preservation method for further use to improve rabi varieties 3. Learner learns to apply breeding method to improve rabi crops and nature of gene action 4. Learner learns identification of resistance gene related to rabi crop with high yield, quality and potential against pest and pathogen and utilization genes 5. Learner learns new genetic approaches to achieve a definite ideotype of rabi crop, hybrid production and climate resilient crop varieties				
7	Outline syllabus:					
7.01	Paper Code	Unit	Introduction	Page Numbers ¹	Lect ures	
7.02	AGN-T-302	Unit I	Unit-1: Centres of origin, distribution of species, wild relatives in different cereals; pulses Unit-2: Centres of origin, distribution of species, wild relatives in oilseeds; fodders and cash crops Unit-3: Centres of origin, distribution of species, wild relatives in vegetable crops	1-84	1 to 4	

			Units-4: Centres of origin, distribution of species, wild relatives in horticultural crops		
7.03		Unit II	Unit-1: Plant genetic resources, its utilization and conservation Unit-2: Floral biology Unit-3: Study of genetics of qualitative characters Unit-4: Study of genetics of quantitative characters	85-95	4 to 8
7.04		Unit III	Unit-1:Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids nit-2:Major breeding objectives and procedures including conventional and modern innovative approaches for development of varieties for yield, adaptability and stability Unit-3:Major breeding objectives and procedures including conventional and modern innovative approaches for development of abiotic and biotic stress tolerance Unit-4:Major breeding objectives and procedures including conventional and modern innovative approaches for development of varieties for quality	96-112	8 to 11
7.05		Unit IV	Unit-1: Hybrid seed production technology of Rabi crop Unit-2: Ideotype concept Unit-3: Climate resilient crop varieties for future	113-125	11 to 14
8	Course Evaluation				
8.1	CA: 10%				
8.11	Attendance	25%			
8.12	Homework	2 Assignments, 50%			
8.13	Quizzes	2 Quizzes, 25%			
8.14	Projects				
8.15	Presentation				
8.16	Any other	Practical examination-30%			
8.2	MTE	10%			
8.3	End-term examination: 50%				
9	Text Books & References				
9.1	Text book	Crop Improvement II (Rabi Season) by Dr Shobha Immadi, Dr Nandini B and Dr Uday G			

		Reddy
9.2	References	1. Genetics and breeding vegetable crops by T.Pradeep Kumar and K.V Peter 2. Breeding of horticultural crops by Bijendra Kumar Singh and Rajaneesh Singh 3. Breeding of field crops by D.N. Bharadwaj
9.3	Video references	1. https://www.youtube.com/watch?v=CrZ-20GSiaE&t=710s 2. https://youtu.be/QpTAu8e0eG0 3. https://www.youtube.com/watch?v=6y9xeX9DJ0Y&t=113s 4. https://www.youtube.com/watch?v=GWfxYa3-bAU 5. https://www.youtube.com/watch?v=etDzMYtfJJU 6. https://www.youtube.com/watch?v=zomjCuYyAJ4 7. https://www.youtube.com/watch?v=ERyyanCdOQI 8. https://www.youtube.com/watch?v=SA9wz1bkkZk

Mapping of Outcomes v. Topics

Outcome no. → Syllabus topic↓	1	2	3	4	5
Paper Code. Unit I (1)	✓		✓		
Paper Code. Unit I (2)	✓		✓		
Paper Code. Unit I (3)	✓		✓		
Paper Code. Unit I (4)	✓		✓		
Paper Code. Unit II (1)		✓	✓		
Paper Code. Unit II (2)		✓	✓		
Paper Code. Unit II (3)		✓	✓		
Paper Code. Unit II (4)		✓	✓		
Paper Code. Unit III (1)					✓
Paper Code. Unit III (2)				✓	
Paper Code. Unit III (3)				✓	
Paper Code. Unit III (4)				✓	
Paper Code. Unit IV (1)					✓
Paper Code. Unit IV (2)					✓
Paper Code. Unit IV (3)					✓

Question Bank

(Unit-I)

A) Multiple choice questions

1. Centre of origin of wheat
 - a) South Asia
 - b) Central America
 - c) S.E. Africa, Ethiopia
 - d) W. Africa
2. Centre of origin of chickpea
 - a) South America
 - b) Central America
 - c) S.E. Africa, Ethiopia
 - d) Turkey
3. Centre of origin of oat

- a) South America
 - b) Central America
 - c) Chinese center
 - d) South asia
4. Centre of origin of sunflower
- a) South America
 - b) Central America
 - c) Chinese center
 - d) America
5. Centre of origin of safflower
- a) South America
 - b) China
 - c) Mexico
 - d) Ethiopia

B) Define the following terms

- 1) Primary centers of origin
- 2) Secondary centers of origin
- 3) Tertiary centers of origin
- 4) Microcenters
- 5) Wild relatives

C) Write short notes on the following

- 1. Discuss centres of origin, distribution of species in chickpea
- 2. Discuss centres of origin, distribution of species in linseed
- 3. Explained centres of origin and wild relatives of oat
- 4. Explained centres of origin and wild relatives of barley
- 5. Explained centres of origin and wild relatives of wheat

D) Descriptive question

- 1. Give detailed account on Vavilovian centres of diversity
- 2. Explained in detailed what do you understand by microcenters
- 3. Explained in detailed what do you understand by Chinese center of origin
- 4. Explained in detailed what do you understand by Indian center of origin
- 5. Give detailed account on near eastern centres of diversity?

Unit-II

A) Multiple choice questions

- 1. The sum total of gene in a crop species is refer to as
 - a) Genetic resource
 - b) Genotype
 - c) Gene pool
 - d) Genetic erosion
- 2. Seeds that can be dried to low moisture content of 5%
 - a) Recalcitrant seeds

- b) Orthodox seeds
 - c) Nucleus seeds
 - d) Breeder seeds
3. The process that leads to the adoption of a variety to a new environment
- a) Acclimatization
 - b) Introduction
 - c) Domestication
 - d) Selection
4. Primitive cultivars which were selected and cultivated by the farmers
- a) Land races,
 - b) Wild relatives
 - c) Absolate cultivars
 - d) Wild forms of cultivated species
5. In which type of collections seed are stored at -20° C with 5% moisture content
- a) Base collections
 - b) Active collections
 - c) Working collections
 - d) Both a and b

B) Define the following terms

- 1) Orthodox seed
- 2) Obsolete cultivar
- 3) Modern cultivar
- 4) Land races
- 5) Advance breeding line

C) Write short note on the following

- 1. Enlist breeding methods used in self pollinated crops.
- 2. Enlist breeding methods used in cross pollinated crops.
- 3. Enlist breeding methods used in vegetative propagated crops
- 4. Write short notes on orthodox seed
- 5. Write short notes on advanced breeding lines

D) Descriptive question

- 1. Explain in detailed different kind of germplasm use in crop improvement
- 2. Explain in detailed different type of seed collection
- 3. Discuss six important activities related to plant breeding
- 4. Write in detailed on different devices adopted for maintaining the germplasm
- 5. Explained in detailed what do you understand by population improvement

Unit-III

A) Multiple choice questions

- 1) Chromosome number of wheat

- a) $2n=42$
- b) $2n=46$
- c) $2n=32$
- d) $2n=48$

2) Chromosome number of oat

- a) $2n=42$
- b) $2n=41$
- c) $2n=46$
- d) $2n=48$

3) Chromosome number of barley

- a) $2n=14$
- b) $2n=15$
- c) $2n=16$
- d) $2n=17$

4) Chromosome number of chickpea

- a) $2n=14$
- b) $2n=15$
- c) $2n=16$
- d) $2n=17$

5) Chromosome number of sunflower

- a) $2n=40$
- b) $2n=34$
- c) $2n=36$
- b) $2n=38$

B) Define the following terms

- 1) Heterosis
- 2) Synthetic variety
- 3) Composite variety
- 4) Inbreeding
- 5) General combining ability

C) Write short notes on the following

- 1. Write short note on breeding objection for wheat improvement
- 2. Write short on breeding procedures for chickpea improvement
- 3. Write short note on breeding objectives for sunflower improvement
- 4. Write short note on major breeding objectives for barley improvement
- 5. Write short note on breeding objection for oat improvement

D) Descriptive question

- 1. Describe the major breeding objectives and procedures including conventional and modern innovative approaches for wheat improvement
- 2. Write in detailed the breeding objection and procedure for chickpea improvement
- 3. Describe in detailed the major breeding objectives and procedures for barley
- 4. Describe in detailed the major breeding objectives and procedures for oat
- 5. Explained in detailed the major breeding objectives and procedures for sunflower

Unit-IV

A) Multiple choice questions

1. Who used the term heterosis for the first time?
 - a) Shull.
 - b) Keith Downey.
 - c) Thomas Andrew Knight.
 - d) Niels Ebbesen Hans
2. Which is true about heterosis?
 - a) Superiority of an F1 hybrid over its male parent.
 - b) Superiority of an F1 hybrid over its female parent
 - c) Superiority of an F1 hybrid over both of its parents.
 - d) None of the above mentioned.
3. Who developed the dominance hypothesis?
 - a) James Crow
 - b) Charles Davenport
 - c) Koelreuteris
 - c) None of the above.
4. What is dominance of linked gene hypothesis?
 - a) Where quantitative characters are governed by few genes
 - b) Where qualitative characters are governed by many genes
 - c) Where quantitative characters are governed by many genes
 - d) where qualitative characters are governed by few genes
5. Continuous variation are observed in
 - a) Qualitative characters
 - b) Quantitative characters
 - c) Both a and b
 - d) none of the above

B) Define the following term

- 1) Heterosis
- 2) Additive gene action
- 3) Dominance gene action
- 4) Epistatic gene action
- 5) Polygenic gene action

C) Write short notes on the following

- 1) Stability analysis
- 2) Abiotic stress
- 3) Biotic stress
- 4) Double cross hybrid
- 5) Male sterility

D) Descriptive question

1. Describe the conventional and modern innovative approaches for development of hybrids in wheat
2. Describe the conventional and modern innovative approaches for development of hybrids in chickpea

3. Explained the conventional and modern innovative approaches for development of hybrids in safflower
4. Describe the conventional and modern innovative approaches for development of hybrids in sunflower
5. Explained the conventional and modern innovative approaches for development of hybrids in castor