

**TEACHING PLAN: Crop Improvement-I (Kharif)**

SCHOOL: (SOAS) SCHOOL OF AGRICULTURAL SCIENCES		ACADEMIC SESSION: 2023-2024		FOR STUDENTS' BATCH: 2021-2025		
1	Course No.	AGN-T-301				
2	Course Title	Crop Improvement-II (Kharif)				
3	Credits	1				
4	Learning Hours		Contact Hours	54		
			Assessment	20		
			Guided Study	26		
			Total hours	100		
5	Course Objective	<div>1. The course will focus on providing an overview of the recent trend on crop improvement</div> <div>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</div> <div>3. Develop the understanding of germplasm conservation, utilization, and centre of origin of various kharif field crops, genetics of qualitative and quantitative characters, and their inheritance</div> <div>4. Apply breeding procedures and objectives in different crop important for the development of improved varieties</div> <div>5. Make able to differentiate seed production technology in different classes of kharif field crop</div>				
6	Course Outcomes	<div>1. Learner learn importance of wild relative to produce new varieties of kharif crop</div> <div>2. Learner learns gene preservation method for further use to improve kharif varieties</div> <div>3. Learner learns to apply knowledge of genetics in breeding method to improve kharif crops</div> <div>4. Learner learns identification of resistance gene relate to kharif crop with high yield, quality and potential against pest and pathogen</div> <div>5. Learner learns new genetic approaches to achieve hybrid production in kharif crop</div>				
7	Outline syllabus:					
7.01	Paper Code	Unit	Introduction	Page Numbers <sup>1</sup>	Lectures	
7.02	AGN-T-301	Unit I	Unit-1: Centres of origin, distribution of species, wild relatives in different cereals and pulses Unit-2: Centres of origin, distribution of species, wild relatives in oilseeds, fibre, fodder and	4-12	1 to 4	

			<p>cash crop</p> <p>Unit-3: Centres of origin, distribution of species, wild relatives in vegetable crops</p> <p>Units-4: Centres of origin, distribution of species, wild relatives in horticultural crop</p>		
7.03		Unit II	<p>Unit-1: Plant genetic resources, its utilization conservation, study of genetics of qualitative and quantitative characters</p> <p>Unit-2: Important concepts of breeding self-pollinated crops</p> <p>Unit-3: Important concepts of breeding cross pollinated crops</p> <p>Unit-4: Important concepts of breeding vegetative propagated crops</p>	13-34	4 to 8
7.04		Unit III	<p>Unit-1: Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids</p> <p>Unit-2: Major breeding objectives and procedures including conventional and modern innovative approaches for development of varieties for yield, adaptability and stability</p> <p>Unit-3: Major breeding objectives and procedures including conventional and modern innovative approaches for development of abiotic and biotic stress tolerance</p> <p>Unit-4: Major breeding objectives and procedures including conventional and modern innovative approaches for development of varieties for quality</p>	35-77	8 to 11
7.05		Unit IV	<p>Unit-1: Hybrid seed production technology in rice</p> <p>Unit-2: Hybrid seed production technology in maize and sorghum</p> <p>Unit-3: Hybrid seed production technology in pearl millet and pigeonpea</p> <p>Unit-4: Ideotype concept and climate resilient crop varieties for future</p>	78-107	11 to 14
8	<b>Course Evaluation</b>				

<b>8.1</b>	<b>CA: 10%</b>	
<b>8.11</b>	<b>Attendance</b>	25%
<b>8.12</b>	<b>Homework</b>	2 Assignments, 50%
<b>8.13</b>	<b>Quizzes</b>	2 Quizzes, 25%
<b>8.14</b>	<b>Projects</b>	
<b>8.15</b>	<b>Presentation</b>	
<b>8.16</b>	<b>Any other</b>	Practical examination-30%
<b>8.2</b>	<b>MTE</b>	10%
<b>8.3</b>	<b>End-term examination: 50%</b>	
<b>9</b>	<b>Text Books &amp; References</b>	
<b>9.1</b>	<b>Text book</b>	1. Crop Improvement by Dr Anand Kumar, Dr S.P Singh, Dr R.B.P Nirala and Dr Chandan Roy 2. Breeding of field crops by D.N. Bharadwaj
<b>9.2</b>	<b>References</b>	1. Hayes, Immar & Smith : Methods of Plant Breeding 2. Poelhlhman J.M : Breeding of Asian Field Crops 3. Singh B.D. : Plant Breeding- Principles and Methods
<b>9.3</b>	<b>Video references</b>	1. <a href="https://youtu.be/Yp6W1tDc-0">https://youtu.be/Yp6W1tDc- 0</a> 2. <a href="https://youtu.be/NxGyGI1cvxI">https://youtu.be/NxGyGI1cvxI</a> 3. <a href="https://youtu.be/ITKXJgxBKGg">https://youtu.be/ITKXJgxBKGg</a> 4. <a href="https://youtu.be/kR6O0MnmkRU">https://youtu.be/kR6O0MnmkRU</a> 5. <a href="https://youtu.be/ITKXJgxBKGg">https://youtu.be/ITKXJgxBKGg</a> 6. <a href="https://youtu.be/tunuzyIuNIw">https://youtu.be/tunuzyIuNIw</a> 7. <a href="https://youtu.be/92kU84378VY">https://youtu.be/92kU84378VY</a> 8. <a href="https://youtu.be/nTNofmZyG_I">https://youtu.be/nTNofmZyG_I</a> 9. <a href="https://youtu.be/BJApOIEDIRU">https://youtu.be/BJApOIEDIRU</a> 10. <a href="https://youtu.be/fBSGpTxML5A">https://youtu.be/fBSGpTxML5A</a>

### 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)					✓
Paper Code. Unit IV (4)					✓

## **Question Bank**

## **(Unit-I)**

### **A) Multiple choice questions**

1. Centre of origin of rice
  - a) South East Asia
  - b) Central America
  - c) S.E. Africa, Ethiopia
  - d) W. Africa
2. Centre of origin of maize
  - a) South America
  - b) Central America
  - c) S.E. Africa, Ethiopia
  - d) W. Africa
3. Centre of origin of Common Bean
  - a) South America
  - b) Central America
  - c) Chinese center
  - d) W. Africa
4. Centre of origin of soyabean
  - a) South America
  - b) Central America
  - c) Chinese center
  - d) W. Africa
5. Centre of origin of Apricot
  - a) South America
  - b) Central America
  - c) Chinese center
  - d) W. Africa

### **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 oilseeds
2. Discuss centres of origin, distribution of species in oilseeds
3. Explained centres of origin and wild relatives of oilseeds
4. Explained centres of origin and wild relatives of rice
5. Explained centres of origin and wild relatives of maize

### **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) Absolute 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 rice
  - a)  $2n=24$
  - b)  $2n=26$
  - c)  $2n=32$
  - d)  $2n=28$
- 2) Chromosome number of maize
  - a)  $2n=20$
  - b)  $2n=21$
  - c)  $2n=26$
  - d)  $2n=28$
- 3) Chromosome number of sorghum
  - a)  $2n=20$
  - b)  $2n=21$
  - c)  $2n=22$
  - d)  $2n=24$
- 4) Chromosome number of soyabean
  - a)  $2n=40$
  - b)  $2n=28$
  - c)  $2n=34$
  - d)  $2n=38$
- 5) Chromosome number of groundnut
  - 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 urd bean improvement
2. Write short on breeding procedures for sorghum improvement
3. Write short note on breeding objectives for cotton improvement
4. Write short note on major breeding objectives for pigeon pea improvement
5. Write short note on breeding objection for Sorghum improvement

**D) Descriptive question**

1. Describe the major breeding objectives and procedures including conventional and modern innovative approaches for rice improvement
2. Write in detailed the breeding objection and procedure for urd bean improvement
3. Describe in detailed the major breeding objectives and procedures for sorghum
3. Describe in detailed the major breeding objectives and procedures for cotton
4. Explained in detailed the major breeding objectives and procedures for pigeon pea
5. Write in detailed the breeding objection and procedure for Sorghum

**Unit-IV**

**A) 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 rice
- 2. Describe the conventional and modern innovative approaches for development of hybrids in maize
- 3. Explained the conventional and modern innovative approaches for development of hybrids in sorghum
- 4. Describe the conventional and modern innovative approaches for development of hybrids in pearl millet
- 5. Explained the conventional and modern innovative approaches for development of hybrids in mungbean