

Lesson Plan

***Name of the Faculty** : Dr. O.S. Dahiya (Theory) and Dr. Axay Bhuker (Practical)
Discipline : Seed Science & Technology
Semester : II
Subject : Seed Legislation and Certification
Lesson Plan Duration : 15 weeks (from January, 2018 to April, 2018)
****Work Load (Lecture /Practical) per week (In Hours):** Lectures-02, Praticals-04

Week	Theory		Practical	
	Lecture day	Topic (Including assignment /test)	Practical day	Topic
1 st	1 st	Historical development of Seed Industry in India	1 st	General procedure of seed certification
	2 nd	Seed quality concept		
2 nd	3 rd	Factors affecting seed quality during different stages of production, processing and handling	2 nd	Identification of weed and other crop seeds as per specific crops
	4 th	Seed quality control- concept and objectives		
3 rd	5 th	Regulatory mechanisms of seed quality control- organizations involved in seed quality control programmes	3 rd	Field inspection at different stages of a crop
	6 th	seed legislation and seed law enforcement as a mechanism of seed quality control		
4 th	7 th	Seed Act (1966), Central Seed Certification Board (CSCB)	4 th	Observations recorded on contaminants and reporting of results
	8 th	Seed Rules (1968)		
5 th	9 th	Essential Commodities Act (1955) and Seed (Control) Order 1983	5 th	Inspection and sampling at harvesting/threshing
	10 th	Plants, Fruits and Seeds Order (1989)		
6 th	11 th	National Seed Development Policy (1988) and EXIM Policy regarding seeds, plant materials	6 th	Inspection during processing
	12 th	New Seed Bill-2004		
7 th	13 th	Introduction, objectives and relevance of plant quarantine, regulations and plant quarantine set up in India	7 th	Inspection after processing for seed law enforcement
	14 th	Seed Certification- history, concept and objectives of seed certification		
8 th	15 th	seed certification agency/organization and staff requirement; legal status and phases of seed certification	8 th	Testing of physical purity
	16 th	Formulation, revision and publication of seed certification standards		
9 th	17 th	Indian Minimum Seed Certification Standards(I.M.S.C.S.)- general and specific crop standards including GM varieties, field and seed standards	9 th	Testing of germination
	18 th	Planning and management of seed certification programmes- eligibility of a variety for certification, area assessment		
10 th	19 th	cropping history of the seed field, multiplication system based on limited generation concept	10 th	Testing of moisture content
	20 th	isolation and land requirements etc		
11 th	21 th	Field Inspection- principles, phases and procedures;	11 th	Specifications for tags and labels to be used for certification purpose
	22 th	reporting and evaluation of observations; pre and post-harvest control tests for genetic purity		

		evaluation (grow-out tests);		
12 th	23 th	post harvest inspection and evaluation; seed sampling, testing, labelling, sealing and grant of certificate;.	12 th	Grow-out tests for pre and post-harvest quality control
	24 th	Types and specifications for tags and labels		
13 th	25 th	Maintenance and issuance of certification records and reports; certification fee and other service charges; training and liaison with seed growers	13 th	Visits to regulatory seed testing laboratory
	26 th	OECD seed certification schemes		
14 th	27 th	Introduction to WTO and IPRs	14 th	Visits to plant quarantine lab and seed certification agency
	28 th	Plant Variety Protection and its significance		
15 th	29 th	UPOV and its role	15 th	Visits to seed certification agency
	30 th	DUS testing- principles and applications		

Lesson Plan

***Name of the Faculty** : Dr. V.S. Mor (Theory and Practical) Section A

Discipline : Seed Science & Technology

Semester : II

Subject : Principles of Seed Technology

Lesson Plan Duration : 15 weeks (from January, 2018 to April, 2018)

Work Load (Lecture /Practical) per week (In Hours): Lectures-02, Praticals-04 (Two groups)

Week	Theory		Practical	
	Lecture day	Topic (Including assignment /test)	Practical day	Topic
1 st	1 st	Introduction to seed production	1 st	Seed sampling principles and procedures
	2 nd	Deterioration of crop varieties		
2 nd	3 rd	Maintenance of genetic purity during seed production	2 nd	Physical purity analysis of field crops
	4 th	Seed quality; different classes of seed		
3 rd	5 th	Seed production of field and vegetable crops	3 rd	Germination analysis of field crops
	6 th	Seed production of field and vegetable crops		
4 th	7 th	Seed production of field and vegetable crops	4 th	Moisture tests of field crops
	8 th	Seed production of field and vegetable crops		
5 th	9 th	Seed production of field and vegetable crops	5 th	Viability test of field crops
	10 th	Seed production of field and vegetable crops		
6 th	11 th	Seed production of field and vegetable crops	6 th	Seed health test of field crops
	12 th	Seed production of field and vegetable crops		
7 th	13 th	Seed production of field and vegetable crops	7 th	Seed health test of field crops
	14 th	Seed certification, phases of certification		
8 th	15 th	Procedure for seed certification, field inspection and field counts etc.	8 th	Seed dormancy and breaking methods
	16 th	Seed act		
9 th	17 th	Central seed committee, central seed certification board	9 th	Grow out tests for varietal identification
	18 th	State seed certification agency, central and state seed testing laboratories		
10 th	19 th	Duties and powers of seed inspectors, offences and penalties	10 th	Visit to seed production plots
	20 th	Seed control order		
11 th	21 th	Introduction to WTO	11 th	Visit to seed processing plants
	22 th	Varietal identification through grow-out test and electrophoresis		
12 th	23 th	Seed drying; seed processing plant	12 th	Visit to seed testing laboratories
	24 th	Establishing a seed testing laboratory		
13 th	25 th	Seed testing procedures for quality assessment	13 th	Planting ratios
	26 th	Seed treatment, importance of seed treatment, types of seed treatment		
14 th	27 th	Seed packing and seed storage, stages of seed storage	14 th	Isolation distance
	28 th	Factors affecting seed longevity during storage and conditions required for good storage		
15 th	29 th	General principles of seed storage, measures for pest and disease control, temperature control	15 th	Roguing
	30 th	Seed marketing, factors affecting seed marketing		

Lesson Plan

***Name of the Faculty** : Dr. Axay Bhuker (Theory and Practical) Section- B

Discipline : Seed Science & Technology

Semester : II

Subject : Principles of Seed Technology

Lesson Plan Duration : 15 weeks (from January, 2018 to April, 2018)

Work Load (Lecture /Practical) per week (In Hours): Lectures-02, Praticals-04 (Two groups)

Week	Theory		Practical	
	Lecture day	Topic (Including assignment /test)	Practical day	Topic
1 st	1 st	Introduction to seed production	1 st	Seed sampling principles and procedures
	2 nd	Deterioration of crop varieties		
2 nd	3 rd	Maintenance of genetic purity during seed production	2 nd	Physical purity analysis of field crops
	4 th	Seed quality; different classes of seed		
3 rd	5 th	Seed production of field and vegetable crops	3 rd	Germination analysis of field crops
	6 th	Seed production of field and vegetable crops		
4 th	7 th	Seed production of field and vegetable crops	4 th	Moisture tests of field crops
	8 th	Seed production of field and vegetable crops		
5 th	9 th	Seed production of field and vegetable crops	5 th	Viability test of field crops
	10 th	Seed production of field and vegetable crops		
6 th	11 th	Seed production of field and vegetable crops	6 th	Seed health test of field crops
	12 th	Seed production of field and vegetable crops		
7 th	13 th	Seed production of field and vegetable crops	7 th	Seed health test of field crops
	14 th	Seed certification, phases of certification		
8 th	15 th	Procedure for seed certification, field inspection and field counts etc.	8 th	Seed dormancy and breaking methods
	16 th	Seed act		
9 th	17 th	Central seed committee, central seed certification board	9 th	Grow out tests for varietal identification
	18 th	State seed certification agency, central and state seed testing laboratories		
10 th	19 th	Duties and powers of seed inspectors, offences and penalties	10 th	Visit to seed production plots
	20 th	Seed control order		
11 th	21 th	Introduction to WTO	11 th	Visit to seed processing plants
	22 th	Varietal identification through grow-out test and electrophoresis		
12 th	23 th	Seed drying; seed processing plant	12 th	Visit to seed testing laboratories
	24 th	Establishing a seed testing laboratory		
13 th	25 th	Seed testing procedures for quality assessment	13 th	Planting ratios
	26 th	Seed treatment, importance of seed treatment, types of seed treatment		
14 th	27 th	Seed packing and seed storage, stages of seed storage	14 th	Isolation distance
	28 th	Factors affecting seed longevity during storage and conditions required for good storage		
15 th	29 th	General principles of seed storage, measures for pest and disease control, temperature control	15 th	Roguing
	30 th	Seed marketing, factors affecting seed marketing		

Lesson Plan

***Name of the Faculty** : Dr. R.C. Poonia (Theory) and Dr. V.S.Mor (Practical)

Discipline : Seed Science & Technology

Semester : II

Subject : SST 508 (Seed Quality Testing)

Lesson Plan Duration :15 weeks (from January, 2018 to April, 2018)

****Work Load (Lecture /Practical) per week (In Hours):** Lectures-02, Pratical-02

Week	Theory		Practical	
	Lecture day	Topic (Including assignment /test)	Practical day	Topic
1 st	1 st	Introduction: Structure of monocot and dicot seeds	1 st	Structure of monocot and dicot seeds of important plant species
	2 nd	Seed quality: objectives, concept and components and their role in seed quality control		
2 nd	3 rd	Instruments, devices and tools used in seed testing. ISTA and its role in seed testing	2 nd	Identification and handling of instruments used in seed testing laboratory.
	4 th	Seed Sampling: definition, objectives, seed-lot and its size; types of samples		
3 rd	5 th	Sampling devices; procedure of seed sampling; sampling intensity; methods of preparing composite and submitted samples	3 rd	Identification of seeds of weeds and crops
	6 th	Sub-sampling techniques, dispatch, receipt and registration of submitted sample in the laboratory, sampling in the seed testing laboratory.		
4 th	7 th	Physical Purity: definition, objective and procedure, weight of working samples for physical purity analysis; components of purity analysis and their definitions and criteria	4 th	Physical purity analysis of samples of different crops.
	8 th	Pure seed definitions applicable to specific genera and families; multiple seed units; general procedure of purity analysis; calculation and reporting of results, prescribed seed purity standards		
5 th	9 th	Determination of huskless seeds; determination of weed seed and other seed by number per kilogram; determination of other distinguishable varieties (ODV); determination of test weight and application of heterogeneity test.	5 th	Estimation of seed moisture content (oven method).
	10 th	Seed moisture content: importance of moisture content; equilibrium moisture content		
6 th	11 th	Principles and methods of moisture estimation - types, instruments and devices used; pre-drying and grinding requirements	6 th	Seed dormancy breaking methods
	12 th	Procedural steps in moisture estimation; calculation and reporting of results.		
7 th	13 th	Germination: importance; definitions; requirements for germination, instrument and substrata required	7 th	Requirements for conducting germination test, specifications and proper use of different substrata for germination
	14 th	Principle and methods of seed germination testing; working sample and choice of method		
8 th	15 th	General procedure for each type of method; duration of test; seedling evaluation; calculation and reporting of results	8 th	Seed germination testing (Top of Paper Method) in different agri-horticultural

	16 th	Dormancy: definition, importance, causal mechanisms, types and methods for breaking dormancy.		crops
9 th	17 th	Viability and Vigour Testing: definition and importance of viability tests; different viability tests	9 th	Seed germination testing (Between Paper Method) in different agri-horticultural crops
	18 th	Quick viability test (TZ- test) - advantages, principle, preparation of seeds and solutions, procedure, evaluation and calculation of test results.		Seed germination testing (Sand Method) in different agri-horticultural crops
10 th	19 th	Vigour testing: concept, historical development, definitions	10 th	Seedling evaluation
	20 th	Principles and procedures of different methods used for testing vigour.		
11 th	21 th	Genetic purity testing : objective and criteria for genetic purity testing; types of tests	11 th	Viability testing by tetrazolium test in different crops
	22 th	Laboratory, Growth Chamber and field testing based on seed , seedling and mature plant morphology		
12 th	23 th	Principles and procedures of chemical, biochemical and molecular tests.	12 th	Seed and seedling vigour tests applicable in various crops
	24 th	Seed health Testing: field and seed standards ; designated diseases, objectionable weeds		
13 th	25 th	Significance of seed borne diseases vis-a-vis seed quality	13 th	Species & cultivar identification genetic purity testing by chemical, biochemical and molecular methods
	26 th	Seed health testing and detection methods for seed borne fungi, bacteria, viruses and nematodes.		
14 th	27 th	Testing of GM seeds and trait purity	14 th	Seed health testing for designated diseases, blotter methods, agar method and embryo count methods;
	28 th	Load of detection (LOD)		
15 th	29 th	Preparation and dispatch of seed testing reports; storage of guard samples	15 th	Testing coated/pelleted seeds.
	30 th	Application and use of seed standards and tolerances.		

Lesson Plan

***Name of the Faculty** : Dr. O.S.Dahiya (Theory) and Dr. V.S.Mor (Practical)
Discipline : Seed Science & Technology
Semester : II
Subject : SST 513 (SEED STORAGE AND DETERIORATION)
Lesson Plan Duration : 15 weeks (from January, 2018 to April, 2018)
****Work Load (Lecture /Practical) per week (In Hours):** Lectures-01, Pratical-01

Week	Theory		Practical	
	Lecture day	Topic (Including assignment /test)	Practic al day	Topic
1 st	1 st	Life span of seeds of plant species, classification of seeds on the basis of storage behaviour; orthodox and recalcitrant seeds	1 st	To study the effect of storage environmental factors (RH, SMC and temperature) on seed longevity
2 nd	2 nd	Types of storage; kinds of seed storage (open, bulk, controlled, hermetic, germplasm, cryopreservation) soil seed bank; terminology; survival curve of seed	2 nd	To study the effect of packaging materials on storability
3 rd	3 rd	Factors affecting seed storability- biotic and abiotic and pre- and post-harvest factors affecting seed longevity	3 rd	To study the effect of seed treatment on storability
4 th	4 th	The effects of packaging materials, storage fungi and insects, seed treatment and fumigation and storage environmental conditions on seed storability	4 th	To study the effect of fumigation on storability
5 th	5 th	Moisture equilibrium in seeds; hysteresis effect; thumb rules; selection of suitable areas/places for safe storage	5 th	Prediction of storability and longevity of seed-lots by using viability equations and nomographs
6 th	6 th	Prediction of relative storability and longevity of seed lots, viability equations and nomographs	6 th	Standardization of accelerated ageing (AA) technique for assessing the seed storability of various crops.
7 th	7 th	Concept of seed ageing and deterioration, its causes, symptoms, mechanisms and related theories	7 th	Estimation of carbohydrates in fresh and aged seeds;
8 th	8 th	Different changes associated with the loss of vigour and viability during storage	8 th	Estimation of proteins in fresh and aged seeds
9 th	9 th	Application of physiological and biochemical techniques for evaluation of seed ageing	9 th	Estimation of fats in fresh and aged seeds
10 th	10 th	Genetics of seed viability; effect of seed ageing on crop performance	10 th	Estimation of enzyme activities in fresh and aged seeds
11 th	11 th	Maintenance of viability and vigour during storage	11 th	Estimation of respiration rate and nucleic acids in fresh and aged seeds
12 th	12 th	seed amelioration techniques, mid storage corrections etc.	12 th	Estimation of nucleic acids in fresh and aged seeds

13 th	13 th	Storage methods- requirement of storage facilities in India; types and storage structures available in the country and their impact on short and long term storage	13 th	Use of eco-friendly products to enhance quality of stored seeds
14 th	14 th	Methods of safe seed storage including eco-friendly techniques used in various group of crops viz. cereals, pulses, oilseeds, fibers, forages and vegetables	14 th	Use of amelioration techniques to enhance quality of stored seeds.
15 th	15 th	Operation and management of seed stores; fruit storage; viability loss during transportation and interim storage.	15 th	visit to seed stores

Lesson Plan

***Name of the Faculty** : Drs. R.C.Punia, O.S.Dahiya, S.S.Jakhar (Theory)
Discipline : Seed Science & Technology
Semester : II
Subject : SST 605 (ADVANCES IN SEED SCIENCE AND RESEARCH)
Lesson Plan Duration : 15 weeks (from January, 2018 to April, 2018)
****Work Load (Lecture /Practical) per week (In Hours):** Lectures-01

Week	Theory	
	Lecture day	Topic (Including assignment /test)
1 st	1 st	Physiological and molecular aspects of seed development and control of germination and dormancy
2 nd	2 nd	Gene expression during seed development; desiccation and stress tolerance and conservation
3 rd	3 rd	Prediction of seed dormancy and longevity using mathematical models
4 th	4 th	Structural changes in membranes of developing seeds during acquisition of desiccation tolerance
5 th	5 th	Dehydration damage and repair in imbibed seeds, seed biotechnology; genetic analysis and QTL mapping of germination traits.
6 th	6 th	Seed ageing and ethylene production; recent accomplishments in seed enhancement research and application of nanotechnology
7 th	7 th	Modern techniques for identification of varieties and hybrids
8 th	8 th	Principles and procedures of electrophoresis, machine vision technique
9 th	9 th	DNA fingerprinting and other molecular techniques and their utilization
10 th	10 th	Techniques for improving seed quality; proteomic analysis; seed priming, coating, pelleting and synthetic seeds
11 th	11 th	GM seeds and their detection, terminator technology (GURT)
12 th	12 th	Detection and identification of seed borne fungi, bacteria, viruses, nematodes and insect pests through advanced techniques like ELISA, PCR based techniques etc.
13 th	13 th	Seed production of self incompatible and apomictic plant species
14 th	14 th	Recent developments in seed laws, policies and seed certification system in India and its comparison with OECD seed certification schemes
15 th	15 th	IPR systems and PVP internationally

Lesson Planning for SST-601

***Name of the Faculty** : V.P.S.Sangwan (Theory) and R.C.Punia (Practical)
Discipline : Seed Science & Technology
Semester : 2nd Sem. (2017-18)
Subject : SST-601 (Hybrid Seed Production)
Lesson Plan Duration : 15 weeks (from January, 2018 to April, 2018)

****Work Load (Lecture /Practical) per week (In Hours):** Lectures-01, Praticals-02

Week	Theory		Practical	
	Lecture day	Topic (Including assignment /test)	Practical day	Topic
1 st	1 st	Heterosis: definition, expression and estimation of hybrid vigour.	1 st	Methods of hybrid seed production in major agricultural and horticultural crops
2 nd	2 nd	Utilization of heterosis in agricultural, horticultural and other crop plants for crop improvement.		
3 rd	3 rd	Pre requisites for hybrid seed production; mechanisms and management of pollination in autogamous and allogamous crops.		
4 th	4 th	Genetic constitution of varieties, hybrids and basic principles in seed production.	2 nd	Planting of rows/blocks of parental lines and manipulations for achieving flowering synchrony for production of hybrid seeds
5 th	5 th	Techniques of hybrid seed production - emasculation and crossing: use of self-incompatibility, modification of sex.		
6 th	6 th	Types of male sterility and exploitation in hybrid development and its use in hybrid seed production.	3 rd	Maintenance of A, B and R lines and production of breeder seed
7 th	7 th	Development and maintenance of A, B and R lines.		
8 th	8 th	Fertility restoration; use of chemical hybridizing agents.	4 th	Stable diagnostic characteristics of parental lines and their hybrids
9 th	9 th	Problems of non synchrony in flowering of parental lines and methods to overcome; planting ratios and population density in relation to hybrid seed yield.		
10 th	10 th	Salient features of hybrid seed production of various crops viz., rice	5 th	Genetic purity tests, determination of cost of hybrid seed production of various crops
11 th	11 th	Salient features of hybrid seed production of various crops viz., sorghum and bajra and maize		
12 th	12 th	Salient features of hybrid seed production of various crops viz., maize.	6 th	Visit to seed production plots etc.
13 th	13 th	Salient features of hybrid seed production of various crops viz., sunflower		
14 th	14 th	Salient features of hybrid seed production of various crops viz., cotton.		
15 th	15 th	Salient features of hybrid seed production of major vegetables.		

Lesson Planning for SST-512

***Name of the Faculty** : V.P.S.Sangwan (Theory) and Axay Bhuker (Practical)
Discipline : Seed Science & Technology
Semester : 2nd Sem. (2017-18)
Subject : SST-512 (Seed Production in Pasture, Forage and Green Manure Crops)
Lesson Plan Duration : 15 weeks (from January, 2018 to April, 2018)

****Work Load (Lecture /Practical) per week (In Hours):** Lectures-02, Praticals-04

Week	Theory		Practical	
	Lecture day	Topic (Including assignment /test)	Practical day	Topic
1 st	1 st	Important pasture and forage legume crops in India.	1 st	Study of flower structure
	2 nd	Seed requirement and production.		
2 nd	3 rd	Classification of forage crops.	2 nd	Seed collection and identification
	4 th	Classification of pastures crops.		
3 rd	5 th	Classification of green manure crops; pollination behavior.	3 rd	Characteristics of forage crops
	6 th	Factors influencing seed production.		
4 th	7 th	Maintenance of varietal purity.	4 th	Characteristics of pastures crops
	8 th	Generation systems of seed multiplication self pollinated crops.		
5 th	9 th	Seed production in apomictic grasses.	5 th	Characteristics of green manure crops
	10 th	Methods and techniques of seed production in important grasses.		
6 th	11 th	Methods and techniques of seed production in important pastures.	6 th	Maturity indices for harvest
	12 th	Methods and techniques of seed production in important legumes		
7 th	13 th	Methods and techniques of seed production in important green manure crops; apomictic seed.		
	14 th	Selection of seed production areas, influence of season.		
8 th	15 th	Seed rate and spacing,		
	16 th	Sowing methods, direct seed sowing, transplanting.		
9 th	17 th	Pelleting.		
	18 th	Fertilizer and manure requirement.		
10 th	19 th	Isolation distance.	7 th	Seed testing.
	20 th	Weed control, pollination and seed setting.		
11 th	21 th	Seed shattering.	8 th	Seed sampling.
	22 nd	Seed maturity.		
12 th	23 rd	Stage of harvest	9 th	Seed purity.
	24 th	Seed collection.		
13 th	25 th	Economics of seed production of important fodder crops.	10 th	Seed moisture.
	26 th	Economics of seed production of important fodder crops.		
14 th	27 th	Seed processing.	11 th	Seed germination.
	28 th	Seed treatment.	12 th	Seed dormancy.
15 th	29 th	Seed storage	13 th	Seed treatments.
	30 th	Seed viability of these crops.	14 th	Seed treatments.

