III SEMESTER

S. No.	Course code	Course Title	Credit load
1	PAT 201	Fundamentals of Plant Pathology	2+1
2	AEN 201	Fundamentals of Entomology	2+1
3	SST 201	Principles of Seed Technology	2+1
4	AGR 201	Crop Production Technology – I (*Kharif* crops)	1+1
5	HOR 211	Production Technology for Vegetables and Spices	1+1
6	ENS 201	Environmental Studies & Disaster Management	2+1
7	AMP 201	Livestock and Poultry Management	2+1
8	AEC 201	Farm Management, Production & Resource Economics	1+1
9	SAC 201	Soil Resource Inventory	1+1
10	FMP 211	Farm Machinery and Power	1+1
11	AGR 202	Study tour	0+1*
12	NSS/NCC 101	NSS/NCC	0+1*
13	PED 101	Physical Education	0+1*
		Total	**15+10=25**
		***Non-gradial courses compulsory courses**	

PAT 201 Fundamentals of Plant Pathology (2+1)

Unit I: Introduction to Plant Pathology

Plant Pathology- Definition – Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology. Causes and classification of plant diseases. Important plant pathogenic organisms, different groups**:** fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa and phanerogamic parasites

Unit II: Pathogenesis

Koch's postulates- Types of parasitism- Pathogenesis - Mode of infection – pre-penetration, penetration and post penetration - Role of enzymes and toxins on disease development-Effect of pathogen on physiological functions of the plants

Unit III: General characters and taxonomy of *Protozoa, Chromista* and *Fungi*

General characters, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Binomial system of nomenclature and rules of nomenclature of fungi. Classification of fungi. Key to divisions, sub-divisions, orders and classes based on Ainsworth and Bisby's dictionary of fungi 10th edition complied by Kirk *et al.,* (2008). General characters and symptoms of **Kingdom:*Protozoa*, Phylum: *Plasmodiophoromycota***, *Plasmodiophora brassicae*. **Kingdom**:***Chromista*, Phylum:*Oomycota*-*** *Pythium, Phytophthora, Sclerospora, Plasmopara* and *Albugo* **Kingdom:*Fungi* , Phylum:*Chytridiomycota*-***Synchytrium,** **Phylum: *Zygomycota* -***Mucor, Rhizopus*

Unit IV: General characters and taxonomy of fungi - *Ascomycota* and *Basidiomycota*

Phylum: ***Ascomycota***: Classification , symptoms and taxonomy characters of *Taphrina, Capnodium, Mycosphaerella, Macrophomina, Cochliobolus, Lewia, Venturia, Eurotium, Talaromyces, Sclerotinia, Erysiphe, Leveillula, Phyllactinia,Claviceps, Gibberella, Ustilaginoidea, Verticillium, Glomerella, Pestalotiopsis and Magnaporthe*

Phylum: ***Basidiomycota*:** Classification, symptoms and life cycle of *Puccinia, Uromyces, Hemileia* and *Ustilago*. Important taxonomic characters of *Ganoderma , Agaricus, Pleurotous* and *Calocybe.* Symptoms and Important taxonomic characters of *Athelium, Rhizoctonia* and *Exobasidium*

Unit V: Bacteria, Phytoplasma, virus, viroid, Algae, Phanerogams and abiotic disorders

General characters and symptoms- phytopathogenic bacteria,*Candidatus Phytoplasma*, Spiroplasma, Fastidious vascular bacteria, viruses, viroids, algae, Phanerogams –Abiotic disorders.

Practical

Acquaintance with various laboratory equipments and microscopy. Preparation of media, isolation and Koch's postulates. General characters of fungi – Types of mycelia -Types of vegetative, asexual and sexual spores- asexual and sexual fruiting bodies. Study of important taxonomic characters and symptoms produced by *Plasmodiophora, Pythium Phytophthora, Sclerospora, Plasmopara , Albugo, Mucor, Rhizopus, Taphrina, Capnodium, Cercospora,* (*Mycospaerella*), *Botryodiplodia* (*Botryosphaeria*), *Curvularia, Drechslera* (*Helminthosporium), Alternaria, Venturia, Erysiphe, Phyllactinia, Uncinula, Leveillula , Claviceps, Fusarium* (*Gibberella ,Nectria*), *Verticillium ,Colletotrichum (Glomerella) Pestalotia (Pestalosphaeria), Pyricularia*(*Magnoporthe*) *Sarocladium, Macrophomina, , Puccinia, Uromyces , Hemileia, Ustilago Sphacelotheca (Sporisorium), Tolyposporium (Moesziomyces), Exobasidium, Sclerotium, Rhizoctonia* (*Thanatephorus*), *Ganoderma, Agaricus, Pleurotus* and *Calocybe.*

Symptoms of bacterial diseases, *Candidatus Phytoplasma*, Fastidious vascular bacteria, algal parasite, phanerogamic parasites and non-parasitic diseases.

Theory

1. Definition of Plant Pathology – History of Plant Pathology
2. Importance of plant diseases
3. Causes of Plant diseases – Protozoa , Chromista, , fungi, Bacteria, Fastidious vascular bacteria, Spiroplasma, *Candidatus Phytoplasma,*
4. Causes of Plant diseases -Virus, viroid, algal, phanerogamic parasites and abiotic disorders
5. Pathogenesis – stages in pathogenesis – pre-penetration, penetration and post penetration
6. Role of enzymes in pathogenesis
7. Role of toxins in pathogenesis
8. Effect of pathogen on physiological functions of the plants- Effect on Photosynthesis- Transpiration- Respiration- translocation of water and nutrients
9. General characters of fungi- Mycelia – vegetative resting structures
10. Asexual reproduction in fungi
11. Sexual reproduction in fungi
12. Parasitism in fungi- Types of parasitism – parasite, saprophyte, obligate parasite, facultative parasite, facultative saprophyte- Mode of nutrition in fungi- biotrophs, hemibiotrophs, perthotrophs/ necrotrophs and symbiosis
13. Classification of Kingdom Protozoa - important taxonomic characters , symptoms and life cycle of *Plasmodiophora brassicae* and symptoms of Protozoan diseases
14. Classification of Kingdom Chromista- General characters of Oomycetes- Symptoms and life cycle of *Pythium*, *Phytophthora* and *Albugo*
15. Symptoms and life cycle of *Sclerospora and Plasmopara*
16. Classification of Kingdom– *Chytridiomycota* and *Zygomycota* - important characters, symptoms and life cycles of *Synchtrium* and *Rhizopus* and *Mucor*
17. **Mid Semester Examination**
18. Classification of Kingdom– *Ascomycota*- important characters
19. Symptoms and life cycles of *Taphrina, Capnodium, Cercospora,* (*Mycospaerella*), *Macrophomina, Cochliobolus (Helminthosporium)*, *Lewia* (*Alternaria)* and *Venturia*
20. Symptoms and life cycles of *Eurotium, Talaromyces*, *Erysiphe, Leveillula* and *Phyllactinia,*
21. Symptoms and taxonomic characters of *Claviceps, Fusarium* (*Gibberella, Nectria*) and *Verticillium*
22. Symptoms and taxonomic characters of *Colletotrichum (Glomerella) Pestalotia (Pestalosphaeria), Pyricularia* (*Magnoporthe*) ,*Sarocladium and Ustilagenoidea*
23. Classification of Kingdom - *Basidiomycota*- important characters
24. Symptoms and life cycles of *Puccinia* ,*Uromyces, Hemileia*
25. Symptoms and taxonomic characters of *Ustilago, Sphacelotheca (Sporisorium), Tolyposporium (Moesziomyces), Tilletia and Exobasidium*
26. Symptoms and taxonomic characters of *Athelium, Thanetephorus* and *Ganoderma*
27. Important taxonomic characters of *Agaricus, Pleurotus* and *Calocybe*
28. Classification and general characters of phytopathogenic bacteria
29. Symptoms and characters of *Xanthomonas*, *Ralstonia, Erwinia, Pantoea*, *Pectobacterium Agrobacterium (Rhizobium)*, *Corynebacterium* (*Clavibacter*,) and *Streptomyces*
30. Important characters and symptoms of *Candidatus Phytoplasma* diseases – Phyllody, little leaf, yellow dwarf and sandal spike, Fastidious vascular bacteria and Spiroplasma
31. Virus - definition, nature and properties of plant virus, Single stranded, Double stranded RNA and DNA viruses and Transmission of plant viruses
32. Common symptoms of virus diseases – mosaic, chlorosis, leaf curl, stem pitting, spotted wilt, necrosis , ring spot, vein clearing, leaf crinkle, rosette and bunchy top
33. Important characters and symptoms of Viroid, Algal and Phanerogamic parasites

34. Symptoms and characters of non-parasitic diseases

Practical

1. Acquaintance with light microscope- Preparation of media for isolation and proving koch's postulates
2. General characters of fungi – Types of mycelia -Types of vegetative, asexual and sexual spores- asexual and sexual fruiting bodies
3. Study of important taxonomic characters and symptoms produced by *Plasmodiophora, Pythium* and *Phytophthora*
4. Study of important taxonomic characters and symptoms produced by *Sclerospora Plasmopara* and *Albugo*
5. Study of important taxonomic characters and symptoms produced by *Rhizopus, Taphrina, Capnodium, Cercospora,* (*Mycospaerella*), *Botryodiplodia* (*Botryosphaeria*), *Drechslera* (*Helminthosporium)* and *Alternaria*
6. Study of important taxonomic characters and symptoms produced by *Eurotium, Talaromyces, Erysiphe, Leveillula, Phyllactinia, Uncinula , Podosphaera and Sphaerotheca*
7. Study of important taxonomic characters and symptoms produced by *Claviceps, Fusarium* (*Gibberella, Nectria*) and *Verticillium*
8. Study of important taxonomic characters and symptoms produced by *Colletotrichum (Glomerella), Pestalotia (Pestalosphaeria), Pyricularia* (*Magnoporthe*) *Sarocladium* and *Macrophomina*
9. Study of important taxonomic characters and symptoms produced by *Puccinia, Uromyces*, and *Hemileia*
10. Field visit for exposing students on different crop diseases
11. Study of important taxonomic characters and symptoms produced by *Ustilago, Sphacelotheca (Sporisorium), Tolyposporium (Moesziomyces),and Exobasidium*
12. Study of important taxonomic characters of *Agaricus, Pleurotus, Calocybe* and *Volvariella*
13. Study of important taxonomic characters and symptoms produced by *Athelium, Thanetephorus* and *Ganoderma*
14. Symptoms of bacterial diseases – leaf blight, leaf streak, canker, scab, crown gall, wilt and soft rot.
15. Symptoms and vectors of viral diseases – mosaic, chlorosis, leaf curl, stem pitting, spotted wilt, necrosis , ring spot, vein clearing, leaf crinkle, rosette and bunchy top
16. Symptoms of *Candidatus Phytoplasma* , Algae, Phanerogamic parasites and non-parasitic diseases
17. **Final Practical Examination.**

Note: Students should submit 50 well-preserved disease specimens

Reference text book

1. Alice D, and Jeyalakshmi C 2014. Plant Pathology. A.E Publications ,Coimbatore
2. Agrios, G.N. 2005. Plant Pathology – (5^{th} Edition). Academic Press, New York.

3. Kirk, P.M., P.F. Cannon, D.W. Minter and J.A. Stalpers, (2008). Ainsworth and Bisby's dictionary of fungi , 10th edition. CAB international Wallingford, UK.

E- references

1. Agrios, G.N. 2005. Plant Pathology – (5th Edition). Academic Press, New York.
2. Richard N. Strange. 2003. Introduction of Plant Pathology - John Wiley & Sons Ltd, London
3. John Webster and Ronald Weber, 2007. Introduction to fungi by Cambridge University Press, UK

Semester III

AEN 201 FUNDAMENTALS OF ENTOMOLOGY (2+1)

Theory

Unit I: History and importance of Entomology; Insect morphology

History of Entomology in India; Position of insects in the animal kingdom and their relationship with other classes of Arthropoda; Reasons for insect dominance. General organisation of insect body wall - structure and function, cuticular appendages, moulting; Body regions - insect head, thorax and abdomen, their structure and appendages.

Unit II:

Anatomy and physiology (Part – I) : Digestive, excretory, respiratory, circulatory and nervous systems in insects.

Unit III:

Anatomy and physiology (Part – II) : Reproductive systems in insects, sense organs and their functions, exocrine and endocrine glands; Embryonic and post embryonic development.

Unit IV:

Taxonomy of Apterygota and Exopterygota

Insect systematics; Distinguishing characters of agriculturally important orders and families of Hexapoda. Apterygota (Thysanura, Diplura, Protura and Collembola); Exopterygota (Ephemeroptera, Odonata, Orthoptera, Phasmida, Dictyoptera, Embioptera, Dermaptera, Hemiptera, Isoptera, Psocoptera, Mallophaga, Thysanoptera and Siphunculata).

Unit V:

Taxonomy of Endopterygota

Distinguishing characters of agriculturally important families of Lepidoptera, Coleoptera, Diptera, Hymenoptera, Siphonaptera, Neuroptera and Strepsiptera.

Practical

Observations on external features of grasshopper / cockroach, Methods of insect collection, preservation – Preparation of Riker mount. Types of insect head, antenna, mouth parts – Structure of thorax. Types of insect legs, wings and their modifications – wing coupling. Structure of abdomen, and its modifications. Metamorphosis in insects – immature stages in insects. Study of digestive and reproductive systems of grasshopper / coackroach – Observing the characters of agriculturally important orders and families.

Theory lecture schedule:

1. History of Entomology in India; Position of insects in the animal kingdom - relationship with other members of Arthropoda
2. Structural, morphological and physiological factors responsible for dominance
3. Insect body wall - its structure and function; cuticular appendages
4. Moulting process in insects
5. Structure of insect head and its appendages
6. Structure of insect thorax and its appendages
7. Structure of insect abdomen and its appendages

8. Structure of alimentary canal and its modifications; Digestive enzymes, digestion and absorption of nutrients
9. Excretory system - Malpighian tubules - accessory excretory organs and physiology of excretion
10. Respiratory system – types - structure of trachea - tracheoles - types of spiracles - respiration in aquatic and endoparasitic insects
11. Circulatory system - haemocoel and dorsal vessel - circulation of blood -composition of haemolymph - haemocytes and their functions
12. Nervous system - Structure of neuron – types of nervous systems
13. Axonic and synaptic transmissions of nerve impulses
14. Male and female reproductive systems in insects – structure and modifications - Spermatogenesis and Oogenesis
15. Oviparous, viviparous, paedogenesis, polyembryony, ovoviporous and parthenogenesis
16. Embryogenesis; Types of metamorphosis – Immature stages of insects
17. **Mid-semester examination**
18. Structure of sense organs - types of sensilla – photoreceptors, chemoreceptors and mechan oreceptors
19. Exocrine and endocrine glands and their function - effect on metamorphosis and reproduction
20. Tropism and Biocommunication in insects — Sound and light production
21. Systematics - principles and procedures of classification and nomenclature of insects
22. Distinguishing characters of insect orders — Apterygota (Thysanura, Diplura, Protura and Collembola), Exopterygota — (Ephemeroptera, Odonata and Phasmida)
23. Orthoptera (Ensifera - Tettigonidae, Gryllidae and Gryllotalpidae; Caelifera - Acrididae and Tetrigidae), Dictyoptera, Dermaptera and Embioptera
24. Isoptera — social life in termites
25. Thysanoptera, Pscoptera, Mallophaga and Siphunculata.
26. Hemiptera – Homoptera (Delphacidae, Flatidae, Cercopidae, Cicadidae, Membracidae, Cicadellidae, Psyllidae, Aleyrodidae, Aphididae, Margarodidae, Kerridae, Pseudococcidae, Coccidae, Asterolecaniidae and Diaspididae)
27. Hemiptera - Heteroptera (Tingidae, Reduviidae, Cimicidae, Anthocoridae, Miridae, Lygaeidae, Pyrrhocoridae, Coreidae, Scutellaridae, Pentatomidae, Veliidae, Gerridae, Naucoridae, Belastomatidae, Nepidae, Notonectidae and Corixidae)
28. Endopterygota — Classification of Lepidoptera – suborders; butterfly families (Nymphalidae, Lycaenidae, Pieridae, Papilionidae, Satyriidae and Hesperiidae)
29. Moth families (Psychidae, Gelechiidae, Metarbellidae, Cochlidiidae, Pyralidae, Crambidae, Pterophoridae, Geometridae, Bombycidae, Saturniidae, Sphingidae, Arctiidae, Noctuidae and Lymantriidae)
30. Classification of Coleoptera – suborders; Adephaga (Carabidae, Cicindellidae, Dytiscidae, Gyrinidae)
31. Polyphaga (Hydrophilidae, Staphylinidae, Passalidae, Lucanidae, Scarabaeidae, Dynastidae, Melolonthidae, Cetonidae, Buprestidae, Elateridae, Lampyriidae, Cantharidae, Dermestidae, Anobiidae, Bostrychidae, Coccinellidae, Tenebrionidae, Meloidae, Cerambycidae, Bruchidae, Chrysomelidae, Apionidae and Curculionidae)
32. Diptera – Suborders; Nematocera (Tipulidae, Psychodidae, Culicidae, Bibionidae, and Cecidomyiidae), Brachycera (Tabanidae, Asilidae and Bombylidae,), Cyclorrapha (Syrphidae, Drosophillidae, Muscidae, Calliphoridae, Tachinidae, Hippoboscidae, Micropezidae, Agromyzidae, Chloropidae and Tephritidae)

33. Hymenoptera–Suborders; Symphyta (Tenthredinidae) Apocrita (Ichneumonidae, Braconidae, Evaniidae, Agaonidae, Chalcididae, Encyrtidae, Eulophidae, Trichogrammatidae, Bethylidae, Chrysididae, Scoliidae, Mutillidae, Formicidae, Vespidae, Sphecidae, Megachilidae, Anthophoridae, Xylocopidae and Apidae)
34. Neuroptera (Mantispidae, Chrysopidae, Myrmeleontidae and Ascalaphidae); Siphonaptera and Strepsiptera

Practical schedule:

1. Observations on external features of grasshopper / cockroach and other members of phylum Arthropoda
2. Methods of insect collection, preservation, display and storage
3. Types of insect head and antenna
4. Mouth parts of cockroach, modifications in the mouth parts in plant bug, female mosquito, honeybee, thrips, antlion grub, house fly, moths and butterflies
5. Structure of thorax and their appendages —modifications in insect legs and wings — wing venation, regions and angles — wing coupling.
6. Structure of abdomen and their appendages
7. Types of immature stages of insects
8. Study of digestive system, male and female reproductive systems
9. Observing the characters of Apterygota - Collembola and Thysanura and Exopterygota -Odonata and Ephemeroptera and Phasmida
10. Observing the characters of Dictyoptera, Dermaptera, Embioptera, Orthoptera (Ensifera - Tettigonidae, Gryllidae and Gryllotalpidae; Caelifera - Acrididae and Tetrigidae), Mallophaga and Siphunculata
11. Observing the characters of Exopterygota —Isoptera and Hemiptera — Homoptera (Delphacidae, Flatidae, Cercopidae, Cicadidae, Membracidae, Cicadellidae, Psyllidae, Aleyrodidae, Aphididae, Margarodidae, Kerridae, Pseudococcidae, Coccidae, Asterolecaniidae and Diaspididae) Heteroptera (Tingidae, Reduviidae, Cimicidae, Anthocoridae, Miridae, Lygaeidae, Pyrrhocoridae, Coreidae, Scutellaridae, Pentatomidae, Veliidae, Gerridae, Naucoridae, Belastomatidae, Nepidae, Notonectidae and Corixidae)
12. Observing the characters of orders Thysanoptera and Diptera- Nematocera (Tipulidae, Psychodidae, Culicidae, Bibionidae, and Cecidomyiidae), Brachycera (Tabanidae, Asilidae and Bombylidae,), Cyclorrapha (Syrphidae, Drosophillidae, Muscidae, Calliphoridae, Tachinidae, Hippoboscidae, Micropezidae, Agromyzidae, Chloropidae and Tephritidae)
13. Observing the characters of Hymenoptera-Symphyta (Tenthredinidae) Apocrita (Ichneumonidae, Braconidae, Evaniidae, Agaonidae, Chalcididae, Encyrtidae, Eulophidae, Trichogrammatidae, Bethylidae, Chrysididae, Scoliidae, Mutillidae, Formicidae, Vespidae, Sphecidae, Megachilidae, Anthophoridae, Xylocopidae and Apidae)
14. Observing the characters of Coleoptera - Adephaga (Carabidae, Cicindellidae, Dytiscidae, Gyrinidae) Polyphaga (Hydrophilidae, Staphylinidae, Passalidae, Lucanidae, Scarabaeidae, Dynastidae, Melolonthidae, Cetonidae, Buprestidae, Elateridae, Lampyriidae, Cantharidae, Dermestidae, Anobiidae, Bostrychidae, Coccinellidae, Tenebrionidae, Meloidae, Cerambycidae, Bruchidae, Chrysomelidae, Apionidae and Curculionidae)
15. Observing the characters of Lepidoptera - Butterfly families (Nymphalidae, Lycaenidae, Pieridae, Papilionidae, Satyriidae and Hesperiidae), Moth families (Psychidae, Gelechiidae, Metarbellidae, Cochlidiidae, Pyralidae, Crambidae, Pterophoridae, Geometridae, Bombycidae, Saturniidae, Sphingidae, Arctiidae, Noctuidae and Lymantriidae)
16. Observing the characters of Neuroptera (Mantispidae, Chrysopidae, Myrmeleontidae and Ascalaphidae), Siphonoptera. Identification and naming of collected insects based on characters — order and family
17. **Final Practical examination**

References:

1. Richards O.W. and R.G. Davies. 1977. *Imm's General Text Book of Entomology*. Vol.I and II. Chapman and Hall Publication, London. 1354p. {ISBN 0412 15220 7}

Chapman, R.F. 1998. *The Insects: Structure and Function*. Fourth Edition. Cambridge University Press. 770p. {ISBN 0 521 78732 7}

Snodgrass, R.E. 1994. *Principles of Insect Morphology.* CBS publishers and distributors, New Delhi. 667p.

David, B.V. and V.V. Ramamurthy. 2011. *Elements of Economic Entomology*, Namrutha Publications, Chennai, 386 p. {ISBN: 978-81-921477-0-3}

Srivastava, P. D. and R. P. Singh. 1997. An Introduction to Entomology. Concept Publishing Company, New Delhi.

E- References:

1. **http://www**.itis.usda.gov/it is/
2. **www.zin.ru/animalia**
3. **https://courses.cit.cornell.edu/ent201/content/*anatomy*2.pdf**
4. **www.*insects*explained.com/03*external*.htm**
5. **www.earthlife.net/*insects*/anatomy.html**
6. **www.*insect*identification.org/*orders_insect*.asp**

SST 201 Principles of Seed Technology (2+1)

Theory

Unit I –

Seed : Importance and biology

Seed and seed technology: definition -importance -Characters of good quality seed -Seed development and maturation - Germination - phases of seed germination - Dormancy - types of seed dormancy - Different classes of seed - generation system of seed multiplication in supply chain - Seed replacement rate and varietal replacement - Seed Multiplication Ratio -Seed renewal period. Varietal deterioration of crops - causes and maintenance.

Unit II –

Seed Production

Principles of seed production- Foundation and certified seed production of varieties and hybrids - Cereals - rice, maize, sorghum and bajra - Pulses - greengram, blackgram and redgram - Oilseeds - groundnut, sesame, sunflower and castor - Cotton, Forage crops - Cenchrus sp and lucerne - Vegetables - tomato, brinjal, chillies, bhendi, onion and gourds - bittergourd, ashgourd, snakegourd, ribbedgourd, bottlegourd and pumpkin. Principles of GM crop and organic seed production.

Unit III –

Post harvest handling of seeds

Post harvest handling of seeds - threshing methods - drying - methods of seed drying - Seed processing - seed cleaning and grading - Processing equipments -cleaner cum grader -Upgrading equipments - specific gravity separator, colour sorter, indented cylinder separator, spiral separator, magnetic separator, needle separator - working principles - Seed quality enhancement techniques - importance - seed fortification, seed priming, seed coating, seed pelleting.

Unit IV –

Seed Quality Control and Seed Testing

Seed certification - phases of certification, procedure for seed certification, field inspection, field counts, field and seed standards. Post harvest inspection - processing, bagging and tagging. Seed Act and Rules - Seed law enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983 - Salient features of PPV&FRA 2001 - National Seed Policy 2002 - Seed Bill 2004. Seed testing for quality assessment - importance - Varietal identification through grow out test, molecular and biochemical test. Detection of genetically modified crops.

Unit V - Seed Storage and marketing

Seed storage – principles- factors affecting seed longevity during storage – Seed treatments and packaging materials - measures for pest and disease control during storage and godown sanitation. Seed marketing - structure and organization - sales promotional activities. factors affecting seed marketing and demand - International seed movement - role of international organizations, WTO and OECD in seed trade.

Practical

Study on seed structure of major cereals - rice, wheat, maize, sorghum and bajra - Pulses - greengram, blackgram, redgram, bengalgram and field pea - Oilseeds - groundnut, sesame, sunflower, castor, soybean and mustard - Cotton - Forage crops - Vegetable crops. Seed production techniques - identification of physical and genetic contaminants - supplementary pollination in hybrid rice -
detasselling techniques in hybrid maize - emasculation and dusting technique in cotton - supplementary pollination in sunflower - pre-germinative technique and enhancing female flowers in cucurbits - assessment of physiological maturity indices - seed extraction methods in vegetables. Visit to seed production farms - Seed enhancement techniques - seed coating, seed priming and seed pelleting. Visit to seed processing plant. Seed certification - field inspection and counting procedure - Seed sampling and testing - seed moisture content, physical purity, seed germination, viability - Seed and seedling vigour test - Seed health test- Genetic purity test -grow out test and electrophoresis - Seed production planning - economics - Visit to seed testing laboratory.

Theory lecture schedule:

1. Seed and seed technology - definition -importance -Characters of good quality seed.
2. Seed development and maturation.
3. Germination - phases of seed germination - Dormancy - types of seed dormancy.
4. Different classes of seed - generation system of seed multiplication in supply chain - Seed replacement rate and varietal replacement - Seed Multiplication Ratio -Seed renewal period.
5. Varietal deterioration of crops - causes and maintenance.
6. Principles of seed production - factors affecting seed production - physical and genetic contaminants.
7. Seed production techniques in varieties and hybrids of rice.
8. Seed production techniques in varieties and hybrids of maize.
9. Seed production techniques in varieties and hybrids of sorghum and bajra.
10. Seed production techniques in greengram and blackgram varieties.
11. Seed production techniques in varieties and hybrids of redgram.
12. Seed production techniques in varieties and hybrids of sunflower and groundnut varieties.
13. Seed production techniques in varieties and hybrids of castor and sesame varieties.
14. Seed production techniques in varieties and hybrids of cotton.
15. Seed production techniques in Cenchrus species and lucerne.
16. Seed production techniques in varieties and hybrids of tomato, brinjal and chillies.
17. Seed production techniques in varieties and hybrids of bhendi and onion.
18. **Mid semester examination.**
19. Seed production techniques in varieties and hybrids of gourds - bittergourd, ashgourd, snakegourd, ribbedgourd, bottlegourd and pumpkin.
20. Principles of GM crop and organic seed production.
21. Post harvest handling of seeds - threshing methods - drying - methods of seed drying.
22. Seed processing - principle - importance - seed processing sequence for different crops - equipments.
23. Principles and mechanism of seed cleaning and grading - processing equipments - cleaner cum grader - specific gravity separator.
24. Principles and mechanism of upgrading equipments - colour sorter - indented cylinder separator - spiral separator - magnetic separator - needle separator
25. Seed quality enhancement techniques - importance - seed fortification - seed priming - seed coating - seed pelleting.
26. Seed certification - phases of certification, procedure for seed certification, field inspection, field counts, field and seed standards - post harvest inspection - processing - bagging and tagging.
27. Seed Act and Rules - Seed law enforcement - Duties and powers of seed inspector - offences and penalties - Seeds Control Order 1983.
28. Salient features of PPV&FRA, 2001 - National Seed Policy, 2002 - Seed Bill, 2004.
29. Seed testing for quality assessment - importance - methods.

30. Varietal Identification - grow out test - molecular and biochemical test - Detection of genetically modified crops.
31. Seed storage - principles - factors affecting seed longevity during storage.
32. Seed treatment and packaging materials - measures for pest and disease control during storage and godown sanitation.
33. Seed marketing - structure and organization - sales promotional activities - factors affecting seed marketing and demand.
34. International seed movement - role of international organizations - WTO and OECD in seed trade.

Practical schedule:

1. Study on external and internal seed structure and identification of major cereals - pulses - oilseeds - cotton - forage crops and vegetable crops.
2. Practicing supplementary pollination techniques in hybrid rice and detasselling techniques in hybrid maize.
3. Practicing emasculation and dusting technique in cotton and supplementary pollination in sunflower.
4. Practicing pre-germinative technique and female flowers production enhancement techniques in cucurbits.
5. Assessment of physiological maturity indices in various crops and seed extraction methods in vegetables.
6. Visit to seed production farms.
7. Seed enhancement techniques - Seed coating - seed priming and seed pelleting.
8. Seed certification - field inspection and counting procedure - identification of physical and genetic contaminants in seed production plots and roguing.
9. Seed testing - seed sampling - mixing - dividing - equipments.
10. Estimation of seed moisture content and physical purity.
11. Seed germination testing - tetrazolium test for viability - evaluation.
12. Genetic purity test - grow out test - electrophoresis.
13. Seed health testing - methods.
14. Seed and seedling vigour test - brick gravel test, paper piercing test - cool and cold test - accelerated ageing test.
15. Seed production planning - economics.
16. Visit to seed processing plant and seed testing laboratory.
17. **Final practical examination.**

References

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6. Seed Science Research (www.jgateplus.com)
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AGR 201 Crop production technology – I *(Kharif crops) (1+1)*

Theory :

Unit - I:

Cereals

Rice, Maize, - Origin, geographic distribution, economic importance, soil and climatic requirements, varieties, cultural practices (from land preparation to harvest) and yield.

Unit - II:

Millets

Sorghum, Pearl millet, Small millets - Finger millet, Foxtail millet, little millet, Kodo millet, Barnyard millet and Proso millet - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

Unit - III:

Pulses

Redgram, Blackgram, Greengram, , Cowpea, - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

Unit - IV:

Oilseeds (Kharif)

Groundnut, sesame, Soybean- Origin, and geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices, yield.

Unit - V:

Fibre and forage

Cotton, jute, fodder sorghum, cumbu napier- Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices, yield.

Cereals	Rice, maize
Millets	Sorghum, pearl millet, finger millet and minor millets
Pulses	Pigeonpea, green gram, black gram, cowpea,
Oilseeds	Groundnut, sesame, soybean
Fibre & Forage	Cotton, jute, fodder sorghum, Cumbu napier

Theory Lecture Schedule:

1. Importance and area, production and productivity of major cereals and millets of India and Tamil Nadu.
2. Importance and area, production and productivity of pulses and oilseeds crops of India and Tamil Nadu.
3. Rice - Origin - geographic distribution - economic importance - varieties - soil and climatic requirement.
4. Rice - cultural practices - yield - economic benefits.
5. Special type of Rice cultivation – SRI - and Hybrid rice cultivation.
6. Maize - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
7. Sorghum and Pearl millet - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
8. Finger millet and Minor millets - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
9. **Mid semester Examination.**
10. Pigeonpea - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

11. Greengram, Blackgram and Cowpea - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield - Agronomy of rice fallow pulses.
12. Groundnut - Origin, geographical distribution, economic importance, soil and climatic requirements - varieties, cultural practices yield and economics.
13. Sesame and Soybean - Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield.
14. Cotton - Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield.
15. Jute- Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield.
16. Fodder sorghum- Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield.
17. Cumbu napier- Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield.

Practical Schedule:

1. Identification of cereals, millets, pulses and oilseed crops in the crop cafeteria.
2. Practicing various nursery types and main field preparation for rice crop.
3. Nursery and main field preparation for important millets, pulses and oilseeds.
4. Acquiring skill in different seed treatment techniques in important kharif crops.
5. Estimation of plant population per unit area for important kharif crops.
6. Acquiring skill in field preparation, sowing and manuring of crops under pure and intercropping situations for cereals and millets.
7. Acquiring skill in field preparation, sowing and manuring of crops under pure and intercropping situations for pulses and oilseeds.
8. Acquiring skill in using seed drill for sowing operations.
9. Acquiring skill in foliar nutrition for important field crops.
10. Observations on growth parameters of cereals and millets.
11. Observations on growth parameters of pulses and oilseeds.
12. Study of yield parameters and estimation of yield in cereals and millets.
13. Study of yield parameters and estimation of yield in pulses and oilseeds.
14. Working out cost and returns of important cereals, millets, pulses and oilseeds crops.
15. Visit to farmers field / research stations to study the cultivation techniques of cereal, millets, pulses , cotton and oilseeds.
16. Visit to nearby Agricultural Research Station / Farmer's field.
17. **Practical Examination.**

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HOR 211 Production technology of vegetables and spices (1+1)

Theory

Vegetables

Unit I: Scope, Importance and classification of vegetables

Importance of vegetable growing –area and production of vegetables in India and Tamil Nadu- National economy- nutritive value of vegetables and human nutrition.

Unit II: Production technology of tropical vegetable crops

Origin - climate and soil – varieties and hybrids – seeds and sowing – transplanting – water and nutrient management – fertigation – weed management – use of micronutrients and plant growth regulators - physiological disorders - maturity indices – harvest – pest and diseases – seed production

Crops: Tomato, chilli, brinjal, bhendi, gourds (ash gourd, pumpkin, bitter gourd, ridge gourd, bottle gourd, snake gourd and watermelon) onion, cassava, amaranthus and moringa.

Unit III: Production technology of temperate vegetable crops

Origin -climate and soil – varieties and hybrids – seeds and sowing – transplanting - water and nutrient management – fertigation – weed management – use of micronutrient and plant growth regulators- physiological disorders- maturity indices – harvest – pest and diseases – seed production

(**Crops:** Cabbage, cauliflower, potato, carrot, radish, beetroot, peas and french beans, Protected cultivation of vegetables (tomato, capsicum and cucumber).

SPICES

Unit IV: Crop production techniques of major spices

Spices- scope and importance - classification of spices - origin, area and production - role of commodity boards- export potential of spices.

Climate and soil - varieties - propagation - nursery management and planting – cropping systems- training practices - nutrient, water and weed management - shade regulation - maturity indices - harvest and yield - pests and diseases - processing - value addition.

Black pepper, Cardamom, Turmeric, Ginger and Garlic

Unit V: Crop production techniques in seed spices, tree spices and other spices

Climate and soil- varieties - propagation, nursery management and planting- training , pruning canopy management- weed and water management- shade regulation- nutrient management including drip and fertigation – harvest and yield – pests and diseases – processing – value addition.

Coriander, Fenugreek, Cumin, Fennel, Clove, Nutmeg, Cinnamon, Curry leaf, Tamarind and Herbal spices

Practical

Vegetables

Layout of kitchen garden – seed sowing – nursery management – grafting in vegetables water and nutrient management – fertigation – weed management – practices in use of plant growth regulators - Special horticultural practices in vegetable production - study of maturity indices - Identification of physiological disorders - protected cultivation - visit to vegetable nursery unit/ protected cultivation unit.

Spices

Identification of spices - description of varieties - Propagation methods - rapid multiplication techniques - seed collection and extraction - raising of nurseries - seed sowing - seed treatment - fertilizer application - harvesting – pests and diseases - processing - cost economics - visit to spice gardens

Black pepper, Cardamom, Turmeric, Ginger, Coriander, Fenugreek, Curry leaf, Clove, Nutmeg and Cinnamon

Theory lecture schedule

1. Importance of vegetable growing –area and production of vegetables in India and Tamil Nadu- National economy- nutritive value of vegetables and human nutrition .
2. Climate and soil – varieties and hybrids – seeds and sowing – transplanting - water and nutrient management – fertigation – weed management – use of micronutrients and plant growth regulator - physiological disorders - maturity indices – harvest and yield – pest and diseases – seed production of tomato, chilli and brinjal
3. Climate and soil – varieties and hybrids – seeds and sowing – transplanting - water and nutrient management – fertigation – weed management – use of micronutrients and plant growth regulator - physiological disorders - maturity indices – harvest and yield – pest and diseases – seed production of bhendi and onion.
4. Climate and soil – varieties and hybrids – seeds and sowing – transplanting - water and nutrient management – fertigation – weed management – use of micronutrients and plant growth regulator - physiological disorders - maturity indices – harvest and yield– pest and diseases – seed production of gourds (ash gourd, pumpkin, bitter gourd, ridge gourd, bottle gourd, snake gourd and watermelon)
5. Climate and soil – varieties and hybrids – seeds and sowing – transplanting - water and nutrient management – fertigation – weed management – use of micronutrients and plant growth regulator- physiological disorders - maturity indices – harvest and yield – pest and diseases – seed production of cassava and potato
6. Climate and soil – varieties and hybrids – seeds and sowing – transplanting - water and nutrient management – fertigation – weed management – use of micronutrients and plant growth regulator - physiological disorders - maturity indices – harvest and yield – pest and diseases – seed production of moringa and amaranthus.
7. Climate and soil – varieties and hybrids – seeds and sowing – transplanting - water and nutrient management – fertigation – weed management – use of micronutrients and plant growth regulator - physiological disorders - maturity indices – harvest and yield – pest and diseases – seed production of cabbage and cauliflower.
8. Climate and soil – varieties and hybrids – seeds and sowing – transplanting - water and nutrient management – fertigation – weed management – use of micronutrients and plant growth regulator - physiological disorders - maturity indices – harvest and yield – pest and diseases – seed production of carrot , beetroot and radish.
9. **Mid -semester examination**
10. Climate and soil – varieties and hybrids – seeds and sowing – transplanting - water and nutrient management – fertigation – weed management – use of micronutrients and plant growth regulator - physiological disorders - maturity indices – harvest and yield – pest and diseases – seed production of french beans and peas .
11. Protected cultivation of vegetables (tomato, capsicum and cucumber)
12. Spices- scope and importance - classification of spices - origin, area and production - role of commodity boards- export potential of spices. **Black pepper** - climate and soil- varieties – propagation – rapid multiplication techniques - nursery management and planting- nutrient, water and weed management - special horticultural practices - role of growth regulators - shade regulation- maturity indices - harvest and yield - pests and diseases –post harvest practices- processing and value addition.

13. **Cardamom** - climate and soil - varieties - propagation - nutrient, water and weed management- shade regulation- mulching - maturity indices - harvest and yield - pests and diseases –post harvest practices- processing and value addition.
14. **Turmeric , Ginger and Garlic** - Climate and soil- varieties - propagation, nursery management and planting- nutrient, water and weed management- inter cropping- physiological disorders -maturity indices - harvest and yield - pests and diseases –post harvest practices- processing and value addition.
15. **Seed spices** - climate and soil- varieties - seed treatment/ sowing – nutrient, water and weed management- intercropping - maturity indices - harvest and yield - pests and diseases –post harvest practices- processing and value addition.(**Coriander, Fenugreek, Cumin and Fennel**)
16. **Tree spices -** climate and soil - varieties - propagation, nursery management and planting - nutrient, water and weed management- training and pruning practices- cropping system- special horticultural practices maturity indices - harvest and yield - pests and diseases –post harvest practices- processing and value addition.(**Clove, Nutmeg and Cinnamon**)
17. **Tamarind, Curry leaf and herbal spices -** climate and soil- varieties - propagation, nursery management and planting- nutrient, water and weed management- canopy management - maturity indices - harvest and yield - pests and diseases –post harvest practices- processing and value addition.

Practical schedule

1. Layout of kitchen garden.
2. Seed treatment and sowing practices in direct sown vegetables
3. Nursery management of transplanted ,bulb and tuber vegetable crops
4. Grafting in vegetable crops
5. Water and nutrient management – fertigation in vegetable crops
6. Practices in use of plant growth regulators in vegetable crops
7. Special horticultural practices in vegetable production
8. Identification of physiological disorders in vegetable crops
9. Study of maturity standards and harvesting of vegetables
10. Practices in protected cultivation of vegetable crops
11. Visit to vegetable nurseries/protected vegetable cultivation unit
12. Black pepper and cardamom- identification and description of varieties – seed propagation and vegetative propagation – fertilizers application - preparation of plant bio regulators and application – pests and diseases- harvest and post harvest practices.
13. Turmeric and ginger- identification and description of varieties- propagation, fertilizers application - preparation of plant bio regulators and application – pests and diseases- harvest and post harvest practices.
14. Coriander and Fenugreek - identification and description of varieties - seed treatment, sowing fertilizer application - pests and diseases- harvest and post harvest practices.
15. Clove, Nutmeg and Cinnamon - identification and description of varieties – seed collection and extraction - propagation – fertilizer application – training and pruning – pests and diseases- harvest and post harvest practices.
16. Tamarind and curry leaf - identification and description of varieties – seed collection and extraction - propagation – fertilizer - application – canopy management – pests and diseases- harvest and post harvest practices.
17. Visit to spice gardens or commodity boards and working out cost economics of spice crpops.

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ENS 201 Environmental Studies and Disaster Management (2+1)

Theory

Unit 1: Multidisciplinary nature of environmental studies Definition, scope and importance

Unit 2: Natural Resources: Renewable and non-renewable resources Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources. • Equitable use of resources for sustainable lifestyles.

Unit 3: Ecosystems • Concept of an ecosystem. • Structure and function of an ecosystem. • Producers, consumers and decomposers. • Energy flow in the ecosystem. • Ecological succession. • Food chains, food webs and ecological pyramids. • Introduction, types, characteristic features, structure and function of the following ecosystem. a. Forest ecosystem. b. Grassland ecosystem. c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 4: Biodiversity and its conservation:- Introduction, definition, genetic, species & ecosystem diversity and biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-sports of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit 5 : Environmental Pollution: Definition, cause, effects and control measures of : a. Air pollution. b. Water pollution. c. Soil pollution. d. Marine pollution. e. Noise pollution. f. Thermal pollution. g. Nuclear hazards. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies.

Unit 6: Social Issues and the Environment: From Unsustainable to Sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

Unit 7: Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health: Human Rights, Value

Education, HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health. Case Studies.

DISASTER MANAGEMENT

Unit 8: Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion.

Unit 9 : Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents.

Unit 10 : Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community - based organizations and media. Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations.

Practical

Field work: Visit to a local area to document environmental assets river/forest/grassland/hill/mountain, visit to a local polluted site -Urban/Rural/Industrial/Agricultural, study of common plants, insects, birds and study of simple ecosystems-pond, river, hill slopes, etc.

Lecture Schedule

1. Multidisciplinary nature of environmental studies - Definition, scope and importance - Natural Resources: Renewable and non-renewable resources - Natural resources and associated problems
2. Forest resources: Use and over-exploitation, deforestation, case studies - Timber extraction, mining, dams and their effects on forest and tribal people
3. Water resources: Use and over-utilization of surface and ground water - Floods, drought, conflicts over water, dams - benefits and problems
4. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies - Food resources: World food problems, changes caused by agriculture and overgrazing
5. Effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies - Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Case studies.
6. Land resources: Land as a resource, land degradation, man induced landslides - Soil erosion and desertification - Role of an individual in conservation of natural resources - Equitable use of resources for sustainable lifestyles
7. Ecosystems - Concept of an ecosystem - Structure and function of an ecosystem - Producers, consumers and decomposers - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological pyramids
8. Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem and Desert ecosystem
9. Introduction, types, characteristic features, structure and function of Aquatic ecosystems : ponds, streams, lakes - Rivers, oceans, estuaries
10. Biodiversity and its conservation - Introduction, definition, genetic, species & ecosystem diversity and biogeographical classification of India- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values
11. Biodiversity at global, National and local levels - India as a mega-diversity nation - Hotspots of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts

12. Endangered and endemic species of India - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
13. Environmental Pollution - Definition, cause, effects and control measures of Air pollution and Noise pollution
14. Definition, cause, effects and control measures of Water pollution and Soil pollution
15. Definition, cause, effects and control measures of Marine pollution, Thermal pollution and Nuclear hazards
16. Solid Waste Management: Causes, effects and control measures of urban and industrial wastes
17. **Mid Semester Examination**
18. Role of an individual in prevention of pollution - Pollution case studies - Social Issues and the Environment - From Unsustainable to Sustainable development - Urban problems related to energy
19. Water conservation, rain water harvesting, watershed management - Environmental ethics: Issues and possible solutions, climate change, global warming
20. Acid rain, ozone layer depletion, Nuclear accidents and holocaust - Wasteland reclamation- Consumerism and waste products
21. Environment Protection Act - Air (Prevention and Control of Pollution) Act - Water (Prevention and control of Pollution) Act - Wildlife Protection Act - Forest Conservation Act
22. Issues involved in enforcement of environmental legislation - Public awareness - Human Population and the Environment: Population growth, variation among nations, population explosion, Family Welfare Programme
23. Environment and human health: Human Rights, Value Education, HIV/AIDS - Women and Child Welfare - Role of Information Technology in Environment and human health - Case Studies
24. **Disaster Management -** Natural Disasters - Meaning and nature of natural disasters, their types and effects - Floods, drought
25. Cyclone, earthquakes, Landslides, avalanches
26. Volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion
27. Man Made Disasters - Nuclear disasters, chemical disasters, biological disasters, Building fire, coal fire, forest fire, oil fire
28. Air pollution, water pollution, deforestation, industrial waste water pollution
29. Road accidents, rail accidents, Air accidents, sea accidents
30. Disaster Management - Effect to migrate natural disaster at national and global levels
31. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements
32. Role of NGOs, community - based organizations and media in disaster management
33. Central, state, district and local administration in disaster management
34. Armed forces in disaster response - Disaster response; Police and other organizations.

Practical schedule

1. Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
2. Energy: Biogas production from organic wastes
3. Visit to wind mill / hydro power / solar power generation units
4. Biodiversity assessment in farming system
5. Floral and faunal diversity assessment in polluted and un polluted system
6. Visit to local polluted site-Urban/Rural/Industrial/Agricultural to study of common plants, insects and birds
7. Environmental sampling and preservation
8. Water quality analysis: pH, EC and TDS
9. Estimation of Acidity, Alkalinity
10. Estimation of water hardness

11. Estimation of DO and BOD in water samples
12. Estimation of COD in water samples
13. Enumeration of *E. coli* in water sample
14. Assessment of Suspended Particulate Matter (SPM)
15. Study of simple ecosystem – pond/river/hills
16. Visit to areas affected by natural disaster
17. **Practical Examination**

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2. Proceedings of 2nd India disaster management congress, New Delhi. Organized by National Institute of Disaster Management, New Delhi during 4 – 6, November 2009.

AMP 201 Livestock and Poultry Management (2+1)

Theory

Unit I: Introduction to Livestock Management

Significance of Livestock and Poultry in Indian Economy – Livestock and Poultry census – Different livestock development programs of Government of India and Tamil Nadu- Various systems of livestock production-extensive – semi intensive - intensive- mixed- Integrated and specialized farms.

Unit II: Dairy Cattle Management

Important White and Black cattle breeds-classification-indigenous and exotic – Breed characteristics – Breeding - Cross breeding- Upgrading - Economic traits of cattle –Culling - Estrus Cycle – Artificial Insemination – Introduction to Embryo transfer – Housing – Space requirement calf and adult stock – System and types of housing - Feeding and Management of Calf, Heifer, Pregnant, Milch animal and working animals – Nutrition – Ration – Balanced Ration - Characteristics of ration and classification of feed and fodder –Total Mixed Ration **–** composition of concentrate mixture for different stage - Milking methods - Clean milk production – Factors affecting milk composition – Common diseases of cattle – classification – symptoms - preventing and control measures.

Unit III: Sheep and Goat Management

Breeds - Sheep and goat classification –– Economic traits - system of rearing - Housing Management – Floor space requirement - Care and Management of young and adult stock – Nutrition – Feed and fodders of Small ruminants – Flushing - Common diseases – prevention and control.

Unit IV: Management of Swine

Classification of breeds – Economic traits - Housing - Nutrition – creep feeding - Care and Management of Adult and Young Stock - Common disease- prevention and control.

Unit V: Poultry Management

Classification of breeds - Commercial Strains of broilers and layers – Housing – brooding – deep litter and cage system – care and Management of broilers and layers -Nutrition of Chick, grower, Layer and broiler – Incubation and Hatching of Eggs - Common Diseases - Control and prevention.

Practical

Study of external parts of Livestock - Identification of livestock and poultry-Tattooing-ear tags-wing and leg bands-Common restraining methods-Disbudding (or) Dehorning-Different methods of castration-Dentition-Study of type design of animal and poultry houses-Selection of dairy cow and work bullock-Determination of specific gravity, fat percentage and total solids of milk- Demonstration of cream separation, - Identification of feeds and fodder- Economics Dairy, Goat and Swine farming - Study of external parts of Fowl - Preparation of Brooder House - Brooder management-Identification of layer and non layer- Debeaking, delousing and deworming of poultry-Vaccination schedule for broiler and layer-Dressing of broiler chicken - Economics of Broiler and Layer Farming - Visit to a modern Dairy and commercial layer and broiler farms - Demonstration of incubator and setter.

Lecture schedule:

1. Significance of livestock and poultry in Indian economy-livestock and poultry census. Different livestock development programmes of Government of India and Tamil Nadu - **www.indiastat.com**, Livestock census 2012, Dairying in Tamil Nadu 2014 by NDDB
2. Various systems of livestock production-extensive – semi intensive, intensive- mixed- integrated and specialized farms. -357- 396 Handbook of Animal Husbandry – ICAR
3. Definition of breed-classification of indigenous white and black cattle-breed characteristics of Tamil Nadu cattle breeds and Indian breeds -Sindhi, Gir and Sahiwal. - 1-53- Handbook of Animal Husbandry – ICAR
4. Breed-characteristics of exotic cattle -Jersey and Holstein Friesian – Indian Buffaloes- Murrah, Surti and Toda. - 1-53- Handbook of Animal Husbandry - ICAR

5. Breeding-cross breeding-upgrading-economic traits of cattle-culling importance and methods - 1-53-Handbook of Animal Husbandry – ICAR.
6. Estrous cycle – signs of estrous - artificial insemination-merits and demerits-Principles and outline of embryo transfer -722-723 Handbook of Animal Husbandry - ICAR
7. Housing management-farm site selection and floor space requirement for calves, heifer, milch animal and work bullocks. - 364-379 Handbook of Animal Husbandry – ICAR
8. Systems of housing-single row system-double row system- head to head and tail to tail-merits and demerits - Type design of house. - 364-379 Handbook of Animal Husbandry – ICAR
9. Care and management of new born calf and heifers -358-362 Handbook of Animal Husbandry – ICAR
10. Care and management of pregnant animal and lactating animals. - 362-363 Handbook of Animal Husbandry – ICAR
11. Care and management of dry cows and work bullock. - 756-757 Handbook of Animal Husbandry - ICAR
12. Nutrition-definition-ration-balanced ration-desirable characteristics of a ration. Classification of feed stuffs-concentrate and roughage-comparison, Total Mixed Ration - 395-447 Handbook of Animal Husbandry – ICAR
13. Model composition of concentrate mixture of young and adult stock-age wise feed and fodder requirement-Importance of green fodder. - 395-447 - Handbook of Animal Husbandry – ICAR
14. Milking methods-clean milk production-factors affecting milk yield and composition - 363 Handbook of Animal Husbandry – ICAR
15. Diseases-classification-viral, bacterial and metabolic-general control and preventive measures. - 448-551 Handbook of Animal Husbandry – ICAR
16. Viral diseases-foot and mouth disease, bacterial diseases, anthrax, hemorrhagic septicemia- black quarter - metabolic- tympanites, acidosis, ketosis and milk fever - 448-551 Handbook of Animal Husbandry – ICAR
17. **Mid semester examination**
18. Sheep and goat farming-classification of breeds of Indian and exotic origin – economic traits. - 54-120 Handbook of Animal Husbandry – ICAR
19. Systems of rearing-housing management - type design- floor diagram-space requirement for adult and young stock. - 101 Handbook of Animal Husbandry – ICAR
20. Care and management of ram, ewe and lamb-nutrition- feeds and fodder for small ruminants. - 99-101 Handbook of Animal Husbandry – ICAR
21. Care and management of buck, doe and kid- nutrition- flushing. -102 Handbook of Animal Husbandry – ICAR
22. Common ailments of sheep and goat-sheep pox-foot and mouth-blue tongue- PPR- enterotoxaemia-Ecto and endo parasites. - 448-551 Handbook of Animal Husbandry – ICAR
23. Swine husbandry –Common breeds of exotic origin-Large White Yorkshire, Landrace and Duroc - economic traits- housing of Swine. -256-271Handbook of Animal Husbandry – ICAR
24. Care and management of sow, boar and piglets-nutrition- creep feeding. - 256-271Handbook of Animal Husbandry – ICAR
25. Disease prevention and control of swine diseases –hog cholera, foot and mouth, ecto and endo parasites. - 448-551 Handbook of Animal Husbandry – ICAR
26. Classification of breeds - commercial strains of layer and broiler. - 206-255 Handbook of Animal Husbandry – ICAR
27. Care and management of Chicks-brooder management. - 206-255 Handbook of Animal Husbandry – ICAR
28. Systems of housing- deep litter and cage system- floor space requirement-common litter material-litter management-merits and demerits. - 206-255 Handbook of Animal Husbandry – ICAR
29. Care and management of Grower and Layers- vaccination schedule. - 206-255 Handbook of Animal Husbandry – ICAR

30. Care and management of broilers-vaccination schedule. - 206-255 Handbook of Animal Husbandry – ICAR
31. Incubation and hatching of eggs. - 206-255 Handbook of Animal Husbandry – ICAR
32. Nutrition-feed formulation-composition of chick, grower, layer broiler- starter and Finisher mashes-Feed Conversion Ratio /dozen egg or kg of meat production. - 206-255 Handbook of Animal Husbandry – ICAR
33. Classification of disease –viral – bacterial - protozoan- causative organisms, symptoms and prevention – viral diseases- Ranikhet – IBD-avian flu - 448-551 Handbook of Animal Husbandry – ICAR
34. Bacterial disease-E.coli-coryza-salmonellosis-protozoan–coccidiosis-casuative organism, symptoms and preventive measures. Management of dead birds and manure - 448-551 Handbook of Animal Husbandry - ICAR

Practical Schedule

1. Study of external parts of livestock
2. Identification of livestock and poultry
3. Common restraining methods of livestock
4. Disbudding, Dehorning, Castration and Dentition of livestock
5. Study of type design of animal and poultry houses
6. Selection of dairy cow and work bullock
7. Determination of specific gravity, fat %, total solids, solids not fat
8. Demonstration of cream separation
9. Identification of feed &fodder
10. Economics of dairy, goat and swine Farming
11. Study of external parts of fowl. Preparation of brooder house
12. Identification of layer and non- layer
13. Debeaking, delousing, deworming of poultry Vaccination schedule for broiler and layer
14. Demonstration of dressing of broiler. Economics of layer and broiler farming
15. Visit to a modern dairy and commercial layer and broiler farms
16. Demonstration of incubator and setter
17. **Practical examination**

Reference:

ICAR (2002) Hand of Animal Husbandry, ICAR, New Delhi.

E- Eeference:

1. **http://www.elearnvet.net/**
2. **http://agridr.in/expert_system/cattlebuffalo/Breeding%20management%20of%20cattle%20and%20b uffaloes-2.html**

AEC 201 Farm Management, Production and Resource Economics (1+1)

Theory

Unit 1: Production Economics and Farm Management - Nature and Scope

Meaning and concept of farm management, objectives and relationship with other sciences. Meaning and definition of farms, its types and characteristics, factors determining types and size of farms. Types of farming: Specialized, Diversified, and Mixed farming – Systems of farming: Peasant Farming, State Farming, Capitalistic, Collective and Co – operative Farming.

Unit 2: Factor – Product, Factor – Factor and Product – Product Relationships

Principles of farm management: concept of production function and its characteristics and its type, use of production function in decision-making on a farm. Factor-Product relationship. Meaning, Definition – Laws of Returns. Meaning and concept of cost, types of costs, cost curves - and their inter-relationship - shut down and break-even points, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labor income and farm business income. Economies of Scale – Economies of Size - Determination of Optimum Input and Output – Physical and Economic Optimum. Factor – Factor relationship: Least Cost Combination of inputs; Product – Product relationship: Optimum Combination of Products – Principle of Equi – Marginal Returns – Principle of Opportunity Cost and Minimum Loss Principle. Law of Comparative Advantage.

Unit 3: Farm Planning and Budgeting

Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts. Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting - linear programming, appraisal of farm resources, selection of crops and livestock's enterprises.

Unit 4: Risk and Uncertainty in Agriculture Production

Concept of risk and uncertainty occurrences in agriculture production, nature and sources of risks and their management strategies**,** Crop / livestock / machinery insurance. Weather based crop insurance - Features and determinants of compensations.

Unit 5: Resource Economics

Resource Economics: Concepts, Classification, differences between Natural Resource Economics (NRE) and agricultural economics, unique properties of natural resources. Natural Resources - Issues – Scarcity of resources – Factors mitigating scarcity – Property Rights: Common Property Resources (CPRs): meaning and characteristics of CPRs – Externalities: meaning and types - positive and negative externalities in agriculture, Inefficiency and welfare loss, solutions; Important issues in economics and management of common property resources of land, water, pasture and forest resources.

Practical

Preparation of farm layout. Determination of cost of fencing of a farm. Computation of depreciation cost of farm assets. Application of equi-marginal returns / opportunity cost principle in allocation of farm resources. Determination of most profitable level of inputs use in a farm production process. Determination of least cost combination of inputs. Selection of most profitable enterprise combination. Application of cost principles including CACP concepts in the estimation of cost of crops – Estimation of costs and returns of livestock products. Preparation of farm plan and budget, farm records and accounts and profit and loss accounts. Break – even analysis- Graphical solution to Linear Programming problem. Collection and analysis of data on various resources in India.

References

Sankayan, P.L. 1983. Introduction to Farm Management. Tata McGraw Hill Publishing Company Ltd. New Delhi.

Johl, S.S & Kapoor, T.R. 1973. Fundamentals of Farm Business Management. Kalyani Publishers. Ludhiana.

Kahlon, A.S and Singh K. 1992. Economics of Farm Management in India. Allied Publishers. New Delhi.

Doll, J.P. and F. Orazem. 1983. Theory of Production Economics with Applications to Agriculture. John Wiley, New York.

Debertin, D.L. 1986. Agricultural Production Economics. Macmillan. New York.

Heady, E.O. and H.R. Jensen. 1954. Farm Management Economics. Prentice – Hall. Englewood Cliffs.

Kay, Ronald D., and William M. Edwards, and Patricia Duffy. 2004. Farm Management. Fifth Edition. McGraw–Hill Inc. New York.

Panda, S.C. 2007. Farm Management and Agricultural Marketing. Kalyani Publishers. Ludhiana. India.

Theory lecture schedule

1. Meaning and concept of farm management, objectives and relationship with other sciences. Meaning and definition of farms, its types and characteristics, factors determining types and size of farms.
2. Types of farming: Specialized, Diversified, and Mixed farming – Systems of farming: Peasant Farming, State Farming, Capitalistic, Collective and Co – operative Farming.
3. Principles of farm management: concept of production function and its characteristics and its type, use of production function in decision-making on a farm.
4. Factor - Product relationship: Meaning, Definition – Laws of Returns: Classical production function and its characteristics.
5. Meaning and concept of cost, types of costs, cost curves - and their inter-relationship -shut down and break even points, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labor income and farm business income.
6. Economies of Scale – Economies of Size - Determination of Optimum Input and Output – Physical and Economic Optimum.
7. Factor – Factor relationship: Least Cost Combination of inputs.
8. Product – Product relationship: Optimum Combination of Products – Principle of Equi –Marginal Returns – Principle of Opportunity Cost and Minimum Loss Principle. Law of Comparative Advantage.
9. **Mid Semester Examination.**
10. Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises.
11. Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts.
12. Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting - linear programming, appraisal of farm resources, selection of crops and livestock's enterprises.
13. Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies.
14. Crop / livestock / machinery insurance. Weather based crop insurance - Features and determinants of compensations.
15. Resource Economics: Concepts, Classification, differences between Natural Resource Economics (NRE) and agricultural economics, unique properties of natural resources.

16. Natural Resources Issues – Scarcity of resources – Factors mitigating scarcity – Property Rights – Common Property Resources (CPRs): meaning and characteristics of CPRs – Externalities: meaning and types - positive and negative externalities in agriculture,
17. Inefficiency and welfare loss, solutions, Important issues in economics and management of common property resources of land, water, pasture and forest resources.

Practical Schedule

1. Preparation of farm layout. Determination of cost of fencing of a farm.
2. Computation of depreciation and cost of farm assets: Valuation of assets by different methods.
3. Application of equi - marginal returns / opportunity cost principle in allocation of farm resources.
4. Determination of most profitable level of inputs use in a farm production process.
5. Determination of least cost combination of inputs.
6. Selection of most profitable enterprise combination.
7. Application of cost principles including CACP concepts in the estimation of cost of cultivation and cost of production of agricultural crops.
8. Estimation of cost of cultivation and cost of production of perennial crops / horticultural crops.
9. Estimation of cost of returns of livestock products.
10. Preparation of farm plan and budget.
11. Farm records and accounts: Usefulness, types of farm records: farm production records and farm financial records.
12. Preparation of Cash flow statement
13. Preparation and Analysis of Net worth Statement and Profit and Loss statement
14. Estimation of Break – even analysis.
15. Graphical solution to Linear Programming problem.
16. Collection and analysis of data on various resources in India.
17. **Final Practical Examination.**

SAC 201 Soil Resource Inventory (1+1)

Theory

Unit-I

Soil Survey: Importance-Definition-Purpose of soil survey- Standard soil survey - Scope and objectives - Fundamental and Applied. Soil systematics- pedon and polypedon, control section and three dimensional nature of soil body. Soil mapping units: Soil series, soil association, soil complex, variants, inclusions and miscellaneous land types.

Unit II

Methods of soil survey: Base maps, Traversing: Grid survey and Free survey.Types of soil survey: Detailed, Reconnaissance, Detailed- Reconnaissance and Semi–Detailed soil survey. Soil mapping.

Unit-III

Soil Classification -Purpose -Early and modern systems -USDA system of soil classification and its advantages. Soil taxonomy - Diagnostic horizons: surface and sub surface-structure and differentiating characteristics and limitations. Soil orders – description. Distribution of Soil orders in world. Soils of India and Tamil Nadu.

Unit-IV

Soil survey reports - Soil Survey Interpretations - Land Capability Classification - Soil and Land Irrigability Classification - Storie Index Rating - Productivity potential - Fertility Capability Classification - Crop suitability: Field crops, horticultural crops and forest trees. Delineation of soils for fertility – Nutrient indexing. Land Use Planning concepts and objectives.

Practical

Site characteristics and Soil Profile description - Morphological study of soil profiles - Estimation of CEC in soil - Estimation of cations and free $CaCO_3$ - Study of base maps- Interpretation of soil survey data and maps - Interpretation of soil data for land capability,

crop suitability - Interpretation of soil data for fertility capability classes - Interpretation of soil data for productivity rating - Interpretation of soil data for Nutrient Indexing.

Lecture schedule

1. Soil Survey: Importance-Definition-Purpose of soil survey.
2. Standard soil survey - Its scope and objectives. Fundamental and Applied.
3. Soil systematics - pedon and polypedon, control section and three dimensional nature of soil body.
4. Soil mapping units: Soil series, soil association, soil complex, variants, inclusions and miscellaneous land types.
5. Methods of soil survey: Base maps,Traversing: Grid survey and Free survey.
6. Types of soil survey: Detailed, Reconnaissance, Detailed- Reconnaissance and Semi–Detailed soil survey. Soil mapping.
7. Soil Taxonomy – Purpose. Early and modern systems. USDA system of soil classification and its advantages.
8. **Mid semester examination.**
9. Diagnostic horizons: surface and sub surface.
10. Soil taxonomy – Structure and differentiating characters and limitations.
11. Soil orders, characteristics and their distribution in world.
12. Soils of India and Tamil Nadu.
13. Soil maps, kinds of soil maps and their preparation.
14. Interpretative groupings of soils. Land capability classification and Fertility Capability Classification.
15. Land irrigability classification, Storie index and productivity potential.

16. Land suitability classification for field crops, horticultural crops and forest trees.
17. Land Use Planning - Concepts and objectives - Tropical, subtropical and temperate regions.

Practical schedule

1. Site characteristics and Soil Profile description
2. Morphological study of soil profile 1 (Red soil)
3. Morphological study of soil profile 2 (Black soil)
4. Morphological study of soil profile 3 (Alluvial / Laterite soil)
5. Estimation of CEC in soil
6. Estimation of cations and free $CaCO_3$
7. Study of base maps- Topo sheets and cadastral maps.
8. Study of base maps- Aerial photographs or satellite imageries.
9. Interpretation of soil survey data and maps.
10. Interpretation of soil data for land capability.
11. Interpretation of soil data for crop suitability for field crops.
12. Interpretation of soil data for crop suitability for horticultural crops.
13. Interpretation of soil data for crop suitability for forest trees.
14. Interpretation of soil data for fertility capability classes.
15. Interpretation of soil data for productivity rating.
16. Interpretation of soil data for Nutrient Indexing.
17. **Practical Examination**

References

1. Buol, S.W., Hole, F.D., McCracken, R.J., (1973). Soil genesis and classification. Oxford and IBH publishing Co., New Delhi.
2. Lillesand, T.M. and Kiefer, R.W., 1987. Remote sensing and image interpretation, John Wiley and sons, inc, New York.
3. Sehgal, J.2005. Pedology concepts and applications, Kalyani Publishers, New Delhi.
4. Soil Survey Division Staff 1999. Soil Survey Manual, USDA publication.
5. Steven, M.D. and Clark, J.A. 1990. Applications of Remote Sensing in Agriculture, Cambridge University, UK.
6. USDA 1954. Diagnosis and improvements of Saline and alkali soils. (Ed) L.A.Richards. Handbook No.60. USDA Washington DC.
7. Anji Reddy, M., 2002. Remote sensing and geographical information systems, BS publication, Hyderabad.
8. Somani, L.L. and K.L.Totawat 1993. Management of Salt Affected Soils and Water.

E-references

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2. *ftp://ftp-fc.sc.egov.usda.gov/NSSC/Lab_References/SSIR_51.pdf*
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6. *en.wikipedia.org/wiki/Geographic_information_system*
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12. *www.angrau.net/BSc(Ag)CourseCurriculum.htm*
13. ww.springerlink.com/index/BJG00EL8FLNTFUNL.pdf

14. **www.eurojournals.com/ejsr_42_2_10.pdf**
15. inkinghub.elsevier.com/retrieve/pii/S0166248197800335
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18. *www-wds.worldbank.org/external/.../**INDEX**/multi_page.txt* - **Cached**
19. openaccess.icrisat.org/.../Proceedings-integrated-watershed-management-for-**land**- Asia.pdf
20. **www.springerlink.com/index/jlu87tk58363.pdf**
21. **www.buc.edu.in/sde_book/msc_**soil**.pdf**

FMP 211 FARM MACHINERY AND POWER (1+1)

THEORY

Unit I: Farm Power & IC engines

Status of Farm Power in India, Sources of Farm Power, I.C. engines, working principles of IC engines, comparison of two stroke and four stroke cycle engines , Study of different components of IC engine, I.C. engine terminology and solved problems, Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication, fuel supply.

Unit-II : Tractor & functional components

Hydraulic control system of a tractor, Familiarization with Power transmission system clutch, gear box, differential and final drive of a tractor ,Tractor types, Cost analysis of tractor power and attached implement,

Unit –III: Tillage implements

Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture.

Unit-IV: Sowing & Intercultural implements

Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples, implement for intercultural operations.

Unit-V: Plant Protection and Harvesting equipments

Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.

PRACTICALS

Study of different components of I.C. engine - To study air cleaning and cooling system of engine - Familiarization with clutch – Transmission - Differential and final drive of a tractor - Familiarization with lubrication and fuel supply system of engine - Familiarization with brake – Steering - Hydraulic control system of engine - Learning of tractor driving - Familiarization with operation of power tiller - Implements for hill agriculture - Familiarization with different types of primary and secondary tillage implements - Mould board plough - Disc plough and disc harrow -Familiarization with seed-cum- fertilizer drills their seed metering mechanism and calibration - Planters and transplanter - Familiarization with different types of sprayers and dusters –Familiarization with different inter-cultivation equipment - Familiarization with harvesting and threshing machinery.

LECTURE SCHEDULE:

1. Farm power in India - sources of farm power and their use in agriculture
2. Working principles of IC Engines-Two stroke and Four stroke engines - applications – comparison-Engine terminology.
3. Components of IC engine and systems of IC engine – air cleaning, cooling, lubricating and fuel supply systems.
4. Tractors- types - transmission system- clutch, gearbox, differential and final drive - hydraulic system.
5. Cost analysis of tractor with attached implement.
6. Tillage, objectives, types - ploughing methods. Primary tillage- mould board plough, disc plough, chisel plough and subsoil plough - components and functions, types, advantages and disadvantages
7. Secondary tillage equipment – cultivators, harrows, levelers, land forming equipment – rotovators – puddlers - manure tramplers and cage wheels, Implements for Hill agriculture.
8. Sowing methods - seed drills and planters- seed cum fertilizer drills - components and functions-Calibration.
9. Mid semester examination
10. Paddy transplanters, types, working principle, field and nursery requirements
11. Implements for intercultural operations – cultivators, sweep, junior hoe, manual weeders

and power operated weeders for wet land and garden land

12. Sprayers and their functions, classification, manually operated sprayers, terminology, Nozzle types.
13. Power operated sprayers – Tractor operated boom sprayer, Knapsack mist blower cum duster – Tall tree sprayer-dusters, types and uses.
14. Tools for horticultural crops – propagation tools, planters and harvesting tools and machinery
15. Threshing of crop, thresher and its principles of operation - threshing losses.
16. Harvesting equipment – reapers - mowers and combine harvesters – types, construction and operation-Balers.
17. Harvesting machinery for groundnut, tuber crops, Cotton and sugarcane

PRACTICAL SCHEDULE:

1. Study of working of two and four stroke IC engines and their systems with solved problems.
2. Study of Tractor clutch, gearbox, differential and final drive. Study of brake steering, and hydraulic control.
3. Learning driving of tractor and power tiller
4. Study of tractors and power tillers – their operation and maintenance
5. Study of mould board plough, - methods of ploughing- with solved problems.
6. Disc plough and subsoiler and their components- Hitching and adjustment of plough - field operation of different tractor drawn primary tillage machinery.
7. Study of cultivator, disc harrows, Rotavator, bund former, ridger, leveller and puddling implements and their operation.
8. Study of seed drills, planters and seed-cum-fertilizer drills and their components and metering mechanisms - calibration- simple problems on calibration.
9. Study and operation of machinery for rice cultivation - puddling implements- rotary puddlers and cage wheels, tray seeder for rice nursery, transplanters- types operation and maintenance- Drum seeder, conoweeder, power weeder and finger type weeder.
10. Study of different inter-cultivation equipment for uplands - manual, animal drawn, power operated - tractor and power tiller operated - field operation
11. Study of plant protection equipment – manually operated sprayers and dusters, knapsack mist blower cum duster, tractor operated sprayers- their operation, adjustment, calibration and safety requirements
12. Study of tools for Hill agriculture and horticultural crops – propagation tools, vegetable transplanter, harvesting tools -lawn mower, hole diggers, tree climber, shredders for crop residue.
13. Threshing machinery for paddy and identification of its components- different threshing drums - calculation of efficiency and losses.
14. Study of paddy reaper and paddy combine- their systems, method of operation and adjustment.
15. Study of harvesters for root crops - turmeric and tapioca and groundnut diggers
16. Problems on cost of operation of tractor operated machinery.
17. Final practical examination

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2. Ojha, T. P. and Michael, A.M. **Principles of Agricultural Engineering**. Vol. I, Jain

   Brothers, 16/893, East Park Road, Karol Bagh, New Delhi – 110005

3. S.C.Jain and C.R.Rai. **Farm Tractor – Maintenance and Repair**. Standard Publishers, 1705-B, Nai Sarak, Delhi – 110006
4. Senthilkumar, T., R. Kavitha and V.M.Duraisamy 2015. **A Text Book of Farm Machinery**, Thannambikkai Publications, Coimbatore . ISBN: 978-9381102305

E- RESOURCES:

www.agricoop.nic.in/dacdivision/Machinery1/directory.htm
www.farmmachineryshow.org
http://www.hillagric.ac.in/edu/coa/agengg/lecture/243/agriengg-243.htm
http://www.digitalbookindex.org/subject_search/search010agricultureequipmenta
http://ecoursesonline.iasri.res.in/course/view.php?id=540

AGR 202 Study Tour (0+1)

The students will undertake the short tour during third semester for seven days covering KVK's, Research stations, Sister campuses and ICAR institutes in the southern part of Tamil Nadu. The study tour will provide an exposure to the students to know about the soil, climatic conditions and cropping patterns in the respective agro-climatic zones. The students will also have first-hand information on latest technologies on various crops and allied activities.