P.G. DIPLOMA IN SERICULTURE

APPROVED SYLLABUS (FOR CONFIRMATION BY CIRCULATION)

SEMISTER	SUBJECT	MAXIMUM MARKS & PPW			Hours	Total	Duration of Examination	
		Theory	Hours	Practical			Theory	Practical
SEMISTER – I								
PAPER – I	General Sericulture	90	4 Hrs.	80			3Hrs	--
PAPER – II	Sericulture Botany	90	4 Hrs.	80	6 Hrs.		3Hrs	3 Hrs.
PAPER – III	Mulberry Agronomy	90	4 Hrs.	80	6 Hrs.		3Hrs	3 Hrs.
PAPER – IV	Silkworm, genetics, Breeding and physiology	90	4 Hrs.	80	6 Hrs.		3Hrs	3 Hrs.
						360+240=600		
SEMESTER – II								
PAPER – V	Silkworm Rearing Technology	90	4 Hrs.	80	6 Hrs.		3Hrs	3 Hrs.
PAPER – VI	Seed Technology & Silkworm pathology	90	4 Hrs.	80	6 Hrs.		3Hrs	3 Hrs.
PAPER – VII	Silk Reeling Technology	90	4 Hrs.	80	6 Hrs.		3Hrs	3 Hrs.
PAPER – VIII	Organisation, Extension and Management	90	4 Hrs.		--	360+240=600		
		720		**480**		**1200**		

SERICULTURE

SEMESTER– I

THEORY

PAPER – I GENERAL SERICULTURE **Hours: 35**

1. History of Sericulture.
2. Types of Silkworms, Distribution in India and other countries.
3. Production of mulberry and non-mulberry silk in India and other countries. Comp. Production efficiencies.
4. Sericulture organization in India – Administrative set up – Research and training set up – Seed production – Cocoon production and Marketing of cocoon and silk – Reeling and Weaving sectors – Exports and imports – Tariff protection.
5. Sericulture through five year Plans.
6. Sericulture as rural industry – Employment Potentiality – Comparison with other rural industries.
7. Action plans for development of Sericulture through five years plan – World Bank Projects – Indo-Swiss projects.
8. Sericulture Research in India and its impact and also research being carried out in the universities.

PAPER – II SERICULTURE BOTANY Hours: 45

1. History, Origin and geographical distribution of mulberry, its taxonomy, species, varieties cultivated in India and abroad and the climatic conditions required.
2. Morphology, description of stem, phyllotaxy and anatomy of leaf and petiole, types of leaves with regard to hair, cystolith in relation to worm preference, variation and quality and quantity of leaves in various econones.
3. Asexual reproduction. Cuttings and grafts and their plantation maintenance in nurseries under rain-fed and irrigation conditions.
4. Sexual reproduction – micro and macro sprogenesis. Pollination biology including pollination techniques (hybridization incompatability, heterocysis and its utilization.
5. Cytology, cytogenetics, genetics, polyploidy, mutation breeding and selection of elite races.
6. Physiology of biomass, productivity with reference to leaf yield.
7. Phytohormones, their role in Vegetative propagation (rooting) physiology of bud, role of foliar nutrition in leaf quality.

PATHOLOGY:

8. Diseases of mulberry caused by fungi, bacteria, viruses and mycoplasma – their prevention and control.
9. Pests of mulberry and their control.
10.

PAPER – II PRACTICALS Hours : 20x2=40

1. Taxonomy of mulberry with reference to various species and varieties grown in India and their identification.
2. Morphology of mulberry plant with reference to various vegetative and floral parts.
3. Anatomy of stem, root, leaf, petiole and bud including leaf epidermis (Stomata and hairs).
4. Propagation methods with reference to cuttings, grafts and layering.
5. Identification of weeds of mulberry in nurseries and field.
6. Reproduction biology, flower structure, embryology, pollen sterility/viability.
7. Hybridization techniques of mulberry.
8. Cytology of roots, anthers and callus.
9. Diseases and pests of mulberry.

PAPER – III MULBERRY AGRONOMY **Hours: 45**

1. Influence of environmental factors on growth of mulberry.

   A. Soil: Soil types, texture, porosity, soil water content organic matter, PH, utilization of slopy and other unsuitable lands for mulberry cultivation. Soil microorganisms in relation to mulberry plants.

   B. Mineral nutrition - Role of micro and. macro nutrients, their effects, deficiencies and symptoms.

   C. Climatic: Temperature, relative humidity, Light.

2. Mulberry cultivation in rainfed and irrigated conditions with reference to various varieties.

   a) Nursery requirements and establishments.

   b) Preparation of land, manuring, organic and green manures

   c) Planting systems, spacing and its. Importance in relation to productivity.

3. Irrigations:

   a) Water sources, principles and methods of irrigation water requirements of mulberry.

   b) Inter cultivation its significance inter cultural operation.

   c) Weeds in fields of importance weedicides.

4. Prunning and training methods and frequency of prunning,

5. a) Leaf harvest, methods of transportation of leaf.
   b) Leaf storage methods.

6. a) Fertilizers: types, composition, applications, fertilizers requirements for different regions in India.

   b) Bio fertilizers and mulberry productivity.

7. Farm management, different farming systems, labour management, and maintenance of field records.

8. Economics of leaf production.

PAPER – III PRACTICALS **Hours : 24x2 =48**

1. Identification and use of implements required for mulberry cultivation.
2. Methods of soil sampling for nutrient analysis and determination of total salts.
3. Preparation of mulberry nurseries.
4. Methods of planting mulberry under rainfed and irrigated condition.
5. Irrigation, methods, water requirements of mulberry.
6. Prunning methods followed in India.
7. Harvesting methods, Estimation of leaf production, Farm records and their maintenance. Manures and fertilizers, their identification, Dosage application and calculation to a given area-of plantation.
8. Evaluation of chemicals in plant protection.

PAPER – IV SILKWORM GENETICS, BREEDING AND PHYSIOLOGY: Hours: 58

Part – Silkworm Genetics:

1. Heredity and environment – Effects of environment on genetics characters of silkworm.
2. Genetics of larval markings and cocoon colour – Inheritance of voltinisim and moultinism – maternal inheritance, multiple allele and pleiotropism in silkworm.
3. Chromosome numbers in different silkworms – Hereditary traits in silkworm egg, larva, pupa and moth.
4. Sex limited characters – Chromosomal aberrations – Nature of Polyploids.

Part – B Silkworm Breedings:

5. Silkworm races – Univoltine, bivoltine, multivoltinc, Japanese, Chinese and European and Indian races.
6. Breeding of silkworms – Prerequisite for breeding.
7. Selection – Criteria for selection – Methods of selection – Individual and batch selection.
8. Inbreeding – Advantages and disadvantages – Heterosis – Advantage of hybrids – single and polyhybrids – interspecific hybrids in non-mulberry silkworm – selection and evaluation of breeds and hybrids.
9. Maintenance of races – Basic seed maintenance.

Part – C PHYSIOLOGY:

1. Classification of insects with special reference to the order Lepidoptera – Systematic position of silkworm.
2. Life cycle of different types of silkworm mulberry, Tassar, Eri and Muga.
3. Morphology – Silkworm egg, larva, pupa and moth.
4. Silkworm nutrition in relation to silkworm crop and cocoon quality chemical composition of feed- mulberry leaf – major nutrients – Artificial diet.
5. Digestive system – Food ingestion, digestion and assimilation. Relationship with quality of feed.
6. Circulation and Respiration in Silkworm and adult

7. Excretion – Problems of urination and silkworm crop.
8. Moulting in silkworm – Factors of influence on moulting – Neuro endocrime regulation, voltnism – Factors influencing voltinism.

9. Silk glands – Structure and Biosynthesis of silk – other secretory glands, physical properties of silk.
10. Growth studies – Growth index-Relationship between body weight, silk gland weight and productivity – Factors influencing growth index in silkworm.
11. Reproduction and development – oogenesis, spermatogenesis, fertilization – embryogenesis, organogenesis – critical stages of development - Metamorphosis

PAPER – IV PRACTICALS **Hours: 23x2=46.**

1. Morphology – silkworm egg, larva, pupa and moth.
2. Mulberry and non-mulberry silkworms – comparative study at egg. larva, pupa and moth stage.
3. Anatomy – digestive system – silk glands tracheal system – nervous system – reproductive system – excretory system whole mounts.
4. Head– larval mouth parts – spinneret – gonad – spiracle – ocellii.
5. Embryology – identification of different stages in development, mounting of embryo.
6. Quality test of cocoons for breedings.
7. Observation of different races.

SEMESTER– II

PAPER – V SILKWORM REARING TECHNOLOGY: **Hours: 35**

1. Rearing houses – basic requirements – orientation – different designs – utilization of locally available materials – viny1 sheds, tile –roofed, thatched sheds, mud houses and double walled rearing house.
2. Rearing equipment different types and modification.
3. Preparation of rearing – cleaning and disinfection – types of disinfections and maintenance of hygienic conditions.
4. Environmental conditions required for rearing – methods to control temperature and humidity to suit the different stages/seasons.
5. Incubation – hatching – different methods of brushing young age silkworm rearing – methods of rearing – feed for young age worms- moulting – cleaning and spacing – organization and cooperative chawki rearing centers.
6. Rearing late age silkworms-- environment - rearing methods - leaf preservation – spacing, moulting, cleaning.
7. Mounting and spinning - methods of mounting - different types of mountages - mountages from locally available materials -harvesting, cleaning, of cocoons and marketing
8. Rearing management to suit different seasons, "seed crop and industrial rearing - modification for semi-arid and humid tropics.
9. Assessment of quality of cocoons - maintenance of records, cost of production etc.

PAPER – V PRACTICALS **Hours : 22x2=44**

1. Model rearing house - plan.
2. Rearing equipment – rearing stands, Trays -, chop sticks, ant wells, chopping knives - Chopping board - Feeding stand foam pads - basin stand - feather - paraffin paper – hygrometer and mountages etc.

3. Disinfection of the rearing rooms and appliances - spraying and fumigation - materials required.
4. Brushing -. Methods of brushing - rearing young age worms, feeding, cleaning and spacing schedule for chawki silkworm rearing.
5. Leaf preservation for silk worm rearing.
6. Rearing late instars larvae – feeding, Cleaning, and spacing – temperature, humidity, requirements -. Schedules for rearing of late age silkworms.
7. Mounting Different-types of mountages – methods of mounting
8. Harvesting and cocoon assessment
9. Maintenance of records for rearing silkworms.
10. Individual rearing and mass rearing.

PAPER-VI SEED TECHNOLOGY AND SILKWORM PATHOLOGY Hours :40

PART- A Seed Technology:

1. **Grainage and seed production**.

Model grainage – Equipments for grainage – Selection of seed cocoons – preservation of seed cocoons – Sex separation of pupae for hybrid preparation – Maintenance of temperation and humidity.

Moth emergence – Planned programme of hybridization – methodology to identify male and female moths – coupling – duration of coupling and its importance on fertility – refrigeration of male moth – temperature and humidity for preservation – egg laying – moth examination – disinfection of eggs – packing of eggs in boxes – preparation of loose and sheet eggs – transportation of eggs.

Importance of Individual moth examination in pure races – identification of pebrine, flacheria muscardine and grasserie and poor layings in industrial grainages – sampling of moth examination in industrial grainages.

2 Hibernation of silkworm eggs.

Hibernation schedules – importance of temperature and humidity in hibernation.

3 Acid treatment of silk worm eggs.

Diapause of silkworm eggs – various schedules of acid treatment – preservation of eggs.

4 Incubation of eggs.

Incubation of eggs – conditions necessary for ideal incubation and hatching.

5 Economics of seed production.

Equipments for preparation of economically viable unit of ideal grainage – requirement of seed cocoons – ratio of seed cocoon to DFLS, manpower requirement

of grainage – cost of seed cocoon's – cost of seed production – economics of preparation of disease free layings.

6 Seed organisation.

Seed areas and their importance – supply of basic seed p3, p2, p1 – organisation of seed supply to the seed areas – seed Act – Care and precautions to be taken in seed areas – extension and its importance – marketing of seed cocoons.

Part – B. Silkworm pathology:

7 Insect pathology – diseases of silkworm – classification.

8 Pebrine (Protozoan disease) – causal agent – mode of infection – symptoms – prevention and control.

9 Bacterial diseases of digestive organs – septicemia – sotto disease – rangi disease (court) – causal agents – infection – symptoms – prevention and control.

10 Viral diseases – grasserie or nuclear polyhedrosis – cytoplasmic polyhedrosis, IFV, Causal agents, symptoms – prevention and control.

11 Fungal diseases – muscardine – aspergillus disease – causal agents symptoms – prevention and control.

PART – C ENTOMOLOGY

12. Insect pests of silkworms – Indian uzi fly pest – Tricholyga bombycis – Japanese uzifly – stored cocoons pest dermestid beetles – nature and extent of damage – control measures.

PAPER-VI PRACTICALS: **Hours : 27x2=54**

Part – A. Seed Technology

1. Plan of Grainage.
2. Grainage equipments – cocoon storage articles – microscopes – incubation – moth crushing unit – cocoon cutting machine trays – coupling trays – acid treatment equipment.
3. Selection of seed cocoons.
4. Storage, handling and protection of seed cocoons – temperature and humidity requirements during storage.
5. Identification of male and female pupae.
6. Moth emergence, time of emergence, identification of male and female moths – handling and protection.
7. Synchronization of emergence – refrigeration of cocoons and moths.
8. Pairing – depairing – preparation of egg sheets /loose eggs – pure lines and hybrids – hibernating and non-hybernating eggs.
9. Moth examination – Purpose and observations.
10. Disinfection and washing of layings.
11. Acid treatment of eggs.
12. Preservation and refrigeration of laying – necessity of cold storage – time of releasing etc.
13. Hibernation schedule
14. Incubation of laying.

Part – B. Silkworm Pathology:

15. Pathogens causing pebrine and flacherie in silkworm
16. Fungal disease in silkworm – morphology and methods of infection – control

measures.

17. Viral diseases – external symptoms and microscopic test.
18. Collection and identification of insect pests.

PAPER VII SILK REELING TECHNOLOGY Hours :45

1. Introduction – Evolution of silk reeling – importance of reeling industry – interdependence with other branches of sericulture industry – main problems of the reeling industry.
2. Raw materials – cocoons – patterns of production in various states/ seasons – quality of production in different seasons – characterization of cocoons, defective cocoons – causes – cocoon testing and grading – methods adopted in Japan – marketing organization – present position – marketing of cocoons in Japan – Kakeme system – transportation of cocoons – care of cocoons.
3. Stifling: drying and conditioning – object – equipments and methods vogue in India and in sericulturally advanced countries like Japan.
4. Storage and preservation of cocoons – types of building, equipments, methods of storing – problems – care in different seasons sorting – selection of cocoons for reeling.
5. Reeling: How it differs from spinning – Charka – cottage basins and filature systems of reeling-floating and sunken system reeling – open pan three pan and pressurised cooking, recent advances in reeling industry – multi end basins – semi automatic reeling – planning and organization – modern filatures – various sections – cocoon stifling – drying – storage – sorting – soaking object of cooking – sericin behaviour – impact of water in cooking reeling – rereeling – raw silk examination – cleaning – lacing – skeining – book making – baling.
6. Raw silk: Properties and uses of raw silk, how silk differs from other natural and synthetic fibres – testing and grading of raw silk – international standards – ISI – silk conditioning and purpose – equipments – standard methods of testing and grading – silk exchange – marketing of raw silk.
7. Bye products: Silkwaste – pupa – different types of silkwaste produced – India spun

silk industry.

PAPER VII PRACTICALS: Hours: 36X2=72

1. Cocoon testing and estimation of renditta.
   a) Silk Content
   b) Filament length and denier
   c) Reelability percentage
   d) Defective cocoon percentage
   e) Calculated renditta
2. Reeling technique and cocoon cooking.
   a) Open pan system
   b) Three pan system
   c) Pressurised cooking system
3. Reeling – Different sizes – effect of speed on production – renditta and quality – size test – denier – count.
4. Silk re-reeling – lacing – skeining- book making
5. Spinning.
   a) Spinning of plerced/cut cocoons
   b) Degumming.
   c) Spinning on pedal wheels
6. Machinery studies – drawings – neat sketches and noting speicfications of each functional part.
7. Identification of textile fibres by burning – solubility and stain tests for silk, polyester, polyamids and cellulosic fibre.

PAPER – VIII. ORGANISATION, EXTENSION AND MANAGEMENT.

Part – A Organization:

1. Organization of sericulture co-operatives – Incentives and controls – Management for effective participation of farmers and beneficiaries.
2. Organization of seed areas – Grainages – Reeling Industry – Machinery for quality control and regular review of requirements breeds and seeds etc.
3. Marketing – Stabilization of prices – Regulated and co-operative markets.

Part-B Extension:

4. Extension methods – Criteria for setting up extension units – Demonstration and training to the farmers.
5. Organization of technical man power – labour management – Mulberry planting material & Silk worm eggs.

Part – C Project formulation and Management.

6. Cost of production of mulberry leaf – cocoons – Reeled silk – cost control – cost reduction – Bye products – export of silk goods – economics of mulberry sericulture in General.
7. Financing agencies – Rural indebtedness – Remedies, subsidies Bank financing system – Crop insurance and its scope.
8. Survey – Object of survey – Existence of sericulture in the Districts of A.P. State – Socio-Economic conditions of people Agricultural crops – Profitability.
9. Project – Object – Present condition of infrastructure availability management – staff requirement – training programme – extension facilities – man power utilization – future programme – preparation of a project report.

10. Farm Management – Different farming system – Labour management equipment for establishing and maintaining large scale farm economics of production – Maintenance of field records.

PRACTICAL TRAINING:

Three Months intensive practical training in seed production, farm management and extension. Based on an assessment certificates on the sericulture officer and project report, marks will be awarded.