REVISED SYLLABUS

FOR THREE YEARS B.Sc. (MAJOR) COURSE

IN

SERICULTURE
According to the New Examination Pattern
Part – I, Part- II & Part- III

WITH EFFECT FROM THE SESSION
2009 – 2010
University of Kalyani
Revised Syllabus of Sericulture (Major Course)
(w.e.f. the session 2009-2010)

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| Paper- IV | Practical \((M - 9)\) |

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Group-B : Silkworm seed Technology \((M - 13)\) |
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| Paper- VII | Practical \((M - 17)\) |
| Paper- VIII | Entrepreneurship Development Group-A \((M - 19)\)  
Group-B \((M - 22)\) |
PART - I

Paper - I

Full Marks – 100

Group – A : General Sericulture

50 Marks

No. of Lectures

1. Introduction to Sericulture, scope 1

2. Origin and history of Sericulture, silk route 2

3. World output of silk, other natural fibres and man made fibres.
   Importance of natural fibres vis-à-vis man made fibres – Role of silk fibres amongst natural fibres. 2

4. Silk industry in the World - Silk industry in China, Japan, South Korea, North Korea, India, USSR, France, Italy, Brazil, Thailand, Iran, Sri Lanka, Bangladesh, Pakistan and other countries 3

5. Silk industry in India, West Bengal, Jammu & Kashmir, Karnataka, Tamil Nadu, Andhra Pradesh and other states (Mulberry and non-Mulberry Sericulture). Mulberry area Cocoon production, silk production, Number of reeling units (Charka, Cottage, Basin, Filature basin, Handlooms and Powerlooms. 4

6. Prospects and problems of Sericulture. Qualities of different types of Textile fibres - Advantages of silk fibres over other fibres – International demand for silk – constraints in silk production like labour, land, environmental conditions, skill and production cost. 4

7. Organisation of Sericulture industry in India – Government of India – Central Silk Board – State Departments of Sericulture 4

8. Mulberry silkworm and its food plants – Mulberry sericulture – Silkworm races Classification of Mulberry silkworm on the basis of its origin and voltinism. 4


   Brief account of :
   a) Tasar food plants
   b) Muga food plants
   c) Eri food plants

   Types of cocoon and silk produced by them 5

10. Outline of different reeling machineries and reeling process. History of Reeling Industry- Charka- Cottage basin- Filature basin- Multi end basin Semiautomatic and Automatic reeling machinery - Different types of cocoon stifling – Different types of cocoon cooking – Principles of reeling, reeling process. 4

12. Employment Generation 0.4 hectare under rainfed and Irrigated Mulberry
   i) Direct a) Up to Raw silk
      b) Up to Fabric production
   ii) Indirect a) Marketing
       b) Materials and Machinery Manufacturing

13. Seed organization - Need for seed organization - seed cocoon production at different levels- Silkworm egg production. a) Pure  b) Hybrid

14. Twisting and weaving - Twisting machinery and processing – Handloom Weaving (Different types) Power loom weaving (Different types) printing - Dyeing Calendering and Finishing.

15. Utilization of by products and Seri wastes.


**Group – B : Biology of Silkworm and Silkworm rearing Technology 50 Marks**

**Silkworm Biology**


2. Life history of *Bombyx mori* - morphology of egg, larva, pupa and adult

3. Morphology and anatomy of following organ systems of silkworm
   a) Digestive including mouth parts
   b) Reproductive
   c) Excretory
   d) Nervous system


6. Silkmoth metamorphosis – hormonal control


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<tr>
<th><strong>Rearing Technology</strong></th>
<th>No. of Lectures</th>
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<tbody>
<tr>
<td>10. Rearing appliances – design and cost requirements of caring appliances for 100 dfls.</td>
<td>1</td>
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<tr>
<td>12. Selection of silkworm races/breeds for rearing – advantages and disadvantages of bivoltine, multivoltine and their hybrids.</td>
<td>2</td>
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<tr>
<td>17. Chawki rearing – importance-environmental conditions required -leaf requirement- selection of different chawki - use of nets and feeding schedules - spacing- chawki rearing centers- labour requirements.</td>
<td>2</td>
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<tr>
<td>18. Moulting – symptom – care during pre moulting – moulting and post moulting periods.</td>
<td>2</td>
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<td>19. Late age rearing, spacing– leaf requirement-environmental conditions required – frequency of feeding - bed cleaning schedule.</td>
<td>2</td>
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<tr>
<td>21. Preparation of moulting – methods- manual, shelf and jebrai methods - advantages and disadvantages - types of mountages – bamboo, plastic, revolving and rotary collapsible brush mountages - advantages and disadvantages of their use, spinning – environmental conditions required for spinning.</td>
<td>3</td>
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<tr>
<td>22. Harvesting of cocoons – time harvesting – hybrid crop of cocoons – preservation and transportation of cocoons.</td>
<td>2</td>
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<tr>
<td>23. Mountages: Different types and its advantages.</td>
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<td>24. Cocoon assessment – significance – cost of cocoon production cocoon ratio - maintenance of rearing records.</td>
<td>2</td>
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</tbody>
</table>
A. General Sericulture : (Marks 25)

1. Sericulture maps -
   a) World map of silk road
   b) India

2. Organisation set up in India –
   a) Government of India
   b) Fire traditional states -
      Karnataka, Andhra Pradesh,
      Tamil Nadu, West Bengal,

3. Identification and study of sericulture production :
   a) Cotton and silk yarn types
   b) Pupae
   c) Silk waste
   d) Spun yarn
   e) Nail yarn
   f) Other byproducts

4. Preparation of Histograms on World output :
   a) of silk and other textile fibre
   b) World output of silk fibre of different countries

5. Preparation of line graph on trend of silk yarn and other textile fibre production over a period of 10 years.
   a) Pie-chart on output of different types of silk production in India
   b) Pie-chart on Mulberry silk production in different States.

B. Silkworm Biology : (Marks 25)

6. Morphology :
   a) Mouth parts of silkworm
   b) External morphology of larva, pupa and moth
   c) Sex separation of larva, pupa and moth

7. Anatomy :
   Digestives system, silk gland, nervous system, reproductive system of silkworm.

8. Cocoon characters of uni, bi and multivoltine races.


C. Rearing Technology : (Marks 25)


12. Incubation of silkworm eggs – black boxing and hatching, recording temperature and humidity.


D. Viva – Voce : (Marks 15)

E. Laboratory note book : (Marks 10)
PART - II

Parer - III

Full Marks - 100

Question no. 1 of 10 marks, short/ objective type is compulsory. Answer any six questions from the rest, taking at least one from each unit not more than two from each unit.


Unit – I : Soil Science

1. Soil Formation-an interactive influence of soil forming factors; and soil profile development.  
2. Different types of soil – basics of soil classification
3. Physical properties of soil
   i) Volume constitution of soil
   ii) Soil texture – a) Soil separates b) Soil textural Classes
   iii) Soil Structure- a) Type b)Importance c) Ways to improve soil structures
   iv) Soil colour
   v) Soil permeability- a)Soil bulk and particle density b) soil porosity c) permeability
      As related to soil texture and structure.
   vi) Soil air.
4. Soil Water:
   i) Importance of water
   ii) Physical and biological classification of soil water
   iii) Soil moisture content and their measurement
   iv) Soil moisture calculation relating to irrigation schedule
   v) Forms of soil water mulberry growth
   vi) Water requirements of mulberry
   vii) Factors affecting soil water holding capacity including capillary rise and leaching
   viii) Soil water conservation and management.
5. Soil organic matter:
   i) Soil organic and chemical nature of its constituents.
   ii) Importance of soil organic matter
   iii) Carbon : Nitrogen ration of organic matter and its significance
   iv) Soil micro organism : Types role in mineral nutrition.
6. Mulberry growth and nutrition:
   i) Elements (nutrients) essential for plant growth and their classification
   ii) Forms of elements taken up by plants, their absorption and utilization
   iii) Sources of nutrient elements in the soil
   iv) Role of essential elements in plant growth
   v) Deficiencies/ and toxicity
7. Importance of soil types of India related to mulberry cultivation
   i) Alluvial soils
   ii) Black soils
   iii) Red soils
   iv) Laterites and lateritic soils
8. Soil testing for various chemical and physical properties.
Unit -II  Biology of Mulberry  25 Marks

9. Biology of mulberry
   i) Taxonomy of mulberry and popular mulberry cultivars
   ii) Morphology and anatomy of mulberry (stem, root and leaf)
   iii) An outline of floral biology of mulberry: flower, fruit and seed development

10. Different Agro climates of mulberry

11. Propagation of mulberry
   i) Seedlings : Collection of viable seeds, methods of raising seedlings variability.
   ii) Saplings : Selection of material for cuttings and its anatomical and physiological criteria : preparation and selection of cuttings
   iii) Grafting: Selection of stock and scion materials and their anatomical and physiological criteria: Types of grafting- Stem, Root and bud grafting techniques.
   iv) Layering: Types and techniques
   v) Raising of nursery: preparation, layout, bed size, soil composition, importance of drainage.
   vi) Use of growth regulators in mulberry propagation

12. Establishment of mulberry gardens:
   i) Strategies of long term basis: Intensive cultivation for high leaf productivity and quality
   ii) Cropping patterns : mono crop and mixed crop
   iii) Selection and preparation of site
   iv) Selection of varieties for cultivation
   v) Different planting materials and their practical relevance in various agro climate conditions
   vi) Planning systems : advantages and disadvantages and recommended systems.
   vii) Spacing of mulberry and its significance in leaf productivity and quality under various field conditions.
   viii) Time and type of initial harvests and their effect on the young plant
   ix) Measures to promote development of root system and long term significance

13. Mulberry cultivation practices: (under irrigated and dry land conditions)
   i) Irrigation :
      a) Water requirement of mulberry in different field situations and seasons
      b) Water resources, irrigation systems (surface, sub soil, sprinkler and drip systems) and their practical relevance
      c) Water quality and its effects on soil productivity
      d) Periodicity and quantity of irrigation
      e) Over irrigation and its effects
      f) Drainage: Methods and importance
      g) Sewage water irrigation and its effects. Treatment for irrigation
   ii) Water management practices in dry land mulberry:
      a) Land leveling, bunding, contour bunding. In situ moisture conservation practices and rain water re-cycling.
      b) Mulching: Purpose, methods(surface and sub-soil mulching). Mulching materials and cost effectiveness.
   iii) Manures and their applications:
      a) Basic approaches in mulberry cultivation
      b) Natural farming and vermiculture
d) Biofertilizers: Types, importance, application methods and limitations.


f) Foliar nutrition: Foliar nutrients and commercial formulations, scope and limitations.

iv) Inter-cultivation practice: Purpose, methods, time and frequency.

v) Common weeds of mulberry, their effect on mulberry, productivity and quality and control measures.

vi) Pruning and training objectives: Types and methods of pruning and importance, utility of mulberry pruning in sericulture management practices.


viii) The schedules of package of practices of mulberry cultivation.
   a) Irrigated gardens
   b) Rain fed gardens

14. Mulberry Management:

   a) Significant of ‘leaf cocoon ratio’ concept
   b) Measures of the maintenance of high soil productivity
   c) Exclusive mulberry garden for chawki rearing: concept and methods.
   d) Maintenance of mulberry plots in relation to rearing schedules
   e) Requirements, organization and management of labour
   f) Maintenance of farm records and their relevance
   g) Farm implements and machinery

Group – B: Diseases and pests of mulberry & Silkworm

Unit – III: Diseases and pests of Mulberry

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<th>Description</th>
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<tr>
<td>1.</td>
<td>Concept of plant diseases and importance of plant protection</td>
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<td>2.</td>
<td>Classification of diseases of mulberry</td>
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<td>3.</td>
<td>Influence of biotic and abiotic factors on the incidence of mulberry diseases</td>
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<td>4.</td>
<td>Fungal diseases of mulberry, occurrence, symptoms, epidemiology and control</td>
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<td>5.</td>
<td>Minor diseases of mulberry, occurrence, symptoms, epidemiology and control</td>
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   a) Leaf spot
   b) Leaf rust
   c) Powdery mildew
   d) Leaf blight
   e) Root rot

6. Bacterial- viral ad mycoplasmal diseases of mulberry control measures. 2
7. Root knot nematode diseases of mulberry – its occurrence, symptoms and controls. 2

8. Mineral deficiency symptoms in mulberry reclamation. 3

9. Mulberry pests: Classification, life cycle, symptoms of attack, period of occurrence and types of damage caused by caterpillars and grasshoppers. Mealy bugs and scale insect, Wasps and jassids, borers and defoliators and Termites, mites and slugs. 5

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### Unit – IV : Diseases and pests of Silkworm

25 Marks


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12. protozoon disease and pebrino - symptomology, structure and life history of Nosema bombycis- sources and mode of infection- prevention and control.  

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13. Bacterial diseases flacherie - symptoms of different types flacherie disease - causative agents, factors influencing Flacherie, sources and mode of infection - prevention and control.  

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14. Viral diseases- grasserie- symptoms of different types of viral diseases, causative agents, structure and life cycle of NPV, CPV - Kenchu & DNV viruses, sources and mode of infection, protection and control.  

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15. Fungal diseases- Muscardine-symptoms of different types of fungal diseases - causative agents, structure and life cycle of Beauvaria , mode of infection, prevention and control.  

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17. General account of disinfection and relative efficiencies of different disinfectants.  

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18. Silkworm pests : Life cycle of tachinid fly-Nature of damage, alternate host and other important behaviors in relation to mating, oviposition and flight, prevention, chemical control (ovicidal and chemical attractants), useful natural enemies of Tachinid flies, integrated management against tachinid fly, dermestid beetles : biology, prevention and control . Nature of damage, Prevention and control of other pests like ants, rodents and lizards.  

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Paper - IV (Practical)  
Full Marks – 100

Unit – I : Soil Science  
20 Marks

1. Study of different types of soil
2. Soil Sampling
3. Determination of saturation capacity of soil
4. Soil analysis for pH and electrical conductivity
5. Determination of organic carbon by colorimetric method
6. Determination of available nitrogen by alkaline permanganate method
7. Determination of available phosphorus
8. Determination of available potassium
9. Visit to a soil testing laboratory
10. Visit to a Watershed

Unit – II : Biology of Mulberry  
20 Marks

1. Morphology and anatomy of few important mulberry cultivars.
2. Propagation methods :
   a) Preparation of nursery beds
   b) Collection of fruits and separation of viable seeds, seed sowing, seed Bed maintenance and rising of seedlings.
   c) Selection of materials for cutting, preparation and selection of cuttings, Planting and raising of saplings in nursery beds and polythene bags, Selector and grading of saplings.
   d) Preparation of various types of grafts and their maintenance.
   e) Simple, air and trench layering techniques.
3. Farm implants and machinery
4. Preparatory practices for mulberry establishment.
5. Pit system and row system of planting
6. Different forms of mulberry training and methods of irrigation (Demonstration)
7. Identification of different types of fertilizers, Calculation of doses (Excercise)
8. Preparation of compost
9. Mulching practices and in situ moisture conservation practices
10. Identification of common weeds of mulberry and weeding
12. Preparation of various formals for maintenance of farm records(Exercise)
13. Preparation of flow chart of Annual schedules of operations for 1 ha. Of Irrigated mulberry and also of rain fed mulberry(Exercise).
Unit – III : Disease and pests of Mulberry & silkworm  
20 Marks

1. Collection of disease samples and their preservation
2. Isolation and identification of fungal and bacterial pathogens.
3. Identification of diseases, symptoms and spores of major fungal diseases.
4. Identification of bacterial, viral and minor diseases and their symptoms.
5. Identification of root knot diseases, root galls, egg masses, larvae and nematodes
6. Morphological features of Pebrine infected eggs, larvae, pupae and moths, isolation and microscopic examination, staining of spores (Giemsa staining).
7. Morphological features in larvae infected by different bacteria, isolation and microscopic examination of infected bacteria, staining of bacteria
9. Examination of larvae, pupae and moths infected with fungal diseases collection & microscopic examination of different fungi, staining of pathogens.
10. Practical knowledge of various chemicals used to control silkworm disease, method of application.
11. Aspergilums disease : Examination of different stages of silkworm infected by aspergillus, collection and microscopic examination

Unit- IV : Pests of Mulbery & Silkworm  
20 Marks

1. collection, mounting/preservation of the insects from mulberry garden and silkworm rearing house, grainage, reeling units
2. Identification of pests of mulberry.
4. Identification of developmental stages of pests of silkworm with special reference to techinid fly and dermestid beetle.
5. Identification of the symptoms of pest (mulberry) attack.
6. Identification of the symptoms of pest (silkworm) attack.
8. Assessment of the rates of Uzi infestation in silkworm corps, application/demonstration of prevention and control method.
9. determination and preparation of various concentrations of various insecticides.

Unit- V :  
20 Marks

1. Submission of Laboratory note book 5
2. Viva- vice 5
3. Field report 10
PART - III

Theoretical

Paper - V  100 marks

Group – A
I. Genetics and Breeding of Mulberry - 50 marks
II. Genetics and Breeding of Silkworm

Group – B
Silkworm Seed Technology - 50 marks

Paper - VI  100 marks

Group – A
Silk Technology - 50 marks

Group – B
I. Non-mulberry Sericulture;
II. Sericulture Extension, Organization and Management - 50 marks

Practical

Paper - VII  100 marks

Group – A
Genetics and Breeding of Mulberry - 50 marks
Silkworm
Silkworm Seed Technology
Silk Technology
Non-mulberry Sericulture

Group – B
On the Job Training - 50 marks

PAPER-VIII  100 marks

Entrepreneurship Development
PART - III

Paper - V

Group – A : Genetics and Breeding of Mulberry & Silkworm

Marks 50

I. Genetics and Breeding of Mulberry :

1. Genetic variability in mulberry – sources of variability
   Wilde species – hybrids. Popular varieties of India-
   chromosomal variations. 2

2. Germ plasma conservation – significance and methods. 2

3. General information to plant breeding – objectives of mulberry
   breeding – parameters associated with growth, yield and quality
   of mulberry. 4

4. Selection – characters and importance of a) pure line selection
   b) clonal selection c) mass selection 3

5. Methods of plant breeding – a) Hybridization b) Polyploidy
   c) Mutation 3


7. Tissue culture – meristem, callus, anther, pollen, endosperm, encapsulation of shoot buds and
   cryopreservation of germ / 4

8. Seed organization – types of seed, nucleus seed, foundation seed, certified seed, seed testing,
   certification – seed multiplication and distribution, concept of seed farms. 4

II. Genetics & Breeding of Silkworm :

Silkworm genetics :

1. Silkworm is a laboratory tool for genetic studies 4

2. Mendel’s principles – Dominance, Independent assortment and segregators,
   Test cross and back cross. 1

3. Inheritance of cocoon colour, larval markings, E-alleles, multiple alleles. 1

4. Inheritance of voltnism, material inheritance, inheritance of
   moultinism, environmental influence and hormonal control. 1

5. Sex determination, sex linked and sex limited traits their special
   significance in sericulture. 2

6. Chromosome number and nature of chromosomes in different
   types of silkworm. 1

7. Mutation – use of induction-mutation in sericulture. 2

8. Prospects of Biotechnology to improve silk production –preliminary
   idea of Genetic Engineering.
### Silkworm breeding

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<th>Topic</th>
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<td>2</td>
<td>10. Parameters relevant to silk production – qualitative and quantitative characters and its used in breed selection.</td>
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<td>13. Inbreeding and out breeding- advantages and disadvantages-effects of inbreeding- consequences of homozygosity.</td>
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<td>15. Heterosis – theoretical basis- utilization of heterosis in sericulture – hybrid vigour in different crossing system - hybrid vigour and environment- combining ability tests.</td>
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#### Group – B : Silkworm seed Technology

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<th>Marks</th>
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<tr>
<td>50</td>
<td>1. Morphology of silkworm egg : Size, shape, weight and colour of egg, structure of egg -its constituents</td>
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<td>3</td>
<td>2. Embryology of silkworm egg : Characteristics of different stages – critical stages of development.</td>
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<td>3. Seed organization : Significance ; maintenance of parental stock and multiplication.</td>
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<td>2</td>
<td>a) Seed areas : identification – concept of selected seed rearers and villages</td>
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<td>b) Seed legislation : acts, rules and regulation.</td>
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<td>c) Monitoring of seed crop : screening of egg shells, larval, faecal matters for disease. Disinfection and maintenance of hygiene during rearing.</td>
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<td>d) Seed cocoon market – pupal examination – certification of seed cocoon lots- price fixation for seed cocoons.</td>
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### 4. Commercial Egg Production

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<tr>
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<tbody>
<tr>
<td>1</td>
<td>a) Plan of a model grainage building</td>
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<td>b) Disinfection and hygiene in seed production units.</td>
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<td>1</td>
<td>c) Procurement and transportation of seed cocoon</td>
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<td>3</td>
<td>d) Sorting and preservation of seed cocoon - role of temperature, humidity, light and air on seed cocoon preservation.</td>
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<td>e) Early test for detection of patria disease papal gut examination and forced eclosion test.</td>
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<td>f) Sex separation in seed production</td>
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<td>g) Synchronizations of emergence – synchronized brushing of roles in villages - Old storing of cocoons/pupal and moths</td>
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<td>h) Eclosion or emergence of moth – manipulating of photo - periodic condition - collection of male and female moth – influence of light or emergence.</td>
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<td>i) Pairing or coupling of moths - rejection weak and deformed moths, duration of pairing – potency of male moths – number of pairing – depairing and decoupling.</td>
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<td>1</td>
<td>j) Ovipositor – ideal condition for ovipositor – calculation of age of eggs.</td>
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<td>k) Mother moth examination – individual and mass method – green and dry moth – identification of patria spores – surface sterilization of eggs.</td>
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### 5. Handling and Preservation of Silkworm eggs.

| 1               | a) Handling of multivoltine eggs – ideal embryonic stages for cold storing. |
| 3               | c) Preservation of bivoltine egg – short term chilling and long term chilling – hibernation schedules – 4 months, 6 months and 10 months hibernation schedules – importance of intermediate temperature-relationship between aestivation period and duration of cold stage. |

6. Preparation of loose eggs – advantages and disadvantages-handling of loose eggs.  
7. Economics of seed production.  
8. Protection measures on seed production.  

**Paper - VI**  

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<th>Full Marks - 100</th>
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**Group – A : Silk Technology**  

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<tr>
<th>Marks 50</th>
<th>Activity</th>
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<tbody>
<tr>
<td>2</td>
<td>1. Introduction to textile fibres – Natural fibres vs man made fibres.</td>
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<td>2</td>
<td>2. Physical and chemical properties of silk – uses of silk.</td>
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4. Processing of cocoon:
   a) Stiffing-definition-objective-different methods-sundrying-black cloth
      sundrying, steam stifling hot air drying, Mshuakothi. 3
   b) Sorting-separation of defective cocoons. 1
   c) Conditioning and preservation-methods of preservation of stifled cocoons. 3
   d) Cocoon boiling/cooking-definition and objective, different methods-open
      pan, three pan and six pan cooking/boiling methods. 3
   e) Cocoon brushing-methods-manual and mechanical building. 3

5. Reeling of cocoon
   Objective—different types of reeling machineries comparative account of reeling in different reeling
   machineries-study of yarn passage in different reeling machineries. 4

6. Re-reeling and packing
   Objective-importance of rereeling; book making and bail making; factors
   influencing the quality of fibre. 3

7. Quality of water required for silk reeling - effects of water in silk reeling-
   Japanese standards for silk reeling water-corrective measures. 3

8. Quality control in silk reeling and its necessity. 2

9. Cocoon testing and grading – objectives-different relevant methods adopted in India. 3

10. Raw silk testing and grading-different tests for raw silk quality measurement,
    methods of testing, condition for testing and grading. 3

11. Cocoon market and silk exchange - a general account. 2

12. Chemical processing of silk yarns and fabrics - degumming, bleaching and dying. 3

13. Silk industrial by products. Reeling waste classification and its utility in spun
    silk industry. Utility of pupae. 3

14. Silk testing-winding, warping and weaving - a general account; powerloom and
    handloom weaving. 3

Group – B:

I. **Non-mulberry Sericulture**

1. Type of non-mulberry silkworm and their distribution in India and other countries. 1
2. Non-mulberry Sericulture and its relevance to social forestry; Industrialization vs non-
   mulberry sericulture in India-Existing forest potential and their relevance to non-mulberry
   sericulture and employment potential. 2

3. Primary and secondary host plants of Tasar, Eri and Muga silkworm. 2
4. Propagation of primary food plants of Tasar, Eri and Muga silkworm - Ecoraces
   of Tasar, Eri and Muga silkworms.- 3
5. Morphology of egg, larva, pupa and moth of various non-mulberry silkworm –
   silk glands of Tasar, Eri and Muga silkworms.- 3
6. Rearing: Ecological conditions that influence rearing of non-mulberry silkworms –
   Improved rearing methods for young stage and late stage silkworms. 3
II. **Sericulture Extension, Organization and management.**

1. Extension:
   - Extension education, Definition – meaning–origin and growth principles and attributes of extension education– community development programme–role of extension in rural developments-sericulture as a tool for rural development.

2. Extension education methods and communications:

3. Diffusion of innovations in Sericulture:
   - Concept of diffusion and adoption – lab to land programmed sources of information and adoption stages. Attributes of innovations and their impact on technology adoption.

4. Leadership and motivation:
   - Importance of leadership in sericulture-Identification of local leaders-importance of motivation in sericulture-key motivation facts in sericulture.

5. Marketing management:
   - Sericulture marketing organization – cocoon market and silk exchange-regulated and non regulated market – stabilization of price in cocoon market and silk exchange.

6. Sericulture co-operative:
   - Definition, characters and types of cooperative – principles of cooperative- advantages of cooperative-present status of co-operatives and sericulture- financing agencies in sericulture – short term, mid term and long term financing.

7. Feed back system:
   - Survey – types, merits and limitations Selection of data evaluation.

8. Project formulation/and evaluation
   - Definition and characterization of a project – project formulation- Evaluation/appraisal of a project – project analysis.
PAPER - VII (Practical)

Group – A:

Genetics and Breeding of Mulberry

1. Commercial characters of mulberry – some evolved varieties.
5. Hybridization techniques- sexual polymorphism -selection of parents- pollen fertility and viability-
   bagging, collection of pollen and crossing -harvest of hybrid seeds raising and preliminary screening
   of F1 progeny.
6. Biochemical estimation of nutrients in mulberry leaf estimation of moisture percentage, ash,
   chlorophyll(a,b, and total), soluble proteins, crude proteins and sugars.
7. Morphological variability in diploids, triploids, teraploids and mutants.

Genetics & Breeding of Silkworm

1. Morphological Studies of :
   a) Egg characters : Shape (Spindle, Eliptic, Kidney, Giant, small and Clumpy). Shell
      colour (yellow, green, grey and white). Yolk colour (light and dark yel low). Serosa
      colour (dark, brown, white, pink, red and brown).
   b) Larval Characters : Colour of newly hatched larvae ( black, brown and grey), Larval
      marking ; Moricaud, Stripped, Black, etc.,
   c) Cocoon colour : Golden yellow, light yellow, white, pink, flesh and greenish yellow.
      Cocoon Shape : Oval, Dumbell, Elliptical, Spindle etc.
   d) Pupal Characters : Brown and Black pupa.
   e) Moth colour : White and Black.

2. Chromosome preparations and study of mitosis and meiosis in silkworm.
3. Analysis of quantitative traits (Cocoon Weight, Shell weight, shell ratio etc.,) S.E., Chi square test
   and t-test.
4. Observation of different characteristics in various silkworm breeds.
5. Observation/measuring various traits
   a) Quantitative traits – Fecundity, ERR by No. ERR by weight, Larval duration, V age
      larval duration, Cocoon weight, shell weight, shell ratio, pupation ratio, defective
      cocoons and floss%
   b) Reeling parameters – Boil of loss
      Reliability, Filament length, Denier rendition.

6. Selection of cocoons for breeding based on various characters.
8. Inbreeding and Inbreeding depression calculation.
Silkworm Seed Technology

1. Plan of grain age building and grain age equipments – visit to the commercial grainage.
2. maintenance of records in grainage.
3. Visit to the seed cocoon markets, commercial grainage, multivoltine and bivoltine.
8. Sheet eggs and loose egg preparation - preparation of starch coated paper – washing of loose eggs-
Drying – Treatment of eggs with acid – weighting and packing.
10. Preservation of eggs- short term and ordinary chilling - hibernation schedules 3, 4, 6 and 10 months.

Silk Technology

1. Identification of defective cocoon and their percentage in a lot of cocoon, determination of shell ratio of good cocoon.
2. Single cocoon reeling-determination of average filament length and average denier (size).
3. Study of filature basin racing machine, yarm passage diagram, measurement of crossure angle.
Cooking and reeling and re-reeling of a simple cocoon lot, determination of: 1) Realability,
2) Average filament length and denier, 3) Non-breakable filament length, 4) raw silk percentage,
5) Renditta, 6) Silk waste percentage, lacing and Skoin finishing during re-reeling.
Practical demonstration visit to filatures.
5. Study of silk testing – winding test, denier (size) test, Seri plane test, serigraph test and cohesion test.
Practical demonstration.
6. Degumming of raw silk yarn and silk waste by soap and soda method and estimation of degumming.
7. Spinning of dagummed silk waste on pedal spinning wheel.
8. Study of silk fabric manufacturing unit power loom and handloom (visit to spun silk mill). Study of silk dyeing and pointing unit – (visit to practical centers).
9. Study of spun silk mill (visit to spun silk mill).
10. water analysis – pH Total hardness, Total alkalinity, Electro conductivity, chlorides.

Non – mulberry Sericulture

2. Morphology of egg, larva, pupa, cocoon and moths of different non-mulberry silkworm.
Different ototypes of non-mulberry silkworm.
3. Rearing appliances used in rearing and seed preparation of non-mulberry silkworm (Drawings and sketches).
4. Practical observation and record of symptoms of protozoan, bacterial, viral and fungal diseases - microscopic observation of causative agents.
5. Determination of physical and commercial characters of cocoons - study of different reeling and spinning machines (drawings), identification of different types of yarn, spun silks and wastes.
6. Histograms, pie charts and case study regarding crop.

**Group – B :**

**On-the-Job Training**

Every candidate shall be required to undertake on-the-Job Training for a period of about 8(eight) weeks at the end of the second years of study. The purpose of the on-the-Job Training is to expose the students to the different aspects of sericulture in real situation. Following are the probable sites for on-the-Job training:

- silkworm seed production center/Central Silk Board, Berhampore/Department of sericulture, Govt. of W.B.
- Soil testing laboratory, Department of sericulture, Govt. of W.B.
- Central sericulture Research and training Institute, Central Silk Board, Berhampore.
- State Filatune, Govt. of W.B., Panchantana, Berhampore or any other such center in W.B.
- Any Sericulture Firm/Technical Service Centres(Sericulture etc.)

One faculty member of the colleges will maintain liaison with the organization implanting the training. The candidate shall be under administrative control of the organization regarding site of work and duty hours etc.

Every candidate shall be required to maintain a daily diary of his attendance and work done/experience acquired during the training. The head of the organization/s will furnish a confidential report regarding attendance and an assessment of the performance in respect of every student to the principal of the college concerned on completion of the training which will be taken into account at the time of final evaluation.

The candidate shall have to submit two copies of bound and typed/neatly handwritten report on the training undertaken by him/her in the form of a ……. Along with a certificate of the guide from the college duly endorsed by the Course, Co-ordinator and principal of the college for evaluation. The report shall have to contain the following four separate parts having 10 marks allotted for each part.

- Part – I - Seed Technology
- Part – II - Mulberry Cultivation-silkworm rearing
- Part – III - …… Cocoon Technology
- Part – IV - Extension and Organization.

The report shall have to be submitted to the college concerned at least seven days before the commencement of the University examination which will be jointly evaluated by the internal and external examiners.
ENTREPRENEURSHIP DEVELOPMENT

[ Common paper for Three-Year B.A./B.Sc./B.Com.(Major) Degree Course subjects.]
Six Questions to be answered taking three from each group.

Group A

1. ENTREPRENEURSHIP BUILDING:


   b) Need, Scope and Characteristics of Entrepreneurship, Special Schemes for Technical Entrepreneurs, STED. 2

   c) Social responsibility and business ethics. 1

   d) Environmental Awareness. 1


Total : 12

SOURCE OF FACULTY:

i) In house experts and faculty members of the College.

ii) Director, Cottage & Small Scale Industries, W.B., New Secretariat Building (9th floor), 1, Kiron Sankar Roy Road, Calcutta – 700 001.

iii) SISI, Calcutta, 111 & 112, B.T. Road, Calcutta – 35.

iv) GM / DIC of respective District.

v) GNCCI / NEBCON.

vi) Any successful Entrepreneur of the locality.

vii) IIM, Calcutta.

viii) Experts from Bengal Engineering & Science University.

ix) IISWBM, Calcutta.
2. **TECHNOLOGY MANAGEMENT:**  
   a) Criteria for principles of product, selection and development. 2  
   b) Choice of technology, plant and equipment. 2  
   c) Energy requirement & utilization. 1  
   d) Resource Management – Men, Machine and materials. 1  
   e) Critical Path Method (CPM) & Project Evaluation Review Techniques (PERT) as planning tools for establishing SSI. 3  
   f) Plant Layout & Process Planning for the product. 1  
   g) Quality control/quality assurance and testing of product. 1  
   h) Production Management : Elements of production process, production planning and control, product development testing facilities, patents, Quality Assurance, Time control and Cost control, Total Quality Management. 3  
   i) Materials – Purchasing Management : Materials Planning and budgeting, Source selection, Public buying, Value engineering, Value analysis, Economic ordering quantity, Inventory control, Linkage with Import & Export Management. 2

**SOURCE OF FACULTY:**  
 i) In house experts and faculty members of the College.  
 ii) Experts from Bengal Engineering & Science University  
 iii) Experts from Jadavpur University.  
 iv) SISI, Calcutta, 111 & 112, B.T. Road, Calcutta – 35.  
 v) IIM, Calcutta.  
 vi) IISWBM

Total : 16

3. **PROJECT FORMULATION:**  
   a) Needs, scopes and approaches. 1  
   b) Stages and methodology in project Identification -, 1  
      selection of a project format, Project Report Writing.  
   c) Analysis and evaluation of a project report. 1  
   d) Critical decision making areas- Money-Market-People. 1  
   e) Interaction with appraisal authority and Financial Institutions, project outline of relevant professions. 1  
   f) Economic viability and financial feasibility. 2  
   g) Business and industrial laws, labour relations. 1  
   h) Entrepreneurs and society, changing concept of social responsibility, shift to ethics, institutionalizing & challenge of relativism. 2

**SOURCE OF FACULTY:**  
 i) In house resource persons and faculty members of the College.  
 ii) SISI, Calcutta  
 iii) GM/DIC of respective district.  
 iv) Directorate of Cottage & Small Scale Industries, W.B.  
 v) Experts from Bengal Engineering & Science University  
 vi) Experts from Jadavpur University.  

Total : 10
1. **FINANCIAL MANAGEMENT** :

   a) Institutions, financing procedure and financial incentives, Banking norms as in vogue.  
   b) Financial ratios & their significance.  
   c) Costing and pricing.  
   d) Knowledge of capital market and mobilization thereof  
   e) Funds flow & cash flow concept.  

   Total : 8

   **SOURCE OF FACULTY :**

   i) In house experts and faculty members of the College.  
   ii) Cost Accountant Institutes.  
   iii) Training Institutes of Bank.  
   iv) Directorate of Cottage & Small Scale Industries, W.B., New Secretariat Buildings (9th floor), 1, Kiron Sankar Roy Road, Calcutta – 700 001.  
   v) Reputed consultants.  
   vi) BNCCI / WEBCON.  
   vii) Business Management Deptt., C.U.

2. **MARKETING MANAGEMENT** :

   a) Exposure to demand based, resource based, service based, Import substitute & Export promotion Industries.  
   b) Market survey techniques.  
   c) Elements of marketing & Sales management.  
   d) Nature of product and market strategy - Packing & advertising – After sales service.  
   e) Touch an Import-Export procedure & methods.  
   f) Analysing marketing opportunities, planning marketing strategy, forecasting, marketing mix, advertising the marketing programme & sales management.  

   Total : 14

   **SOURCE OF FACULTY :**

   i) In house experts and faculty members of the College.  
   ii) IIM, Calcutta.  
   iii) Deptt. of Business Management, C.U.  
   iv) Experts from Bengal Engineering & Science University  
   v) SISI, Calcutta.  
   vi) GM/DIC of respective district.  
   vii) IISWBM
3. **MONITORING & FOLLOWUP:**
   
a) Sickness in small scale industries and their remedial measures.  
   b) Coping with uncertainties and managing the situation.  
   
   Total : 2

**SOURCE OF FACULTY:**

i) In house experts and faculty members of the College.  
ii) Directorate of Cottage & Small Scale Industries, W.B.  
iii) Experts from Bengal Engineering & Science University  
iv) Experts from Jadavpur University.

4. **DATA BASE MANAGEMENT:**
   
   a) Books of accounts, financial statements.  
   b) Creation of data base/Management Information System (MIS)  
   
   Total : 4

**SOURCE OF FACULTY:**

i) In house experts and faculty members of the College.  
ii) Experts from Bengal Engineering & Science University  
iii) Experts from Jadavpur University.  
iv) IIM, Calcutta.  
v) Business Management Deptt, C.U.  
vii) IISWBM, Calcutta.

5. **STATUTORY PROVISION:**
   
   a) Licensing, registration – Municipal bye laws and Insurance coverage.  
   b) Important provisions of factory Act, Sales of goods Act, partnership Act.  
   c) Pollution control & Environmental Act.  
   d) Income Tax, Sales Tax and Excise Rules.  
   
   Total : 5

**SOURCE OF FACULTY:**

i) Faculty with Industrial Relation Management / Experience background.  
ii) Tax Practitioner / Lawyer.  
iii) Member from WBPCB, Calcutta.

6. **KNOWLEDGE INPUT:**
   
   a) Industrial and economic policy declared by Govt. from time to time.  
   
   Total : 2
SOURCE OF FACULTY:

i) Directorate of Cottage & Small Scale Industries, W.B.
ii) SISI, Calcutta.

N.B.: The students shall be required to visit to linked institutions & promotional agencies, like Commercial banks, WBFC, SISI, DIG, Commercial Tax Offices, WBPCB & some testing centers for getting practical exposure.

Suggested Reading Material:

8. Department of Industrial: Incentives & Concessions for Setting up Industries in Development. Backward Areas, Deptt. of Industrial Development, Govt. of India, New Delhi.
10. Entrepreneurship Development Institute of India: A handbook for New Entrepreneurs (with special reference to S & T group), Entrepreneurship Development Institute of India.
11. Philip Kotler Publisher: Marketing Management, Prentice Hall of India.