



# UNIVERSITY OF CALCUTTA

**GURUPADA SAREN**

**SECRETARY**

COUNCILS FOR UNDERGRADUATE STUDIES,  
UNIVERSITY OF CALCUTTA.

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**SENATE HOUSE**

Kolkata – 700 073.

Phone : 2241-0071-74,  
2241-0077-78,2241-4989-90,  
2241-2850-51,2241-2859

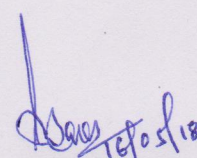
Fax : 91-033-2241-3222

E-mail : u.g.councilsc.u@gmail.com

Website : www.caluniv.ac.in

## NOTICE

It is notified for all concerned that the **semester wise draft Syllabus for “Sericulture (Major)”** for three-year undergraduate Courses of Studies under **CBCS** has been prepared by the **U.G. Board of Studies in Zoology, C.U.** The detail syllabus is enclosed herewith.

  
Secretary



**UNIVERSITY OF CALCUTTA**

**DRAFT SYLLABUS**

**IN**

**B.Sc. (MAJOR) IN SERICULTURE**

**Under**

**CHOICE BASED CREDIT SYSTEM (CBCS)**

## CBCS SERICULTURE SYLLABUS FOR B.SC (MAJOR), CU

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GE P1- Choose From the CBCS Syllabus of Zoology/ Chemistry/ Botany	
GE T2- Choose From the CBCS Syllabus of Zoology / Chemistry/ Botany	
GE P2- Choose From the CBCS Syllabus of Zoology/ Chemistry/ Botany	
GE T3- Choose From the CBCS Syllabus of Zoology/Chemistry/Botany	
GE P3- Choose From the CBCS Syllabus of Zoology/ Chemistry/ Botany	
GE T4-Choose From the CBCS Syllabus of Zoology/Chemistry /Botany	
GE P4- Choose From the CBCS Syllabus of Zoology/ Chemistry/Botany	

## 1. INTRODUCTION

The syllabus for Sericulture at undergraduate Major ( of Honours level ) using the Choice Based Credit System (CBCS) has been framed in accordance with the model syllabus given by the UGC. The main objective of framing this new syllabus is to give the students a thorough understanding of the subject giving adequate weightages to both the core content and techniques used in Sericulture. Keeping in mind and in tune with the changing nature of the subject, adequate emphasis has been given on new techniques and understanding of the subject. The syllabus has also been framed in such a way that the basic skills of subject are taught to the students, and everyone might not need to go for higher studies and the scope of securing a job after graduation will increase. There is wide deviation in the infrastructure, be it physical or in human resource, in the form of teachers' expertise and ability and aspiration of the students. Hence, University is free to choose the Electives as per their infrastructural strengths and offer at least 6 to 7 electives. While the syllabus is in compliance with UGC model curriculum, it is necessary that students of this discipline should learn "Entrepreneurship" along with "Extension Education" as part of the core courses rather than as elective. Also, important discipline specific elective courses on "Insect Classification and Biology" and Ecology have been introduced. Project Work has also been introduced as one of the alternatives of discipline specific elective courses with a credit of 6 for continuous evaluation and for the merit of the dissertation.

## 2. SCHEME FOR CBCS CURRICULUM(CREDIT DISTRIBUTION ACROSS COURSES)

Course Type	Number of Courses	Credits		
		Theory	Practical	Theory+ Practical
<b>Core Courses</b>	<b>14</b>	<b>14x4=56</b>	<b>14x2=28</b>	<b>84</b>
<b>Discipline specific Electives</b>	<b>4</b>	<b>4x4=16</b>	<b>4x2=8</b>	<b>24*</b>
<b>Generic Elective</b>	<b>4</b>	<b>4x4=16</b>	<b>4x2=8</b>	<b>24</b>
<b>Ability Enhancement Courses</b>	<b>2</b>	<b>2x2=4</b>		<b>4</b>
<b>Skill Enhancement Courses</b>	<b>2</b>	<b>2x2=4</b>		<b>4</b>
<b>Totals</b>	<b>26</b>	<b>96</b>	<b>44</b>	<b>140</b>

\* For Project Work ( DSE4) will be of 6 Credits

## 3. SCHEME FOR CBCS CURRICULUM (Courses at a glance under semester module)

### 3 A. COMPULSORY CORE COURSES (CC)

<b>Compulsory Courses</b>			
General sericulture	Grainage and Seed Technology	Mulberry Physiology and Mulberry breeding and Genetics	Silkworm Physiology and silkworm Breeding and Genetics
Biology of Silkworm and silkworm crop protection	Non- mulberry Sericulture	Sericulture Economics and Statistics	Sericulture Extension Education
Silkworm rearing	Post Cocoon Technology and Silk Technology	Sericulture Marketing	
Biology of Mulberry plant, Mulberry cultivation and Protection	Entrepreneurship and Human Resource development	Sericulture Organization and Management	

### 3B. CHOICES FOR DISCIPLINE SPECIFIC ELECTIVES (DSE)

<b>Discipline Specific Elective- 4</b>	
1. Soil Science	2. Insect Classification and Biology
3. Computer Application	4. Project Work Or Ecology

### 3 C. CHOICES FOR SKILL ENHANCEMENT COURSES (SE)

<b>Skill Enhancement Courses-2</b>	
1. Seri-Bio-technology	2. Seri- textile technology

### 3 D. CHOICES FOR GENERIC ELECTIVE COURSES

<b>Generic Elective Courses-4</b>	
1. Zoology/ Chemistry/ Botany	2. Zoology/ Chemistry/ Botany
3. Zoology/ Chemistry/ Botany	4 Zoology/ Chemistry/ Botany

## SEMESTER WISE DISTRIBUTION OF COURSES

Semester	Course Name	Course Detail	Credit	Page No.
<b>Semester I</b>	Ability Enhancement	English Communication	2	
	Compulsory Course-I	Environmental Science	2	
	Core course-I Theory	General Sericulture (CT1)	4	8
	Core course-I Practical	General Sericulture Lab(CP1)	2	9
	Core course-II Theory	Biology of silkworm and silkworm crop protection (CT2)	4	9
	Core course-II Practical	Biology of silkworm and silkworm crop protection Lab(CP2)	2	9
	Generic Elective-I Theory	Zoology/ Chemistry/ Botany (GET1)	4	
	Generic Elective-I Practical	Zoology/ Chemistry/ Botany (GEP1)	2	
<b>Semester II</b>	Ability Enhancement	English Communication	2	
	Compulsory course II	Environmental Science	2	
	Core course III Theory	Silkworm rearing (CT3)	4	10
	Core course III Practical	Silkworm rearing Lab(CP3)	2	11
	Core course IV Theory	Biology of Mulberry plant and Mulberry crop cultivation and protection (CT4)	4	11
	Core course IV Practical	Biology of Mulberry plant and Mulberry crop cultivation and protection Lab(CP4)	2	12
	Generic Elective-2 Theory	Zoology/ Chemistry/ Botany (GET2)	4	
	Generic Elective-2 Practical	Zoology/ Chemistry/ Botany (GEP2)	2	
<b>Semester III</b>	Core course –V Theory	Grainage and Seed Technology (CT5)	4	14
	Core course –V Practical	Grainage and Seed Technology Lab(CP5)	2	15
	Core course –VI Theory	Non- mulberry Sericulture (CT6)	4	15
	Core course –VI Practical	Non- mulberry Sericulture Lab(CP6)	2	16
	Core course –VII Theory	Post cocoon Technology & Silk technology (CT7)	4	17
	Core course –VII Practical	Post cocoon Technology & Silk technology Lab(CP7)	2	18
	Skill Enhancement Course-1 Theory	Seri-bio Technology (SET1)	4	19
	Generic Elective-3 Theory	Zoology/ Chemistry/ Botany (GET3)	4	
	Generic Elective-3 Practical	Zoology/ Chemistry/ Botany (GEP3)	2	

Semester IV	Core course –VIII Theory	Mulberry Physiology and Mulberry Breeding &Genetics (CT8)	4	18
	Core course –VIII Practical	Mulberry Physiology and Mulberry Breeding &Genetics Lab(CP8)	2	18
	Core course –IX Theory	Silkworm Physiology and silkworm Breeding &Genetics (CT9)	4	21
	Core course –IX Practical	Silkworm Physiology and silkworm Breeding &Genetic Lab(CP9)	2	22
	Core course –X Theory	Sericulture Extension Education (CT10)	4	23
	Core course –X Practical	Sericulture Extension Education Lab(CP10)	2	23
	Skill Enhancement Course-2 Theory	Seri- textile technology (SET2)	4	24
	Generic Elective-4 Theory	Zoology/ Chemistry/ Botany (GET4)	4	
	Generic Elective-4 Practical	Zoology/ Chemistry/ Botany (GEP4)	2	
Semester V	Core course –XI Theory	Sericulture Economics and Statistics (CT 11)	4	25
	Core course –XI Practical	Sericulture Economics and Statistics Lab (CP 11)	2	26
	Core course –XII Theory	Sericulture Marketing (CT 12)	4	26
	Core course –XII Practical	Sericulture Marketing Lab(CP12)	2	27
	Discipline Specific Elective-1 Theory	Soil Science (DSET 1)	4	27
	Discipline Specific Elective-1 Practical	Soil Science Lab (DSEP1)	2	28
	Discipline Specific Elective -2 Theory	Insect classification and Biology (DSET2)	4	28
Discipline Specific Elective-2 Practical	Insect classification and Biology (DSEP2)	2	29	
Semester VI	Core course –XIII Theory	Entrepreneurship and Human Resource development (CT13)	4	30
	Core course –XIII Practical	Entrepreneurship and Human Resource development (CP13)	2	30
	Core course –XIV Theory	Sericulture Organization and Management (CT14)	4	31
	Core course –X IV Practical	Sericulture Organization and Management Lab(CP14)	2	32
	Discipline Specific Elective-3 Theory	Computer Application (DSET 3)	4	32
	Discipline Specific Elective-3 Practical	Computer Application Lab(DSEP 3)	2	33
	Discipline Specific Elective-4	Ecology( DSET4)		4
Ecology( DSEP4)			2	
Or Project work (DSE 4)			6	35



# SEMESTER I

## ABILITY ENHANCEMENT COMPULSORY COURSE I: ENGLISH COMMUNICATION

### CORE THEORY1 (CT1)

### GENERAL SERICULTURE

**CREDITS 4; CLASSES 50; MARKS 50**

- Unit 1.** Introduction to Sericulture: Origin and history of sericulture. Silk route and map of India and World; Temperate and tropical climate for sericulture practice.
- Unit 2.** Environmental impact of sericulture: Eco-friendly activity of sericulture;. Employment generation in sericulture and role of women in sericulture.
- Unit 3.** Characteristics of sericulture industry: Land and agro based part of industry. Industrial aspect of the industry; Silk reeling as a cottage industry; Handloom and power loom activities.
- Unit 4.** Textile fibers: Natural and Synthetic fibers: Advantage of silk fiber over other fibers: International demand of silk. Function Central Silk Board; Role of State Department of Sericulture (Karnataka, Tamil Nadu, Andhra Pradesh, West Bengal); Role of universities and NGOs in sericulture development.
- Unit 5.** Prospects and problems of sericulture industry
- Unit 6:** SWOT Analysis of Sericulture industry

### Examination pattern

**Time: 2 Hour**

**Full Marks: 50**

**(40 Theory + 10 Internal Assessment)**

**Questions are to be set from entire syllabus; 4 questions (out of six) of 2 marks each (2x4=8), four question (out of six) of 4 marks each (4x4=16), and two questions (compulsory) of 8 marks each (8x2=16) are to be answered.**

### References:

1. CHARSLEY, S.R. (1982). **CULTURE AND SERICULTURE**. ACADEMIC PRESS INC., NEW YORK, U.S.A
2. FAO MANUALS- I **MULBERRY CULTIVATION**. FAO ROME.
3. FOTH, H.D. (1984) **FUNDAMENTALS OF SOIL SCIENCE**. 7TH EDN., JOHN WILEY & SONS, NEW YORK.
4. GANGA, G., AND J. SULOCHANA CHETTY. (1991) **AN INTRODUCTION TO SERICULTURE**. OXFORD & IBH PUBLISHING COMPANY.
5. HASAO ARUGA (1994). **PRINCIPLES OF SERICULTURE** (TRANSLATED FROM JAPANESE ) OXFORD & IBH PUBLISHING CO., PVT. LTD. NEW DELHI.
6. KICHISABURO M. (1997) **MORICULTURE – SCIENCE OF MULBERRY CULTIVATION**. OXFORD & IBH
7. KRISHNASWAMI, S.; NARASIMHANNA, M.N.; SURYANARAYAN, S.K AND KUMARARAJ, S. (1973) **SERICULTURE MANUAL-2 - SILKWORM REARING**. AGRICULTURE SERVICE BULLETIN, FAO, ROME.
8. RAJANNA, L., DAS, P.K., RAVINDRAN, S., BHOGESHA, K., MISHRA, R.K., SINGHVI, N.R., KATIYAR, R.S. AND

JAYARAM, H. (2005) **MULBERRY CULTIVATION AND PHYSIOLOGY**. CENTRAL SILK BOARD, BANGALORE.

9. RANGASWAMI, G.; NARASIMHANNA, M.N.; KASIVISWANATHAN, K., SASTRY, C.R. AND JOLLY, M.S. (1976)

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**CORE PRACTICAL 1 (CP1)****GENERAL SERICULTURE LAB****CREDITS 2****LIST OF PRACTICAL**

1. Sericulture maps :
  - a) World maps and Silk Road
  - b) Sericulture map of India and West Bengal
2. Preparation of histograms and pie charts on:-
  - a) Production of Textile fibers in India
  - b) World Silk Production
  - c) Pie chart on mulberry and non-mulberry silk production in India
3. Organization set up in India :- (Demonstration & Exercise)
  - a) Govt. of India
  - b) Five traditional states viz., Karnataka, Andhra Pradesh, Tamilnadu, West Bengal and Jammu & Kashmir
4. Identification and study of Sericulture products :

Cotton and Silk Yarn different types, Pupae, Silk Yarn, Noil Yarn
5. Laboratory Note Book
6. Internal Assessment

**Question Pattern****Time: 2<sup>1</sup>/<sub>2</sub> Hour****Full Marks-25**

1. Preparation of histograms on: - Production of Textile fibers in India/World Silk Production/ Pie-chart on mulberry and non-mulberry silk production in India. (Item No.1) 8x1=8
2. Point out the Seri cultural countries on World maps/ sericultural zones on Indian map ,West Bengal Seri cultural map/ Mapping of Silk Road.(Item No.2) 4x1=4
3. Identification and uses of two sericulture products : Pupae/Silk waste/Spun Yarn/Noil Yarn (Item No.3) 2x2=4
4. One Spot identification on different types of Cotton and Silk Yarn.(Item No.4) 2x1=2
5. Laboratory Note Book. =2
6. Internal Assessment. =5

**SEMESTER I****CORE THEORY2 (CT2) BIOLOGY OF SILKWORM AND SILKWORM CROP PROTECTION  
CREDITS 4; CLASSES 50; MARKS 50****Unit 1:** Silkworm taxonomy & life-cycle.**Unit 2:** Races & classification of silkworm: Classification based on the number of Larval Moults, Moultnism and Voltinism. Indigenous pure race& cross breed of India. Races with sex limited Characters**Unit 3:** Silkworm morphology: Morphology of the egg, larva, pupa, adult.**Unit 4:** Silkworm Anatomy: Digestive system: Larva, Circulatory system: Larva, pupa, adult, Nervous

system: Larva, adult, Silk gland: Larva, Reproductive system: Adult.

**Unit 5:** Silkworm Diseases: Protozoan disease, Bacterial disease, Fungal disease, Viral disease, Sototo disease, septicemia, galtine.

**Unit 6:** Silkworm Pests: Uzi fly, Ants, Dermestid Beetles.

### Examination pattern

**Time: 2 Hour**

**Full Marks: 50**

#### (40 Theory + 10 Internal Assessment)

**Questions are to be set from entire syllabus; 4 questions (out of six) of 2 marks each (2x4=8), four question (out of six) of 4 marks each (4x4=16), and two questions (compulsory) of 8 marks each (8x2=16) are to be answered.**

#### References:

1. CHARLESLEY, S.R. (1982). **CULTURE AND SERICULTURE**. ACADEMIC PRESS INC., NEW YORK, U.S.A
2. GANGA, G., AND J. SULOCHANA CHETTY. (1991) **AN INTRODUCTION TO SERICULTURE**. OXFORD & IBH PUBLISHING COMPANY.
3. MANUAL-2 - **SILKWORM REARING**. AGRICULTURE SERVICE BULLETIN, FAO, ROME.
4. MADAN MOHAN RAO, M. (1999) **COMPREHENSIVE SERICULTURE MANUAL**. PS PUBLICATIONS, HYDERABAD.
5. S. MOROHOSHI (2001). **DEVELOPMENT PHYSIOLOGY OF SILKWORMS**. SCIENCE PUBLISHERS,U.S.
6. YATARO TAZIMA (2001). **IMPROVEMENT OF BIOLOGICAL FUNCTIONS IN THE SILKWORM**. SCIENCE PUBLISHERS
7. M. AMIN MASOOD AND AFIFA S. KAMILI (2000). **PRINCIPLES OF TEMPERATE SERICULTURE**. KALYANI PUBLISHER.
8. **SILKWORM CROP PROTECTION**, CENTRAL SILK BOARD, BANGALORE, INDIA.
9. GOVINDAN, R.; NARAYANASWAMY, T.K. AND DEVAIAH, M.C. (1998) **PRINCIPLES OF SILKWORM PATHOLOGY**. SERI SCIENTIFIC PUBLISHERS, BANGALORE.
10. GOVINDAN, R.; RAMAKRISHNA NAIKA AND SANNAPPA, B. (2004) **ADVANCES IN DISEASE AND PEST MANAGEMENT IN SERICULTURE**. SERI SCIENTIFIC PUBLISHERS, BANGALORE

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**CORE PRACTICAL 2 (CP2) BIOLOGY OF SILKWORM AND SILKWORM CROP PROTECTION LAB**  
**CREDITS 2**

#### List of practical

## SILKWORM BIOLOGY

1. Life Cycle of *Bombyx mori*:
  - a) Morphology of egg, larva, pupa and adult of silkworm *Bombyx mori*:
2. Sex separation in larva, pupa and adult of silkworm *Bombyx mori*:
3. Anatomy of Silkworm
  - Dissection and respiratory system
  - a) Digestive and respiratory system
  - b) Mounting of larval mouth parts and spiracle
  - c) Silk gland
  - d) Nervous system of silkworm larva
  - e) Reproductive system of male and female silkworm moth
4. Cocoon characters of popular uni-, bi- and multivoltine races

## SILKWORM CROP PROTECTION

1. Identification of different diseased silkworms based on external symptoms (Grasserie, Flacherie, Muscardine and Pebrine)
2. Identification of permanent slide of bacteria, spores of Pebrine, polyhedral of NPV, spores of Muscardine /mycelial mat.
3. Methods of applications of silkworm bed disinfectants for management of silkworm diseases.
4. Predators of silkworms
5. Laboratory Note Book
6. Internal Assessment

### Question Pattern

Time: 2<sup>1</sup>/<sub>2</sub> Hour

Full Marks-25

1. Identification of one diseased silkworms (Grasserie, Flacherie, Muscardine and Perrine) and one predator of silkworm based on external symptoms.(Item No.1) 3x2=6
2. Dissection, display, drawing and labeling of Digestive system, respiratory system, silk gland, nervous system, Reproductive system of male or female silkworm moth.(Item No. 2) 5+1+1+1=8
3. Mounting, drawing and labeling of larval mouth parts or spiracle. (Item No.3) 3+1/2 +1/2=4
4. Laboratory Note Book. =2
5. Internal Assessment. =5

## SEMESTER II

### CORE THEORY3 (CT3)

### SILKWORM REARING

**CREDITS 4; CLASS 50; MARKS 50**

**Unit 1:** Silkworm Rearing (C.S.B. proposed model rearing house)

**Unit 2:** Rearing appliances, disinfection, disinfectants, bed cleaning, feeding of worms

**Unit 3:** Maintaining optimum condition of rearing, brushing, frequency of spacing, care during moulting

**Unit 4:** Mounting and mountage, process of spinning, cocoon harvesting

**Unit 5:** Rearing method: chawki rearing or young age worm rearing.

**Unit 6:** Late age Silkworm rearing.

### Examination pattern

Time: 2 Hour

Full Marks: 50

(40 Theory + 10 Internal Assessment)

Questions are to be set from entire syllabus; 4 questions (out of six) of 2 marks each (2x4=8), four question (out of six) of 4 marks each (4x4=16), and two questions (compulsory) of 8 marks each (8x2=16) are to be answered.

#### References:

1. GANGA, G., AND J. SULOCHANA CHETTY. (1991) AN INTRODUCTION TO SERICULTURE. OXFORD & IBH PUBLISHING COMPANY.
2. KRISHNASWAMI, S.; NARASIMHANNA, M.N.; SURYANARAYAN, S.K AND KUMARARAJ, S. (1973) SERICULTURE MANUAL-2 - SILKWORM REARING. AGRICULTURE SERVICE BULLETIN, FAO, ROME.

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### CORE PRACTICAL3 (CP3)

### SILKWORM REARING LAB

CREDITS 2

#### LIST OF PRACTICAL

1. Rearing houses: Model rearing house and low-cost rearing house. (Demonstration and Exercise); Rearing Appliances (Estimation of rearing appliances for 100df/s)
2. Disinfection: Types of disinfectants; Concentration and dosage requirement; Preparation of spray formulation of disinfectants (For 100df/s)
3. Rearing Techniques: Harvesting and preservation technique; leaf selecting for different instants; mulberry leaf estimation; Identification of moulting larva, care during moulting, mounting and mounting density, types of mountages; Harvesting of cocoons, assessment of cocoons.
4. Maintenance of records for silkworm rearing/Internal Assessment/Local silkworm rearing field visit.
5. Laboratory Note Book.
6. Internal Assessment

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#### Question Pattern

Time: 2½ Hour

Full Marks: 25

(20 Theory + 5 Internal Assessment)

1. Identification and uses of two sericulture rearing appliances. . (Item No.1) 2x2=4
2. Calculate the brushing capacity in accordance to leaf estimation/acre.(Item No.2) 4+4=8
3. Submission of record book of silkworm rearing/ Field note book on Local silkworm rearing field visit (Item No.3) = 6
4. Laboratory Note Book. =2
5. Internal Assessment =5

### SEMESTER II

### CORE THEORY 4 (CT4) BIOLOGY OF MULBERRY PLANT AND MULBERRY CROP CULTIVATION AND PROTECTION

## **CREDITS 4; CLASS 50; MARKS 50**

- Unit 1:** Biology of Mulberry: Botanical description of mulberry. Economic importance of mulberry Plant; Salient features of family Moraceae; Phyto-geography and systematic of the genus *Morus* L. and its species; Morphology of mulberry plant; Different cultivars of mulberry; Floral biology of mulberry: Structure of male and female flowers, catkins
- Unit 2:** Anatomy of mulberry: Stem, root, leaf lamina
- Unit 3:** Mulberry crop protection: Planting system, pruning and training, propagation, irrigation, fertilizer application, manuring, composting, vermicomposting weeding method
- Unit 4:** Diseases of mulberry Leaf: Leaf spot, Powdery mildew, Leaf Rust, Leaf blight
- Unit 5:** Diseases of mulberry root: Root rot disease, Root knot disease
- Unit 6:** Mulberry pest management (Major Pest)(\*Pest Definition, Pest Outbreak, Pest Forecasting) : Mealy bug, Bihar hairy caterpillar, Jassid, Leaf roller, Scale insect and Thrips: their preventive and control measures. Minor Pest: Termites and mites their preventive and control measures.

### **Examination pattern**

**Time: 2 Hour**

**Full Marks: 50**

**(40 Theory + 10 Internal Assessment)**

**Questions are to be set from entire syllabus; 4 questions (out of six) of 2 marks each (2x4=8), four question (out of six) of 4 marks each (4x4=16), and two questions (compulsory) of 8 marks each (8x2=16) are to be answered.**

### **References:**

1. FAO MANUALS- I **MULBERRY CULTIVATION**. FAO ROME.
2. FOTH, H.D. (1984) **FUNDAMENTALS OF SOIL SCIENCE**. 7TH EDN., JOHN WILEY & SONS, NEW YORK.
3. KICHISABURO M. (1997) **MORICULTURE – SCIENCE OF MULBERRY CULTIVATION**. OXFORD & IBH
4. RAJANNA, L., DAS, P.K., RAVINDRAN, S., BHOGESHA, K., MISHRA, R.K., SINGHVI, N.R., KATIYAR, R.S. AND JAYARAM, H. (2005) **MULBERRY CULTIVATION AND PHYSIOLOGY**. CENTRAL SILK BOARD, BANGALORE.
5. RANGASWAMI, G.; NARASIMHANNA, M.N.; KASIVISWANATHAN, K., SASTRY, C.R. AND JOLLY, M.S. (1976) **SERICULTURE MANUAL-1- MULBERRY CULTIVATION**. AGRICULTURE SERVICES BULLETIN, FAO, ROME.
6. RAVICHANDRA N.G (2013). **FUNDAMENTALS OF PLANT PATHOLOGY**. PRENTICE HALL INDIA LEARNING PRIVATE LIMITED.
7. DUBE H.C. (2007). **A TEXTBOOK OF FUNGI, BACTERIA AND VIRUSES (STUDENT EDITION)**. AGROBIOS INDIA.
8. AGRIOS (2006). **PLANT PATHOLOGY**. ELSEVIER; FIFTH EDITION (22 SEPTEMBER 2006).
9. **MULBERRY CROP PROTECTION**, CENTRAL SILK BOARD, BANGALORE, INDIA

## CORE PRACTICAL 4 (CP4)

### BIOLOGY OF MULBERRY, MULBERRY CROP CULTIVATION AND PROTECTION LAB 2 CREDITS

#### LIST OF PRACTICAL

1. Biology of Mulberry Plant:-
  - a) Morphological study of few important cultivars in West Bengal (S<sub>1635</sub>, S<sub>1</sub>, C<sub>776</sub> and Kajjli)
  - b) Anatomy of petiole, leaf lamina, stem and root
  - c) Identification of common weeds of mulberry and weeding
2. Mulberry Crop Cultivation:-
  - a) Preparation of nursery beds
  - b) Selection of materials for cuttings, preparation and selection of cutting planting. Selection and grading of sapling.
  - c) Different propagation methods – grafting and layering.
  - d) Planting System and Intercultural Operations: - pit and row system, mulching, irrigation. (Demonstration basis)
3. Identification of different types of fertilizers, calculation of dosages (exercise), Preparation Compost
4. Mulberry Crop Protection:-
  - a) Study of powdery mildew, leaf spot and leaf rust through sectioning, staining and temporary mounting
  - b) Identification of bacterial, viral and minor diseases and their symptoms
  - c) Identification of root knot disease in mulberry
  - d) Collection, mounting/preservation of insect pests of mulberry (field work)
  - e) Identification of mulberry pests, study of nature of damage of the following pests:- Bihar hairy caterpillar, scale insect, mealy bug, Jassid, thrips, beetles and grasshopper
5. Internal Assessment
6. Field Note Book

#### Question Pattern

Time: 2½ Hour

Full Marks: 25

(20 Theory + 5 Internal Assessment)

1. Identification of two different types of fertilizer/herbicides and their uses.(Item No.1) 2x2=4
2. Calculation of dosages of mixed fertilizers (Item No. 2) = 6
3. Preparation of grafting (bud or shoot grafting) or layering (simple layering) drawing and labeling.
4. Spot identification (any two) of mulberry pests/ root knot disease in mulberry/ powdery mildew, leaf spot and leaf rust , Tukra affected mulberry leaf with external symptoms.(Item No. 4) 2x2=4
5. Submission of the Collection, mounting/preservation of insect pests of mulberry (field work) =4
6. Laboratory Note Book and Field Note Book =2
7. Internal Assessment =5

#### SEMESTER III

#### CORE THEORY 5 (CT5)

#### GRAINAGE AND SEED TECHNOLOGY

CREDITS 4; CLASS 50; MARKS 50

**Unit 1:** Breeding station (P4, P3, P2, P1 station) and grainage management

**Unit 2:** Diapausing and Non-diapausing eggs, methods of egg storage, incubation, embryonic incubation

**Unit 3:** Industrial seed, reproductive seed, certified seed. Transportation of seed eggs.

### Examination pattern

**Time: 2 Hour**

**Full Marks: 50**

#### (40 Theory + 10 Internal Assessment)

Questions are to be set from entire syllabus; 4 questions (out of six) of 2 marks each (2x4=8), four question (out of six) of 4 marks each (4x4=16), and two questions (compulsory) of 8 marks each (8x2=16) are to be answered.

#### References:

1. A.K. DHOTE.SILKWORM SEED PRODUCTION TECHNOLOGY,
2. M.N NARASIMHANA. MANUAL ON SILKWORM EGG PRODUCTION,
3. KRISHNASWAMI, S.; NARASIMHANNA, M.N.; SURYANARAYAN, S.K AND KUMARARAJ, S. (1973) SERICULTURE MANUAL-2 - SILKWORM REARING. AGRICULTURE SERVICE BULLETIN, FAO, ROME.
4. GANGA, G., AND J. SULOCHANA CHETTY. (1991) AN INTRODUCTION TO SERICULTURE. OXFORD & IBH PUBLISHING

### CORE PRACTICAL 5 (CP5) GRAINAGE AND SEED TECHNOLOGY LAB CREDITS 2;

#### LIST OF PRACTICAL

1. Morphology of silkworm egg.
2. Seed cocoon processing/handling – deflossing, sorting and preservation – pupal examination and sex separation of pupa and moth.
3. Treatment of eggs with acid, acid preparation.
4. Visit to seed cocoon markets, commercial grainage and cold storage centre to know activities of cocoon markets, preparation of laying and cold storage of eggs.
5. Internal Assessment

#### Question Pattern

**Time: 2½ Hour**

**Full Marks: 25**

1. Sex separation from a given cocoon lot and determination the percentage of male and female pupa/hatching percentage / Pupa/ mother moth examination. (Item No.1) 3+3=6
2. Preparation of acid for cold acid treatment of silkworm eggs. (Item No.2) =4
3. Submission of two record books on commercial grainage visit / basic seed farm visit. (Field work) (Item No3) =6
4. Identify and comment on two spots (Item no.4) 2+2=4
5. Internal Assessment. =5

### CORE THEORY 6 (CT6)

### NON- MULBERRY SERICULTURE

**CREDITS 4; CLASS 50; MARKS 50**



**Unit 1:** Scope of Non-mulberry sericulture and mulberry vs. non-mulberry sericulture

**Unit 2:** Non-mulberry silkworms (Tasar, Muga, Eri silk) and their distribution in India and other countries

**Unit 3:** Taxonomy of food plants of non-mulberry silkworms: Sailer feature of the families of non-mulberry silkworm

**Unit 4:** Cultivation of primary food plants of Tasar, Muga and Eri silkworms: *Terminalia arjuna*, *Machilus bombycina*, *Ricinus communis*

**Unit 5:** Life cycle of Tasar, Eri and Muga silkworm. Brief account of important disease and pest of primary non-mulberry food plants and their management.

**Unit 6:** Disease of non-mulberry silkworms. Protozoan, bacterial viral and fungal diseases, symptoms, causative agent preventive and control measures.

### Examination pattern

**Time: 2 Hour**

**Full Marks: 50**

**(40 Theory + 10 Internal Assessment)**

**Questions are to be set from entire syllabus; 4 questions (out of six) of 2 marks each (2x4=8), four question (out of six) of 4 marks each (4x4=16), and two questions (compulsory) of 8 marks each (8x2=16) are to be answered.**

### References:

1. CHOWDHURY, S.N. (1998) MUGA CULTURE. CENTRAL SILK BOARD, BANGALORE, INDIA
2. DOKUHON, Z.S. (1998). ILLUSTRATED TEXTBOOK ON SERICULTURE. OXFORD & IBH PUBLISHING CO., PVT. LTD. CALCUTTA.
3. JOLLY, M.S. CHOWDHURY, S.N AND SEN. (1975). NON-MULBERRY SERICULTURE IN INDIA. CENTRAL SILK BOARD, BOMBAY, INDIA.
4. JOLLY, M.S (1998). **TASAR CULTURE**. CENTRAL SILK BOARD, BANGALORE, INDIA.
5. SARKAR, D.C. (1998) ERI CULTURE. CENTRAL SILK BOARD, BANGALORE
6. THANGAVELU, K.; CHAKRABORTY, A.K.; BHAGAWATI, A.K. AND ISA, MD. (1998) **HANDBOOK OF MUGACULTURE**. CSB, BANGALORE.
7. CHAUDHURY, S.N. (1982) **ERI SILK INDUSTRY**. DIRECTORATE OF SERICULTURE & WEAVING, GOVT. OF ASSAM, GOUHATI, ASSAM.

### **CORE PRACTICAL 6 (CP6) NON- MULBERRY SERICULTURE**

**CREDITS 2**

#### **LIST OF PRACTICAL**

1. Rearing appliances used in rearing and seed preparation of non-mulberry silkworms (Drawings/sketches)
2. Taxonomic features of non-mulberry (*Terminalia arjuna*, *Ricinus communis*)
3. Identification of the morphological features of egg, larva, pupa, cocoon and moths of different non-mulberry silkworms

4. Identification of Tasar, Eri and Muga raw silk
5. Internal Assessment
6. Laboratory Note Book

### Question pattern

**Time: 2½ Hour**

**Full Marks: 25**

1. Identification of the leaves of two food plants of non- mulberry silkworms with morphological characters and taxonomic traits. (Item No.1) 4x2=8
2. Two Identifications of egg, larva, pupa, cocoon and moth and yarns of different non- mulberry silkworms. (Item No.2) 4x2=8
3. Field visit.(Item No.3) =4
4. Internal Assessment. =5

## SEMESTER III

### CORE THEORY 7(CT7)

### POST COCOON TECHNOLOGY AND SILK TECHNOLOGY

**CREDITS 4; CLASSES 50; MARKS 50**

**Unit1:** Cocoon stifling (sun drying, steam stifling, hot air stifling), storage of cocoon, sorting of cocoons

**Unit2:** Deflossing, cocoon riddling, mixing or blending, cocoon cooking, brushing

**Unit3:** Concept of difference reeling machines, reeling operation, reeling end formation

**Unit4:** Degumming, bleaching, dyeing of silk yarn

**Unit5:** Twisting, Reeling, Re-reeling, lacing, skeining and testing of raw silk material

**Unit6:** Weaving of silk.

### Examination pattern

**Time: 2 Hour**

**Full Marks: 50**

**(40 Theory + 10 Internal Assessment)**

**Questions are to be set from entire syllabus; 4 questions (out of six) of 2 marks each (2x4=8), four question (out of six) of 4 marks each (4x4=16), and two questions (compulsory) of 8 marks each (8x2=16) are to be answered.**

#### References:

1. ANON. 1972 **MANUAL ON SERICULTURE, VOL.3 SILK REELING** FAO, AGRICULTURE SERVICE BULLETIN NO. 2/3.
2. BYONG HO KIM. 1989. **FILATURE WATER ENGINEERING**, SEOUL NATIONAL UNIVERSITY PRESS, REPUBLIC OF KOREA.
3. HUANG GUO RUI. 1988. **SILK REELING**, OXFORD AND IBH PUBLISHING CO. PVT. NEW DELHI.
4. MAHADEVAPPA, D., HALLIYAL, V.G., SHANKAR, A.G. AND BHANDIWAD, R. 2000 **MULBERRY SILK REELING TECHNOLOGY**, OXFORD AND IBH PUBLISHING CO. PVT. LTD. NEW DELHI.
5. SONG, K.E AND LEE, Y.W. 1973. **MODERN SILK REELING TECHNOLOGY**. SERICULTURE EXPT. STATION, REPUBLIC OF KOREA

6. SONWALKER, T.N. **HANDBOOK OF SILK TECHNOLOGY**, NEW AGE INTERNATIONAL PVT., LTD.
7. YONG WOO LEE. 1999. **SILK REELING AND TESTING MANUAL**, FAO AGRICULTURAL SERVICES BULLETIN NO. 136, ROME, ITALY.
8. Akira Nakamura (2000) **Fiber Science and Technology**. Oxford & IBH Publications, New Delhi.

## **CORE PRACTICAL 7(CP7) POST COCOON TECHNOLOGY AND SILK TECHNOLOGY**

**CREDITS 2; MARKS 25**

### **LIST OF PRACTICAL**

1. Identification of silk, cotton, wool and synthetic fiber (nylon/polyester) by physical method-flame and microscopic test, chemical test.
2. Determination of average size, Size deviation and maximum deviation of the given sample of silk.
3. Determination of good cocoon and defective cocoon percentage
4. Determination of silk ratio percentage and estimated of Rendition
5. Epprouvette reeling and determination of average filament length and filament denier.
6. Reeling sector visit and demonstration
7. Internal assessment

### **Question Pattern**

**Time: 2½ Hour**

**Full Marks: 25**

- |   |     |
|---|-----|
| 1. Identification of textile fibers by physical and chemical tests: tests- microscopic examination, flame test and solubility test for silk, cotton, wool and synthetic fiber (nylon/polyester)/ Determination of good cocoon and defective cocoon percentage and SR% from good cocoon lot. (Item No.1) | =10 |
| 2. Determination of average filament length, non-breakable filament length and filament denier/ Determination of silk ratio percentage and estimated of Rendition/ Determination of average size, Size deviation and maximum deviation of the given sample of silk.(Item No.2)                          | =10 |
| 3. Internal assessment  | = 5 |

## **SEMESTER III**

### **CHOSE EITHER SEC 1**

**SKILL ENHANCEMENT COURSE 1(SET1)**

**SERI-BIOTECHNOLOGY**

**2 CREDITS; CLASS 25**

**Unit 1:** Introduction, scope and importance of plant biotechnology. Plant cell and tissue culture techniques, laboratory equipments, preparation of culture media, application of cell and tissue culture in mulberry plant.

**Unit 2 :** Insect transgenesis: Silkworm transgenesis, application of silkworm transgenesis. Silkworm

cell culture, Establishment of primary and secondary cell lines, composition and preparation of media for cell culture.

**Unit 3:** Types of Polymerase Chain Reaction (PCR), Its application in silkworm and mulberry genetic studies.

**Unit 4:** Recombinant DNA Technology: Cloning vectors for recombinant DNA, Cloning and expression of vector, Transgenic plants and their role in crop improvement, molecular farming and regulated gene expression.

**Unit 5:** Application of biotechnology in silk fibers improvement and marker assisted breeding both silkworm and mulberry plant.

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### EXAMINATION PATTERN

**Time: 1 Hrs.**

**Full Marks: 25**

**( 20 Theory + 05 Internal Assessment)**

**Question are to be set covering the entire syllabus; 2 questions; out to four of 2 marks each (2x2=4), 2 questions; out of four of 4 marks each(4x2=08) and one question; out of three of 8 marks(8x1=08), are to be answered.**

#### **Reference Books:**

1. BROWN, T. A. (2016). **GENE CLONING AND DNA ANALYSIS: AN INTRODUCTION.** JOHN WILEY & SONS.
2. GLICK, B.R., PASTERNAK, J.J. (2003). **MOLECULAR BIOTECHNOLOGY- PRINCIPLES AND APPLICATIONS OF RECOMBINANT DNA.** ASM PRESS, WASHINGTON.
3. KUNDU, S. (ED.). (2014). **SILK BIOMATERIALS FOR TISSUE ENGINEERING AND REGENERATIVE MEDICINE.** ELSEVIER.
4. MURRAY, D.R. (1991) **ADVANCED METHODS IN PLANT BREEDING BIOTECHNOLOGY.** CAB,INTERNATIONAL, WALLINGFORD, OXON, UNITED KINGDOM.
5. PEVSNER, J. (2009). **BIOINFORMATICS AND FUNCTIONAL GENOMICS.** II EDITION. JOHN WILEY & SONS.
6. RUSSELL, P. J. (2009). **iGENETICS- A MOLECULAR APPROACH.** III EDITION. BENJAMIN CUMMINGS

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### SEMESTER IV

**CORE THEORY 8 (CT8)**

**MULBERRY PHYSIOLOGY, BREEDING AND GENETICS**

**CREDITS 4; CLASS 50; MARKS 50**

**Unit1:** Absorption of water and solutes by root, root pressure, ion exchange and active absorption – Mineral nutrients – macro and micro nutrients – their physiological role

**Unit2:** Transpiration – significance mechanism of opening and closing stomata, Factor influencing the rate of transpiration

- Unit3:** Brief account of photo synthesis and photorespiration: its significance.
- Unit4:** Importance and application of plant growth regulators in mulberry
- Unit5:** Cell derision: Mitosis and Meiosis; chromosomal aberration: deletion, duplication, inversion and translocation
- Unit6:** Germplasm bank: Importance, collection, characterization and maintenance. Plant introduction, acclimatization and quarantine.
- Unit7:** Mulberry breeding – objective selection method. Hybridization technique and Selection; Mutation and polyploidy breeding; Breeding for draught and disease resistance varieties

### Examination pattern

**Time: 2 Hour**

**Full Marks: 50**

#### (40 Theory + 10 Internal Assessment)

**Questions are to be set from entire syllabus; 4 questions (out of six) of 2 marks each (2x4=8), four question (out of six) of 4 marks each (4x4=16), and two questions (compulsory) of 8 marks each (8x2=16) are to be answered.**

#### References:

1. GOLDSMITH, M AND WILKINSON, A.S. (1996) **MOLECULAR MODEL SYSTEM IN LEPIDOPTERANS.** CAMBRIDGE PRESS, LONDON.
2. HIRATSUKA. (1999) **SILKWORM BREEDING** OXFORD & IBH PUBLISHING CO, PVT. LTD. NEW DELHI. CALCUTTA.
3. MOROHOSHI, S (2000) **DEVELOPMENT, AND PHYSIOLOGY OF SILKWORM.** OXFORD & IBH PUBLISHING CO, PVT. LTD., NEW DELHI.
4. SREERAMREDDY (ED), G. (1998). **SILKWORM BREEDING.** IBM PUBLISHERS, NEW DELHI.
5. STRICKBERGER, M.W.(1996). **GENETICS.** PRENTICE-HALL OF INDIA, NEW DELHI.

### CORE PRACTICAL 8 (CP8)

### MULBERRY PHYSIOLOGY, BREEDING AND GENETICS

**CREDITS 2**

#### LIST OF PRACTICAL

##### Physiology of Mulberry

1. Determination of stomatal index/frequency
2. Estimation of moisture percentage and moisture retention capacity of mulberry leaf
3. Estimation of leaf protein/transpiration rate in mulberry leaf

##### Mulberry Breeding and Genetics

4. Mulberry germplasm and multi-locational trials (field visit)
5. Study of mitosis in onion root tip/mulberry root tip(Permanent slide Demonstration)

6. Hybridization technique in mulberry (Demonstration)
7. Induction of tetraploidy in mulberry by using colchicin (Demonstration)
8. Field Note Book
9. Internal Assessment

### Question pattern

**Time: 2½ Hour**

**Full Marks: 25**

- |   |     |
|---|-----|
| 1. Determination of stomatal index/frequency/ Estimation of moisture percentage and moisture retention capacity of mulberry leaf/ Transpiration rate in mulberry leaf.(Item No.1) | =09 |
| 2. Estimation of leaf protein/Estimation of chlorophyll a in mulberry leaf. (Item No.2)   | =09 |
| 3. Field Note Book.   | =02 |
| 4. Internal Assessment.   | =05 |

### CORE THEORY 9 (CT9)

### SILKWORM PHYSIOLOGY, BREEDING AND GENETICS

**CREDITS 4; CLASS 50; MARKS 50**

**Unit1:** Digestion: Artificial diets, feeding apparatus, feeding behaviour. Structure and function of digestive system, digestive enzyme, process of digestion

**Unit2:** Respiration: tracheal systems, spiracles, mechanism of respiration, factor affecting respiration

**Unit3:** Excretion: Structure and function of excretory system. Sense organ: Photoreceptor, Chemoreceptor and Mechanoreceptor

**Unit4:** Nervous system. Circulation systems. Haemolymph

**Unit5:** Reproduction: Male and female reproductive system; Metamorphosis and types.

**Unit6:** Silkworm germplasm bank. Sex determination mechanism in silkworm: importance of ZZ and ZW chromosome; Parthenogenesis in silkworm. Gametogenesis: oogenesis and Spermatogenesis; Genetics and inheritance of cocoon colour. Linkage group in *Bombyx mori*; Method of selection, fixation of character.

**Unit7:** Evolution of new breeds – race authorization. Heterosis/hybrid vigour; Exploitation of heterosis in silkworm – concept of single double and polyhybrids.

### Examination pattern

**Time: 2 Hour**

**Full Marks: 50**

**(40 Theory + 10 Internal Assessment)**

**Questions are to be set from entire syllabus; 4 questions (out of six) of 2 marks each (2x4=8), four question (out of six) of 4 marks each (4x4=16), and two questions (compulsory) of 8 marks each (8x2=16) are to be answered.**

#### References:

- BASAVARAJA, H.K., ASWATH, S.K., SURESH KUMAR, N., MAL REDDY, N. AND KALPANA, G.V. (2005) **SILKWORM BREEDING AND GENETICS**. CENTRAL SILK BOARD, BANGALORE.

- DILIP DE SARKAR (1998) **THE SILKWORM – BIOLOGY, GENETICS AND BREEDING**. VIKAS PUBLISHING HOUSE PVT. LTD., NEW DELHI.
- NATARAJU, B., SATHYAPRASAD, K., MANJUNATH, D. AND ASWANI KUMAR, C. (2005) **SILKWORM CROP PROTECTION**. CENTRAL SILK BOARD, BANGALORE
- TAZIMA, Y. (1964) **GENETICS OF SILKWORM**. ACADEMIC PRESS, LONDON.
- ATHER H. SIDDIQI (1982) **EXPERIMENTAL PHYSIOLOGY**. OXFORD & IBH PUBLISHING CO. PVT. LTD., NEW DELHI AND CALCUTTA.
- EIKICHI HIRATSUKA (2000) **SILKWORM BREEDING**. OXFORD & IBH PUBLICATIONS, NEW DELHI.
- ELCIO P. GUIMARAES, JOHN RUANE, BEATE D. SCHERF, ANDREA SONNINO AND JAMES D. DARGIE (2007) **MARKER-ASSISTED SELECTION**, FAO, ROME
- WIGGLESWORTH, V.B. (1956) **INSECT PHYSIOLOGY**. 5TH EDN., REV. METHUEN, LONDON.
- AMITABHA SARKAR (2009). **MULBERRY BREEDING**. KALYANI PUBLISHERS
- B.D. SINGH (2015). **PLANT BREEDING PRINCIPLES & METHODS**.
- N. NADARAJAN & LT. M. GUNASEKARAN (2012). **QUANTITATIVE GENETICS AND BIOMETRICAL TECHNIQUES IN PLANT BREEDING**.
- PHUNDAN SINGH (2015) **ESSENTIALS OF PLANT BREEDING**. KALYANI PUBLISHERS; 5TH EDITION
- PHUNDAN SINGH (2013). **PRACTICAL AND NUMERICAL PROBLEMS IN PLANT BREEDING**.
- ROBERT W. ALLARD (2010). **PRINCIPLES OF PLANT BREEDING**.
- S. ROY CHOWDHURI, B.B. BINDROO S.P. CHAKRABORTI (2013). **A TEXTBOOK ON MULBERRY BREEDING AND GENETICS**. KALYANI PUBLISHERS

## **CORE PRACTICAL 9 (CP9)**

## **SILKWORM PHYSIOLOGY AND BREEDING & GENETICS**

**CREDITS 2; MARKS 25**

### **LIST OF PRACTICAL**

#### **Physiology of Silkworm:-**

1. Estimation of proteins in haemolymph/egg
2. Estimation of glycogen in fat body/ovary of silkworm

#### **Silkworm Breeding & Genetics:-**

3. Identification of different races of silkworm – NB<sub>4</sub>D<sub>2</sub>, PM, C. Nichi, KA, CSR<sub>2</sub> and CSR<sub>4</sub> race/breed characters.
4. Comparative assessment of the hybrids and pure race cocoon.
5. Estimation of heterosis and inbreeding depression.
6. Laboratory Note Book.

## 7. Internal Assessment.

### Question pattern

**Time: 2½ Hour**

**Full Marks: 25**

1. One identification of sex- limited traits of egg, larva and cocoon with external features. (Item No.1) 3x1=3
2. Chi square test /calculation on heterosis/Inbreeding depression calculation.(Item No.2) =8
3. Any one Quantitative trait calculation on fecundity/ ERR by no. / ERR by weight/Defective cocoon and floss%. (Item no. 3) =7
4. Laboratory Note Book. =2
5. Internal Assessment. =5

### **CORE THEORY 10 (CT10)**

### **SERICULTURE EXTENSION EDUCATION**

**CREDITS 4; CLASS 50; MARKS 50**

**Unit1:** Meaning, objective and importance of sericulture extension. Principle and concept of extension education

**Unit2:** Extension programme: concept and principle, role of extension personnel and farmers in programme planning, transfer of technology

**Unit3:** Training: different methods of training, teaching aids.

### Examination pattern

**Time: 2 Hour**

**Full Marks: 50**

**(40 Theory + 10 Internal Assessment)**

**Questions are to be set from entire syllabus; 4 questions (out of six) of 2 marks each (2x4=8), four question (out of six) of 4 marks each (4x4=16), and two questions (compulsory) of 8 marks each (8x2=16) are to be answered.**

#### References:

1. DHAMA, O.P. AND BHATNAGAR (1984): **EDUCATION AND COMMUNICATION FOR DEVELOPMENT**
2. FAO **AGRICULTURAL EXTENSION MANUAL** (SECOND EDITION).
3. S.V SUPE. **AN INTRODUCTION TO EXTENTION EDUCATION**,.
4. G.L ROY . **EXTENTION MANAGEMENT**,.

### **CORE PRACTICAL 10 (CP10)**

### **SERICULTURE EXTENSION & EDUCATION**

**CREDITS 2; MARKS 25**

#### LIST OF PRACTICAL

1. Visit to rearers' house and panel discussion with farmers



2. Visit to TSC and CRC
3. Presentation of statistical data – Bar Chart and Graph, Pie Chart of raw silk, cocoon area
4. Field/Institute Visit.

### Question pattern

**Time: 2½ Hour**

**Full Marks: 25**

- |  |     |
|--|-----|
| 1. Presentation of statistical data – Bar Chart and Graph, Pie Chart of raw silk, cocoon area (Item No. 1) | =04 |
| 2. Preparation of a survey based questionnaire on a given problem. (Item No.2)                             | =08 |
| 3. Tour/Visit report   | =08 |
| 4. Internal Assessment.  | =05 |
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## SEMESTER IV

**SKILL ENHANCEMENT COURSE 2 (SEC T2)**

**SERI- TEXTILE TECHNOLOGY**

**2 CREDITS: CLASS 25 : MARKS 25**

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**Unit 1:** General classification of textile fibers. Difference between nature and synthetic fibers according to their composition and properties.

**Unit 2:** Identification of Silk Textile Fibers by Physical and Chemical Test: Microscopic Examination, Flame Test, Solubility Test

**Unit 3:** Longitudinal and cross section view of silk textile fibers and their impact on physio-mechanical properties like tenacity, elongation toughness, elastic recovery and moisture absorption.

**Unit 4:** Introduction and Objective of Degumming Methods. Silk Bleaching, Importance and Processing, Silk Dyeing – Acid and Basic Dyeing Processing. Introduction of Different Classes of Dyes and Chemicals used for Silk Dyeing.

**Unit 5:** Printing of Silk Fabrics: - Objective, Method -Hand and Screen Printing. Silk Finishing: Objectives, Methods - Mechanical and Chemical Finishing

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### Examination pattern

**Time: 1 Hrs.**

**Full Marks: 25**

**20 Theory + 05 Internal Assessment**

**Question are to be set covering the entire syllabus; 2 questions; out to four of 2 marks each (2x2=4), 2 questions; out of four of 4 marks each(4x2=08) and one question; out of three of 8 marks(8x1=08), are to be answered.**

**References:**

1. ANON. 1972 MANUAL ON SERICULTURE, VOL.3 SILK REELING FAO, AGRICULTURE SERVICE BULLETIN NO. 72/3.
2. BYONG HO KIM. 1989. FILATURE WATER ENGINEERING, SEOUL NATIONAL UNIVERSITY PRESS, REPUBLIC OF KOREA.

3. HUANG GUO RUI. 1988. SILK REELING, OXFORD AND IBH PUBLISHING CO. PVT. NEW DELHI.
4. MAHADEVEPPA, D., HALLIYAL, V.G., SHANKAR, A.G. AND BHANDIWAD, R. 2000 MULBERRY SILK REELING TECHNOLOGY, OXFORD AND IBH PUBLISHING CO. PVT. LTD. NEW DELHI.
5. SONG, K.E AND LEE, Y.W. 1973. MODERN SILK REELING TECHNOLOGY. SERICULTURE EXPT. STATION, REPUBLIC OF KOREA
6. SONWALKER, T.N. HANDBOOK OF SILK TECHNOLOGY, NEW AGE INTERNATIONAL PVT., LTD.
7. YONG WOO LEE. 1999. SILK REELING AND TESTING MANUAL, FAO AGRICULTURAL SERVICES BULLETIN NO. 136, ROME, ITALY.

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## SEMESTER V

### CORE THEORY 11 (CT11) SERICULTURE ECONOMICS AND STATISTICS CREDITS 4; CLASSES 50; MARKS 50

- Unit1:** Economics: Principles of economics, micro and macro economics; classification of costs – explicit And implicit, fixed, variable, marginal, average; profits – gross and net.
- Unit 2:** Advantages and characteristics of sericulture. Scope of sericulture in India – vis-à- vis other agricultural crops - income and employment generation.
- Unit 3:** Economics of silkworm egg production in government and private grainage.
- Unit4:** Economics of mulberry production under rain-fed and irrigated systems; comparative economics of mulberry production under traditional and improved practices.
- Unit 5:** Economics of raw silk production in charka, cottage basin and multi-end reeling units.
- Unit 6:** Measures of Central Tendency: Mean, Median, Mode; Measures of variation: Range, mean deviation, standard deviation; Coefficient of variation; Testing of hypothesis: Chi-square test and students' t-test; Probability theory; Correlation, regression analysis.

#### Examination pattern

**Time: 2 Hour**

**Full Marks: 50**

#### (40 Theory + 10 Internal Assessment)

**Questions are to be set from entire syllabus; 4 questions (out of six) of 2 marks each (2x4=8), four question (out of six) of 4 marks each (4x4=16), and two questions (compulsory) of 8 marks each (8x2=16) are to be answered.**

#### Reference Books:

1. CONCERNED LITERATURES WILL BE COMMUNICATED BY THE FACULTY MEMBERS.
2. KUMARESAN, P. AND SRINIVASA, G. (2005) SERICULTURE EXTENSION MANAGEMENT AND ECONOMICS. CENTRAL SILK BOARD, BANGALORE.
3. MC GRATH, E.H (1986): BASIC MANAGERIAL SKILL FOR ALL. PRENTICE HAL OF INDIA PVT, LTD.,NEW DELHI

**CORE PRACTICAL 11 (CP11)**

**SERICULTURE ECONOMICS AND STATISTICS**

**CREDITS 2, MARKS 25**

**LIST OF PRACTICAL**

1. Mulberry cultivation (per hectare): Cost-return from irrigated and rain fed condition
2. Visit to field and farmers rearing house  
(Economics of silkworm rearing: Investment and return)
3. Visit to silk reeling establishments  
(Economics of silk reeling: cost and returns for different types of reeling establishment.)
4. Field Note Book.
5. Internal Assessment.

**Question pattern**

**Time: 2½ Hour**

**Full Marks: 25**

1. Calculation of Cost-return from irrigated and rain fed condition per hectare basis/ calculation of the Economics of silkworm rearing: Investment and return/ Sericulture Vs. other agriculture crop (cost-return analysis/hectare) =10
2. Calculation on Central Tendency: Mean, Median, Mode. /Measures of variation: Range, mean deviation, standard deviation, coefficient of variation/: Chi-square test/ t-test /Probability theory/ correlation, regression analysis. =10
3. Internal Assessment =05

**SEMESTER V**

**CORE THEORY 12 (CT12)**

**SERICULTURE MARKETING**

**CREDITS 4; CLASS 50; MARKS 50**

**Unit1:** Sericulture markets and their kinds. Marketing problems of silk industry

**Unit2:** Law of demand and supply price determination, problems of cocoon market, price stabilization

**Unit3:** Marketing of cocoons and by-products. Regulated cocoon market. Non-regulated cocoon market.

**Unit4:** Role of Silk exchange in Sericulture Marketing.

**Unit 5:** Cocoon and Silk Marketing system in Karnataka and West Bengal.

**Examination pattern**

**Time: 2 Hour**

**Full Marks: 50**

**(40 Theory + 10 Internal Assessment)**

**Questions are to be set from entire syllabus; 4 questions (out of six) of 2 marks each (2x4=8), four question (out of six) of 4 marks each (4x4=16), and two questions (compulsory) of 8 marks each (8x2=16) are to be answered.**

**Reference Books:**

1. GANGA, G., AND J. SULOCHANA CHETTY. (1991) **AN INTRODUCTION TO SERICULTURE**. OXFORD & IBH PUBLISHING
2. **MANUAL ON SILKWORM EGG PRODUCTION**, Dr. M.N NARASIMHANA
3. CONCERNED LITERATURES WILL BE COMMUNICATED BY THE FACULTY MEMBERS.

**CORE PRACTICAL 12 (CP12)****SERICULTURE MARKETING****CREDITS 2, MARKS 25****LIST OF PRACTICAL**

1. Visit of cocoon market and demonstration.
2. Field Note Book.
3. Internal assessment.

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<b>Time: 2½ Hour</b>	<b>Question pattern</b>	<b>Full Marks: 25</b>
	1. Calculation on Price fixation. Of cocoon or seed cocoon or raw silk.	=10
	2. Report of tour visit/ field visit.	=10
	3. Internal Assessment.	=05

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**SEMESTER V****DISCIPLINE SPECIFIC ELECTIVE; DSET 1****SOIL SCIENCE****CREDITS 4; CLASS 50; MARKS 50****DISCIPLINE SPECIFIC ELECTIVE; DSET 1**

**Unit1:** -Definition of Soil Science; Soil forming factor (parent material, climate, organism including vegetation time topography)

**Unit 2:** Importance soil types of India: Alluvial soil; Black soil ; Red soil; Laterites and lateritic soils; Problem soil (Acid soil, Saline soil, Sodic soil, Holomorphic soil)

**Unit 3:** Physical properties of soil :Volume constitution of soil; Soil texture ; Soil structure; Soil color ; Soil permeability; Soil air; Soil water

**Unit 4:** Soil chemical properties-Significance of ion exchange including base exchange and base saturation

**Unit5:** Soil Organic matter and Soil microorganism: Soil organic matter and chemical nature of its constituents; Importance of soil organic matter ; Carbon: nitrogen ratio of organic matter and its significance; Types of soil microorganisms; Role of microorganisms in mineral nutrition.

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**Examination Pattern****Time: 2 Hrs****Full Marks: 50****(40 Theory + 10 Internal Assessment)**

**Question are to be set from entire syllabus; 4 question (out of six) of 2 marks each(2x4=8), four question (out of six) of 4 marks each(4x4=16), and two question ( Out of two) of 8 marks each(8x2=16), are to be answered.**

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**References:.**

1. YELLAMANDA REDDY, T. AND SHANKARA REDDI, G.H. (1995) **PRINCIPLES OF AGRONOMY**. PUBLISHERS, NEW DELHI
2. T.D BISWAS, S.K MUKHERJEE. **TEXT BOOK OF SOIL SCIENCE**,
3. **THE NATURE AND PROPERTIES OF SOIL**, NYLC C. BRADY
4. A.K. SACHETI. **SOIL AND ITS PROPERTIES**,
5. GURMEL SINGH.VENKATARAMANAN, G.SASTRY, B.P JOSHI **MANUAL OF SOIL AND WATER CONSERVATION PRACTICES**,

**DISCIPLINE SPECIFIC ELECTIVE PRACTICAL 1; DSEP 1**

**SOIL SCIENCE**

**CREDITS 2; MARKS 25**

**LIST OF PRACTICAL**

1. Study soil profile
2. Study of different types of soil
3. Soil sampling
4. Study of soil color
5. Determination of bulk density and particle density of soil.
6. Determination of organic carbon by Titration method
7. Determination of available phosphorus
8. Visit to soil testing laboratory
9. Internal assessment

**Question pattern**

**Time: 2½ Hour**

**Full Marks: 25**

- |   |       |
|---|-------|
| 1. Identification of different types of soil. (any two)   | 4x2=8 |
| 2. Determination of bulk density and particle density of soil/ Determination of organic carbon by Titration method/ Soil PH/Conductivity test/ Determination of available phosphorus. | =10   |
| 3. Laboratory Note Book   | =02   |
| 4. Internal assessment.   | =05   |

**SEMESTER V**

**DISCIPLINE SPECIFIC ELECTIVE 2; DSET2 INSECT BIOLOGY AND CLASSIFICATION**

**CREDITS 4; CLASS 50; MARKS 50**

**Unit 1:** Introduction to Entomology; insect biodiversity; Why Insects are so Successful? ; importance of insects

**Unit 2:** Classification and selected diagnostic features of Insects: characteristics of Superclass Hexapoda; comparison between non-insect hexapods and insect hexapods; schematic presentation of Class Insecta; diagnostic features with examples of insect Orders Isoptera, Orthoptera, Hemiptera, Coleoptera, Hymenoptera, Lepidoptera and Diptera.

**Unit 3:** Insect Structure and Function: Head, thorax and abdomen; insect exoskeleton and moulting.

**Unit 4:** Insect internal anatomy and physiology: feeding and digestion; circulatory system; nervous

system; excretory system; endocrine system and reproductive system.

**Unit 5:** Insect Growth and Development: phases of insect ontogeny; metamorphosis- types and hormonal regulation of metamorphosis.

**Unit 6:** Insect and plant interactions.

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### Examination Pattern

**Time: 2 Hrs**

**Full Marks: 50**

**(40 Theory + 10 Internal Assessment)**

**Question are to be set from entire syllabus; 4 question (out of six) of 2 marks each(2x4=8), four question (out of six) of 4 marks each(4x4=16), and two question ( Out of two) of 8 marks each(8x2=16), are to be answered.**

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### References:.

1. GULLAN, P.J. AND CRANSTON, P.S. **THE INSECTS: AN OUTLINE OF ENTOMOLOGY.** PUBLISHER: BLACKWELL SCIENCE LTD, USA.
2. ROMOSER, W.S. AND STOFFOLANO, JR. J.G. **THE SCIENCE OF ENTOMOLOGY.** PUBLISHER: MCGRAW-HILL.
3. CHAPMAN, R.F.**THE INSECTS: STRUCTURE AND FUNCTION.** HARVARD UNIVERSITY PRESS.

### DISCIPLINE SPECIFIC ELECTIVE PRACTICAL 2; DSEP 2 INSECT CLASSIFICATION AND BIOLOGY

**CREDITS 2; MARKS 25**

### LIST OF PRACTICAL

1. Identification of common insects associated with sericulture industry
2. Demonstration of different parts of the body of insects (Dissected)
3. Demonstration of Internal body and all the systems of cockroach
4. Techniques – Mounting, Haemolymph and Haemocyte Staining.
5. Collection and Preservation techniques.
6. Internal assessment

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### QUESTION PATTERN

**Time: 2½ Hour**

**Full Marks: 25**

- |                                   |    |
|-----------------------------------|----|
| 1. One question from the item no1 | =6 |
| 2. One question from item no. 2   | =2 |
| 3. One question from the item no3 | =8 |
| 4. Laboratory Note Book           | =4 |
| 5. Internal Assessment            | =5 |

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### SEMESTER VI

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## **CORE THEORY 13 (CT13) ENTREPRENEURSHIP AND HUMAN RESOURCE DEVELOPMENT**

**CREDITS 4; CLASS 50; MARKS 50**

**Unit1:** Entrepreneurship Building: Meaning, Importance, Psychological, Sociological factors and distinctive competence. Entrepreneurship processes.

**Unit2:** Need, scope, characteristics and types of Entrepreneurship.

**Unit3:** Social responsibility and business ethics

**Unit4:** Human resource management; Leadership, Motivation attitude, communication, Group dynamics, Dedication, Setting of goals, self assessment Transactional analysis, Creativity.

**Unit 5:** Problem solving, Strength weakness opportunity and threat (SWOT) Techniques; Decision making, Stress management; Reinforcement, recruitment, selection and training.

### **Examination pattern**

**Time: 2 Hour**

**Full Marks: 50**

**(40 Theory + 10 Internal Assessment)**

**Questions are to be set from entire syllabus; 4 questions (out of six) of 2 marks each (2x4=8), four question (out of six) of 4 marks each (4x4=16), and two questions (compulsory) of 8 marks each (8x2=16) are to be answered.**

### **Reference Books: .**

1. S.S KHANKA. **ENTREPRENEURIAL DEVELOPMENT**, S.CHAND PUBLISHING
2. A. NIRJAR **ENTREPRENEURSHIP DEVELOPMENT**, SANBUN PUBLISHERS
3. V.S.P .RAO **HUMAN RESOURCE MANAGEMENT**, TAXMANN
4. PHILIP KOTLE **MARKETING MANAGEMENT ANALYSIS, PLANNING, IMPLEMENTATION & CONTROL** RPEARSON

## **CORE PRACTICAL13(CP13) ENTREPRENEURSHIP AND HUMAN RESOURCE DEVELOPMENT**

**CREDITS 2; MARKS 25**

### **LIST OF PRACTICAL**

- 1) EDP in raising mulberry saplings (Kisan nursery) and vermicomposting
- 2) EDP in organization of chawki rearing centres.
- 3) EDP in silkworm egg production and rearing.
- 4) EDP in silk reeling – charaka, cottage basin and multi-end reeling units.
- 5) EDP in mass production of parasitoids and predators.
- 6) Lab Note Book
- 6) Internal assessment

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### **QUESTION PATTERN**

**Time: 2½ Hour**

**Full Marks: 25**

1. Deliberation of a topic on EDP in raising mulberry saplings (Kisan nursery) / vermicomposting/silkworm egg production and rearing/ mass production of parasitoids and predators with power point presentation.

10+10=20

2. Internal assessment.

=05

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## SEMESTER VI

**CORE THEORY 14 (CT14)**

**SERICULTURE ORGANIZATION AND MANAGEMENT**

**CREDITS 4; CLASSES 50; MARKS 50**

**Unit1:** Sericulture organisational setup: central silk board, RSRS, KVK, NGOs, and universities.

**Unit2:** Technology Management: 1) Criteria for principles of product, selection and development. 2) Choice of technology, plant and equipment, 3) enquiry recruitment & utilization 4) Critical Path Method (CPM) & Project Evaluation Review Techniques (PERT) as planning tools for establishing SSI.

**Unit3:** Financial Management: 1) Institutions, Financing procedure and Financial incentives, Banking Norms as in vogue.2) Financial ratios & and their significance, Costing and Pricing.3) Fund flow and Cash flow concept.4) Break even analysis.

**Unit4:** Marketing Management -1) Elements of marketing & sales management. 2) Nature of product And market strategy – Packing & advertising – After sales service3) Touch on Import – Export Procedure and methods.4) Analyzing marketing opportunities, Planning marketing strategy, Forecasting, Marketing mix, Advertising the marketing programme & sales management, market survey techniques.

**Unit5:** Project Formulation-1) Stages and methodology in Project identification, Selection of a project format, Project report writing.2) Analysis and evaluation of a Project report.

**Unit6:** Statutory provisions: 1) Licensing, Registration – Municipal bye laws and Insurance coverage.2) Important provisions of Factory Act, Sales of Goods Act, Partnership Act.3)Pollution control & Environmental Act.4)Income Tax, Sales Tax and Excise



Rules.5)Business & Industrial laws, labour relations.

**Unit7:** Knowledge input:1)Industrial and Economic policy declared by Government from time to time.2) Sickness in small scale industries and their remedial measures.3) Management Information System (MIS)

#### Examination pattern

**Time: 2 Hour**

**Full Marks: 50**

**(40 Theory + 10 Internal Assessment)**

**Questions are to be set from entire syllabus; 4 questions (out of six) of 2 marks each (2x4=8), four question (out of six) of 4 marks each (4x4=16), and two questions (compulsory) of 8 marks each (8x2=16) are to be answered.**

#### References:

1. **ENTREPRENEURIAL DEVELOPMENT** BY S.S KHANKA, S.CHAND PUBLISHING
2. **ENTREPRENEURSHIP DEVELOPMENT** BY A.NIRJAR,SANBUN PUBLISHERS
3. **HUMAN RESOURCE MANAGEMENT** BY V.S.P .RAO,TAXMANN
4. **MARKETING MANAGEMENT ANALYSIS,PLANNING,IMPLEMENTATION&CONTROL** BY PHILIP KOTLER PEARSON

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### **CORE PRACTICAL 14 (CP14) SERICULTURE ORGANIZATION AND MANAGEMENT**

**CREDITS 2; MARKS 25**

#### LIST OF PRACTICAL

1. A project on Sericulture management/Agro- farm management.
2. Internal assessment.

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#### Question pattern

**Time: 2½ Hour**

**Full Marks: 25**

1. Submission of a project on Sericulture management/Agro- farm management =10
2. Deliberation of a topic from the above project with viva-voce 7+3=10
3. Internal assessment. =05

## **SEMESTER VI**

### **DISCIPLINE SPECIFIC ELECTIVE 3 (DSET3)**

### **COMPUTER APPLICATION**

**CREDITS 4; CLASS 50; MARKS 50**

**Unit1:** What is a computer; software and hardware; Hardware components; Operating system software  
Software application

**Unit2:** Working with Computers: Computer Terminology; Starting and stopping the computer; Using the  
Mouse

**Unit3:** Computer Tools & Utilities: Disk utility; Files and directories; Manipulating Files and Folders; Working with the windows environment

**Unit4:** Computer network: LAN; Internet; E-Mail

**Unit5:** MS Word: Introduction; Working with documents ; Formatting documents; Creating tables Drawing, tools, Printing documents

**Unit 6:** MS Excel: Introduction; Working with spread sheet, formatting spread sheet, creating chart MS PowerPoint: Introduction; Opening new presentation; Different presentation templates; Setting backgrounds; Setting presentation layout; Creating presentation

**Examination pattern**

**Time: 2 Hour**

**Full Marks: 50**

**(40 Theory + 10 Internal Assessment)**

**Questions are to be set from entire syllabus; 4 questions (out of six) of 2 marks each (2x4=8), four question (out of six) of 4 marks each (4x4=16), and two questions (compulsory) of 8 marks each (8x2=16) are to be answered.**

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**References:**

- B ANTONISAMY, PRASANNA S. , PREMKUMAR, CHRISTOPHER S- PRINCIPLES AND PRACTICE OF BIOSTATISTIC, ELSEVIER INDIA
- RAO. BIOSTATISTICS A MANUAL OF STATISTICAL METHODS FOR USE IN HEALTH, NUTRITION AND ANTHROPOLOGY- JAYPEE BROTHERS MEDICAL PUBLISHERS; SECOND EDITION
- ARORA S.- COMPUTER APPLICATIONS: A TEXTBOOK. DHANPAT RAI & CO. (P) LTD.
- DIXIT P.G. AND RAYARIKAR A.V.- COMPUTER APPLICATIONS IN STATISTICS. NIRALIPRAKASHAN.

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**DISCIPLINE SPECIFIC ELECTIVE PRACTICAL 3 (DSEP 3)**

**COMPUTER APPLICATION**

**CREDITS 2; MARKS 25**

**LIST OF PRACTICAL**

1. Identification of computer accessories.
2. Preparation of chart, graphs and power point presentation in computer.
3. Internal Assessment.

**Question pattern**

**Time: 2½ Hour**

**Full Marks: 25**

- 
- |                                |     |
|--------------------------------|-----|
| 1. One question from item no.1 | =08 |
| 2. One question from item no.2 | =12 |
| 3. Internal Assessment         | =05 |

**DISCIPLINE SPECIFIC ELECTIVE; DSET 4**

**ECOLOGY**

**CREDITS 4; CLASS 50; MARKS 50**

**Unit1:** Concept of Ecosystem: Components, Basic properties, Principles, Examples.

**Unit 2:** Energy flow: Energy flow through trophic levels and Ecological pyramids.

**Unit 3:** Population Dynamics: Natality, Mortality, Growth forms, Regulation of population density.

**Unit 4:** Community Structures and Function: Characteristics, Types, Niche Concepts, Resource partitioning

**Unit 5:** Ecological Succession: Concept of Community change, Theories of Succession, Model of Succession.

**Unit 6:** Environmental pollution: Air and Water pollution, Global Warming, Acid Rain, Eutrophication.

**Unit 7:** Environmental hazards in Sericulture : Pollutants and their effects on Silkworm and Mulberry.

**Examination pattern**

**Time: 2 Hour**

**Full Marks: 50**

**(40 Theory + 10 Internal Assessment)**

Questions are to be set from entire syllabus; 4 questions (out of six) of 2 marks each (2x4=8), four question (out of six) of 4 marks each (4x4=16), and two questions (compulsory) of 8 marks each (8x2=16) are to be answered.

**References:**

1. COLINVAUX, P. A. (1993). **ECOLOGY. II EDITION.** WILEY, JOHN AND SONS, INC.
2. KREBS, C. J. (2001). **ECOLOGY. VI EDITION.** BENJAMIN CUMMINGS.
3. ODUM, E.P., (2008). **FUNDAMENTALS OF ECOLOGY.** INDIAN EDITION. BROOKS/COLE
4. ROBERT LEO SMITH **ECOLOGY AND FIELD BIOLOGY** HARPER AND ROW PUBLISHER
5. RICKLEFS, R.E., (2000). **ECOLOGY. V EDITION.** CHIRON PRESS

**DISCIPLINE SPECIFIC ELECTIVE; DSET 4**

**ECOLOGY**

**CREDITS2**

**LIST OF PRACTICAL**

1. Study of life tables and plotting of survivorship curves of different types from the hypothetical/real data provided.
2. Determination of population density in a natural/hypothetical community by quadrat method and calculation of Shannon-Weiner diversity index for the same community.
3. Study of an aquatic ecosystem: Phytoplankton and zooplankton, Measurement of area,
4. Temperature, turbidity/penetration of light, determination of pH, and Dissolved Oxygen content (Winkler's method)

5. Report on a visit to National Park/Biodiversity Park/Wild life sanctuary.

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**Question Pattern**

**Time: 2<sup>1</sup>/<sub>2</sub> Hour**

**Full Marks-25**

1. Study of life tables and plotting of survivorship curves of different types from the hypothetical/real data provided. =5
2. Determination of population density in a natural/hypothetical community by quadrat method and calculation of Shannon-Weiner diversity index for the same community. =5
3. Study of an aquatic ecosystem: Phytoplankton and zooplankton, Measurement of area, =5
4. Temperature, turbidity/penetration of light, determination of pH, and Dissolved Oxygen content (Winkler's method) (Any one) =5
5. Report on a visit to National Park/Biodiversity Park/Wild life sanctuary/ Internal assessment. =5

**OR**

**DISCIPLINE SPECIFIC ELECTIVE; DSET 4**

**PROJECT WORK**

**CREDITS 6; CLASS 75; MARKS 75**

Project work to be done under a faculty member of the department. Project supervisors may be allocated during the end of second semester. Completed project report may be submitted at the end of Semester VI.

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**Examination Pattern**

**Time: 3Hrs**

**Full Marks: 75**

- |                                 |    |
|---------------------------------|----|
| 1. Submission of Project Report | 30 |
| 2. Power Point Presentation     | 10 |
| 3. Grand Viva                   | 20 |
| 4. Internal Assessment          | 15 |
- 

**END**