



**UNIVERSITY OF JAMMU**  
**NOTIFICATION**  
(12/Aug/ ADP/11)

In pursuance of the decision taken by the Academic Council at its meeting held on 19.06.2012 vide Resolution No. 3.12.2, It is hereby notified for the information of all concerned that the Syllabi and Courses of Study in the subject of Sericulture for I semester of Master's Degree Programme as given in annexure (newly started course at Poonch Campus) are adopted for the examinations to be held in the years Dec. 2012, 2013, 2014.


Sd/-  
REGISTRAR

No. F.Acd./12/ 9231-50  
Dated: 30/08/12

Copy for information and necessary action to:

1. P.S to Vice-Chancellor
2. P.S. to Dean Academic Affairs
3. P.A. to Registrar
4. Sr. P.A. to Controller of Examinations
5. Dean, Faculty of Life Sciences
6. Convener, Board of Studies in Sericulture
7. All the members of the Board of Studies in Sericulture
8. C.A. to Controller of Examinations
9. I/c Deputy Registrar (Publication)
10. Asst. Registrar (Conf./ Exams. P/G /Inf.)
11. S.O (Confidential)
- ~~12. I/c University Website~~

  
(Vivek Slathia)  
Deputy Registrar (Academics)

  
29/8/12

POONCH CAMPUS  
UNIVERSITY OF JAMMU

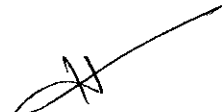


**M.Sc. Sericulture**

**SYLLABUS**

*H*  
*Convener Board of Studies*  
*in Sericulture*

# SEMESTER I



## SEMESTER I

**COURSE NO. 401**

**Course title: General Sericulture**

**CREDIT : 4**

**MAXIMUM MARKS: 100**

**DURATION OF EXAM: 3 hrs.**

**a) Semester Examination: 80**

**b) Internal Assessment: 20**

**Syllabus for the examination to be held in  
December 2012, December 2013 and December 2014.**

### OBJECTIVES

The course is designed to introduce the students to various aspects of Sericulture so that they may acquaint themselves with the historical background of silk culture in India and other countries. Emphasis is also laid on the nature of the silk fiber and its properties.

#### Unit-I

##### **Sericulture- An Overview**

**10 hrs.**

- 1.1. Introduction to sericulture; Geographical distribution, scope and importance of mulberry and non-mulberry sericulture in India; Origin and history of sericulture in India and other countries, the silk route
- 1.2. World output of silk; sericulture practices in different countries of the world: silk industry in China, Japan, South Korea, North Korea, India, Brazil, Thailand, Iran, Bangladesh and others, production and present status.
- 1.3. Silk industry in India; West Bengal, Jammu and Kashmir, Karnataka, Tamil Nadu, Andhra Pradesh, Gujarat and other states. Mulberry areas, sericulture villages; cocoon and silk production.
- 1.4. Characteristics of sericulture; role of sericulture in sustainable agriculture and rural development.

## Unit-II

### Silk Fiber

10 hrs.

- 2.1. Introduction to textile fibers; types – natural and synthetic fibers; importance of natural manmade fibers, need for textile fibers; role of silk fibers amongst the natural fibers
- 2.2. Properties of silk; in comparison with other fibers such as wool, cotton and jute; properties of mulberry silk in comparison with other types of silk such as Tassar, Eri and Muga.
- 2.3. Advantages of silk fiber over other fibers; A comparative study of sericulture other agriculture crops
- 2.4. Prospects and problems of sericulture.

## Unit-III

### Components of Sericulture

10 hrs.

- 3.1. Mulberry cultivation; Raising of mulberry plantation, soil for mulberry, systems of mulberry cultivation in different agro climatic conditions; cultivated varieties of mulberry in different parts of India and world.
- 3.2. Silkworm egg production; Seed organization, organizational set up, multiplication and maintenance of parental seed norms; Seed Legislation Act. Rules and regulations in Karnataka, A.P, T.N, W.B and J&K state
- 3.3. Silkworm rearing; Mulberry sericulture, mulberry silkworm and its food plants; silkworm races: Classification of mulberry silkworm on the basis of its origin and voltinism. Life cycle of *Bombyx mori L.*
- 3.4. Silk Technology; History of reeling industry; Different types of cocoons, physical and commercial characters of mulberry silkworm reeling cocoons, a brief account of different processes in silk reeling, cocoon sorting, cocoon stifling, cooking, reeling and re-reeling.

## Unit-IV

### Sericulture organization in India

10 hrs.

- 4.1. Administrative set up; research and training set up in Central Silk Board, State Department with special reference to Sericulture
- 4.2. Role of central Silk Board in research and development of sericulture in different states of India; Sericulture research in India and its impacts, Sericulture an important rural cottage industry in India, its development, problems and prospects.
- 4.3. Sericulture extension organization at various level especially CSB policy for development research and training in states and at National level; Role of NGOs, self help groups and private enterprise in sericulture development.
- 4.4. Sericulture for women and tribal; Women's participation in sericulture, Mulberry garden and rearing management in silk reeling, weaving and finishing, Sericulture and women advancement.

## Unit-V

### Marketing of cocoon and silk

10 hrs.

- 5.1 Marketing of silk; Marketing set up in different states, market operation, cocoon and silk cocoon grading.
- 5.2 Silk grading; Brief account of silk conditioning and testing.
- 5.3 By- products of sericulture; Economic importance utilization of byproducts of mulberry silkworm pupae and moths.
- 5.4. Cocoons and silk in crafts

### Note for paper setting:

The question paper will contain three sections: A, B and C.

Section 'A' will be compulsory for all and consist of 15 questions, each carrying 01 mark.

Section 'B' will carry 10 short answer type questions, 02 questions from each unit (unit I-V) of which the candidates will attempt only 05 questions, selecting 01 question from each unit. Each question will carry 04 marks.

Section 'C' will consist of 05 long answer type questions, 01 question from each unit. Candidates will have to attempt any 03 questions. Each question will carry 15 marks.

### Books Recommended:

- Akira Nakamura (2000) *Fiber Science and Technology*. Oxford & IBH Publications, New Delhi.
- Anonymous (1998) *Illustrated Textbook on Sericulture*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi and Calcutta.
- Anonymous (1997) *Silkworm Egg Production*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi and Calcutta.
- Boraiah, G. (1994) *Lectures on Sericulture*. SBS Publishers, Bangalore.
- Borror, D. J and Delong, D. M. (1960) *Introduction to of Insects*. Holt, New York.
- Chinnaswamy, K.P.; Govindan, R.; Krishnaprasad, N.K. and Reddy, D.N.R. (2000) *Moriculture in Tropics. Vol. 1 – Proceedings of NSTS – 1999*, UAS, Bangalore.
- Chinnaswamy, K.P.; Govindan, R.; Krishnaprasad, N.K. and Reddy, D.N.R. (2000) *Silkworm Management in Tropics. Vol. 2 – Proceedings of NSTS – 1999*, UAS, Bangalore.
- Dandin, S.B. and Gupta, V.P. (2002) *Advances in Indian Sericulture Research*. CSR&TI, Mysore.
- Dandin, S.B.; Jayant Jayaswal and Giridhar, K. (Eds.) (2003) *Handbook of Sericulture Technologies*. CSB, Bangalore.
- Bernard P. Corbman (1983) *Textiles: Fiber to Fabric*. 6<sup>th</sup> Edition, Mc. Graw – Hill International Editions, Home Economic Series, Singapore, p. 594.
- Bernard P. Corbman (1983) *Textiles: Fiber to Fabric*. 6<sup>th</sup> Edition, Mc. Graw – Hill International Editions, Home Economic Series, Singapore, p. 594.
- Boraiah, G. (1994) *Lectures on Sericulture*. SBS Publishers, Bangalore.
- Borror, D. J and Delong, D. M. (1960) *Introduction to of Insects*. Holt, New York.
- Chapman, R.F. (1998) *The Insects-Structure and Function*. Cambridge University Press, UK.
- Charles J. Huber (1929) *The Raw Silk Industry of Japan*. The Silk Association of America, Inc., New York.
- Chinnaswamy, K.P.; Govindan, R.; Krishnaprasad, N.K. and Reddy, D.N.R. (2000) *Silkworm Management in Tropics. Vol. 2 – Proceedings of NSTS – 1999*, UAS, Bangalore.
- Dandin, S.B.; Jayant Jayaswal and Giridhar, K. (Eds.) (2003) *Handbook of Sericulture Technologies*. CSB, Bangalore.

- Govindan, R.; Chinnaswamy, K.P.; R.; Krishnaprasad, N.K. and Reddy, D.N.R. (2000) *Advances in Tropical Sericulture. Vol. 4 – Proceedings of NSTS – 1999*, UAS, Bangalore.
- Huang, G. R. (1998) *Silk Reeling*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi and Calcutta.
- Kichisaburo M. (1997) *Moriculture – Science of Mulberry Cultivation*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi and Calcutta.
- Krishnaswami, S.; Narasimhanna, M.N.; Suryanarayan, S.K and Kumararaj, S. (1973) *Sericulture Manual-2 - Silkworm Rearing*. Agriculture Service Bulletin, FAO, Rome.
- Madan Mohan Rao, M. (1999) *Comprehensive Sericulture Manual*. PS Publications, Hyderabad.
- Mahadevappa, D.; Halliya, V.G.; Shankar, D.G. and Ravindra Bhandiwad (2000) *Mulberry Silk Reeling Technology*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi and Calcutta.
- Mehta, S.S. and Vinod Shanbhag (1990) *Indian Textiles – An Intersectoral Perspective*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi and Calcutta.
- Misra, R.D. and Ahmed, M. (1993) *Manual on Irrigation Agronomy*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, Bombay and Calcutta.
- Narasimhanna, M.N. (1998) *Manual on Silkworm Egg Production*. CSB, Bangalore.
- Omura, S. (1973) *Silkworm Rearing Techniques in Tropics*. Overseas Technical Co- operation Agency, Tokyo, Japan.
- Rajan, R.K. and Himantharaj, H.T. (2005) *Silkworm Rearing Technology*. Central Silk Board, Bangalore.
- Tazima, Y. (1972) *Handbook of Silkworm Rearing*. Fuji Pub.Co. Ltd., Tokyo, Japan.
- Tripurari Sharan (1984) *Sericulture and Silk Industry*. Published by Y.K. Sharma, Consortium on Rural Technology, Delhi.
- Ullal, S.R. and Narasimhanna, M.N. (1981) *Handbook of Practical Sericulture*. CSB, Bangalore.
- Yonemura, M. and Rama Rao, N. (1925) *Handook of Sericulture*. Mysore Government Branch Press.



## SEMESTER I

COURSE NO. 402

Course title: Mulberry Biology and Production

CREDIT : 4

MAXIMUM MARKS: 100

DURATION OF EXAM: 3 hrs.

a) Semester Examination: 80

b) Internal Assessment: 20

**Syllabus for the examination to be held in  
December 2012, December 2013 and December 2014.**

### OBJECTIVES

In this course, a detailed study of mulberry is included which is the sole food of mulberry silkworm and also the course aims to familiarize the students about the requirement of the mulberry leaves at various stages of silkworm rearing and other aspects essential for sericulture industry.

### Unit I

#### Mulberry Biology

10 hrs.

- 1.1 Salient features; economic importance and affinity of the family Moraceae
- 1.2 Phytogeography and systematic position of the genus *Morus* L. and its species, centers of origin and diversity of cultivated plants. Botanical description of mulberry.
- 1.3 Reproductive biology of mulberry; Sexual polymorphism, development of anther, pollen and male gametophyte, development of ovary, megaspore and female gametophyte, pollination, fertilization, embryo and seed development; polyembryony, parthenocarpy and apomixes

- 1.4 Anatomy of mulberry leaf, stem and root; secondary growth, structure and organization of shoot and root meristems.

## Unit II

10 hrs.

### Soil Management

- 2.1 Classification of different types of soils; soil profile.
- 2.2 Properties of soil; Physical properties of soils, soil texture, color, permeability, soil air, soil water; Chemical properties of soil; Soil colloids-cation exchange capacity of soil, factors affecting CEC, Cation exchange and availability plant nutrients, soil organic matter C: N ratio and its importance.
- 2.3 Problematic soils; Acidic soils, properties of acid soil, causes of acidity, their problems and reclamation and management of acidic soils; Alkali and saline soil, their properties and causes, management of alkali soil and saline soils by reclamatory materials, types of reclamation materials and reclamation technologies.
- 2.4 Soil Management for proper NPK and Sulphur ratio in mulberry garden; Reclamation of problematic soils, economics involved in reclamation of problematic soils.

## Unit-III

### Integrated Nutrient Management

10 hrs.

- 3.1. Nutrient management; Mulberry growth and nutrition, essential elements their types, mechanism of absorption utilization, role of plants nutrients in leaf production.
- 3.2. Use of Manures and fertilizers; Manure types of organic manures, dosage, schedule and mode of application, chemical fertilizers -types, dosage, schedule and mode of application.
- 3.3. Bio fertilizers; Concept, different types of bio fertilizers, use of bio fertilizers in mulberry plant nutrient management, effect of synthetic fertilizers, fungicides and pesticides on bio fertilizers.
- 3.4. Integrated Plant Nutrient management; Concept of IPNM and its role in mulberry production, role of organic manures and green manures in integrated farming, concept of organic farming, recycling of sericultural farm waste in management

of compost production, importance of composting and bio fertilizers in IPNM and organic farming.

#### Unit- IV

##### **Mulberry production technology**

**10 hrs.**

- 4.1. Concept of mulberry cultivation; Agro climatic zones and agro climatic condition for mulberry cultivation, site suitability for mulberry garden establishment, mulberry varieties, characteristic features of popular mulberry cultivars of tropical and temperate regions.
- 4.2. Mulberry propagation; Scope and significance of sexual and asexual propagation, Seedlings, collection of seeds, viability and preservation of seeds, Saplings-nursery preparations, time and schedule for production of saplings, Grafting-different methods and their significance (stem, root and bud), Layering-different methods and their significance.
- 4.3. Mulberry crop production; Planning for establishment for mulberry garden, Selection and preparation of planting material, different methods of planting for rain fed irrigated and hilly areas, Concept and establishment of mulberry garden for chawki, Pruning- Objectives, methods and schedule.
- 4.4. Harvesting; Methods of harvesting, criteria for maintenance of quality of leaves, transportation and preservation, Growth analysis, mulberry crop growth analysis, estimation of leaf yield and leaf cocoon ratio.

#### Unit-V

##### **Water Management**

**10 hrs.**

- 5.1. Water management; Water management and sources, Suitability of irrigation water-methods of irrigation and layout, their efficiency and management, Drainage-need, benefits and methods of drainage.
- 5.2. Soil and fertility management; Factors affecting soil fertility and their management, Soil management for acidity, alkalinity and salinity.
- 5.3. Integrated soil fertility management; Soil pollution and waste management, Farm management, Principles and scope of dry land farming, soil moisture and its conservation.

- 5.4 Weeds and weed management; Effect of weeds in mulberry and its production, control and identification of weeds.

**Note for paper setting:**

The question paper will contain three sections: A, B and C.

Section 'A' will be compulsory for all and consist of 15 questions, each carrying 01 mark.

Section 'B' will carry 10 short answer type questions, 02 questions from each unit (unit I-V) of which the candidates will attempt only 05 questions, selecting 01 question from each unit. Each question will carry 04 marks.

Section 'C' will consist of 05 long answer type questions, 01 question from each unit. Candidates will have to attempt any 03 questions. Each question will carry 15 marks.

**Books Recommended:**

Chinnaswamy, K.P.; Govindan, R.; Krishnaprasad, N.K. and Reddy, D.N.R. (2000) *Moriculture in Tropics. Vol. 1 – Proceedings of NSTS – 1999*, UAS, Bangalore.

Dandin, S.B.; Jayant Jayaswal and Giridhar, K. (Eds.) (2003) *Handbook of Sericulture Technologies*. CSB, Bangalore.

Foth, H.D. (1984) *Fundamentals of Soil Science*. 7<sup>th</sup> Edn., John Wiley & Sons, New York.

Govindan, R.; Chinnaswamy, K.P.; R.; Krishnaprasad, N.K. and Reddy, D.N.R. (2000) *Advances in Tropical Sericulture. Vol. 4 – Proceedings of NSTS – 1999*, UAS, Bangalore.

Hartmann, H.T. and Kaster, D.E. (1961) *Plant Propagation: Principles and Practices*. N.J. Englewood Cliffs, Prentice Hall, New York.

Hiroo and Sibuya-ku (1975) *Textbook of Tropical Sericulture*. Japan Overseas Corporation Volunteers, Tokyo, Japan.

Kichisaburo M. (1997) *Moriculture – Science of Mulberry Cultivation*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi and Calcutta.

Kolay, A.K. (1996) *Basic Concepts of Soil Science*. New Age International Pvt. Ltd., New Delhi.

- Konhar, S.L. (1981) *Economic Botany in the Tropics*. Mcmillan India Ltd., Delhi.
- Krame, P.J. (1969) *Plant and Soil Water Relationships: Modern Synthesis*. McGraw-Hill New York.
- Misra, R.D. and Ahmed, M. (1993) *Manual on Irrigation Agronomy*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, Bombay and Calcutta.
- Pandey, S.N. and Chada, A. (1996) *Economic Botany*. Vikas Publishing House Pvt. Ltd., New Delhi.
- Rajanna, L., Das, P.K., Ravindran, S., Bhogsha, K., Mishra, R.K., Singhvi, N.R., Katiyar, R.S. and Jayaram, H. (2005) *Mulberry Cultivation and Physiology*. Central Silk Board, Bangalore.
- 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.
- Singh, S.S. (1996) *Principles and Practices of Agronomy*. Kalyani Publishers, New Delhi.
- Shankar, M.A. (1997) *Hand Book of Mulberry Nutrition*. UAS - Multiplex, Bangalore.
- Simon R. Charlsley (1982) *Culture and Sericulture*. Academic Press Inc. London.
- Ullal, S.R. and Narasimhanna, M.N. (1981) *Handbook of Practical Sericulture*. CSB, Bangalore.
- Yonemura, M. and Rama Rao, N. (1925) *Handook of Sericulture*. Mysore Government Branch Press.

## SEMESTER I

COURSE NO. 403

Course title: Silkworm Biology, Physiology and Biochemistry

CREDIT : 4

MAXIMUM MARKS: 100

DURATION OF EXAM: 3 hrs.

a) Semester Examination: 80

b) Internal Assessment: 20

**Syllabus for the examination to be held in  
December 2012, December 2013 and December 2014.**

### OBJECTIVES

The course is designed in such a way that it will introduce the students to the basic theoretical and various aspects of silkworm biology, its physiology and biochemistry which are necessary to learn the basics about this wonderful insect.

### Paper-III

#### Unit-I

#### Silkworm Biology-I

10 hrs.

- 1.1 Classification of insects - general characteristic features of insects; classification of sericigenous insects; characteristic features of order Lepidoptera and families – Bombycidae and Saturniidae.
- 1.2 Metamorphosis in insects: Importance, types and hormonal influence; Role of hormones in insect metamorphosis.
- 1.3 Morphology of egg, larva, pupa and adult and life cycle of the silkworm, *Bombyx mori*
- 1.4 Classification of silkworms: Geographical distribution, moultnism, voltinism, cocoon color and shape.

## Unit-II

### Silkworm Biology-II

10 hrs.

- 2.1 Spermatogenesis and oogenesis in *Bombyx mori*.
- 2.2 Embryonic development in *Bombyx mori*.
- 2.3 Oviparity, ovoviviparity and viviparity, polyembryony, parthenogenesis and pedogenesis; Reproductive systems of silk moths.
- 2.4 Silk gland of silkworm; Silk protein and its synthesis in *Bombyx mori*; Anatomical features of silkworm: Digestive, circulatory, excretory, nervous, and respiratory systems.

## Unit-III

### Silkworm Biology and Physiology

10 hrs.

- 3.1. Ultra structure of cell types in silkworm gut; Mechanism of gut movements digestive enzymes in phytophagous insects; Absorptions and transport of nutrients across gut epithelium. Digestion and assimilation efficiencies of feed or nutrients.
- 3.2. Respiration; Tracheal respiration-Gas exchange in insects; Ventilation-Role of temperature and humidity on metabolic rate in silkworm.
- 3.3. Circulation; Composition of haemolymph and its buffering capacity. Estimation of blood pH with electrodes-haemolymph as storage of nutrients.
- 3.4. Neuro Muscular physiology; Structure of insect striated muscle molecular mechanism of muscle contraction energy metabolism during flight. Silkworm Transgenesis; Historical account, piggyback transposon, transformation methodology, and application of silkworm transgenesis.

## Unit-IV

### Biochemistry- I

10 hrs.

- 4.1. Cell environment; Water and gases in cell environment, electrolytes, pH, buffer, Handerson-Hasslbalch equation.
- 4.2. Amino-acid; Essential and non-essential amino acids, their chemical structure and function. Usual and unusual amino acids found in silkworms.

- 4.3. Proteins; Primary, secondary and tertiary structure of proteins. Metabolism of proteins, Structure and composition of silk protein;
- 4.4. Biosynthesis of fibroin initiation, elongation and termination of peptide chain; Biosynthesis of urea and uric acid.

## Unit-V

10 hrs.

### Biochemistry- II

- 5.1 Carbohydrates Structure and classification; Properties of different classes of sugars and amino sugars; Isomerism - optical and stereoisomerism in sugars; Carbohydrates metabolism in relation to diapauses in silkworm.
- 5.2. Enzymes Classification, nomenclature and enzyme code ; Mechanism of enzyme action. Enzyme inhibition.
- 5.3. Bioenergetic. Principle, generation of ATP First and second laws of thermodynamics; Concepts of entropy and free energy change in cellular reaction.
- 5.4. Biological oxidation: Respiratory chain, redox potential and mechanisms of oxidative phosphorylation; Alternate pathways of carbohydrate metabolism - HMP / PPP.

### Note for paper setting:

The question paper will contain three sections: A, B and C.

Section 'A' will be compulsory for all and consist of 15 questions, each carrying 01 mark.

Section 'B' will carry 10 short answer type questions, 02 questions from each unit (unit I-V) of which the candidates will attempt only 05 questions, selecting 01 question from each unit. Each question will carry 04 marks.

Section 'C' will consist of 05 long answer type questions, 01 question from each unit. Candidates will have to attempt any 03 questions. Each question will carry 15 marks.



### Books Recommended:

- Alex Fraser (1966) *Heredity, Genes and Chromosomes*. McGraw Hill Book Company, New York.
- Ather H. Siddiqi (1982) *Experimental Physiology*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi and Calcutta.
- Biotol Series (1993) *Analysis of Amino Acids, Proteins and Nucleic Acids*. Butterworth - Henmann.
- Biotol Series (1993) *Cellular Interactions and Immunobiology*. Butterworth - Heinemann.
- Biotol Series (1993) *Technological Applications of Immunochemicals*. Butterworth-Heinemann.
- Borror, D. J and DeLong, D. M. (1960) *Introduction to of Insects*. Holt, New York.
- Branden, C. and Tooze, J. (1991) *Introduction to Protein Structure*. Garland Publishing Inc., New York & London.
- Bruce A.; Dennis B.; Jullian L.; Martin R.; Keith R. and James W. (1983) *Molecular Biology of the Cell*. Garland Pub. Inc., New York & London.
- Chapman, R.F. (1998) *The Insects-Structure and Fuction*. Cambridge University Press, UK.
- De Robertis and De Robertis (1988) *Cell and Molecular Biology*. Lea & Febiger, Hong kong.
- Dilip De Sarkar (1998) *The Silkworm - Biology, Genetics and Breeding*. Vikas Publishing House Pvt. Ltd., New Delhi.
- Giese, A.C. (1973) *Cell Physiology*. 4<sup>th</sup> Edn., Philadelphia, Saunders.
- Gilmour, D. (1961) *Biochemistry of Insects*. Academic Press, New York.
- Goldsmith, M.R. and František Marec (2010) *Molecular Biology and Genetics of the Lepidoptera*, CRC Press Taylor & Francis Group, Broken Sound Parkway NW, USA.
- Govindan, R.; Bharathi, V.P., Sannappa, B. and Ramakrishna Naika (2005) *Growth Regulators and Hormones in Sericulture*. Seri Scientific Publishers, Bangalore.
- Hames, B.D.; Hooper, N.M. and Haughtan, I.D. (1997) *Instant Notes in Biochemistry*. Viva Books Pvt. Ltd., Chennai.
- Harper, H.A. (1967) *Review of Physiological Chemistry*. Los Altos, Lange Medical Publications.
- Kerkut, G.A. and Gilbert, L.I. (1985) *Comprehensive Insect Physiology, Biochemistry and and Biochemistry - Vol.1-12*. Pergamon Press, Oxford, New York and Toronto.

- Lehninger, A.L. (1978) *Biochemistry, Molecular Basis of Cell Structure and Function*. 2<sup>nd</sup> Edn., Ludhiana, Kalyani.
- Mathews, C.K. and Van Holde, K.E. (1995) *Biochemistry*. 2<sup>nd</sup> Edition, Benjamin Cumings, Redwood City, C.A.
- Natesh, S.; Chopra, V.L. and Ramachandran, S. (Eds.) (1989) *Biotechnology in Agriculture*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi and Calcutta.
- Robert, P.W. (1975) *Genes and Proteins*. Dowden, Hutchinson & Ross Inc., Stroudsburg, Pennsylvania.
- Saxena, A.B. (1996) *Development of Behaviour in Insects*. Anmol Publications Pvt. Ltd., New Delhi.
- Saxena, A.B. (1996) *Hormones of Insects*. Anmol Publications Pvt. Ltd., New Delhi.
- Sivarama Sastry. K.; Padmanabhan, G. and Subramanyam, C. (1994) *Textbook of Molecular Biology*. Macmillan India Ltd., New Delhi.
- Strayer, U. L. (1995) *Principles of Biochemistry*. 4<sup>th</sup> Edition, W.H. Freeman, New York.
- Swanson, C. P. (1968) *Cytology and Cytogenetics*. Macmillan Co., Bombay.
- Yokoyama (1954) *Synthesised Science of Sericulture*. Published by CSB, Bombay.
- Verma, P.S. and Agarwal, V.K. (2004) *Cell Biology, Genetics, Evolution and Ecology*. Published by S. Chand & Co., New Delhi.
- White, M.J.D. (1973) *Animal Cytology and Evolution*. 3<sup>rd</sup> Edn., C.U.P, London.
- Wilson, K. and Walker, J. (1994) *Practical Biochemistry – Principles and Techniques*. Cambridge University Press, Cambridge.



## SEMESTER I

**COURSE NO. 404**

**Course title: Silkworm rearing technology  
& Egg production**

**CREDIT : 4**

**MAXIMUM MARKS: 100**

**DURATION OF EXAM: 3 hrs.**

**a) Semester Examination: 80**

**b) Internal Assessment: 20**

**Syllabus for the examination to be held in  
December 2012, December 2013 and December 2014.**

### OBJECTIVES

The course is introduced to acknowledge the students about the silkworm rearing technology to produce the quality cocoons. It also provides the knowledge of producing silkworm seed which is a backbone of sericulture industry and other aspects that are associated with seed technology.

#### Unit-I

##### **Silk worm rearing technology-I**

**10 hrs.**

- 1.1. Silkworm races; Characteristic features of popular races of silkworm, hybrids and significance of their rearing.
- 1.2. Prerequisites of silkworm rearing; Mulberry leaves availability of leaves, estimation of mulberry leaf quality and yield; Rearing house, rearing requirements their uses and quantitative requirements to rear 100 disease Free Laying; Availability of labor. Annual Planning and schedule of silkworm rearing.
- 1.3. Disinfection; Importance and different methods of disinfection-disinfectants; Different types, composition, action and mode of application. Disinfection of rearing house and equipments.

- 1.4. Rearing houses; Types, location and orientation of rearing houses; Rearing houses for young (chawki) and grown up (late-age) silkworms; Rearing appliances and their uses.

## Unit -II

### Silk worm rearing technology-II

10 hrs.

- 2.1. Egg transportation- time and devices; egg incubation – methods and black boxing; methods of brushing silkworms.
- 2.2. Incubation; Concept of incubation, different methods. Effect of temperature, relative humidity and light on incubation; Black boxing, concept and different types of black boxing
- 2.3. Chawki rearing; Characteristics features of young age silkworms. Different methods of chawki rearing; Feeding-qualitative and quantitative requirements of mulberry leaves. Spacing –concept, density and frequency of spacing. Bed cleaning –Importance, method and frequency of bed cleaning; Concept of co-operative chawki rearing and chawki rearing centers
- 2.4. Late age silkworm rearing; Different methods of late age silkworm rearing and their merits and demerits; Feeding –qualitative and quantitative requirements of mulberry leaves -Spacing concept, density and frequency of spacing. Bed cleaning –Importance, method and frequency of bed cleaning.

## Unit-III

### Silk worm rearing technology-III

10 hrs.

- 3.1. Moulting; Mechanism, symptoms and care at moulting; Harvesting transportation and preservation of mulberry leaves.
- 3.2. Mounting and spacing; Characteristic features of spinning larva, density of mounting; Effect of environmental conditions on spinning. Different types of mountages and their relative influence on quality of cocoons.

- 3.2. Harvesting of cocoons; Harvesting procedure for pure and hybrid cocoons, Cocoons sorting, transportation and marketing.
- 3.3. Mechanisation of silk worm rearing; Machines used in silkworm rearing and their advantages.
- 3.4. Artificial Diet for Silkworm rearing; Byproducts of silkworm rearing and their utilization

#### **Unit-IV**

##### **Silkworm seed Technology-I**

**10 hrs.**

- 4.1. Silkworm seed Technology; Silkworm seed: Definition, structure and composition of silkworm egg; Seed legislation Act-Rules and regulation in Karnataka, AP, WB, and J&K
- 4.2. Concept of breeds-Hybrids –Characteristics of hybrids –Seasonal breeds-hybrids for different agro-climatic condition-authorization;
- 4.3. Silkworm seed organization concept, silkworm seed organization in Karnataka. Basic seed farms-P4, P3 -stock maintenance, selection criteria for maintenance and multiplication. Management of basic seed farms; Seed multiplication farms:P2 and P1 farms, selection criteria for maintenance and multiplication. Management of seed multiplication farms
- 4.4. Parent seed production: Seed areas, selected seed rearers, rearing of pure races, and management of hygiene during pure race rearing; Seed cocoon markets, norms for purchase of multivoltine and bivoltine seed cocoons, procurement and transportation of seed cocoons.

#### **Unit-V**

##### **Silkworm seed Technology-II**

**10 hrs.**

- 5.1. Silkworm egg production centre-Grainages reproductive (Govt.) and commercial grainages (Govt. and LSPs) their aims and objectives; Model grainages-Location, building and capacity. Grainages equipments and their uses.
- 5.2. Process of egg production, Seed cocoon markets MV and BV cocoon markets and their functions; Cocoons-Selection criteria for MV and BV, P1 Seed cocoons. Cocoon transportation, sorting of cocoons and arrangements of cocoons;Sex

separation & Gut examination. Emergence of moths and synchronization of moth emergence. Pairing and depairing. Oviposition. Surface sterilization and washing of eggs. Preparation of sheet and loose eggs. Disposal of eggs.

- 5.3. Acid treatment and cold storage of Bivoltine eggs. Hot and room temperature acid treatment; Acid treatment after short and long duration chilling. Cold storage of acid treated eggs; Preservation of eggs for different season and region. Hibernation schedule for 6 and 10 months in tropical condition. Preservation of eggs in tropical condition.
- 5.4. Management of grainages Programme for production of pure and hybrid disease free laying. Management of grainages activities. Interaction with the farmers; Diagnosis of hereditary disease: Moth examination sample testing, individual and mass moth examination. Dry moth examination. Advanced technique of pebrine detection.

#### **Note for paper setting:**

The question paper will contain three sections: A, B and C.

Section 'A' will be compulsory for all and consist of 15 questions, each carrying 01 mark.

Section 'B' will carry 10 short answer type questions, 02 questions from each unit (unit I-V) of which the candidates will attempt only 05 questions, selecting 01 question from each unit. Each question will carry 04 marks.

Section 'C' will consist of 05 long answer type questions, 01 question from each unit. Candidates will have to attempt any 03 questions. Each question will carry 15 marks.

#### **Books Recommended:**

Anonymous (1997) *Silkworm Egg Production*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi and Calcutta.

Anonymous (1998) *Illustrated Textbook on Sericulture*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi and Calcutta.

Dandin, S.B.; Jayant Jayaswal and Giridhar, K. (Eds.) (2003) *Handbook of Sericulture Technologies*. CSB, Bangalore.

Govindan, R.; ChinnaSwamy, K.P.; R.; Krishnaprasad, N.K. and Reddy, D.N.R. (2000) *Advances in Tropical Sericulture. Vol. 4 – Proceedings of NSTS – 1999*, UAS, Bangalore.

Jolly, M.S. (1987) *Appropriate Sericulture Techniques*. Published by International Centre for Training and Research in Tropical Sericulture, Mysore.

Narasimhanna, M.N. (1998) *Manual on Silkworm Egg Production*. CSB, Bangalore.

Omura, S. (1973) *Silkworm Rearing Techniques in Tropics*. Overseas Technical Co-operation Agency, Tokyo, Japan.

Rajan, R.K. and Himantharaj, H.T. (2005) *Silkworm Rearing Technology*. Central Silk Board, Bangalore.

Tazima, Y. (1972) *Handbook of Silkworm Rearing*. Fuji Pub.Co. Ltd., Tokyo, Japan.

Tripurari Sharan (1984) *Sericulture and Silk Industry*. Published by Y.K. Sharma, Consortium on Rural Technology, Delhi.

Ullal, S.R. and Narasimhanna, M.N. (1981) *Handbook of Practical Sericulture*. CSB, Bangalore.

Yonemura, M. and Rama Rao, N. (1925) *Handook of Sericulture*. Mysore Government Branch Press.



**SEMESTER: I**

**LABORATORY COURSES**

**LAB COURSE No.**

426	Laboratory course-I; based on theory course no. 401, 402	4 credit
427	Laboratory course-II; based on theory course no. 403,404	4 credit

