UNIVERSITY OF JAMMU

Baba Sahib Ambedkar Road, Jammu-180006 (J&K)

NOTIFICATION

(19/May/Adp/04)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Academic Council, is pleased to authorize the adoption of the revised Syllabi and Courses of Study in the subject of **Sericulture** of **Master Degree Programme** for I and IV Semesters under the **(Non-CBCS Scheme)** in the **Off-Site Campuses** for the examinations to be held in the years as per the details given below:-

Subject	**Semester**	**for the examination to be held in the years**
Sericulture	Semester-I	December 2019, 2020 and 2021
	Semester-II	May 2020, 2021 and 2022
	Semester-III	December 2020, 2021 and 2022
	Semester-IV	May 2021, 2022 and 2023

The Syllabi of the courses is available on the University website: www.jammuuniversity.in

Sd/-
DEAN ACADEMIC AFFAIRS

No. F. Acd/II/19/1926 - 1936
Dated: 30-5-2019

Copy for information and necessary action to:

1. Dean, Faculty of Life Science
2. Director, Poonch Campus
3. All members of the Board of Studies
4. C.A to the Controller of Examinations
5. I/c Director, Computer Centre, University of Jammu
6. Asst. Registrar (Conf. /Exams. PG/ Inf./Pub.)
7. Incharge, University Website for necessary action please.

Assistant Registrar (Academic)

29/5/19 29/5/19

SCHEME OF M.SC. SERICULTURE

Theory courses: - **Semester-I**

S.No.	Course No.	Title of Course Theory	Nature of Course	Maximum Marks100 Int.	Ext.	Credit
1.	SE-101	General Sericulture.	Compulsory	20	80	4
2.	SE-102	Mulberry Biology& Production.	Compulsory	20	80	4
3.	SE-103	Silkworm Biology, Physiology and Bio-Chemistry.	Compulsory	20	80	4
4.	SE-104	Silkworm Rearing Technology and Egg Production.	Compulsory	20	80	4

Laboratory Courses:- **Semester-I**

S.NO.	Lab. Course no.	Courses	Maximum Marks 100 Int.	Ext.	Credit
1	SE-105	Lab course-I based on theory course no. SE-101 & SE-102.	50	50	4
2	SE-106	Lab course-II based on theory course no. SE-103 & SE-104.	50	50	4

Total Credit: 24

Theory courses: - **Semester-II**

S.No	Course No.	Title of Theory Courses	Nature of Course	Maximum Marks 100 Int.	Ext .	Credits
1.	SE-201	Cell Biology, Molecular Biology and Immunology.	Compulsory	20	80	4
2.	SE-202	Genetics and Bio chemical techniques.	Compulsory	10	40	2
3.	SE-203	Applied Entomology.	Compulsory	10	40	2
4.	SE-204	Breeding and Genetics of Silkworm and Mulberry.	Compulsory	20	80	4
5.	SE-205	Mulberry and Silkworm crop Protection.	Compulsory	20	80	4

Laboratory courses: - **Semester-II**

S.No.	Lab. Course No.	Courses	Maximum Marks 100 Int.	Ext.	Credits
1.	SE-206	Lab Course-I-Based on theory Course No SE-201,202 & SE-203.	50	50	4
2.	SE-207	Lab-Course –II based on theory course No. SE-204 & SE-205.	50	50	4

Total Credit: 24

Theory courses: - Semester-III

S.No.	Course. No	Title of Theory Courses	Nature of Course	Maximum Marks 100 Int.	Ext.	Credits
1.	SE-301	Biotechnology.	Compulsory	20	80	4
2.	SE-302	Post-Cocoon Technology.	Compulsory	20	80	4
3.	SE-303	Entrepreneurships Development in Sericulture .	Compulsory	10	40	2
4.	SE-304	Biostatistics and Computers.	Compulsory	10	40	2
5.	SE-305	Cocoon Production –I.	Optional	20	80	4
6.	SE-306	Mulberry Physiology Breeding and Genetics .	Optional	20	80	4

Laboratory courses: - Semester-III

S.No	Lab Course. No	Course	Maximum Marks 100 Int.	Ext.	Credits
1.	SE-307	Lab-Course –I; Based on theory course No. SE-301& SE-302.	50	50	4
2.	SE-308	Lab-Course-II;based on theory course No SE-303,304 & SE-305, (Optional).	50	50	4
3.	SE-309	Lab-Course-II;based on theory course No SE-303,304 & SE-306 (Optional).	50	50	4

Total Credits:24

Theory courses: Semester-IV

S. No.	Course. No.	Title of theory Courses	Nature of Course	Maximum Marks 100 Int.	Ext.	Credit
1.	SE-401	Sericulture Extension &VanyaSilk.	Compulsory	20	80	4
2.	SE-402	Textile Technology.	Compulsory	20	80	4
3.	SE-403	On Job skill Training.	Compulsory	20	80	4
4.	SE-404	Cocoon Production-II (Vanya).	Optional	20	80	4
5.	SE-405	Silkworm Physiology, Toxicology, Breeding and Genetic.	Optional	20	80	4

Laboratory courses SEMESTER- IV

S.No	Lab. Course	Course	Maximum Marks 100 Int.	Ext.	Credit
1	SE-406	Lab Course –I; based on theory course No SE-401& SE-402.	50	50	4
2	SE-407	Lab-Course II; Course No SE- 404.	50	50	4
3	SE-408	Lab course –II based on theory No SE-405 (Optional).	50	50	4

Total Credits: 24

Grand Total (Semester-I, II, III and IV):96 Credits

Programme Specific Outcomes (SPO's) of M.Sc. Sericulture

PSO1 **Understanding the basis of sericulture and mulberry cultivation**

PSO2 **Understanding the basic genetics of Silkworm and mulberry**

PSO3 **Understanding and learning the practical aspects of Sericulture**

PSO4 **Entrepreneurship based knowledge of Sericulture**

SEMESTER I

SEMESTER I

COURSE NO. SE 101 **Course Title: General Sericulture**
Credits: **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 2019, December 2020 and December 2021.

Course outcomes.

Understanding of:
CO1: History and distribution of sericulture in India and world.
CO2: Scope and importance of sericulture.
CO3: Characteristics of different types of fibres.
CO4: Properties of silk.
CO5: Mulberry cultivation in different regions.
CO6: Silkworm seed production processes.
CO7: Physical and chemical properties of silk.
CO8: Role of CSB in development of sericulture.
CO9: Economic importance of sericulture bi-products.
CO10: Different types of reeling machines.

UNIT-I

Sericulture: An overview

12hrs.

1.1. Introduction to Sericulture: Geographical distribution; History, development & status of mulberry & non mulberry sericulture in India and other Countries.The silk route.

1.2. Evolution and History of Silk production in world: China, India, Japan, Uzbekistan, South-Korea, North Korea, Brazil, Thailand and Srilanka.

1.3. Industry in India:Karnataka, Assam, Chhattisgarh, West Bengal, Jharkhand, Jammu and Kashmir, Tamil Nadu, Andhra pradesh and Telangana.

1.4. Science of Sericulture: Characteristic features of sericulture, Scope problems and prospects of Sericulture in India and its comparison to other agricultural crops, Role of sericulture in rural development.

UNIT-II

Silk Fiber and its components **13hrs.**

2.1. Introduction to Textile fibres: Their types, natural and synthetic fibres. Comparative account of natural fibres & man-made fibres, Advantages of silk fibres amongst the other natural fibres.

2.2. Properties of Silk**:** Propertiesof 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 Tasar, Eri and Muga.

2.3. Mulberry cultivation: Raising of mulberry plantation, soil for mulberry cultivation, systems of mulberry cultivation in different agro climatic conditions. Cultivated varieties of mulberry in different parts of India.

2.4. Silkworm Seed organization and its significance: Seed areas (bivoltine & multivoltine) Selected seed rearers andsilkworm seed legislation act. Silkworm races: Classification-geographical distribution on the basis of voltanism, moultinism,,Indigenous, exotic,,multivoltine and bivoltine.

UNIT-III

Sericulture organization in India **12hrs.**

3.1. Administrative set up: Research and training set up in Central Silk Board, Role & responsibilities of State Sericulture Development Department and Schemes.

3.2. History of Central Silk Board: Before and after independence. Role of Central Silk Board in research and development of sericulturein different states of India; Sericulture research in India and its Impacts.

3.3. Sericulture Extension: organization at various levels especially CSB policy fordevelopment of research and training at National and at state level. Role of NGOs, Self-help groups and private enterprises in sericulture development.

3.4. Sericulture for women: Womenôs empowerment in sericulture, Mulberry garden and rearing management, silkreeling, weaving and finishing. Schemes for Women in Sericulture.

UNIT-IV

Marketing of cocoon and silk materials **13hrs.**

4.1. Marketing of Silk: Market set up in different states like Karnataka and Andrapradesh market and Regulated market.

4.2. Silk Grading: Brief account of silk conditioning and testing of silk, Methods of testing visual test and mechanical test (winding test, Size test, Seriplane test, Tenacity and elongation test, Weight test and cohesion test, Evenness and Neatness test).

4.3. Economic Importance: By products and utilization of mulberry silkworm, pupae, moths and litter used as compost: Cocoons and silk in crafts.

4.4. Silk Reeling: Factors to be considered before setting up of silk reeling, throwing, weaving, dying, printing, Dyes used in printing.

UNIT –V

Economics of Sericulture **12hrs.**

5.1. Cost and Return under rain fed& irrigated conditions: Leaf cocoon ratio and Cost benefit ratio of improved sericulture practices viz a viz traditional practices.

5.2. Cocoon Dflôs ratio: Comparative economics between charkha, cottage basin & multi end basin.

5.3. Comparative Economics between handloom &powerloom; value addition during printing.

5.4. Export & Import policies: Impact of silk import on domestic silk industry, impact of WTO on sericulture industry.

Note for paper setting:

Note 1: There shall be one theory paper of 100 marks 20 % marks shall be reserved for internal assessment (20 marks) and 80 % of marks (80 marks) shall be reserved for external examination to be conducted by University.

Note2: The external question paper will contain two sections: A and B.

Section 'A' consist of 15 short answer type questions, each question carries 02 marks. The candidates are required to attempt all questions. (Answer should not exceed 100 words).

Section 'B' consist of 10 long answer type questions (02 questions from each unit). The candidates are required to attempt only 5 questions, selecting 01 question from each unit. Each question will carry 10 marks.

Books Recommended:

1. Akira, N. (2000) *Fiber Science and Technology.* Oxford & IBH Publications, New Delhi.
2. Mahadevappa, D.; Halliya, V.G.; Shankar, D.G. and RavindraBhandiwad (2000) *Mulberry Silk Reeling Technology*. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi and Calcutta.
3. Dandin, S. B. and Gupta, V. P. (2002) *Advances in Indian Sericulture Research*. CSR & TI, Mysore.
4. Dandin, S. B. Jayaswal J. and Giridhar K. (2003) *Handbook of Sericulture Technologies*. CSB, Bangalor.
5. Rajan, R. K. and Himantharaj, H. T. (2005) *Silkworm Rearing Technology.* Central Silk Board, Bangalor.
6. Patnaik, R.K. (2008) *Sericulture Manual*. Biotech Books, New Delhi.
7. Singh, Amar Dev and Kumar Ravinder (2013) *Sericulture Handbook*. Biotech Books, New Delhi.
8. Suresh Kumar, N. Harjeet Singh and Saha, A. K., (2015) *A textbook of Silkworm rearing technology*. Dominant and Distribution Publishers, New Delhi.
9. Anantha Narayanan, S.K (2017)*Silkworm Rearing*. Biotech books, New Delhi.
10. Graves, Daniel. (2017*). A treatise on sericulture*. Daniel publisher house books.
11. Geoghegan,(2018*) Silk in India*. Franklin classics, an imprint of creative media partners.
12. Ganga, G. and SulochanaChetty, J. (2018) *An Introduction to Sericulture*. Oxford and IBH Publishing. Co. Pvt. Ltd. New Delhi.
13. Rao, M. and Madan, M.(2019) *An Introduction to sericulture.* BS publisher.

SEMESTER I

COURSE NO. SE 102 **Course Title: Mulberry Biology and Production**
Credits: 4 **Maximum marks: 100**
Duration of Exam: 3hrs. **a)Semester Examination: 80**
b) Internal Assessment: 20

Syllabus for the examination to be held in

December 2019, December 2020 and December 2021.

Course Outcomes.

Understanding of:
CO1. Taxonomy and morphology of mulberry.
CO2. Classification of soil.
CO3. Soil fertility management practices.
CO4. Essential nutrients required for mulberry growth.
CO5. Different types of biofertilizers.
CO6. Concept of Integrated Plant Nutrient Management.
CO7. Methods of propagation in mulberry.
CO8. Pruning and harvesting methods.
CO9. Mulberry weeds and their management.
CO10. Concept of exclusive chawki garden for chawki rearing.

UNIT- I

Mulberry biology **12 hrs.**

1.1. Mulberry Biology: Salient features, morphology, taxonomy of mulberry and principles. Popular mulberry)cultivars.Uses of mulberry; Medicinal value, by-products utilization and economic importance of mulberry.

1.2. Floral Biology of Mulberry: Flower, fruit & seed development. Transition to flowering, floral meristem & floral development.

1.3. Reproductive Biology of Mulberry: Development of anther and pollen, male gametophyte, development of ovary, megaspore and female gametophyte.

1.4. Anatomy of Mulberry: Leaf, Stem and Root. Secondary growth; structure and organization of shoot and root meristem. Shoot, root and leaf development. Concept of Phyllotaxy.

UNIT -II

Soil management **13 hrs.**

2.1. Soil Formation: Classification of different types of soil, Major soils of India related to mulberry cultivation, Soil profile and soil survey.

2.2. Properties of Soil: Physical properties (Soil texture, color, air and water) and chemical properties; soil reaction, Cation/anion exchange capacity and availability of nutrients. Soil organic matter, soil organisms.

2.3. Problematic soils and Reclamation: Acidic and alkaline soils. Requirement of lime stone and application, Reclamation methods of problematic soils.

2.4. Soil Fertility Management: soil fertility vs soil productivity, soil fertility evaluation, maintenance of soil fertility and factors affecting soil fertility. Soil Management for proper NPK content; Recommendeddosage and schedule for NPK application.

UNIT-III

Integrated Nutrient Management **13 hrs.**

3.1. Elements/ Nutrients essential for mulberry growth: Role of macro and micro nutrients sources of nutrients elements in the soil: their absorption and utilization.

3.2. Manures: Organic manure-compost, vermin-compost, green manuring, dosage, schedule and mode of application.

3.2. Bio-fertilizers: Concept and different types of bio fertilizers. Use of bio-fertilizers in mulberry. Soil pollution and waste management.

3.4. Integrated Plant Nutrient Management (IPNM): Concept of IPNM and its role in mulberry production, Role of organic manures and green manures in integrated farming.

UNIT- IV

Mulberry Biology and Production **12 hrs.**

4.1. Sexual & Asexual propagation in Mulberry:Seedlings, collection of seeds, viability and preservation of seeds. Saplings-nursery preparations, time for production of saplings. Grafting:different methods and their significance (stem, root and bud).Layering: different methods and their significance.

4.2. Pruning and Harvesting: Objectives, types, and schedule of pruning, care at pruning. Methods of harvesting, Evaluation of the mulberry leaf quality, estimation of leaf yields.

4.3. Irrigation and Drainage: Different methods and schedule of irrigation, Drainage-need, benefits and methods of drainage.

4.4. Weeds and their Management: Different types of weeds, Effect of weeds in mulberry and its production, control and identification of weeds.Mulching: purpose, methods, surface & sub-soil mulching.

UNIT-V

Mulberry management **12 hrs.**

5.1. Maintenance of Mulberry plots in relation to rearing schedules, Requirements, organization & management of labour.

5.2. Mulberry based Integrated farming system: Mixed farming system for sustainable income, features of integrated farming system, common inter cropping system.

5.3. Farm Management: Types of farms, Farm management system, farm management practices, farm planning, Function and scope of farm management.

5.4. Importance of Farm mechanization: Classification of machinery. Implements used in the farm for raising crops. Primary and secondary tilliage implements, land development implements.

Note for paper setting:

Note 1: There shall be one theory paper of 100 marks 20 % marks shall be reserved for internal assessment (20 marks) and 80 % of marks (80 marks) shall be reserved for external examination to be conducted by University.

Note2: The external question paper will contain two sections: A and B

Section 'A' (consist of 15 short answer type questions, each question carries 02 marks. The candidates are required to attempt all questions. (Answer should not exceed 100 words).

Section 'B' (consist of 10 long answer type questions (02 questions from each unit).The candidates are required to attempt only 5 questions, selecting 01 question from each unit. Each question will carry 10 marks.

Books Recommended:

1. 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, Bangalor.
2. Hand book of sericulture technologies. (2005) CSB Bangalor.
3. Silkworm Breeding & Genetics (2006) CSB Bangalor
4. Tips to successful silkworm cocoon crops, (2006) CSB Bangalor.
5. Guideline for bi-voltine rearing (2009)CSB Bangalor.
6. Dandin, S.B. and Giridhar, K. (2010) *Handbook of Sericulture Technologies*. CSB, Bangalore.
7. Gupta, P. K. (2011) *A handbook of soil fertilizer and Manure.*Agrobios, Jodhpur.
8. Singh, T and Singh P. K. (2013) *Mulberry Crop Protection.*DPH publishers, New Delhi.
9. Siva Prasad,V.,Himantharaj,M.T. ,Verma, S., Mogali, T.(2016) *Commercial chawki rearing.* CSRTI (Mysuru).
10. Justin, J. (2017) *Indian journal of sericulture*. CSRTI (Mysuru).
11. S.Balavenkalasubbaiah, M. and verma, S.(2017) *Mulberry sericulture*.CSRTI,(Mysuru)

SEMESTER I

COURSE NO. SE-103 **Course Title: Silkworm biology, physiology and biochemistry**

Credits: 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 2019, December 2020 and December 2021.

Course Outcomes.

Understanding of:

C01. Characteristic features of Arthropod.
C02. Embryonic development in silkworm.
C03. Physiology of digestion and different types of digestive enzymes.
C04. Silk gland structure and protein synthesis.
C05. Concept of artificial diets and feeding behavior in silkworm.
C06. Metamorphosis in insects and types of metamorphosis.
C07. Structure and functions of amino acids.
C08. Classification and metabolism of proteins.
C09. Classification of carbohydrates.
C010. Mechanism of enzyme action.

UNIT -I

Silkworm biology **12 hrs.**

1.1. Classification of Insects: General characteristic features of insects; classification of sericigenous insects; characteristic features of order Lepidoptera and families ï Bombycidae and Saturnidae.

1.2. Morphology of Silkworm: Egg, larva, pupa and adult; life cycle of the silkworm, *Bombyxmori.*

1.3. Spermatogenesis and oogenesis in *Bombyx mori*:Male and Female reproductive systems of silk moth.

1.4. Embryonic development in *Bombyx mori*:stages of development, Oviparity, ovoviviparity and viviparity,polyembryony, parthenogenesis and pseudogenesis.

C.NO. SE 103 Silkworm biology, physiology and biochemistry (2019-2021)

UNIT -II

Silkworm physiology-I **12 hrs.**

2.1. Digestion: Structure of Digestive system, physiology of digestion, cell types in silkworm gut, mechanism of gut movements, digestive enzymes in phytophagous insects.

2.2. Excretion: Important nitrogenous waste, excretory organs, structure of excretory system, Physiology of excretion.

2.3. Respiration: Phases of respiration, important respiratory organs, structure of respiratory system, Physiology of respiration.

2.4. Circulation: Structure of circulatory system, Composition and function of haemolymph, accessory pulsatile organs and mechanism of circulation in silkworm.

2.5. Silk gland of silkworm: Structure of silk gland, Silk proteins. Bio-synthesis of fibrion; initiation, elongation and termination of peptide chain.

UNIT -III

Silkworm physiology-II **13hrs.**

3.1. Insects Integument: Structure and chemistry, cuticular modifications, moulting and sclerotization. The head, thorax, wings, abdomen, and Mouth parts of Insects.

3.2. Nutritional Physiology: Artificial diets, feeding apparatus, feeding behavior, phagostimulant, feeding deterrents, nutritive requirement of the silkworm.

3.3. Silkworm Transgenesis: Historical account, piggyback transposon, transformation methodology, and application of silkworm transgenesis.

3.4. Metamorphism : Metamorphosis in insects, Importance, types of metamorphosis and hormonal influence of metamorphosis.

UNIT-IV

Biochemistry-1 **13 hrs.**

4.1. Cell Environment: Water and gases in cell environment, role of electrolytes, pH, buffer, acid ï base balance.

4.2. Amino acids: Essential and non-essential amino acids, their chemical structure and functions .Vitamins: Classification of vitamins, role of vitamins in silkworm *Bombyx mori* L.

4.3. Proteins: Classification of proteins, structure of protein- Primary, secondary and tertiary .Metabolism of proteins.

4.4. Plasma proteins: components of plasma proteins;albumin,globulins,immuno-globulins. Importance of blood and blood clotting.

UNIT-V

Biochemistry-11 **13 hrs.**

5.1. Carbohydrates: Classification, structure and function. Lipids: classification and function.

5.2. Metabolism of carbohydrates, glycolysis, glycogenolysis, gluconeogenesis pathway and regulation.

5.3. Enzymes : Classification and nomenclature.Mechanismof enzyme action. Enzyme inhibition; Competitive inhibition, non- competitive inhibition, un competitive inhibition.

5.4. Bioenergetics: Principle, generation of ATP First and second laws of thermodynamic and applications of bioenergetics.

Note for paper setting:

Note 1: There shall be one theory paper of 100 marks 20 % marks shall be reserved for internal assessment (20 marks) and 80 % of marks (80 marks) shall be reserved for external examination to be conducted by university.

Note 2: The external question paper will contain two sections: A and B.

Section 'A' (consist of 15 short answer type questions, each question carries 02 marks. Candidates are required to attempt all questions. (Answer should not exceed 100 words).

Section 'B' (consist of 10 long answer type questions (02 questions from each unit). The candidates are required to attempt only 5 questions, selecting 01 question from each unit. Each question will carry 10 marks.

C.NO. SE 103 Silkworm biology, physiology and biochemistry (2019-2021)

Books Recommended:

1. Verma, P.S. and Agarwal, V.K. (2004) *Cell Biology, Genetics, Evolution and Ecology*. Published by S. Chand & Co., New Delhi.
2. Govindan, R.,Bharathi, V.P., Sannappa, B. and Ramakrishna Naika (2005) Growth Regulators and Hormones in Sericulture. Seri Scientific Publishers, Bangalore.
3. Handbook of Sericulture Technologies-(2005) CSB Bangalore
4. Tips to successful silkworm cocoon crops, (2006) CSB Bangalore.
5. Silkworm Breeding & Genetics, (2006) CSB Bangalore.
6. *Guidelines for bivoltine rearing* (2009) CSB Bangalore.
7. Shamsuddin, M. (2009) *Silkworm Physiology*. Daya Publishers. New Delhi.
8. Goldsmith,M.R. and Frantisek Marec (2010) *Molecular Biology and Genetics of the Lepidoptera*, CRC Press Taylor & Francis Group, Broken Sound Parkway NW, USA.
9. Ragland, A.&Arumugam, N. (2013)Biochemistry & Biotechniques Kanyakumari-Tamil Nadu.
10. Fatima, D. & others (2013) *Biochemistry*, Kanyakumari, Tamil Nadu.
11. Satyanarayan, U. and Chakrapani, U (2017) *Biochemistry*. Daya Publishers. New Delhi.
12. Singh, T. Bhat, M. M and Khan, M. A (2018) *Silkworm Egg Science*. Daya Publishers. New Delhi.

SEMESTER I

COURSE NO. SE 104 **Course Title: Silkworm Rearing Technology and Egg production**

Credits: 4 **Maximum marks: 100**

Duration of Exam: 3hrs. a**) Semester Examination: 80**

b) Internal Assessment: 20

Syllabus for the examination to be held in

December 2019, December 2020 and December 2021.

Course Outcomes.

Understanding of:

CO1. Morphology of silkworm egg.
CO2. Estimation of mulberry leaf quality and yield.
CO3. Different methods of disinfection and disinfectants.
CO4. Characteristic features of young age silkworms.
CO5. Different chawki rearing methods.
CO6. Characteristic features of late age silkworms.
CO7. Preservation of eggs for different seasons and regions.
CO8. Incubation and different methods of incubation.
CO9. Different bed cleaning methods.
CO10. Silkworm seed organization concept.

UNIT-I

Silkworm Rearing Technology-I **13 hrs.**

1.1. Morphology of Silkworm: Egg, size, shape, weight, color, structure & constituents of egg. Handling and preservation of silkworm eggs.Oviposition, ideal conditions for oviposition.

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 labour. Annual Planning and schedule of silkworm rearing

1.3. Disinfection: Different methods, types, composition, action and mode of application. Disinfection of rearing house and equipmentõs.Importance of disinfection.

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

Silkworm Rearing Technology - II **13 hrs.**

2.1. Concept of Grainage: plan of grainage building & grainage equipments. Egg transportation- time and devices.

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: Characteristic 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 ï Importance, method and frequency of bed cleaning.Concept of cooperative chawki rearing and chawki rearing centres.

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 **12 hrs.**

3.1. Moulting: Mechanism, symptoms and care at moulting. Harvesting, transportation and preservation of mulberry leaves. Harvesting of cocoons: Harvesting procedure for pure and hybrid cocoons, Cocoon sorting, transportation and marketing.

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.

3.3. Concept of Hybrid Breeds: Characteristics of hybrids; Seasonal breed, hybrids for different agro-climatic condition. Authorization;Seed areas and selected seed rearers.

3.4. Mechanization of Sericulture: Machines used in mulberry cultivation &silkworm rearing: their advantages.

C.NO. SE 104 Silkworm Rearing Technology and Egg production (2019-2021)

UNIT-IV

Silkworm Seed Technology-I **12 hrs.**

4.1. 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 farmsSeed multiplication farms:P2 and P1 farms, selection criteria for maintenance and multiplication.Management of seed multiplication farms.

4.2. 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.

4.3. 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.

4.4. Acid treatment and cold storage of Bi-voltine 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 seasons and regions.Hibernation schedule for 6 and 10 months in tropical condition.Preservation of eggs in tropical condition.

UNIT-V

Silkworm Seed Technology-II12 hrs.

5.1. Concept of grainages: Management Programme for production of pure and hybrid disease freelaying. Management of grainages activities. Interaction with the farmers.

5.2. Diagnosis of hereditary diseases: Moth examination, sample testing, individual and mass moth examination. Dry moth examination. Advanced technique of pebrine detection.

5.3. Monitoring of seed crop: screening of egg shells & larval faecal matter for diseases.

5.4. Detection of pebrine disease: Various test, pupal gut examination & forced eclosion test.

C.NO. SE 104 Silkworm Rearing Technology and Egg production (2019-2021)

Note for paper setting:

Note 1: There shall be one theory paper of 100 marks 20 % marks shall be reserved for internal assessment (20 marks) and 80 % of marks (80 marks) shall be reserved for external examination to be conducted by University.

Note2: The external question paper will contain two sections: A and B.

Section 'A' consist of 15 short answer type questions, each question carries 02 marks. Candidates are required to attempt all questions. (Answer should not exceed 100 words).

Section 'B' consist of 10 long answer type questions (02 questions from each unit). The candidates are required to attempt only 5 questions, selecting 01 question from each unit. Each question will carry 10 marks.

Books Recommended:

1. Dandin, S.B. Jayant, J. and Giridhar, K. (2003) *Handbook of Sericulture Technologies*. CSB, Bangalor.
2. *Silkworm Breeding & Genetics,* (2006). CSB Bangalore.
3. *Tips to Successful Silkworm Cocoon Crops,* (2006). CSB Bangalor.
4. *Handbook of Sericulture Technologies*- CSB Bangalor. 2005.
5. Rajan, R.K. and Himantharaj, H.T. (2005) *Silkworm Rearing Technology.* Central Silk Board, Bangalor.
6. *Guidelines for bivoltine rearing,* 2009.
7. Dandin, S.B. and Giridhar, K. (2010) *Handbook of Sericulture Technologies*. CSB, Bangalor.
8. Singh, Amar Dev and Kumar Ravinder (2013) Sericulture Handbook. Biotech Books, New Delhi.
9. Suresh Kumar, N. Harjeet Singh and Saha, A. K., (2015) *A textbook of Silkworm technology*. Dominant and Distribution Publishers, New Delhi.
10. Anantha Narayanan, S.K (2017) *Silkworm Rearing*. Biotech books, New Delhi.

11. Singh, T. Bhat, M. M and Khan, M. A (2018) *Silkworm Egg Science*. Daya Publishers. New Delhi.
12. Ganga, G. and SulochanaChetty, J. (2018) *An Introduction to Sericulture*. Oxford and IBH Publishing. Co. Pvt. Ltd. New Delhi.

SEMESTER: I

LABORATORY COURSES

SE 105 Laboratory course-I; based on theory course no. SE-101, SE-102 **4 credits**

SE 106 Laboratory course-II; based on theory course no. SE-103 and SE-104. **4 credits**

Practical Semester-I

Lab. Course No.SE-105Title: Laboratory Course-I

(Based on Theory Course No.SE-101 & SE-102)

Credits: 04

Duration of Exam: 06 hrs. Maximum Marks: 100

External Exam: 50
Internal Exam: 50

Syllabus for the examination to be held in

December 2019, December 2020 and December 2021.

1. Silk Map of India.
2. Silk Map of world.
3. Different types of fibers natural and synthetic.
4. Morphology of mulberry.
5. Anatomy of Leaf Blade.
6. Anatomy of Stem and Root of mulberry.
7. Salient feature of popular mulberry cultivars.
8. Raising of Sapling: cutting preparation, planting and maintenance of nursery.
9. Grafting (bud, stem, root)and layering in mulberry.
10. Plants methods: Row, pit system and tree planting.
11. Characteristic features of important weeds of mulberry garden.
12. Soil sampling and preparation of soil samples for analysis.
13. Preparation of compost and Vermicompost.
14. Application of organic manures and chemical fertilizers for mulberry.
15. Irrigation methods (surface, sprinkler and drip irrigation) for mulberry.
16. Estimation of leaf yields, leaf shoots and leaf area in mulberry.
17. Methods of pruning and harvesting of mulberry.
18. Estimation of leaf yields in mulberry garden.
19. Selection of mulberry for feeding young and late age silkworm.
20. Determination of soil pH, alkalinity.
21. Determination of NPK in the given soil sample.
22. Study of different types of soil.
23. Identification of common weeds of mulberry.

Note:-Any other need based practical if required shall be incorporated.

Practical Semester-I

Lab. Course No.SE-106 **Title: Laboratory Course-II**

(Based on Theory Course No.SE-103& SE-104)

Credits: 04

Duration of Exam: 06 hrs. **Maximum Marks: 100**

External Exam: 50
Internal Exam: 50

Syllabus for the examination to be held in

December 2019, December 2020 and December 2021.

1. Protein estimation by Kjeldhaland chlorometric method.
2. Sepatation of amino acid by paper & thin layer chromatography.
3. Estimation of amylase activity in silkworm gut fluid & haemolymph.
4. Agrose gel Electrophoresis.
5. Estimation of glycogen in fat body & ovary of Bombyx mori.
6. Estimation of protein content in the fat body/midgut tissue of silkworm.
7. Moulting:Identification of moultng larvae & care.
8. Mounting:Mountages, identification & mounting of spinning larvae.
9. Harvesting & sorting of cocoon.
10. Preparation of crop report & other records in the rearing house.
11. Ground plan of grainage building & equipments.
12. Disinfection & hygiene practices in grainage.
13. Sorting & processing of seed cocoons for egg production.
14. Sexing of pupa & moth.
15. Preparation of loose & sheet eggs.
16. Acid treatment (Hot & cold)of hibernating silkworm eggs & mother-moth examination.
17. Identification of different types of eggs & incubation of eggs.
18. Visit to an egg production centre.
19. Silkworm rearing house- model & plan.
20. Silkworm rearing equipments & their uses.
21. Disinfection of rearing house & equipments.
22. Incubation & black boxing of silkworm.
23. Methods of silkworm brushing.
24. Preservation of mulberry for feeding of young & late age silkworm.
25. Morphology of the silkworm *Bombyx mori*.
26. Life cycle of mulberry silkworm.
27. Dissect & display the digestive & excretory system in silkworm.
28. Dissect & display the nervous system & silk gland in silkworm.
29. Dissect & display the respiratory system in silkworm.

30. Dissect & display the reproductory system of male & female moth of *Bombyx mori.*
31. Microscopic study of different embryonic development stages in silkworm.
32. Visit to P4,P3,P2& P1 Stations.
33. Visit to farmers house during silkworm rearing.
34. Mouth parts of silkworm.

Note:-Any other need based practical if required shall be incorporated.

SEMESTER II

SEMESTER II

COURSE NO. SE 201 **Course Title: Cell Biology, Molecular biology and Immunology**

Credit: 4 **Maximum marks: 100**
Duration of Exam: 3hrs. **a) Semester Examination: 80**
b) Internal Assessment: 20

Syllabus for the examination to be held in

May 2020, May 2021 and May 2022.

Course outcomes.

Understanding of:
CO1: Applications of UV-spectrophotometer and electron microscopy.
CO2: Types of Chromatography.
CO3: Multiple alleles.
CO4: Extensions of Mendelism.
CO5: Linkage and crossing over.
CO6: Alterations of chromosomes.
CO7: Types and causes of Mutation.
CO8: Methods of genetic transfer.
CO9: Applications of immunology.
CO10: Major histocompatibility complex (MHC)

UNIT-I

Cell Biology **12 hrs.**

1.1. The Cell: Origin and Evolution of cell, the structure of Prokaryotic and Eukaryotic cells.

1.2. Structure and function of cell organelles: Nucleus, Chromatin and chromosome, Endoplasmic reticulum, Golgi complex, Ribosome, Lysosome and Mitochondria.

1.3. Cell cycle: Mechanism of cell division; Meiosis, Mitosis and their significance Events of cell cycle progression and regulation.

1.4. Plasma Membrane: Structure, composition and function of plasma membrane Molecular model of plasma membrane and membrane transport.

C. NO. SE 201 Cell Biology, Molecular biology and Immunology (2020- 2022)

UNIT-II

Molecular Biology- I **12 hrs.**

2.1. Introduction to Nucleic acid: Chemical and Physical properties of DNA, helical structure of DNA, Structure and types of RNA.

2.2. DNA replication in prokaryotes and eukaryotes: Semi conservative synthesis of DNA, Enzymes in DNA replication.

2.3. Transcription: Biosynthesis of RNA from DNA, RNA polymerase, initiation, elongation and termination of transcription, RNA processing in eukaryotes.

2. 4. Translation: Factors and enzymes involved in protein synthesis; initiation, elongation and termination of translation in prokaryotes and eukaryotes. Concept of Genetic code.

UNIT-III

Molecular Biology- II **12 hrs.**

3. 1. Gene regulation in prokaryotes: Lac operon, Repressor proteins, Promoters, Structural genes and their regulation.

3.2. Gene organization in eukaryotes: Euchromatin and Heterochromatin, Retrovirus and cellular oncogenes.

3.3. Model organisms for molecular biology: Bacteriophages, E. coli, Fruit fly, Silkworm, *Arabidopsis thaliana, Bacillus subtitis, Lemnagibba*and Lab mice.

3.4. Cell death and Apoptosis: Mechanism of cell death, toxicity and survival, Intrinsic and extrinsic pathway. Significance of Apoptosis.

UNIT-IV

Immunology- I **12 hrs.**

4.1. Immunology: History, scope and applications of immunology.

4.2. Immunity: Types of immunity, innate immune response and host defense mechanism. Organs associated with immunity.

4.3. Antigens and their features: Immuno-globulins (antibodies) - structure, types, biological properties and functions; monoclonal antibodies. Antigen ï antibody reactions: Salient features of antigen-antibody reaction.

4.4. Complement system: Salient features, source of origin. complement activation:-classical and alternate pathway .Complement fixation and biological function.

UNIT-V

Immunology-II **12 hrs.**

5.1. Cells associated with immune system: Origin and types of cells.

5.2. Basic Autoimmunity: Immunopathogenic mechanism. Autoimmune diseases:- Haemolyticanaemia, Rheumatoid arthritis, Thyrotoxicosis, Addisonôs disease, Hashimotoôs disease; Diagnosis and treatment of autoimmune disease.

5.3. Major histocompatibility complex (MHC): Types of MHC molecules. Transplantation:- graft retention and rejection.

5.4. Immuneresponse in Silkworm: Immune response against bacterial infection. Mechanism of genetic resistance.

Note for paper setting:

Note 1: There shall be one theory paper of 100 marks 20 % marks shall be reserved for internal assessment (20 marks) and 80 % of marks (80 marks) shall be reserved for external examination to be conducted by University.

Note 2: The external question paper will contain two sections: A and B.

Section 'A' consist of 15 short answer type questions, each question carries 02 marks. Candidates are required to attempt all questions. (Answer should not exceed 100 words).

Section 'B' consist of 10 long answer type questions (02 questions from each unit). The candidates are required to attempt only 5 questions, selecting 01 question from each unit. Each question will carry 10 marks.

Books Recommended:

1. Joshi, P. (2000) *Genetic Engineering and its Application*. Agrobios Pvt. Ltd.

2. Bhojwani, S.S. and Razdan, M.K. (2003) *Plant Tissue Culture: Theory and Practice*. Elsevier, Amsterdam.

3. Govindan, R.; Ramakrishna Naika and Sannappa, B. (2004) *Advances in Disease and Pest Management in Sericulture*. Seri Scientific Publishers, Bangalore.

4. Verma, P.S. and Agarwal, V.K. (2004) *Cell Biology, Genetics, Evolution and Ecology*. Published by S. Chand & Co., New Delhi.

5. Nataraju, B., Sathyaprasad, K., Manjunath, D. and Aswani Kumar, C. (2005) *Silkworm Crop Protection.* Central Silk Board, Bangalore.

6. Goldsmith,M.R. and FrantiġekMarec (2010) *Molecular Biology and Genetics of the Lepidoptera*, CRC Press, Taylor & Francis Group, USA.

7. Arumugam, N. (2013) *Cell Biology, Molecular Biology, Genetic, Immunology & Biotechnology.*Saras Publication, Kanyakumari-Tamil Nadu.

8. Fatima D &Arumugam, N (2013*) Immunology*. Saras Publication, Kanyakumari-Tamil Nadu.

9. Fatima, D & others (2013) *Animal Physiology & Biochemistry*. (Saras Publication, Kanyakumari-Tamil Nadu.

SEMESTER II

COURSE NO. SE 202 **Course Title: Genetics of Biochemical Techniques**
Credit: 2 **Maximum marks: 50**
Duration of Exam: 2hrs. **a) Semester Examination: 40**
b) Internal Assessment: 10

Syllabus for the examination to be held in
May 2020, May 2021 and May 2022.

Course outcomes.

Understanding of:
CO1: Applications of UV-spectrophotometer and electron microscopy.
CO2: Types of Chromatography.
CO3: Multiple alleles.
CO4: Extensions of Mendelism.
CO5: Linkage and crossing over.
CO6: Alterations of chromosomes.
CO7: Types and causes of Mutation.
CO8: Methods of genetic transfer.

UNIT-I **12hrs.**

Biochemical Techniques

1.1. Specrotrophotometry: Principle and biochemical application of UV-Spectrophotometry. Light and electron microscopy.

1.2. Chromatography: Introduction-principle & applications of partition chromatography (paper chromatography) & adsorption chromatography (Thin layer chromatography) Gas Liquid chromatography, Ion Exchange chromatography.

1.3. Centrifugation: Principle and Types of centrifuge. Differential and density gradient centrifugation.

1.4. Electrophoresis: Principle, procedure & applications of polyacrylamide gel electrophoresis (PAGE), Sodium dodecyl sulphate- polyacrylamide gel electrophoresis (SDS-PAGE) &Iso electric focusing(IEF).

UNIT-II

Genetics -I **12hrs**.

2.1. Concept of Gene: Allele, Multiple alleles, pseudo- alleles, complementation tests.

2.2. Extensions of Mendelism: Concept of incomplete dominance & co-dominance, Gene intraction, penetrance& expressivity &pleiotrophy.

2.3. Linkage & crossing over: sex linkage, sex limited & sex influenced characters. Inheritance of Mitochondrial and Chloroplast genes.

2.4. Population Genetics: The Hardy-Weinberg principles. Application of the Hardy-Weinberg principle, exception to the Hardy-Weinberg principle.

UNIT-III

Genetics –II **12hrs**.

3.1. Structural & numerical alterations of chromosomes: Deletion, Duplication, Inversion, Translocation, ploidy & their genetic implications.

3.2. Mutation: Types, causes & detection, mutant types-lethal, conditional, biochemical, loss of function, gain of function, germinal verses and somatic mutants.

3.3. Recombinaton: Homologous & Non Homologous Recombination including transposition.

3.4. Microbial Genetics: Methods of genetic transfers- transformation, conjugation, transduction & Sex-duction.

Note for paper setting:

Note 1: There shall be one written theory of 50 marks. 20% marks shall be reserved for internal assessment (10 marks). 80% of marks (40 marks) shall be reserved for internal examination to be conducted by University. Theory paper will be set for 40 marks.

Note 2: The external question paper will contain 2 sections: A&B.

Section 'A' consists of 08 short answer type questions. Each question carries 02 marks. Candidates are required to attempt all questions (Answer should not exceed 100 words).

Section 'B' consists of 06 long answer type questions (02 questions from each unit). The candidates have to attempt only 03 questions, selecting 01 question from each unit. Each question carries 08 marks.

Books Recommended:

1. Joshi, P. (2000) *Genetic Engineering and its Application*. Agrobios Pvt. Ltd.
2. Verma, P.S. and Agarwal, V.K. (2004) *Cell Biology, Genetics, Evolution and Ecology*. Published by S. Chand & Co., New Delhi.
3. Govindan, R.; Ramakrishna Naika and Sannappa, B. (2004) *Advances in Disease and Pest Management in Sericulture*. Seri Scientific Publishers, Bangalore.

4. Goldsmith,M.R. and Frantisek Marec (2010) *Molecular Biology and Genetics of the Lepidoptera*, CRC Press Taylor & Francis Group, Broken Sound Parkway NW, USA.
5. Goldsmith,M.R. and FrantiĝekMarec (2010) *Molecular Biology and Genetics of the Lepidoptera*, CRC Press Taylor & Francis Group, USA.
6. Arumugam, N & others (2013) *Cell Biology Genetics & Biotechnology*.Saras Publication,Kanyakumari-Tamil Nadu.
7. Fatima, D. & others (2013) *Biochemistry*, Kanyakumari, Tamil Nadu.
8. Ragland, A.&Arumugam, N. (2013)Biochemistry &BiotechniquesKanyakumari-Tamil Nadu.
9. Satyanarayan, U. and Chokrapani, U (2017) *Biochemistry*. Daya Publishers. New Delhi.

SEMESTER II
COURSE NO. SE 203 **Course Title: Applied Entomology**
Credits: 2 **Maximum marks: 50**
Duration of Exam.: 2 hrs. **a) Semester Examination: 40**
b) Internal Assessment: 10

Syllabus for the examination to be held in:
May 2020, May 2021 and May 2022.

Course outcomes.

Understanding of:
CO1. Origin & Evolution of Insects.
CO2. Collection & preservation of insects.
CO3. Economic importance insects in relation to man.
CO4.Defense mechanism of plants against insects.
CO5. Management of Household insects.
CO6. Scanning electron Microscopy.C07.Circumferential factors.

UNIT –I

Applied Entomology–I **12hrs**.

1.1. Origin & Evolution of Insects.
1.2. Elementary knowledge of Collection and preservation of insects.
1.3. Classification and Identification of insects: Modern scheme of Insect classification, density of Insect Fauna. Economically important and Extinct Insect Orders.
1.4. Harmful and Beneficial insects in relation to man: Bed bugs, Mosquitos, tse-tse flies. Benificial Insects: Lac Insects, Honey bee and Silkworm.

UNIT –II

Applied Entomology–II **12hrs**.

2.1. Insects and the abiotic Environment, insect population: Factors affecting Insect population, pest outbreaks: Causes that make the insects as pests; factors causing pest outbreaks.
2.2. Insect-Plant Interaction: Host plant selection, feeding habit, insects as vectors of plant diseases. Defense mechanism of plants against insects.
2.3. Disease transmitting insects in plants: Pests of cotton, sugarcane, paddy, wheat, pulses, Oil seeds and vegetables.

2.4. Household Insects: The Rice Weevil, Red Flour Beetle, Khapra Beetle , Meal Worm and Grain Moth. Control and their management.

UNIT –III

Forensic Entomology-III **12hrs**.

3.1. Forensic Entomology: Concept, History and Evolution of Forensic Entomology.

3.2. Principle, Scope and applications of Forensic Entomology.

3.3. Forensic Insects and Circumferential Environment Factors: Insects of Forensic Importance; Flies, Beetles and Mites.

3.4. Forensic Entomological Investigation methodology: Modern Forensic techniques, Insect habitat study, Forensic procedures and case study.

Note for paper setting:

Note 1: There shall be one written theory of 50 marks. 20% marks shall be reserved for internal assessment (10 marks). 80% of marks (40 marks) shall be reserved for internal examination to be conducted by University. Theory paper will be set for 40 marks.

Note 2: The external question paper will contain 2 sections: A & B.

Section 'A' consists of 08 short answer type questions. Each question carries 02 marks. Candidates are required to attempt all questions (Answer should not exceed 100 words).

Section 'B' consists of 06 long answer type questions (02 questions from each unit). The candidates have to attempt only 03 questions, selecting 01 question from each unit. Each question carries 08 marks.

Books Recommended:

1. Gullan, P. J. (2005) *The Insects and outline of Entomology.* Blackwell Publishing Oxford. UK.
2. Grimaldi, D and Engel, M. S. (2005) Evolution of the Insects. Cambridge University Press, New York.
3. Gennard and Dorothy. (2007) Forensic Entomology. Wiley.
4. Tembhare, D. B. (2015) Modern Entomology. Himalayan Publishing House.
5. Chapman, R. F.(2016) *The Insects*.Cambridge Uni Press.London.

SEMESTER II

COURSE NO. 204 **Course Title: Breeding & Genetics of Silkwom & Mulberry**

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 May 2020, May 2021 and May 2022.

Course outcomes.

Understanding of:

CO1: Methods of selection for qualitative and quantitative traits in silkworm.
CO2: Linkage map in silkworm.
CO3: Region and season specific breeds of silkworm.
CO4:Genetics of voltinism and moultinism.
CO5: Sex determination in silkworm.
CO6: Methods of plant breeding.
CO7: Polyplody in mulberry improvement.
CO8: Plant breeding for quality and yield of mulberry.
CO9: Tissue culture techniques.
CO10: Release and multiplication of improved varieties.

UNIT-I **12hrs.**

Breeding of Silkworm

1.1. Breeding methods: Inbreeding and out breeding, their merits and demerits.Selection: methods and types of selection for qualitative and quantitative traits.

1.2. Hybridization: Theories of heterosis; combining ability - general and specific; line x tester and diallele analysis.

1.3. .Drought resistant silkworm strains: The concept of season and region specific silkworm breeds.

1.4. Parthenogenesis: cytological studies on parthenogenesis. Role of Z and W chromosomes .Linkage map in silkworm.

C. NO. SE 204 Breeding& Genetics of Silkworm & Mulberry (2020- 2022)

UNIT-II

Genetics of Silkworm **12hrs.**

2.1. Heredity and Environment: Interaction of a genotype &environment with reference to silkworm.Hereditary traits of *Bombyx mori*-egg, larva, pupa and adult.

2.2. Genetics of voltinism and moultinism: Maternal inheritance of voltinism, Relationship between voltinism genes and moultinism genes.

2.3. Cocoon colour: Colour variation at different layers, Relationship between blood colour and cocoon colour. Linkage group of cocoon colour. Inheritance of cocoon colour-green, pink, flesh white and yellow. Inheritance of cocoon colour, larval marking. Multiple alleles and E-group alleles.

2.4. Sex determination in silkworm: Chromosome theory of sex determination, genetic theory of sex determination.Radiation and chemical mutagenesis in silkworm.

UNIT-III

Breeding of Mulberry-I **12hrs.**

3.1 General introduction to plant breeding: Methods of plant breeding.Objectives of mulberry breeding:Parameters associate with growth, yield and quality of mulberry.

3.2Pure-line selection: Characters and importanceof pure lines and their application in mulberry.Clonal selection-Characters of clone:Source of clonal variation in mulberry.Procedure, characters and achievements.

3.3. Hybridization: Techniques, types & application of Hybridization. Methods of detecting hybridization, Effect of hybridization & achievements.

3.4. Polyploidy breeding: Induction, Identification and evaluation of triploid varieties evolved by polyploidy breeding. Mutation breeding; Physical and chemical mutagens, Induction, identification and evaluation of mutants/varieties evolved by mutation breeding.

UNIT-IV

Breeding of Mulberry-II **12hrs.**

4.1. Breeding techniques for stress conditions: Drought salinity, alkalinity.Breedingfor disease and pest resistance.

4.2. Tissue culture techniques in mulberry: Culture media, micro-propagation, somaclonal variation, haploid induction, somatic hybridization in-vitro screening and cryopreservation.Callus Culture & Suspension culture.

4.3. Evaluation techniques of selected mulberry Genotypes: Primary, final and multi-locational trials (PYT,FYT& MLT) plot experimentation, multiplication & authorization of variety.

4.4. Maintenance of improved varieties: Release , multiplication , naming of a variety and distribution to farmers.

UNIT-V

Genetics of Mulberry **12hrs.**

5.1 Concept of Polyploidy: euploidy, aneuploidy andits application in mulberry breeding. Geographical distribution, important mulberry varieties cultivated in India and abroad.

5.2. Mendelôs Principle: Mendelôs experimental organism, Monohybrid crosses anddihybrid crosses-Applications of Mendelôs principles.

5.3. Plant introduction and acclimatization: Plant introduction agencies in India, quarantine and scope. Approaches involving farmers in biodiversity conservation and plant breeding strategies.

5.4. Germplasm Bank: objectives, collection, characterization and introduction of mulberry Germplasm. Resources-conservation its significance and methods.Functions of plant genetic resource centers.

Note for paper setting:

Note 1: There shall be one theory paper of 100 marks 20 % marks shall be reserved for internal assessment (20 marks) and 80 % of marks (80 marks) shall be reserved for external examination to be conducted by University.

Note 2: The external question paper will contain two sections: A and B.

Section 'A' consist of 15 short answer type questions, each question carries 02 marks. Candidates are required to attempt all questions. (Answer should not exceed 100 words)

Section 'B' consist of 10 long answer type questions (02 questions from each unit). The candidates are required to attempt only 5 questions, selecting 01 question from each unit. Each question will carry 10 marks.

Books Recommended:

1. Eikichi Hiratsuka (2000) *Silkworm Breeding.* Oxford & IBH Publications, New Delhi.
2. Verma, P.S. and Agarwal, V.K. (2004) *Cell Biology, Genetics, Evolution and Ecology.* Published by S. Chand & Co., New Delhi.
3. 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.
4. Handbook of Sericulture Technologies (4th Edition) CSB Bangalore. 2005.
5. Silkworm Breeding & Genetics, CSB Bangalore. 2006
6. Tips to Successful Silkworm Cocoon Crops, CSB Bangaloreé 2006

SEMESTER II

COURSE NO. SE 205 **Course Title: Mulberry and Silkworm crop Protection**

Credits: 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 May 2020, May 2021 and May 2022.

Course outcomes.

Understanding of:

CO1: Influence of environmental factors on the occurrence and spread of diseases.
CO2: Fungal diseases of mulberry.
CO3: Bacterial diseases of mulberry.
CO4:Minor diseases of mulberry.
CO5Nematodes of mulberry.
CO6: Microsporadianand Viral diseases of silkworm.
CO7: Non-infectious diseases of silkworm.
CO8: Different types of Disinfectants used for management of silkworm diseases.
CO9: Major and minor pests of mulberry.
CO10: Major and minor pests of silkworm.

UNIT-I

Diseases of Mulberry-I **12 hrs.**

1.1. Diseases of mulberry: Concept of plant diseases, pathogenesis, parasitism, host-parasitic relationship.
1.2. Environment: influence of environmental factors on the occurrence and spread of diseases.
1.3. Fungal diseases: Leaf spot, powdery mildew, leaf rust and root rot: their causative agent, symptoms, disease cycle and control.
1.4. Leaf blight, trunk rot, stem canker; their causative agents, symptoms, disease cycle and control.

UNIT-II

Diseases of Mulberry-II **12 hrs**

2.1. Bacterial diseases: itscausative agents , symptoms and control measures.
2.2. Viral diseases: its causative agents, symptoms and control measures of the dwarf disease and Mosaic disease.
2.3. Mineral deficiency symptoms in mulberry and reclamation.
2.4. Nematode disease; Root knot nematode- causative agent, symptoms, disease life cycle and control.

C. No. SE 205 Mulberry and Silkworm crop Protection (2020- 2022)

UNIT-III

Diseases of Silkworm –I **12 hrs.**

3.1. Infectious and Non-infectious diseases of *Bombyx mori*.

3.2. Diseases of silkworm; Disease: Definition and diagnosis, .Influence of environmental condition for occurrence and spread of diseases. .

3.2. Microsporadian diseases (Protozoan Diseases)Causative agent, mode of infection, life cycle, symptoms and management.

3.3. Viral diseases: Causative agent, structure, symptoms, prevention and control measures of Nuclear Polyhedrosis (NPV), Cytoplasmic Polyhederosis (CPV), Infectious flacherie (IFV) and Densonucleosis (DNV).

UNIT-IV

Diseases of Silkworm-II **12 hrs.**

4.1. Bacterial Diseases: Septicemia, Sotto, bacterial disease of the digestive tract; causative agent, life cycle, symptoms and management.

4.2. Fungal Diseases: White, green, yellow and brown muscardine, life cycle, symptoms and management

4.3. Aspergillosis: Causative agent, life cycle, symptoms, prevention and control.

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

UNIT-V

Pests of Silkworm and Mulberry **12 hrs.**

5.1. A brief account of Pests, Predators and Parasitoids.

5.2. Tachinid flies associated with *Bombyx mori* - classification, distribution, incidence, extent of damage and management strategies with reference to *Exoristabombycis*. Life cycle, Prevention and Control measures of *Exoristabombycis.*

5.3. Dermestid beetles associated with *Bombyx mori* and their management. Distribution, extent of damage, prevention and control measures of Dermestid beetles.

5.4. Pests of mulberry; Majorand minor pests of mulberry, their management, Integrated pest management.

C. No. SE 205 Mulberry and Silkworm crop Protection (2020- 2022)

Note for paper setting:

Note 1: There shall be one theory paper of 100 marks 20 % marks shall be reserved for internal assessment (20 marks) and 80 % of marks (80 marks) shall be reserved for external examination to be conducted by University.

Note 2: The external question paper will contain two sections: A and B.

Section 'A' consist of 15 short answer type questions, each question carries 02 marks.

Candidates are required to attempt all questions. (Answer should not exceed 100 words).

Section 'B' consist of 10 long answer type questions (02 questions from each unit). The candidates are required to attempt only 5 questions, selecting 01 question from each unit. Each question will carry 10 marks.

Books Recommended:

1. Trivedi, P.C. (Ed.) (2001) *Plant Pathology.* Pointer Publishers, Jaipur, India.
2. Huang, E. (2003) *Protection of Mulberry Plants*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi and Calcutta.
3. Khan M. A. (2004) Pests and Diseases of Mulberry and their Management.
4. Mulberry Crop Protection (2005) CSB Bangalore.
5. Nataraju, B., Sathyaprasad, K., Manjunath, D. and Aswani Kumar, C. (2005) *Silkworm Crop Protection.* Central Silk Board, Bangalore.
6. Govindaiah, Gupta, V.P., Sharma, D.D., Rajadurai, S. and NishithaNaik (2005) *Mulberry Crop Protection.* Central Silk Board, Bangalore.
7. Silkworm Crop Protection (2006). CSB Bangalore.
8. Suresh Kumar, N. Harjeet Singh and Saha, A. K., (2015) *A textbook of Silkworm rearing technology*. Dominant and Distribution Publishers, New Delhi.
9. Anantha Narayanan, S.K (2017) *Silkworm Rearing*. Biotech books, New Delhi.
10. Ganga, G. and SulochanaChetty, J. (2018) *An Introduction to Sericulture*. Oxford and IBH Publishing. Co. Pvt. Ltd. New Delhi.

SEMESTER: II

LABORATORY COURSES

SE 206 Laboratory course-I; based on theory course no. SE-201, SE-202 and SE-203 **4 credits**

SE 207 Laboratory course-II; based on theory course no. SE-204 and SE-205. **4 credits**

Practical Semester-II

Lab. Course No.SE-206Title: Laboratory Course-I

(Based on Theory Course No.SE-201, 202& SE-203)

Credits: 04

Duration of Exam: 06 hrs. **Maximum Marks: 100**

External Exam: 50
Internal Exam: 50

Syllabus for the examination to be held in

May 2020, May 2021 and May 2022.

1. Study of micro – techniques.
   (a) Collection, preparation of material and laboratory produce for use collected materials.
   (b) Fixation, Dehydration Clearing.
   (c) Embedding and Block Marking.
   (d) Section cutting and staining.
2. To explore the stomata form the given leaf.
3. Mounting of embryo of identification of stages of embryonic development based on cytological features.
4. Study of different stages of mitosis through prepared slides.
5. Study of different stages of meiosis through prepared slides.
6. Estimation of heterosis, inbreeding depression for selected traits.
7. Collection and method of insect preservation.
8. Studies on beneficial insects.
9. Studies on harmful insects.
10. Studies on social insects.
11. Studies of insects for scientific research.
12. Planning the facilities required for establishment of insect.
13. Study of forensic insects.
14. Modern forensic techniques-SEM, Potassium permanganate staining, Mitochondrial DNA, Gene expression studies.
15. Study of forensic insectôshabitat.

Note:- Any other need based practical if required shall be incorporated.

Practical Semester-II

Lab. Course No.SE-207Title: Laboratory Course-II

(Based on Theory Course No.SE-204& SE-205)

Credits: 04

Duration of Exam: 06 hrs. **Maximum Marks: 100**

External Exam: 50
Internal Exam: 50

Syllabus for the examination to be held in

May 2020, May 2021 and May 2022.

1. Salient feature of egg, larva, cocoon, pupa and adult of Multivoltine, Bivoltine and hybrids of silkworm.
2. Determination of fecundity and hatching percentage of BV and MV silkworm breeds.
3. Identification of mutants of silkworm.
4. Assessment of Larval and cocoon characters for breeding. Estimation of filament length.
5. Preparation of breeding plan for evolution of superior breeds.
6. Identification bacterial diseases of silkworm :
7. Identification of Viral diseases of silkworm.
   - A) NPV
   - B) CPV
   - C) DNV
   - D) IFV
8. Identification of pests of silkworm.
9. Visit to silkworm seeds production canters.
10. Collection and methods of insect preservation.
11. Identification of fungal diseases of mulberry:
    - (a) Powdery mildew.
    - (b) Leaf spot
    - (c) Leaf rust.
    - (d) Root rot
12. Identification of viral diseases of Mulberry.
    - (a) Dwarf Disease.
    - (b) Mosaic Disease
13. Identification of Bacterial disease of mulberry.
    - (a) Leaf blight.

14. Identification of Nematode disease of mulberry.
(a) Root knot(Preparea T.S.of infected root).
15. Identification of major and minor and minor pest of mulberry (Visit to mulberry farm).
16. To study the technique of collection & preservation of insects.
17. To study the harmful & beneficial insects in relation to man.
18. To study the insects transmitting diseases.

Note: - Any other need based practical if required shall be incorporated.

SEMESTER III

SEMESTER III

COURSE NO. SE 301 **Course Title: Biotechnology**
Credits: 4 **Maximum marks: 100**
Duration of exam: 3hrs. **a) Semester Examination: 80**
b)Internal Assessment: 20

Syllabus for the examination to be held in

December, 2020, December 2021, and December 2022

Course outcomes.

Understanding of :
CO1. Scope and importance of biotechnology.
CO2. Concept of intellectual property rights CIPR.
CO3. Nanotechnology in crop improvement programes.
CO4. Biofertilizers in crop improvement.
CO5. Bioremediation and phytoremedation.
CO6. Scope of Tissue culture.
CO7. Recombinant DNA Technology.
CO8. Gene amplification and application of PCR in silkworm Biotechnology.
CO9. Manipulation of Fibroin and Sericin gene.
CO10. Application of silkworm transgenesis.

UNIT-I

Biotechnology-I **12 hrs.**

1.1. Biotechnology: Origin, definition, scope and importance of biotechnology
1.2. Status of transgenic research with special reference to plants.
1.3. GMO: International regulations, bio-safety issues of GMO, Regulatory procedures in India, ethical, legal and social issues.
1.4. Intellectual property rights: Introduction to Nanotechnology and its applications in crop improvement programmes.

UNIT-II

Plant Biotechnology **12 hrs.**

2.1. Gene organization: A typical plant gene, plant promoters, coding region of transgenes, reporter genes, problemõs posed by antibiotic resistance reporter genes.
2.2. Transgenic Plant:Herbicide resistance, Insect resistance, Virus resistance, Resistance to fungal and bacterial diseases, drought resistance.
2.3. GeneticTransformation of chloroplast: Vectors for chloroplast transformation, selectable markers and methods for chloroplast transformation- advantages and limitations.

2.4. Bio fertilizers*: Rhizobiumspp., Azotobactor spp., Azospirillum spp.,* Blue green algae and Azola- Advantages and limitations of Biofertilizers.

UNIT- III

Applied Biotechnology **12 hrs.**

3.1. Biotechnology and health care.
3.2. Bioleaching, Biomolecular computers, Biosensors, Biometrics, biodiesel from waste food, bioweapons and biochips.
3.3. Microbial fermentation and production of micro-and macromolecules.
3.4. Bioremediation and phytoremedation.

UNIT-IV

Silkworm Biotechnology-I **12 hrs.**

4.1. Animal cell and tissue culture: Introduction, scope, advantages and disadvantages, cell culture ï establishment of primary and secondary cell lines
4.2 Tissue and organ culture; whole embryo culture; tissue grafting. Embryo and endosperm culture; bioreactors
4.3 Recombinant DNA technology: Cloning vectors for recombinant DNA, cloning and expression of vectors. Transgenic plants and their role in crop improvement
4.4. Polymerase chain reaction (PCR):Gene amplification, Application of PCR in silkworm biotechnology.

UNIT-V

Silkworm Biotechnology-II **12 hrs.**

5.1. Biotechnology of silkworm: Manipulation of Fibroin and Sericin gene.
5.2 Silkworm Transgenesis: Historical account, piggybac transposon, transformation methodology, and application of silkworm transgenesis.
5.3. Blotting: Southern blotting , western blotting, dot blot assay, cDNA library.
5.4. Genome mapping: Genetic marker- RFLPs, SSPLs, SNPs, Physical mapping and restriction method.

Note for paper setting:

Note 1: There shall be one theory paper of 100 marks 20 % marks shall be reserved for internal assessment (20 marks) and 80 % of marks (80 marks) shall be reserved for external examination to be conducted by University.

Note 2: The external question paper will contain two sections: A and B

Section 'A' consist of 15 short answer type questions, each question carries 02 marks. Candidates are required to attempt all questions. (Answer should not exceed 100 words).

Section 'B' consist of 10 long answer type questions (02 questions from each unit) . The candidates are required to attempt only 5 questions, selecting 01 question from each unit. Each question will carry 10 marks.

Books Recommended:

1. Joshi, P. (2000) *Genetic Engineering and its Application*. Agrobios Pvt. Ltd.
2. Singh, B.D. (2000) *Biotechnology*. Kalyani Publishers, New Delhi.
3. Bhojwani, S.S. and Razdan, M.K. (2003) *Plant Tissue Culture: Theory and Practice*. Elsevier, Amsterdam.
4. *Handbook of Sericulture Technologies*-(4th Edition) CSB Bangalore. 2005.
5. Kumaresan, V. (2012)*Biotechnology*.Saras Publication, Kanyakumari-Tamil Nadu.
6. Fatima, D & others (2013) *Biochemistry*. Saras Publication, Kanyakumari-Tamil Nadu.
7. Kumaresan, V. (2013) *Animal Biotechnology*. Saras Publication, Kanyakumari-Tamil Nadu.
8. Fatima, D & others (2013) *Animal Physiology & Biochemistry*. (Saras Publication, Kanyakumari-Tamil Nadu.
9. Fatima, D & others (2013) *Biochemistry*. Saras Publication, Kanyakumari-Tamil Nadu.
10. Ragland, A &Arumugam, N. (2013) *Biochemistry &Biotechniques*.Saras Publication, Kanyakumari-Tamil Nadu.
11. Meyyan, R. P &Kumaresan. V (2013) *Genetics & Biotechnology*. Saras Publication, Kanyakumari-Tamil Nadu.
12. Ragland, A &Arumugam, N. (2013) *Biochemistry &Biotechniques*.Saras Publication, Kanyakumari-Tamil Nadu.

SEMESTER III

COURSE NO. SE 302 **Course Title: Post Cocoon Technology**
Credits: 4 **Maximum marks: 100**
Duration of exam: 3hrs. **a) Semester examination: 80**
b) Internal Assessment: 20

Syllabus for the examination to be held in

December, 2020, December 2021, and December 2022

Course outcomes.

Understanding of:
CO1. Classification of textile fibres and their properties.
CO2. Different types of silk.
CO3. Assessment and grading of cocoon.
CO4. Objectives and methods of cocoon stifling.
CO5. Storage and preservation of cocoons.
CO6. Cocoon cooking: methods and objectives.
CO7.Importance of reeling industry.
CO8. Reeling process and different types of reeling machines.
CO9. Degumming and Dyeing of silk fibre.
CO10. Weaving of different types of fibres.

UNIT-I

Introduction to Silk fibre **12 hrs.**

1.1. Textile fibre: Introduction and classification of textile fibres. Physical and chemical properties of silk, wool, cotton, and synthetic fibres. Different varieties of commercial silk- mulberry, tasar, muga and eri and their properties. Fine, crystal structure and texture of silk fibres.

1.2. Factors influencing the properties of raw silk. Silk exchanges ï structure and function.

1.3. Cocoons: Physical and commercial properites of univoltine, bivoltine and multivoltine cocoons. Assessment and grading of cocoons. Influence of cocoon quality on reeling and raw silk production.

1.4. Various by products of cocoon & silk and their uses, hand Spinning and machine spinning.

UNIT-II

Post cocoon Technology-I **12 hrs.**

2.1. Assessment of cocoon properties: shell ratio %, filament length, filament size reelability %, Renditta, raw silk %, Kakame cost, Different types of defective cocoons, cocoon sorting method, effect of defective cocoons in the reeling.

2.2. Cocoontesting and grading methods adopted in Japan and India cocoon purchasing for reeling industry cocoon market.

2.3. Cocoon Stifling : Objectives of stifling, suitable stifling method according to cocoon quality, viz., Multivoltine, Bivoltine etc, Different stifling methods- Sun drying ,steam stifling ,Hot air-drying ,Batch type and conveyer type Aadvantages and disadvantages of various methods.

2.4. Storage and preservation of cocoons:Factors to be considered for ideal storage ï effect of faulty storage on cocoon quality.

UNIT-III

Post cocoon technology-II **12 hrs.**

3.1. Cocoon Cooking:Objectives - mechanism of cocoon cooking ï Selection of cocoon cooking methods according to cocoon quality viz., Multivoltine, Bivoltine etc.Open pan, three pan, pressurized cooking ï conveyer cooking merits and demerits of cocoon cooking methods.

3.2. Cocoon brushing: Importance of brushing, different devices for brushing; bamboo stick , coconut stick, paddy straw, hand brushing and mechanical brushing.

3.3. Reeling:Evolution and history of reeling. Reeling machines; Charka, cottage basin, Multi-end and automatic/semiautomatic reeling machines.Objectives of reeling.

3.4. Reeling process: Charka, Cottage basin, multi-end, automatic and semiautomatic machines. Its advantages and disadvantages.

UNIT-IV

Post cocoon Technology-III **12 hrs.**

4.1. Re-reeling and finishing: Importance of re-reeling, re-reeling machine, process of re-reeling.

4.2. Reeling water: Sources and quality, importance in cocoon cooking and raw silk quality; factors influencing water quality; corrective measures.

4.3. Raw silk testing and grading: Raw silk tests-visual, mechanical- winding, size deviation evenness, cleanness and neatness, tenacity and elongation, cohesion strength exfoliation serigraph and seriplane tests.

4.4. Importance of reeling industry for the development of sericulture. Position of Indian reeling industry, problems of reeling industry.

UNIT-V

Post cocoon Technology-1V **12 hrs.**

5.1. Wet processing: Degumming- principles and methods of degumming; Bleaching- principles and methods of bleaching.Dyeing- Principles andmethods of dyeing, Dyeing of silk with natural dyes. Chemical finishing of silk fibres.

5.2. Throwing: aims and objectives of throwing, Process of throwing, winding, doubling, twisting and rewinding.

5.3. Weaving: Preparation of warp and weft.Methods of weaving-hand and power loomsand their merits and demerits.Weaving process. Different types of fabrics.

5.4. Spun silk- Raw material -hand spinning -Spun silk industry.

Note for paper setting:

Note 1: There shall be one theory paper of 100 marks 20 % marks shall be reserved for internal assessment (20 marks) and 80 % of marks (80 marks) shall be reserved for external examination to be conducted by University.

Note2: The question paper will contain two sections: A and B

Section 'A' consist of 15 short answer type questions, each question carries 02 marks. Candidates are required to attempt all questions. (Answer should not exceed 100 words)

Section 'B' consist of 10 long answer type questions (02 questions from each unit) . The candidates are required to attempt only 5 questions, selecting 01 question from each unit. Each question will carry 10 marks.

Books Recommended:

1. Akira, N. (2000) *Fiber Science and Technology.* Oxford & IBH Publications, New Delhi.

2. Mahadevappa, D.; Halliya, V.G.; Shankar, D.G. and RavindraBhandiwad (2000) *Mulberry Silk Reeling Technology*. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi and Calcutta.
3. Akira Nakamura (2000) *Fiber Science and Technology.* Oxford & IBH Publications, New Delhi.
4. Anonymous (2000) *Silk Dyeing and Finishing Handbook.* Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi and Calcutta.
5. Dandin, S. B. and Gupta, V. P. (2002) *Advances in Indian Sericulture Research*. CSR & TI, Mysore.
6. Anonymous (2002) *Silk Weaving*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi and Calcutta.
7. Anonymous (2002) *Colours from Nature – Silk Dyeing Using Natural Dyes.* Vol. I and II, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi and Calcutta.
8. Dandin, S. B. Jayaswal J. and Giridhar K. (2003) *Handbook of Sericulture Technologies*. CSB, Bangalore.
9. Rajan, R. K. and Himantharaj, H. T. (2005) *Silkworm Rearing Technology.* Central Silk Board, Bangalore.
10. Patnaik, R.K. (2008) *Sericulture Manual*. Biotech Books, New Delhi.
11. Singh, Amar Dev and Kumar Ravinder (2013) *Sericulture Handbook*. Biotech Books, New Delhi.
12. Suresh Kumar, N. Harjeet Singh and Saha, A. K., (2015) *A textbook of Silkworm rearing technology*. Dominant and Distribution Publishers, New Delhi.
13. Anantha Narayanan, S.K (2017)*Silkworm Rearing*. Biotech books, New Delhi
14. Ganga, G. and SulochanaChetty, J. (2018) *An Introduction to Sericulture*. Oxford and IBH Publishing. Co. Pvt. Ltd. New Delhi.

SEMESTER III

COURSE NO.SE 303 Course Title: Entrepreneurship Development in Sericulture
Credits: 2 MAXIMUM MARKS: 50
Duration of exam: 2 hrs. a) Semester Examination: 40
b) Internal Assessment: 10

Syllabus for the examination to be held in

December, 2020, December 2021, and December 2022

Course outcomes.

Understanding of:

CO1. Objectives of EDP.
CO2. EDP policies of CSB and other Sericultural organizations.
CO3. EDP in raising Mulberry nurseries and vermicomposting.
CO4. Special schemes for technical entrepreneurs.
CO5. Worldwide status of Entrepreneurship
CO6.To study various aspects of Entrepreneurship Development in Sericulture.

UNIT-I

Sericultural Entrepreneurship Development -1 12 hrs.

1.1. Entrepreneurship development programme (EDP): Introduction and objectives of EDP, essential qualities to become an entrepreneur; selection of a potential entrepreneur.
1.2. Entrepreneurship Development policies of Central Silk Board and other sericultural organizations. Planning for EDP and follow-up for EDP: Need, extent and mechanism.
1.3. EDP in raising mulberry saplings (Kisan nursery) and vermicomposting. EDP in organization of chawki rearing centres.
1.4. EDP in silkworm egg production and rearing.EDP in silk reeling :charaka, cottage basin and multi-end reeling units.

UNIT-II

Sericultural Entrepreneurship Development- II 12 hrs.

2.1. Entrepreneurship Development in Sericulture Industry: Basic concepts of entrepreneurship development.
2.2. Need, scope and characteristics of EDP. Special schemes for technical entrepreneurs (STED).

2.3. Social responsibility, business ethics and environmental awareness.

2.4. Biography of Indian Entrepreneurship- status of worldwide Entrepreneurship.

UNIT-III

Sericultural Entrepreneurship Development -III **12 hrs.**

3.1. Insectary facilities and equipments: Location, building specification, air conditioning and environmental control, furnishings and equipment, sanitation and equipment, subsidiary facilities.

3.2. Massproduction of insect pathogens: Culturing of hosts / preparation of culture substrates, inoculation, collection of diseased/dead hosts; isolation, purification and storage of pathogens.

3.3. Mass production of parasitoids: Culturing of host insects, oviposition of parasitoids, emergence of parasitoid adults from hosts, collection of parasitoid adults, feeding and storage of parasitoid adults.

3.4. Mass production of insect predators: Culturing of prey insects, release of adults of predators on the colony of prey insects for oviposition, collection and feeding of predator adults, storage of predator adults.

Note for paper setting:

Note 1: There shall be one theory paper of 100 marks 20 % marks shall be reserved for internal assessment (20 marks) and 80 % of marks (80 marks) shall be reserved for external examination to be conducted by University.

Note 2: The external question paper will contain two sections: A and B.

Section 'A' will be compulsory for all and consist of 08 questions, each carrying 02 mark.

Section 'B' will carry 06 long answer type questions, 02 questions from each unit (unit I-III) of which the candidates will attempt only 03 questions, selecting 01 question from each unit. Each question will carry 10 marks.

Books Recommended:

1. Kumaresan, P. and Srinivasa, G. (2005) *Sericulture Extension Management and Economics.* Central Silk Board, Bangalore.
2. Handbook of Sericulture Technologies-(4th Edition) CSB Bangalore. 2005.
3. SatishVerma& S.B Dandin (2006) Mechanistion in Sericulture

4. Kumar, K S Arun (2010) Readings in Sericulture Economics Marketing and Management.
5. Koshy, T D (2011) Silk Production and Export Management.

SEMESTER III

COURSE NO. SE 304 **Course Title: Biostatistics and Computers**
Credits: 2 **Maximum marks: 50**
Duration of Exam : 2 hrs. **a) Semester Examination: 40**
b) Internal Assessment: 10

Syllabus for the examination to be held in

December, 2020, December 2021, and December 2022

Course Outcomes.

Understanding of:

CO1. Application of computer.
CO2. Advantages of power point presentation in present era.
CO3. Statistics.
CO4. Linear co-relation.
CO5. Various Assumptions.
CO6. Uses of statistical software.

UNIT-I

General Computers **12 hrs**

1.1. Introduction to computers: Characteristics, history and evolution, generation and types of computers.

1.2. Introduction to internet: World Wide Web, database, e-mail and chat.

1.3. M.S. Office: Word, Excel and Power Point.

1.4. Hardware, software, virus, Antivirus, E-paper technology, 4D Visualization ,3D internet DOS & Role of computer in Sericulture.

UNIT-II

Biostatistics -II **12 hrs**

2.1. Definition and scope of statistical methods in scientific studies.

2.2. Population and sample, descriptive and inductive statistics, discrete and continuous variables.

2.3. Frequency distribution, preparation of frequency table, relative and cumulative frequency, frequency distribution, histogram, polygon, frequency curves and ogives.

2.4. Measurement of central tendency and dispersion. Linear correlation and regression.

C.No.SE 304 Biostatistics and Computers (2020- 2022)

UNIT-III

Biostatistics -III **12 hrs**

3.1. Elementary sampling theory, sampling theory, random sample, random numbers, sampling distribution of standard errors.

3.2. Tests of significance: normal students ót ô, chi-square, and ôFô tests, tests of hypothesis about population mean and variance of a normal population level of significance.

3.3. Analysis of variance, assumptions, one-way classification, two way classification, equal number of observations per cell, multiple comparisons.

3.4. Use of statistical softwareôs for data analysis.

Note for paper setting:

Note 1: There shall be one written theory of 50 marks. 20% marks shall be reserved for internal assessment (10 mark 80% of marks (40 marks) shall be reserved for internal examination to be conducted by University. Theory paper will be set for 40 marks.

Note 2: The external question paper will contain 2 sections: A & B.

Section 'A' consists of 08 short answer type questions. Each question carries 02 marks. Candidates are required to attempt all questions (Answer should not exceed 100 words).

Section 'B' consists of 06 long answer type questions (02 questions from each unit). The candidates have to attempt only 03 questions, selecting 01 question from each unit. Each question carries 08 marks.

Books Recommended

1. Mathur, N. (2012) *Algorithms and Data*. Structures Publishing Radha Krishan Anand& Co.
2. Gurm, J.S Data. (2013)*Communication Networks A Technological Approach*, Publishing Radha Krishan Anand& Co.
3. Ahmed, T.*Cyberlaws E-Commerce & M-Commerce*. Publishing Radha Krishan Anand& Co.
4. Mathur, N.*Web Programming.* Publishing Radha Krishan Anand& Co.
5. R . N. *Web Technology Srivasatava*. Publishing Radha Krishan Anand& Co.
6. Kadam S. C.*Programming A Practical*. Prospective Publishing Radha Krishan Anand& Co.
7. Arumugam, N. (2013) *Basic concepts of Biostatistics*.Saras Publication, Kanya kumari-Tamil Nadu.

8. Gopi, A; Meena, A & others (2013) *Biostastistics, Instrumentation, computer Applications and Bioinformatics*. Saras Publication, Kanyakumari-Tamil Nadu.

COURSE NO. SE 305 (Special Optional) **Course Title: -Cocoon Production-I**
Credits: 4 **Maximum marks: 100**
Duration of exam: 3hrs. **a) Semester Examination: 80**
b) Internal Assessment: 20

Syllabus for the examination to be held in

December, 2020, December 2021, and December 2022

Course Outcomes.

Understanding of:

CO1. Prerequisite of mulberry plantation.
CO2. Mulberry cultivation in different agro climatic regions.
CO3. Different varieties of mulberry.
CO4. Planting and spacing pattern in mulberry.
CO5. Leaf harvesting methods and their preservation.
CO6. Types of rearing houses and rearing equipments.
CO7. Methods and devices used in incubation.
CO8. Chawking rearing methods.
CO9. Late-age rearing methods.
CO10. Mounting and different types of mountage.

UNIT-I

Moriculture -I **12 hrs**

1.1. Selection of land: Preparation of land for establishment of mulberry plantation.

1.2. Mulberry cultivation technology in hilly slopes and its management.

1.3. Mulberry cultivation under irrigated and rain fed condition.

1.4. Establishment of mulberry gardens; strategies for long term basis, intensive cultivation for high leaf productivity and quality.

UNIT-II

Moriculture -II **12 hrs**

2.1. Mulberry varieties, selection of varieties, spacing system of plantation, planting material, saplingproduction-different methods, transport of cuttings and saplings, planting techniques

2.2. Establishment of plantation. Different systems of Cultivation, Post planting care, cultural and intercultural operation

2.3. Common weeds and their control, use of weedicides.

2.4. Leaf harvesting; methods, transport, preservation. Chawki garden importance, pruning and training.

UNIT-III

General Sericulture -I **12 hrs**

3.1. Model rearing house-basic plan, site selection, size of rearing houses, orientation, advantages and disadvantages

3.2. Rearing equipments/appliances types and uses.

3.3. Disinfection: different types of disinfectants, different methods of disinfection.

3.4. Incubation; environmental conditions required. Methods and devices.Low cost and high cost incubation.

Unit-IV

General Sericulture -II 12 hrs

4.1. Brushing, cellular and mass brushing, evaluation of leaf quality, moulting test and bioassay.

4.2. Chawki rearing.Different chawki rearing methods.Concept of chawki rearingcenters.Environmental condition required for chawki rearing.

4.3. Moulting: Symptoms and moulting care during pre-moulting and post moulting periods.

4.4. Late age rearing; spacing and leaf requirement, environmental conditions required, frequency of feeding and bed cleaning schedules.Different rearing methods shelf, shoot and floor rearing. Advantages and disadvantages.Leaf quality and leaf preservation.

UNIT-V

General Sericulture -III 12 hrs

5.1. Spinning and mounting: Symptoms of spinning larvae, care to be taken during spinning. Methods of mounting, different types of mountages, effect of mountages on the quality of cocoons and environment management.

5.2. Harvesting of cocoons: Time of harvest of seed cocoons and commercial cocoons. Sorting of cocoons.Cocoon assessmentand leaf-cocoon ratio. Preservation and transportation of cocoons.

5.3. Insect and non-insect pests of mulberry silkworm and their status. Tachinid flies and dermestid beetles associated with *Bombyx mori* and their management.

5.4. Diseases of *Bombyx mori*: Causal organism, mode of infection and transmission.

Symptomatology, incidence, extent of crop loss, cross infectivity and management of microsporidiosis (pebrine),Virosis (NPV, CPV, IFV and DNV), Bacteriosis bacterial flacherie) and Mycoses (muscardine and aspergillosis) diseases.

Note for paper setting:

Note 1: There shall be one theory paper of 100 marks 20 % marks shall be reserved for internal assessment (20 marks) and 80 % of marks (80 marks) shall be reserved for external examination to be conducted by University.

Note 2: The external question paper will contain two sections: A and B.

Section 'A' consist of 15 short answer type questions, each question carries 02 marks. Candidates are required to attempt all questions. (Answer should not exceed 100 words)

Section 'B' consist of 10 long answer type questions (02 questions from each unit) . The candidates are required to attempt only 5 questions, selecting 01 question from each unit. Each question will carry 10 marks.

Books Recommended:

1. Mahadevappa, D.; Halliya, V.G.; Shankar, D.G. and RavindraBhandiwad (2000) *Mulberry Silk Reeling Technology*. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi and Calcutta.
2. Akira, N. (2000) *Fiber Science and Technology.* Oxford & IBH Publications, New Delhi.
3. Dandin, S. B. and Gupta, V. P. (2002) *Advances in Indian Sericulture Research*. CSR & TI, Mysore.
4. Dandin, S. B. Jayaswal J. and Giridhar K. (2003) *Handbook of Sericulture Technologies*. CSB, Bangalore.
5. Rajan, R. K. and Himantharaj, H. T. (2005) *Silkworm Rearing Technology.* Central Silk Board, Bangalore.
6. Patnaik, R.K. (2008) *Sericulture Manual*. Biotech Books, New Delhi.
7. Singh, Amar Dev and Kumar Ravinder (2013) *Sericulture Handbook*. Biotech Books, New Delhi.

8. Suresh Kumar, N. Harjeet Singh and Saha, A. K., (2015) *A textbook of Silkworm rearing technology*. Dominant and Distribution Publishers, New Delhi.
9. Anantha Narayanan, S.K (2017) *Silkworm Rearing*. Biotech books, New Delhi
10. Ganga, G. and SulochanaChetty, J. (2018) *An Introduction to Sericulture*. Oxford and IBH Publishing. Co. Pvt. Ltd. New Delhi.

SEMESTER III

COURSE NO. SE 306 (Special Optional) **Course Title: Mulberry Physiology, BreedingandGenetics -I**

Credits: 4 **Maximum marks: 100**
Duration of exam: 3hrs. **a) Semester Examination: 80**
b) Internal Assessment: 20

Syllabus for the examination to be held in

December, 2020, December 2021, and December 2022

Course outcomes

CO1. History of plant breeding.
CO2. Biodiversity and its significance.
CO3. Physiology of flowering.
CO4. Biological Nitrogen fixation.
CO5. Growth regulators.
CO6. Objectives of mulberry breeding.
CO7. Plant and water relations.
Co8. Transpiration and translocation.
CO9. Geographical distribution of mulberry.
CO10. Cycological techniques.

UNIT-I

Plant Breeding -1 **12 hrs.**

1.1. History of Plant Breeding: Pre and post Mendalian era. Patterns of Evolution in Crop Plants, Centreôs of Origin-biodiversity and its significance.

1.2. Genetic basis of breeding self- and cross-pollinated crops including mating systems and response to selection - nature of variability, components of variation.

1.3. Heritability and genetic advance: Genotype-environment interaction; General and specific combining ability; Types of gene actions and implications in plant breeding.

1.4. Plant introduction and role of plant genetic resources in plant breeding.

UNIT-II

Plant physiology-1 **12 hrs**

2.1. Stress physiology; Water stress and physiological consequences, salinity stress, alkalinity stress. Chilling injury, drought resistance, concept and adaptations, high temperature stress.

2.2. Physiology of flowering: Photoperiodism and vernalization. Phytochrome ï concept. Senescence, dormancy and seed germination.

2.3. Biological Nitrogen fixation; symbiotic, non-symbiotic and associative mechanism.

2.4. Growth regulators. Auxins,Gibberlic Acid, Cytokinins and Ethylene

UNIT-III

Plant Genetics-1 12 hrs

3.1. Yield and quality of mulberry leaf: Variations in relation to irrigated and rainfedsystems, varieties - scope for improvement.

3.2. Cytogenetics: chromosome number (basic, somatic and gametic). Karyotype.

3.3. Chromosome banding; meiotic irregularities, chromosome associations during meiosis in polyploids.

3.4. Objectives of mulberry breeding; reproductive systems- parameters associated with yield and quality of mulberry leaf; problems in breeding of asexually propagated crops.

UNIT-IV

Plant physiology-II 12 hrs

4.1. Concept of plant ideo type and its role in crop improvement, Transgressive breeding.

4.2. Plant and water relations: Concept of water potential. Absorption of water ï active and passive absorption; absorption of minerals.Translocation of solutes; mechanism of translocation. Source and sink relationship, Apoplast, symplast, concept and factors affecting translocation.

4.3. Transpiration: Significance, types; mechanism of stomatal opening and closing: Anti transpirants; guttation, factors affecting rate of transpiration.

4.4. Photosynthesis. Mechanism of electron transport,Co2 fixation ,C3,c4 , and CAM pathway.

UNIT-V

Plant Breeding -II 12 hrs

5.1. Geographical distribution of mulberry, important mulberry varieties cultivated in India and abroad

5.2. Cytological techniques; Mitosis, Meiosis and karyotypes studies

5.3. Production and uses of haploids: Anther culture, pollen culture, ovule culture, bulbasum technique; detection of haploids; applications of haploids in mulberry breeding.

5.4. Somatic hybridization: .Isolation of protoplast; viability and plating density of protoplasts; protoplast culture; isolation of sub-protoplast.

Note for paper setting:

Note 1: There shall be one theory paper of 100 marks 20 % marks shall be reserved for internal assessment (20 marks) and 80 % of marks (80 marks) shall be reserved for external examination to be conducted by University.

Note2: The external question paper will contain two sections: A and B.

Section 'A' consist of 15 short answer type questions, each question carries 02 marks. Candidates are required to attempt all questions. (Answer should not exceed 100 words)

Section 'B' consist of 10 long answer type questions (02 questions from each unit) . The candidates are required to attempt only 5 questions, selecting 01 question from each unit. Each question will carry 10 marks.

Books Recommended:

1. Eikichi Hiratsuka (2000) *Silkworm Breeding.* Oxford & IBH Publications, New Delhi.

2. Verma, P.S. and Agarwal, V.K. (2004) *Cell Biology, Genetics, Evolution and Ecology.* Published by S. Chand & Co., New Delhi.

3. Verma, P.S. and Agarwal, V.K. (2004) *Cell Biology, Genetics, Evolution and Ecology.* Published by S. Chand & Co., New Delhi.

4. 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.

5. *Handbook of Sericulture Technologies* (4th Edition) CSB Bangalore. 2005.

6. *Silkworm Breeding & Genetics*, CSB Bangalore. 2006

7. *Tips to Successful Silkworm Cocoon Crops*, CSB Bangalore. 2006

SEMESTER: III

LABORATORY COURSES

SE-307 Lab-Course ï I; Based on theory course No. SE-301& SE-302 **4 credits**

SE-308 Lab-Course-II; based on theory course No SE-303,304 &

SE-305(Optional) **4 credits**

SE-309 Lab-Course-II; based on theory course No SE-303,304 &

SE-306 (Optional) **4 credits**

Practical Semester-III

Lab. Course No.SE-307Title: Laboratory Course-I

(Based on Theory Course No.SE-301 & SE-302)

Credits: 04

Duration of Exam: 06 hrs. **Maximum Marks: 100**

External Exam: 50
Internal Exam: 50

Syllabus for the examination to be held in

December 2020, December 2021 and December 2022.

1. Preparation of plant cell culture medium.
2. Estimate of protein in mulberry leaf.
3. Procedure for sterilization and preparation f culture media.
4. Preparation of synthetic seeds in Mulberry.
5. Media preparation for silkworm cell lines.
6. Selection of tissue for establishment of silkworm cell lines.
7. Estimation of protease enzyme in the mid gut tissue of silkworm through calorimetric method.
8. Demonstration of Northern and southern blotting technique.
9. Calorimetric estimation of RNA in silk gland silkworm.
10. To study basic molecular biology techniques: PCR, Electrophoresis, Centrifugation and chromatography.
11. Study of various micro propagation techniques.
12. Study of different hybridization techniques.
13. To study the principle and working of different microscopes.
14. Study of physical and commercial characters of cocoon in Multivoltine and Bivoltine races/ breeds.
15. Sporting of cocoon – identification of good and defective cocoon.
16. Cocoon stifling and cooking.
17. Determination of alkalinity and hardness of reeling water by titration methods.
18. Reeling techniques : Epprouvette
19. , Charkha, Cottage basin.

20. Dyeing of Multivoltine and Bivoltine silk using acidic, basic and compound dyes.
21. Study of different types of reeling establishment.
22. Estimation of Remitter, Cocoon shall ratio and raw silk percentage.
23. Raw silk testing and grading (sailplane and Serigraph test)
24. To find the average filament length, Non broken filament length and Denier of the cocoons.
25. Assessment and grading of cocoon.
26. To study some of the important GMO's.
27. To study the application of Nano-technology in crop improvement programms.
28. To study the Health care applications of Biotechnology.
29. To study the process of microbial fermentation.

Note: Any other need based practical if required shall be incorporated.

Practical Semester-III

Lab. Course No.SE-308Title: Laboratory Course-I

(Based on Theory Course No.SE-303, 304 & SE-305)

Credits: 04

Duration of Exam: 06 hrs. **Maximum Marks: 100**

External Exam: 50
Internal Exam: 50

Syllabus for the examination to be held in

December 2020, December 2021 and December 2022.

1. Preparation of vermin-compositing & its applications.
2. Study of various EDP policies of CSB & other sericulture organizations.
3. Internet browsing, surfing, e-mail & chatting.
4. Anti-virus & its applications.
5. Role of Rural banks for the upliftment of Sericulture in rural areas.
6. M.S. Word, M.S. Power-point & its applications.
7. Use of statistical soft-wares-like Microsoft excel,SPSS, Mathematica.
8. To prepare frequency tables & frequency distribution.
9. To prepare Histogram, polygon, frequency curvs & oogives.
10. Measurement of central tendency & dispersion.
11. To study various physical parameters like: soil colour & texture.
12. Visit to chawki rearing canters.
13. Planning for raising Mulberry saplings (Kisan Nursery & vermin-compositing).
14. Collection & conservation of Mulberry Gemplasm.
15. Hybridization studies in Mulberry: Floral Biology, Pollen viability, pollen collection, artificial pollination, bagging & handling the crossed fruits.
16. Polyploidy breeding: Induction & identification of varieties evolved.

Note: Any other need based practical if required shall be incorporated.

Practical Semester-III

Lab. Course No.SE-309Title: Laboratory Course-I

(Based on Theory Course No.SE-303, 304& SE-306)

Credits: 04

Duration of Exam: 06 hrs. **Maximum Marks: 100**

External Exam: 50
Internal Exam: 50

Syllabus for the examination to be held in

December 2020, December 2021 and December 2022.

1.Preparation of vermin-compositing & its applications.
2.Study of various EDP policies of CSB & other sericulture organizations.
3. Internet browsing, surfing, e-mail & chatting.
4. Anti-virus & its applications.
5. Role of Rural banks for the upliftment of Sericulture in rural areas.
6. M.S. Word, M.S. Power-point & its applications.
7. Use of statistical soft-wares-like Microsoft excel, SPSS, Mathematics.
8. To prepare frequency tables & frequency distribution.
9. To prepare Histogram, polygon, frequency curvs&oogives.
10. Measurement of central tendency & dispersion.
11. To study various physical parameters like: soil color& texture.
12. Visit to chawki rearing canters.
13.Planning for raising Mulberry saplings (KisanNursery & vermin-compositing).
14. Collection & conservation of Mulberry Gemplasm.
15. Hybridization studies in Mulberry: Floral Biology, Pollen viability, pollen collection, artificial pollination, bagging & handling the crossed fruits.
16. Polyploidy breeding: Induction & identification of varieties evolved.
17. Tissue culture techniques: Preparation of culture media, Inoculation of ex-plants, micro-propagation & screening for acidity, alkalinity & salinity stress.
18. Determination of transpiration rate of Mulberry.
19. Role of growth regulators on Mulberry production.
20. Production of haploids & their application in Mulberry breeding.

Note: Any other need based practical if required shall be incorporated.

SEMESTER IV

SEMESTER IV

COURSE NO. SE 401 **Course Title: Sericulture Extension and Vanya Silk**

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 May 2021, May 2022, and May 2023.

Course outcomes.

Understanding of:

CO1. Objectives of extension education.
CO2.Passive and active process of teaching.
CO3. Importance of Extensionorganisation.
CO4. Staffing process.
CO5. Host plants of vanya silkworms.
CO6. Social forestry schemes.
CO7. Morphological features of non-mulberry silkworm.
CO8. Why Muga is endemic in nature.
CO9. Models of Agricultural Development.
CO10.WTOôs Agreement on Agriculture.

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UNIT-I

Extension Education **12 hrs.**

1.1. Extension Education:Meaning, objectives, importance, principles and concept. Functions of extension education: Teaching and learning process. Education and behavioral changes

1.2. Types of education-formal and informal. Organization of extension services in India; Training &Visit system, Broad based extension system.

1.3. Extension programme: Programme planning, principles of planning, criteria for setting up of extension units, Philosophy and steps in programme planning, Role and responsibility of different categories of extension workers. Extension services available in sericulture for the establishment of Chawki Rearing Centers, Basic Seed Farms, Grainages and Markets.

1.4. Role of co-operatives in sericulture extension; Organization of co-operatives at various levels, Chawki rearing, Grainages, reeling and marketing services. Role of Non-Government Organizations, co-operatives bodies in development of sericulture.

C. No. SE 401 sericulture extension and vanya silk (2021- 2023)

UNIT-II

Management **12 hrs.**

2.1. Management: Concept, objectives , principles and functions of Management.

2.2. Planning: Importance of planning in Extension organization, Definition, importance & advantages of planning and six Pôs of planning.

2.3. Staffing: Meaning & steps in staffing, direction & coordination-Techniques of effective coordination & directions.

2.4. Budgeting & Controlling: Meaning and types of budget, role of budgeting in effective management. Meaning and role of controlling in achieving management goals.

UNIT- III

Vanya Sericulture 1 **12 hrs.**

3.1. History of non-mulberry sericulture: Status of vanya silks in India ï characteristic features and advantages.

3.2. Insect and non-insect fauna producing silk and their distribution in world and India**.** Non- mulberry sericulture and its relevant to social forestry schemes.

3.3. Host plants of vanya silkworms: State-wise distribution in India, area and economic importance. Primary and secondary host plants of Tasar, Muga and Eri silkworm.

3.4. Pests and diseases of primary host plants of vanya silkworms and their management.

UNIT- IV

Vanya Sericulture IV **12 hrs.**

4.1. Comparative account of the morphological features of egg, larva, pupa and moth of non-mulberry silkworm.

4.2. Planning for Vanya silkworm egg production, rearing, grainage, & rearing equipments.

4.3. Basic difference between mulberry and non-mulberry silk reeling. Different reeling machines-traditional and modern methods of reeling.

4.4. Muga culture and its endemic nature to Assam.By-products of Vanya sericulture and their utilization.

C. No. SE 401 sericulture extension and vanya silk (2021- 2023)

UNIT-V

Sustainable Development **12 hrs**

5.1.Sustainable agriculture - definition, scope and objectives, Natural resources, their characterization and management.

5.2. Sustainable cropping and farming systems in agriculture in relation to environmental degradation, Research needs on sustainable agriculture.

5.3. Developmental issues, poverty, inequality, unemployment and environmental degradation. Models of Agricultural Development.

5.4. Globalization and the relevance of development policy analysis, WTOôs Agreement on Agriculture.

Note for paper setting:

Note 1: There shall be one theory paper of 100 marks 20 % marks shall be reserved for internal assessment (20 marks) and 80 % of marks (80 marks) shall be reserved for external examination to be conducted by University.

Note 2: The external question paper will contain two sections: A and B

Section 'A' consist of 15 short answer type questions, each question carries 02 marks. Candidates are required to attempt all questions. (Answer should not exceed 100 words)

Section 'B' consist of 10 long answer type questions (02 questions from each unit) . The candidates are required to attempt only 5 questions, selecting 01 question from each unit. Each question will carry 10 marks.

Books Recommended:

1. Mohanty, P. K. (2003) *Tropical wild silk cocoons of India*. Daya publishing house Delhi.
2. P. Kumaresan& Dr. G. Srinivasa (2005) *Sericulture Extension Management & Economics.*
3. Kumaresan, P. and Srinivasa, G. (2005) *Sericulture Extension Management and Economics.* Central Silk Board, Bangalore.

4. Jha, U. M. & Daman C. M. (2006) *Economics of Silk Weavers*.
5. Subramani, T (2008) *Sericulture Economics*.
6. Singh, T. Bhat, M. M and Khan, M. A (2009) *Sericulture Extension: Principles and Management*. APH Publications, New Delhi.
7. Singh, T. Bhat, M. M and Khan, M. A (2009) *Sericulture Extension: Principles and Management*. APH Publications, New Delhi.
8. Dandin, S. B and Ghirdhar, K. (2010) *Handbook of sericulture technologies*. Central Silk Board, Bangalore
9. Sathe and kavane, R.PM (2011) *Wild Silk*. Daya publishing house Delhi.

SEMESTER IV

COURSE NO. SE 402 **Course Title: Textile Technology**

Credit: 4 **Maximum marks: 100**
Duration of exam: 3hrs. **a) Semester Examination: 80**
b) Internal Assessment: 20

Syllabus for the examination to be held in May 2021, May 2022, and May 2023.

Course outcomes.

Understanding of:

CO1. Properties of natural fibers.
CO2. Yarn formation.
CO3. Fabric defects in Silk.
CO4. Importance of Fabric.
CO5. Properties of mineral fibres.
CO6. Blending process.
CO7. Properties of manmade fibres.
CO8. Consumer goods.
CO9. Flow chart of silk activities.
CO10. Textile laboratory.

UNIT-I

Textile Fibre- I **12 hrs.**

1.1. Introduction: Classification of textile fibres according to their nature and origin, Essential and desirable properties of textile fibers, staple and continuous filaments, comparison of natural and manmade fibers.

1.2. Introduction and history of textile: Textile fibre /fabric and their importance.classification of fibres; natural and manmade fibres.

1.3. Yarn formation: characteristics of yarns, staple, filament and integrated multi-component yarns; textured, stretch and bulk yarns, types of yarn, Types of twisted yarn, Selection of raw material

1.4 Soaking, winding, doubling, twisting, twist setting, handling of silk, speed settings and production calculation, Management of twisting unit.

UNIT-II

Textile Fibre- II **12 hrs.**

2.1 Fabric defects and their grading of silk fibres and uses. Degumming, bleaching, dying and printing of silk yarn and fabrics. Introduction to different classes of dyes and chemicals used for silk dyeing.

2.2 Weaving: Preparation for weaving, essential weaving operations.

2.3. Fabric structure ï Types of weavers and designs, fabric defects

2.4. Decorative fabric construction: braiding, knitting, lace and embroidery; finishing processes: types and effects.

UNIT –III

Textile Fibre- III **12 hrs.**

3.1. Printing and flocking: Dyes used for printing, methods of printing and flocking

3.2. Major natural fibres (cotton, linen, wool, hair and silk): History, types, manufacturing process, finishing and blending process.

3.3. Minor natural fibres: vegetable and mineral fibres.

3.4. Major manmade fibres (rayon, acetate, triacetate, nylon, aramid, polyester, acrylic, modacrylic, spandex, polypropylene and glass), History, methods of production, types, finishing, evaluating and blending process of major manmade fibres.

UNIT-IV

Textile Fibre- 1V **12 hrs.**

4.1. Minor manmade fibres: Polymers, saran, novoloid and polybenzimidazole fibres.

4.2. Comparative characteristics of natural and manmade fibres.

4.3. Consumer goods for apparels: Its composition, properties and uses.

4.4. Non-mulberry silk reeling: Multi-end reeling and re-reeling machines used.

UNIT-V

Textile Fibre- V **12 hrs.**

5.1. Indian Silk Industry: Demand and Supply of Silk, Silk Industry Structure, Competence of India in Global silk, Silk Technology and flow chart of silk activities

5.2. Consumer goods for home finishing ï curtains, pillows, blankets, terry towels, table clothes, carpets and rugs.

5.3. Fabric care: Permanent care and labeling.

5.4. Role of textile laboratory and by-product utilization.

Note for paper setting:

Note 1: There shall be one theory paper of 100 marks 20 % marks shall be reserved for internal assessment (20 marks) and 80 % of marks (80 marks) shall be reserved for external examination to be conducted by University.

Note 2: The external question paper will contain two sections: A and B

Section 'A' consist of 15 short answer type questions, each question carries 02 marks. Candidates are required to attempt all questions. (Answer should not exceed 100 words)

Section 'B' consist of 10 long answer type questions (02 questions from each unit). The candidates are required to attempt only 5 questions, selecting 01 question from each unit. Each question will carry 10 marks.

Books Recommended:

1. Anonymous (2000) *Silk Dyeing and Finishing Handbook.* Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi and Calcutta.
2. Mahadevappa, D. Halliya, V. G. Shankar, D. G. and RavindraBhandiwad (2000) *Mulberry Silk Reeling Technology*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi and Calcutta.
3. Nobumasa, H. (2000) *Structure of the Silk Yarn.* Oxford and IBH Publications, New Delhi.
4. Anonymous (2002) *Colours from Nature – Silk Dyeing Using Natural Dyes.* Vol. I and II, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi and Calcutta.
5. Anonymous (2002) *Silk Weaving*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi and Calcutta.
6. Dandin, S.B.; JayantJayaswal and Giridhar, K. (Eds.) (2003) *Handbook of Sericulture Technologies*. CSB, Bangalore.
7. Manual on Bivoltine Silk Reeling Technology (2003) CSTRI Central Silk Board.

8. Handbook of Sericulture Technologies- CSB Bangalore. (2005).
9. Jewel, R. (2009) *Textile testing*. APH publishing corporation New Delhi.
10. Barker, A. F. (2010) *Handbook of textile*. Abhishek publication Chandigarh.
11. Vidyasagar, P. V. (2010) *Encyclopedia of textile*. Mittal publications New Delhi.
12. Aror, J. K. (2011) *Modern weaving technology*. Abhishek publications Chandigarh
13. Anantha Narayanan, S. K. (2012) *Silk reeling*. Biotech books Delhi.

SEMESTER- IV

COURSE NO. SE 403 **Course Title: On Job Skill Training**

Credit: **4** **Maximum marks: 100**

a) External Examiner: 80

Project work (4-6weeks) **b) Internal Examiner: 20**

1 Centarl Silk Board, Banglore/ CSR & TI, Mysore/Department of Sericulture, Government of J&K
2 SKUAST Jammu/Kashmir.
3 RSRS Miran Shaib, Jammu
4 SSPC Udhampur
5 CSR&TI, Pampore, Kashmir.
6 Any Sericulture Firm/ Technical Service Centers within/outside the state.
7 State Filature J&K
8 Silk Weaving, Dyeing and printing units within/outside the state candidates shall undertake the skill based project under the guidance of the faculty member.

One or two Faculty members of the department of Sericulture will maintain liaison with the organization/units/research institutes/Universities etc. in planning the training. The candidate shall be under administrative control of that organization implanting skill training.Every candidate shall be required to maintain a daily attendance and work done/ experience acquired during the training.The Head of the organization will furnish a confidential report regarding attendance and the assessment of the performance in respect of every student to the Department of Sericulture, Poonch campus on completion of the training which will be taken into account at the time of final evaluation.The candidates shall have to submit two copies of bound and typed report on the training undertaken by him/her along with the certificate of the allotted guide from the department of sericulture of Poonch Campus, endorsed by the Director of the Campus. The evaluation of the project work will be assessed as per the following norms. The skilled project report shall have to be submitted to the department at least 15 days before the commencement of the University Examination which will be jointly evaluated by the internal examiner having a weightage of 20% and External examiner having the weightage of 80% of the total weightage of the Skill Based Project.

SEMESTER- IV

COURSE NO. SE 404 (Special optional) **Course Title: Cocoon Production-II (Vanya)**

Credit: 4 **Maximum marks: 100**

Duration of exam. 3hrs. **a) Semester Examination: 80**

b) Internal Assessment: 20

Syllabus for the examination to be held in May 2021, May 2022, and May 2023.

Course outcomes.

Understanding of:

CO1. Fertilizers and manures.
CO2. Bio-fertilizers.
CO3. Saturniidae and Bombycidae.
CO4. Non-mulberry Sericulture.
CO5. Significance of Rearing.
CO6. Importance of Spinning.
CO7. Importance of Disinfection.
CO8. Harvesting and sorting of cocoons.
CO9. Chemical Properties of vanya silk.
CO10Silk conditioning and testing.

UNIT-I

Vanya Sericulture- I **12 hrs.**

1.1. Package of practices: Suitable methods of host plant cultivation for non-mulberry silkworms.

1.2. Recommended doses of fertilizers and manures; Schedule of their application.

1.3. Field layout and preparation of land; Digging, Hoeing and Irrigation.

1.4. Establishment of plantation after transplantation. Gap filling and weed control; Bio-fertilizers like Azotobacter, Azospirillum, Phospho-bacterium, VAM etc.

C. No. SE 404 Cocoon Production-II (Vanya) (2021- 2023)

UNIT-II

Vanya Sericulture- II **12 hrs.**

2.1. Classification of insects - general characteristic features of insects; characteristic features of the order Lepidoptera; detailed study of the families ï Saturniidae and Bombycidae; classification of sericigenous insects.

2.2. History and importance of non-mulberry Sericulture.

2.3. Systematic position and distribution of non-mulberry silkworm including salient features.

2.4. Brief account of various diseases of non-mulberry silkworm; Maintenance of hygiene and disinfection procedure; type of disinfectants and mode of application; Preparation of desired strength of disinfectants; Types and uses of various appliances of disinfection.

UNIT-III

Vanya Sericulture -III **12 hrs.**

3.1. Tasar and muga: Incubation, Hatching and brushing: Effect of temperature, humidity and light on hatching of eggs; Fecundity, hatching percentage. Brushing of silkworm larvae.

3.2. Young age rearing: Selection of quality leaf, different methods of young age rearing with special reference to rearing under nylon net and its economics; Advantages and disadvantages; Rearing appliance required; Care during young age rearing.

3.3. Late age rearing: Preparation of site and selection of quality leaf for different instar; Transfer of silkworms; Regulation of population density of worms on bushes; Care during moulting, transfer. Effect of climatic conditions on growth and development of silkworms.

3.4. Mounting and Spinning: Maturation of silkworm; Hammock formation; Ring, peduncle and cocoon formation; Collection of matured silkworms and mounting on jali; Density regulation of Muga silkworms; Care during spinning; Harvesting and sorting of cocoons.

C. No. SE 404 Cocoon Production-II (Vanya) (2021- 2023)

UNIT-IV

VanyaSericulture- IV **12 hrs.**

4.1. Eri: Rearing house; Plan and design of model rearing house; Equipments and appliances; Disinfection of rearing house and appliance.

4.2. Young age rearing: Quality, quantity and size of leaves; feeding schedule; Spacing; Moulting; Temperature and humidity regulation.

4.3. Late age rearing: Quality, quantity and size of leaves; feeding schedule; Spacing; Moulting;Temperature and humidity regulation.

4.4. Moulting and spinning: Mountages; Maturation of larvae; Spinning, suitable site for spinning; Harvesting of cocoons; Care during mounting and harvesting.

UNIT-V

Vanya Sericulture- V **12 hrs.**

5.1. Stifling of vanya cocoons: Methods, conditioning of cocoons; storage and preservation; seasonal interaction; harvesting of solar energy for stifling.

5.2. Cooking: Methods of cooking; Merits and demerits.Water quality and its impact on cooking.

5.3. Reeling: Different methods, Re-reeling,Lacing, Skeining: Book making and boiling, Physical and Chemical Properties of vanya silk.

5.4. Silk conditioning and testing: Use of different types of machines and equipments for testing and grading of silk, spinning: Types of raw material; methods, industrial process and Economics.

Note for paper setting

Note 1: There shall be one theory paper of 100 marks 20 % marks shall be reserved for internal assessment (20 marks) and 80 % of marks (80 marks) shall be reserved for external examination to be conducted by University.

Note 2: The external question paper will contain two sections: A and B.

Section 'A' consist of 15 short answer type questions, each question carries 02 marks. Candidates are required to attempt all questions. (Answer should not exceed 100 words).

Section 'B' consist of 10 long answer type questions (02 questions from each unit) . The candidates are required to attempt only 5 questions, selecting 01 question from each unit. Each question will carry 10 marks.

Books Recommended:

1. Anonymous (2000) *International J. Wild Silkmoth and Silk*. International Society for Wild Silkmoths, Japan and CSB, India.
2. Mohanty, P K (2003) *Tropical Wild Silk Cocoons of India*. Daya publishing house Delhi.
3. Mahanty, P. K. (2003) *Tropical wild silk cocoons of India*. Daya publishing House Delhi.
4. Goel, R K & J V Krishna Rao (2004) *Oak Tasar Culture.* Aboriginal of Himalaya
5. Govindan, R. Ramakrishna Naika and Sannappa, B. (2004) *Progress of Research on Disease and Pest Management in Sericulture*. Seri Scientific Publishers, Bangalore
6. FAO/Lee, Yong Woo (2005) Silk Reeling and testing Manual.Central Silk Board, Bangalore.
7. Handbook of Sericulture Technologies-(4th Edition) CSB Bangalore. (2005)
8. Ananthanarayanan,S K (2008) *Silk Reeling.* Central Silk Board, Bangalore.
9. Kavane, R. K.&Sathe, T. V. (2011) Wild Silk Technology. Daya Publishing House.
10. Singh, Amar Dev and Kumar Ravinder (2013) *Sericulture Handbook*. Biotech Books, New Delhi.
11. Ganga, G. and SulochanaChetty, J. (2018) *An Introduction to Sericulture*. Oxford and IBH Publishing. Co. Pvt. Ltd. New Delhi.

SEMESTER- IV

COURSE NO. SE 405 (Special Optional) **Course Title: Silkworm Physiology, Toxicology, Breeding and Genetics**

Credit: 4 **Maximum marks: 100**

Duration of exam: 3hrs. **a) Semester Examination: 80**

b) Internal Assessment: 20

Syllabus for the examination to be held in May 2021, May 2022, and May 2023.

Course outcomes.

Understanding of:

CO1. Physiology and Histology of insect muscles .
CO2 Neurophysiology and Endocrinology.
CO3. Insecticide toxicology.
CO4. Insecticide Act.
CO5. Growth regulators.
CO6. Biochemical genetics.
CO7. Race authorization system.
CO8. Mutagenesis.
CO9. Mosaicism.
CO10Heritability studies.

UNIT-I

Silkworm Physiology **12 hrs.**

1.1. Muscle Physiology: Histology of insect muscles, flight muscles in insects, ultra structure of skeletal muscle, mechanism of muscle contraction.

1.2. Neurophysiology: Insect nervous system, structure of the neuron.Neurochemistry and physiology.

1.3. Receptor Physiology: Photoreceptors ï compound eyes, mechanism of image formation, Chemoreceptors; mechanism of chemorecption.Mechanoreceptors; and their functions.

1.4. Endocrinology: Anatomical Organization, structure, endocrine control of metamorphosis, reproduction, diapause, osmoregulation and intermediary metabolism.

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UNIT-II

Silkworm Toxicology **12 hrs.**

2.1. Definition and scope of insecticide toxicology: History of chemical control; pesticide use and pesticide industry in India.

2.2. Classification of insecticides and acaricides: Based on mode of entry, mode of action and chemical nature.

2.3. Insect growth regulators: Microbials, botanicals, new promising compounds, etc. principles of toxicology; evaluation of insecticide toxicity.

2.4. Insecticide Act, registration and quality control of insecticides; safe use of insecticides; diagnosis and treatment of insecticide poisoning.

UNIT-III

Silkworm Breeding **12 hrs.**

3.1. New concepts of silkworm breeding: Biochemical genetics and breeding; inheritance of genes for amylases, esterases and phosphatases.

3.2. Heritability studies in Bombyx mori: Broad and narrow range of heritability for various economic traits in silkworm. Breeding plans.

3.3. Breeding for thermotolerance, disease resistance, higher productivity, shorter larval duration and fine denier.

3.4. Race authorization system of India: A comparative analysis; release of races for commercial exploitation; authorized races / hybrids of India.

UNIT-IV

Silkworm Genetis- I **12 hrs.**

4.1. Sex limited breeds: Role of translocation in silkworm breeding, methods of evolving sex- limited breeds; sex limited breeds of China, Japan and India..

4.2. Concept of multiple alleles: Pleiotropism-mechanism of pleiotropic action of e-group allele.

4.3. Quantitative Genetics: Mendelian population, quantitative trait loci (QTL).

4.4. Silkworm breeding organization in India and China.

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UNIT-V

Silkworm Genetis- II **12 hrs.**

5.1. Mosaicism: Types and theories; induction of mosaics in silkworm.

5.2. Linkage and crossing over: Linkage groups in *Drosophila* and *Bombyx mori*. Classical linkage map of *B. mori*.

5.3. Radiation and chemical mutagenesis in silkworm: measurement of mutation through specific locus test; dominant and autosomal recessive lethal; strain and stage sensitivity.

5.4. Introduction to toxicology of silkworm: Procedures used in toxicology studies, methods of administration of pesticides, toxic symptoms in silkworm, LC-50 and LD-50 values.

Note for paper setting:

Note 1: There shall be one theory paper of 100 marks 20 % marks shall be reserved for internal assessment (20 marks) and 80 % of marks (80 marks) shall be reserved for external examination to be conducted by University.

Note2: The external question paper will contain two sections: A and B.

Section 'A' consist of 15 short answer type questions, each question carries 02 marks. Candidates are required to attempt all questions. (Answer should not exceed 100 words)

Section 'B' consist of 10 long answer type questions (02 questions from each unit). The candidates are required to attempt only 5 questions, selecting 01 question from each unit. Each question will carry 10 marks.

Books Recommended:

1. Eikichi Hiratsuka (2000) *Silkworm Breeding.* Oxford & IBH Publications, New Delhi.
2. Eikichi Hiratsuka (2000) *Silkworm Breeding.* Oxford & IBH Publications, New Delhi.
3. Verma, P.S. and Agarwal, V.K. (2004) *Cell Biology, Genetics, Evolution and Ecology*. Published by S. Chand & Co., New Delhi.
4. Verma, P.S. and Agarwal, V.K. (2004) *Cell Biology, Genetics, Evolution and Ecology*. Published by S. Chand & Co. New Delhi.
5. Handbook of Sericulture Technologies-(4th Edition)(2005) CSB Bangalor.

6. Basavaraja, H.K., Aswath, S.K., Suresh Kumar, N., Mal Reddy, N. and Kalpana, G.V. (2005) *Silkworm Breeding and Genetics.* Central Silk Board, Bangalor.
7. Tips to Successful Silkworm Cocoon Crops, (2006) CSB Bangalor.
8. Silkworm Breeding & Genetics, (2006) CSB Bangalor.
9. Guidelines for bivoltine rearing, (2009) CSB Bangalor.
10. Shamsuddin, M. (2012) Silkworm Physiology, Daya publishing house New Delhi

SEMESTER: IV

LABORATORY COURSES

SE-406	Laboratory course-I; based on theory course no. SE-401, SE-402	**4 credits**
SE-407 (Optional)	Laboratory course-II; based on theory course no. SE-404	**4 credits**
SE-408 (Optional)	Laboratory course-II; based on theory course no. SE-405	**4 credits**

Practical Semester-IV

Lab. Course No.SE-406Title: Laboratory Course-I

(Based on Theory Course No.SE-401& SE-402)

Credits: 04

Duration of Exam: 06 hrs. **Maximum Marks: 100**

External Exam: 50
Internal Exam: 50

Syllabus for the examination to be held in

May 2021, May 2022 and May 2023.

1.Study of extension activities of J&K state.
* Sericulture development department.
* Centre Silk Board, Jammu.
* SKUAST, Jammu.
* S .S.P.C, Udhampur.
*Demonstration cum training centre poulara.

2. Study of extension activities of NGO.
3. Study of sericulture extension programme of department of sericulture.
4. Practical exercise on participatory of rural appraisal and rapid rural appraisal.
5. Preparation of flash card, model, poster, leaflets, pamphlets and bulletin.
6. Conducting method demonstration.
7. Study of diffusion process of selected from innovation.
   * Silk Worm breeds.
   * Chawki rearing
   * Diseases control measures.
8. Preparation of an interview schedule/ questionnaire.
9. Construction of Knowledge test- rating and ranking scale.
10. Developing a research proposal.
11. Visit to cocoon market and any other regulated agricultural market.
12. Visit to temperate and tropical research institutes and silk producing states of India. (Educational) Tour.
13. Morphology of different non mulberry silk worms.
*Egg
*Larva
* Pupa
* Cocoon
*Adult

14. Different Eco types of non mulberry silk worms.
15. Comparison and characteristics features of Taser, Muga and Eri silkworm.
16. Comparison and characteristics features of Tasar, Muga, Eri, Cocoons.
17. Comparison and characteristics features of Taser, Muga, Eri, Silk threads.
18. A visit silk reeling factory to study:
    - Filature
    - Reeling machine
    - Yarn passage diagram
    - Cooking
    - Reeling

19. Determination of
    - Reelability
    - Average filament length
    - Raw silk percentage.
    - Renditta.
    - Silk waste percentage.

20. Detail study of multiend silk reeling machine, automatic and semi automatic reeling machine practical demonstration.

21. Study of silk fabric manufacturing unit.
    - Powerloom
    - Handloom

22. Visit to spun silk mill.
23. Study of silk dyeing and printing unit- visit to practical centres.
24. Study the permanent slide of the different natural and man –made fibers.
25. Preparation of herbarium of the locally available mulberry & non mulberry host plants.

Note:- Any other need based practical if required shall be incorporated.

Practical Semester-IV

Lab. Course No.SE-407Title: Laboratory Course-II

(**Based on Theory Course No.SE-404)**

Credits: 04

Duration of Exam: 06 hrs. **Maximum Marks: 100**

External Exam: 50
Internal Exam: 50

Syllabus for the examination to be held in

May 2021, May 2022 and May 2023.

1.Quality test of cocoons for breeding colour shape size compactness, grains, assessment and selection of cocoons on the basic of shall/ cocoon weight and shall percentages .
2. Material inheritance in silkworm *Bombyx mori*– study of diapauses character in multi x Bivoltine, bi (colour).
3. Sex limited breeds study of sex limited characters in egg (colour, larve marking) and cocoon (colour).Heterosis – study of heterosis over mid parent and better parent / calculations, methods.
4. Estimation of fecundity and hatching % in Bivoltine and Multivoltine races or breeds.
5. Racial characters of the silkworm Bombyx mori L. –Multivoltine and bivoltine: egg, larva, cocoon and adult stages (univoltine bivoltine and Multivoltine.)
6.Selection of cocoons for breeding and maintenance of breeding date.
7.Breeding plan for evolution of robust and productive breeds.

Note:- Any other need based practical if required shall be incorporated.

Practical Semester-IV

Lab. Course No.SE-408Title: Laboratory Course-III

(Based on Theory Course No.SE-405)

Credits: 04

Duration of Exam: 06 hrs. **Maximum Marks: 100**

External Exam: 50
Internal Exam: 50

Syllabus for the examination to be held in

May 2021, May 2022 and May 2023.

1. Observation of morphological characteristics of egg, Larvae, pupa and adult stages in mulberry silkworm.
2. Quality test of cocoons for breeding color shape size compactness, grains, assessment and selection of cocoons on the basic of shall/ cocoon weight and shall percentages .
3. Material inheritance in silkworm Bombyx mori– study of diapauses character in multi x Bivoltine, bi (colour).
4. Sex limited breeds study of sex limited characters in egg (colour, larvae marking) and cocoon (colour).Heterosis – study of heterosis over mid parent and better parent / calculations, methods.
5. Estimation of fecundity and hatching % in Bivoltine and Multivoltine races or breeds.
6. Study of adult life span (longevity) in Bombyx mori L. Multivoltine and bivoltine races or breeds and sexes.
7. Racial characters of the silkworm Bombyx mori L. –Multivoltine and bivoltine: egg, larva, cocoon and adult stages (univoltine, bivoltine and Multivoltine.)
8. Selection of cocoons for breeding and maintenance of breeding date.
9. Breeding plan for evolution of robust and productive breeds.
10. Study of egg production after conducting spring rearing.
11. Estimation of total carbohydrates in silkworm breeds.
12. To study the flight behavior of insects of orders Lepidoptera.
13. Preparation of temporary slide of respiratory system of silkworm (Tracheal bush).
14. Preparation of temporary / permanent slides of silk glands of silkworm.
15. Dissect and expose the spinneret of silkworm.
16. To study the ultra-structure of skeletal muscle in insects.
17. To study different insecticidal Acts.

Note: - Any other need based practical if required shall be incorporated.