UNIVERSITY OF CALCUTTA

Notification No.CSR/38/2023

It is notified for information of all concerned that in terms of the provisions of Section 54 of the Calcutta University Act, 1979, (as amended), and, in exercise of her powers under 9(6) of the said Act, the Vice-Chancellor has, by an order dated 11.08.2023 approved the Syllabus of **Sericulture for B.Sc. (Honours with a Core Vocational subject)**, Courses of Studies under CCF,2022, under this University, as laid down in the accompanying pamphlet.

The above shall take effect from the academic session 2023-2024 and onwards.

18/9/2023

SENATE HOUSE

Kolkata-700073

The 18th September, 2023

Prof.(Dr.) Debasis Das

Registrar

University of Calcutta

Programme Curriculum of 4 Yrs. B.Sc. (Honours) in Sericulture
Under Notification No. CSR/12/2023; Dated 10th July, 2023

Course Structure (under Curriculum & Credit Framework, 2022)

Total Semester: 08 (4 Yrs.); Total Credit: 172

CVC - Core Vocational Course;

Minor – Botany / Zoology;

IDC – Inter Disciplinary Course;

AEC – Ability Enhancement Course;

SEC – Skill Enhancement Course;

CVAC – Common Value Added Course.

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All Semester Credits: 21+21+21+22+24+20+20+20=169

Summer Internship at the end of 2nd, 4th or 6th semester – 3 Credits

TOTAL CREDITS: 169+3=172

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All Semester Marks: 525+525+525+550+600+500+500+(400+100) =4225

Summer Internship at the end of 2nd, 4th or 6th semester – 75 marks

TOTAL MARKS: 4225+75=4300

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SEMESTER – I

Course Code	Course Name	Course Type	L-T-P	Credits	Total Marks
BSRTC101	Basic Fundamentals of Sericulture	CVC	3-0-1	4	75+25
	Botany	Minor	3-0-1	4	75+25
	Choose from the IDC subject list	IDC	2-0-1	3	50+25
	Compulsory English	AEC	2-0-0	2	50
BSRTS181	Seri-Biotechnology	SEC	4-0-0	4	100
	Environmental Studies	CVAC	2-0-0	2	50
	Constitutional Values	CVAC	2-0-0	2	50
	Total			**21**	**525**

Course Name and Code: Basic Fundamentals of Sericulture and BSRTC101
Course type: CVC
Credit and hour: 3 and 45 Hr

Unit 1:General Sericulture [15H]
Introduction to Sericulture: Origin and history of sericulture. Silk route and map of India and World; Temperate and tropical climate for sericulture practice. Environmental impact of sericulture: Eco-friendly activity of sericulture; Employment generation in sericulture and role of women in sericulture. Characteristics of sericulture industry: Land and agro based part of industry. Industrial aspect of the industry; Silk reeling as a cottage industry; Handloom and power loom activities. Textile fibers: Natural and Synthetic fibers: Advantage of silk fiber over other fibers: International demand of silk. Function Central Silk Board; Role of State Department of Sericulture (Karnataka, Tamil Nadu, Andhra Pradesh, West Bengal); Role of universities and NGOs in sericulture development. Prospects and problems of sericulture industry, SWOT Analysis of Sericulture industry

Unit 2: Biology of silkworm [12H]
Silkworm taxonomy & life-cycle. Races & classification of silkworm: Classification based on the number of Larval Moults, Moultinism and Voltinism. Indigenous pure race& cross breed of India. Races with sex limited Characters. Silkworm morphology: Morphology of the egg, larva, pupa, adult. Silkworm Anatomy: Digestive system: Larva, Circulatory system: Larva, pupa, adult, Nervous system: Larva, adult, Silk gland: Larva, Reproductive system: Adult. Silkworm Diseases: Protozoan disease, Bacterial disease, Fungal disease, Viral disease, Sotto Silkworm Pests: Uzi fly, Ants, Dermestid Beetles.

Unit 3:Rearing Technology [9H] Silkworm Rearing (C.S.B. proposed model rearing house). Rearing appliances, disinfection, disinfectants, bed cleaning, feeding of worms. Maintaining optimum condition of rearing, brushing, frequency of spacing, care during mounting. Mounting and mountage, process of spinning, cocoon harvesting. Rearing method: chawki rearing or young age worm rearing.Late age Silkworm rearing.

Unit 4: Non-Mulberry sericulture [9H]

Different serigenous insects; **N**on mulberry silkworms (Tasar, Muga, Eri Silk) and their distribution in India and other countries. Taxonomy of food plants of non-mulberry silkworms; salient features of the families of non-mulberry silkworms. Disease and pest of non-mulberry silkworm.

References:

1. Charsley, S.R. (1982). Culture and Sericulture. Academic Press Inc., New York, U.S.A
2. Fao Manuals- I Mulberry Cultivation. Fao Rome.
3. Foth, H.D. (1984) Fundamentals of Soil Science. 7th Edn. John Wiley & Sons, New York.
4. Ganga, G., And J. SulochanaChetty. (1991) An Introduction to Sericulture. Oxford &Ibh Publishing Company.
5. HasaoAruga (1994). Principles of Sericulture (Translated from Japanese) Oxford &Ibh Publishing Co., Pvt. Ltd. New Delhi.
6. Kichisaburo M. (1997) Moriculture – Science of Mulberry Cultivation. OXFORD & IBH
7. Krishnaswami, S.; Narasimhanna, M.N.; Suryanarayan, S.K AndKumararaj, S. (1973) Sericulture Manual-2 - Silkworm Rearing. Agriculture Service Bulletin, Fao, Rome.
8. Rajanna, L., Das, P.K., Ravindran, S., Bhogesha, K., Mishra, R.K., Singhvi, N.R., Katiyar, R.S. And Jayaram, H. (2005) Mulberry Cultivation and Physiology. Central Silk Board, Bangalore.
9. Manual-2 - Silkworm Rearing. Agriculture Service Bulletin, Fao, Rome.
10. Jolly, M.S. Chowdhuty, S.N and Sen. (1975). Non-Mulberry Sericulture in India. Central Silk
11. Board, Bombay, India. 4. Jolly, M.S (1998). Tasar Culture. Central Silk Board, Bangalore, India.
12. Sarkar, D.C. (1998) Eri Culture. Central Silk Board, Bangalore
13. Thangavelu, K.; Chakraborty, A.K.; Bhagawati, A.K. And Isa, Md. (1998) Handbook of Mugaculture. CSB, Bangalore

List of practical – 15 Hr

1. Sericulture maps:a) World maps and Silk Road, b) Sericulture map of India and West Bengal
2. Preparation of histograms and pie charts on: a) Production of Textile fibers in India, b) World Silk Production, c) Pie chart on mulberry and non-mulberry silk production in India
3. Organization set up in India: (Demonstration & Exercise) a) Govt. of India, b) Five traditional states viz., Karnataka, Andhra Pradesh, Tamil nadu, West Bengal and Jammu & Kashmir
4. Life Cycle of Bombyxmori: a) Morphology of egg, larva, pupa and adult of silkworm Bombyxmori
5. Sex separation in larva, pupa and adult of silkworm Bombyxmori:
6. Anatomy of Silkworm
7. Silkworm rearing technology
8. Identification of egg, larva, pupa and moths of different non-mulberry insects.
9. Laboratory Note Book
10. Internal Assessment

References:
1. Fao Manuals- I Mulberry Cultivation. Fao Rome.
2. Ganga, G., And J. SulochanaChetty. (1991) An Introduction to Sericulture. Oxford &Ibh Publishing Company.
3. Krishnaswami, S.; Narasimhanna, M.N.; Suryanarayan, S.K and Kumararaj, S. (1973) Sericulture Manual-2 - Silkworm Rearing. Agriculture Service Bulletin, Fao, Rome.
4. Rajanna, L., Das, P.K., Ravindran, S., Bhogesha, K., Mishra, R.K., Singhvi, N.R., Katiyar, R.S. And Jayaram, H. (2005) Mulberry Cultivation and Physiology. Central Silk Board, Bangalore.
5. Jolly, M.S. Chowdhuty, S.N and Sen. (1975). Non-Mulberry Sericulture in India. Central Silk

Course Name and Code: Seri-Biotechnology and BSRTS181

Course type: SEC

Credit and hour: 4 and 60 Hr

Unit 1: **[12H]**
Introduction, scope and importance of plant biotechnology. Plant cell and tissue culture techniques, laboratory equipment, preparation of culture media, application of cell and tissue culture in mulberry plant.

Unit 2: **[10H]**
Insect transgenesis: Silkworm transgenesis, application of silkworm transgenesis. Silkworm cell culture, Establishment of primary and secondary cell lines, composition and preparation of media for cell culture.

Unit 3: **[6H]**
Types and mechanism of Polymerase Chain Reaction (PCR). Application of PCR in silkworm and mulberry breeding and genetic studies.

Unit 4: **[12H]**
Recombinant DNA Technology: Cloning vectors for recombinant DNA, Cloning and expression of vector, transgenic plants and their role in crop improvement, molecular farming and regulated gene expression.

Unit 5: **[10H]**
Concept and types of DNA markers. Detail study about molecular DNA markers like; RAPD, ISSR, SSR, SCAR, RFLP, AFLP.

Unit 6: **[10H]**
Application of biotechnology in silk fibers improvement and marker assisted breeding both silkworm and mulberry plant.Commercial application of biotechnological tools in mulberry and silkworm in medical and industrial sectors.

Reference:

1. Brown, T. A. (2016) Gene Cloning and DNA Analysis: An Introduction. John Wiley & Sons.
2. Glick, B.R., Pasternak, J.J. (2003) Molecular Biotechnology- Principles and Applications of Recombinant Dna. Asm Press, Washington.
3. Kundu, S. (Ed.). (2014). Silk Biomaterials for Tissue Engineering and Regenerative Medicine. Elsevier.
4. Murray, D.R. (1991) Advanced Methods in Plant Breeding Biotechnology. Cab, International, Wallingford, Oxon, United Kingdom.
5. Pevsner, J. (2009). Bioinformatics and Functional Genomics. Ii Edition. John Wiley & Sons.
6. Russell, P. J. (2009). Igenetics- A Molecular Approach. Iii Edition. Benjamin Cummings

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SEMESTER – II

Course Code	Course Name	Course Type	L-T-P	Credits	Total Marks
BSRTC201	Biology of Silkworm & Silkworm Crop Protection	CVC	3-0-1	4	75+25
	Botany	Minor	3-0-1	4	75+25
	Choose from the IDC subject list	IDC	2-0-1	3	50+25
	Compulsory English	AEC	2-0-0	2	50
BSRTS281	Apiculture	SEC	4-0-0	4	100
	Environmental Studies	CVAC	2-0-0	2	50
	From Any Other Departments	CVAC	2-0-0	2	50
	Total			**21**	**525**

Course Name and Code: Biology of Silkworm & Silkworm Crop Protection and BSRTC201
Course type: CVC
Credit and hour: 3 and 45 Hr

Unit 1: **[5H]**
Biological classification and taxonomy of Silkworms. Life-cycle pattern and general occurrence.

Unit 2: **[12H]**
Races & classification of silkworm: Classification based on the number of Larval Moults, Moultinism and Voltinism. Indigenous pure race& cross breed of India. Races with sex limited Characters.

Unit 3: **[8H]**
Silkworm morphology: Morphology of the egg, larva, pupa, adult.

Unit 4: **[10H]**
Silkworm Anatomy: Digestive system: Larva, Circulatory system: Larva, pupa, adult, Nervous system: Larva, adult, Silk gland: Larva, Reproductive system: Adult.

Unit 5: **[8H]**
Silkworm Diseases: Protozoan disease, Bacterial disease, Fungal disease, Viral disease, Sotto disease, septicemia, galtine.

Unit 6: **[3H]**
Silkworm Pests: Uzi fly, Ants, Dermestid Beetles.

References:

1. Charsley, S.R. (1982) Culture and Sericulture. Academic Press Inc., New York, U.S.A

2. Ganga, G., And J. SulochanaChetty. (1991) An Introduction to Sericulture. Oxford &Ibh Publishing Company.

3. Manual-2 - Silkworm Rearing. Agriculture Service Bulletin, FAO, Rome.

4. Madan Mohan Rao, M. (1999) Comprehensive Sericulture Manual. Ps Publications, Hyderabad.

5. S. Morohoshi (2001). Development Physiology of Silkworms. Science Publishers, U.S.

6. YataroTazima (2001). Improvement of Biological Functions in The Silkworm. Science Publishers

7. M. Amin Masood and Afifa S. Kamili (2000). Principles of Temperate Sericulture. Kalyani Publisher.

8. Silkworm Crop Protection, Central Silk Board, Bangalore, India.

9. Govindan, R.; Narayanaswamy, T.K. And Devaiah, M.C. (1998) Principles of Silkworm Pathology. Seri Scientific Publishers, Bangalore.

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

List of practical – 15 Hr

Silkworm Biology

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

Silkworm Crop Protection

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

6. Internal Assessment

Course Name and Code: Apiculture and BSRTS281
Course type: SEC
Credit and hour: 4 and 60 Hr

Unit 1: **[8H]**
Biology and taxonomy of Bees: History; Classification; Biology of Honey Bees; Social organization of Bee Colony.

Unit 2: **[14H]**
Bee culture practice: Artificial Bee rearing (Apiary); Modern hives –Langstroth Box and its operation; Bee Pasturage; Selection of Bee Species for Apiculture, Bee Keeping Equipment; Methods of Extraction of Honey (Indigenous and Modern).

Unit 3: **[8H]**
Diseases and Enemies: Bee Diseases, Enemies and pests; Control and Preventive measures.

Unit 4: **[10H]**
Bee Economy: Products of Apiculture Industry and their Uses.

Unit 5: **[20H]**
Entrepreneurship in Apiculture: Bee Keeping Industry – Recent Efforts, Modern Methods in employing artificial Beehives for cross pollination in horticultural gardens. Queen rearing, low cost nursery raising techniques, value addition from bee-wax etc.

Reference:
1. Sarkar, Kundu and Chaki (2014) Introduction to Economic Zoology. Ncba Publication, Kolkata.
2. Atuar Rahman (2017) Apiculture in India. Chicken Neck Publishers.
3. George Arthur Joseph Carter (2004) Beekeeping: A Guide to the Better Understanding of Bees, Their Diseases, and the Chemistry of Beekeeping.

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List of IDC subjects

12. List of IDC subjects for B.A./ B.Sc.:

1. English	40. Defence Studies
2. Bengali	41. Film Studies
3. Sanskrit	42. Molecular Biology
4. Pali	43. Physical Education
5. Urdu	44. Household Art
6. Arabic	45. Social Science
7. Persian	46. Home Science Extension Education
8. Hindi	47. Women's Studies
9. History, Islamic History & Culture	
10.Philosophy	
11.Economics	
12.Physics	
13.Chemistry	
14.Botany	**List of IDC subjects for B.Com. Course of Study:**
15.Zoology	All IDC subjects offered in B.Com. Courses of Study
16.Physiology	
17.Geography	
18.Geology	
19.Anthropology	
20.Psychology	
21.Sociology	
22.Linguistics	
23.Political Science	
24.Mathematics	
25.Electronics	
26.ComputerScience	
27.Education	
28.Statistics	
29.Human Development	
30.Journalismand Mass Communication	
31.Food & Nutrition	
32.Music	
33.Microbiology	
34.Biochemistry	
35.Environmental Science	
36.Russian	
37. French	
38. Library & Information Science	
39. Human Rights	