Savitribai Phule Pune University, Pune

(Formerly, University of Pune)

Under Graduate Degree Program in Science

(Faculty of Science and Technology)

Revised Syllabi as per National Education Policy (2020) for

S.Y.B.Sc. Restructuring Pattern (Semester-III and IV)

(This Syllabus is only applicable for Restructuring Colleges only Affiliated to Savitribai Phule Pune University, Pune)

To be implemented from

Academic Year 2025-2026

Framed by

BOARD OF STUDIES IN RESTRUCTURING PATTERN

Savitribai Phule Pune University,

Ganeshkhind, Pune -07.

AIMS AND OBJECTIVES

- To develop employability oriented diversified course content.
- To introduce skill oriented specialized education.
- To expose students to basic and applied knowledge of skill course.

1. Title of the Course: B.Sc. Restructuring Pattern (03 years)

2. Syllabus revised as per National Education Policy (NEP) 2020 for the Colleges Affiliated to Savitribai Phule Pune University, Pune

3. Faculty – Science (Science and Technology)

4. To be implemented -For S.Y.B.Sc. (Semester III and Semester IV) from June 2025.

Program Duration and Exit Options

The UG Program lasts for four years or six semesters. Student may leave the program after the third year if, he/she would like to receive a three- year undergraduate degree. If the student decides to withdraw after the first or second year, he/she will receive a UG Certificate or UG Diploma, depending on how many credits he/she is able to complete. Re-entering within three years to finish the degree program is allowed for students who leave with a UG certificate or UG diploma. A student must earn a minimum of 18 credits and a maximum of 26 credits each semester. It is recommended, nevertheless, that student should opt 22 credits per semester. This clause aims to give student the comfort of a flexible semester-based course load. However, Table 1 lists the minimum number of credits required to be earned in order to be awarded an Undergraduate Certificate/Undergraduate Diploma/Bachelor Degree/Bachelor's Degree.

Table1: **Type of Awards and Stages of Exit**

Sr. No.	Type of Award	Stage of Exit	Mandatory Credits
1.	Undergraduate certificate in Major core course subject (Botany/Physics/Chemistry/Zoology Subject) with Restructuring courses	After successful completionof First year Semesters	44
2.	Undergraduate Diploma in Botany/Physics/Chemistry/Zoology Subject with Restructuring courses	After successful completionof Second year Semesters	88
3.	Bachelor of Science in Botany/Physics/Chemistry/Zoology Subject with Restructuring courses	After successful completion of Third year Semesters	13 2

5. Eligibility Criteria –

The basic criteria for Under Graduate Degree S.Y.B.Sc. Restructuring pattern course subject pass with FYBSc restructuring pattern course subject. Admissions will be given as per the selection procedure / policies adopted by the college keeping in accordance with the conditions laid down by the Savitribai Phule Pune University, Pune. Reservation and relaxation are as per the State Government rules.

6. Fee Structure – As per the norms of Savitribai Phule Pune University, Pune.

7. Duration of the Course

Certificate Course- 01 year (Completion of 02 Semesters)

Diploma Course- 02 years (Completion of 04 Semesters)

BSc. Degree- 03 years (Completion of 06 Semesters)

8. No. of semesters – Two semesters per year

9. Medium of instructions and teaching: English

10. Course Implementation criteria for Theory and Practical:

a. Each semester comprises of 15 weeks (12 weeks Actual Teaching + 3 weeks forContinuous Internal Evaluation).

b. **One Credit of the Theory** is equal to15 clock hours (Teaching 1 hour per week for each credit, 12 hours Actual Teaching + 3 hours Continuous Internal Evaluation – Assignments, Tutorials, Practice, Problem solving sessions, Group discussion, Seminars and Unit Tests.

c. **One Credit of Practical** = 30 clock hours. (2 Contact hours per credit per week) One Credit = 30 clock hours (24 hours' Actual Table work + 6 hours for journal competition, and Continuous Internal Evaluation of each practical).

d. **Practical for each course comprises of 02 Credits = 60 clock hours.** Therefore,

- Minimum 12 laboratory/ Filed sessions of 04 clock hours must be conducted in one semester.
- In case of short practical, two practical's should be conducted in one session.
- Each practical of 04 clock hours in the laboratory should consist of: Table performance for concerned practical, careful observations, calculation, writing results and conclusion, and submission of practical in written form.
- Pre-laboratory reading and post laboratory assignments should be given on each practical as a part of continuous internal evaluation.

11. Examination Pattern (For each Semester): The examinations will be conducted semester wise for both Theory as well as Practical courses.

- **Theory Paper of 02 Credits -**
  - Internal Exam (15 M) + University Theory Exam (35 M) = Total 50 M
  - Duration: For Internal exam = 40 Min. and For University Exam = 02 hours.
- **Practical Paper of 2 Credits -**
  - Internal Exam (15 M) + University Practical Exam (35 M) = Total 50 M
  - Duration: For Internal exam = 40 Min. and For University Exam = More than 04 hours.

12. Award of Class/Grade: The class / grade for the courses of each semester will be followed as per the norms and conditions laid down by SPPU, Pune.

13. ATKT Rules: As per the norms given by SPPU, Pune.

14. Important Note:

a. There shall be at least a short tour/field visit/industrial visit (1-2 days) per year for all UG students. Tours are the part of curriculum and obligatory to each student, failing which they will not be considered eligible to appear for the practical examination. Under unavoidable circumstances, if the student fails to attend the tour, he/she have to produce justifiable evidence for not attending the tour. However, in lieu of tour the candidate will have to complete the work assigned bythe Department.

c. The documents to be produced by each student at the time of practical Examination (at the end of each Semester) are:

- Submission of practical records compulsory (Journals).
- Submission of a Tour / Visit report duly signed by the concerned practical In-charge and Head of the Department.
- Any submissions / assignments, etc. based on the practical course.

Question paper pattern for Theory (2 Credit courses)

A student will have to solve the question paper of 35 marks. The paper setter should set the paper on entire syllabus for total 60 marks, including optional questions. As the course is of 2 Credits (30 clock hour lectures), paper setter should allot two marks per lecture and accordingly, questions should be set for 30 lectures, 60 marks on entire syllabus.

Note: All questions are compulsory.
Time: 2 Hours

Que. 1) Answer any five of the following in one sentence 05 Marks

- Six questions
- Each for 1 mark

Que. 2a) Write any one of the following 06 Marks

i.
ii.

Que. 2b) Write any one of the following 04 Marks

i.
ii.

Que. 3a) Solve any one of the following 06 Marks

i.
ii.

Que. 3b) Solve any one of the following 04 Marks

i.
ii.

Que. 4) Write notes on (Any four) 10 Marks

a.
b.
c.
d.
e.
f.

CREDIT FRAME WORK FOR S.Y.B.Sc. RESTRUCTURING PATTERN, SEMESTER–III

Course details	Course code	Course title	Credits
Vertical–1(V1)			
Discipline Specific Core (DSC) Major Core Courses – (2T + 1P) x 2C = 6C	4(T)	As per Major Subjects groups Theory Botany/Physics/Chemistry/Zoology Subject	**4 C**
	2 (P)	As per Major Subjects groups Practical Botany/Physics/Chemistry/Zoology Subject	**2 C**
Major Elective Courses – (0C)	**-----**	**------**	**0 C**
Vertical – 2 (V2)			
Minor Courses **1T+1P**	**2(T)+2(P)** As per Major Subjects groups Botany/Physics/Chemistry/Zoology Subject		**4 C**
Vertical–3(V3)			
Generic Elective(GE) / Open Elective (OE)	**(1T=2C)**	As per regular group	**2C**
Vertical–4(V4)			
Vocational Skill Courses (VSC) –(1T = 2C/P) (Any one from basket)	VSC-221-RE-PC-T	Pharmaceutical Chemistry-I	**2C**
	VSC-222-RE-ES-T	Energy Studies-I	
	VSC-223-RE-HM-T	Horticulture and Its Management -I	
	VSC-224-RE-AE-T	Applied Entomology-I	
	VSC-225-RE-DS-T	Diary Science-I	
Skill Enhancement Courses	-----	-------	**0 C**
FP/OJT/CEP	2 (FP)	As per regular group	**2 C**
Vertical–5(V5)			
Indian Knowledge Systems (IKS) – (1T=2C)(Anyone From basket)	---------	As per Regular syllabus (Major Subject Specific)	**2C**
Ability Enhancement Courses (AEC)– (1T=2C)	-------	As per Regular syllabus	**2C**
Value Education Courses(VEC)	--------	---------	**0C**
Vertical–6(V6)			
FP/OJT /CEP	**-----**	**------**	**0C**
Co-curricular Courses (CC) –(1T=2C) (Anyone From basket)	CC-221-RE-SM-T	Soap Manufacturing -I	**2 C**
	CC-222-RE-RR-T	Radio Repairing - I	
	CC-223-RE-ND-T	Nursery Development- I	
	CC-224-RE-MLT-T	Medical Lab Technique-I	
	CC-225-RE-MMP-T	Milk and Milk Products-I	
Total Credits (V1+V2+V3+V4+V5+V6)			**22 C**

CREDIT FRAME WORK FOR S.Y.B.Sc. RESTRUCTURING PATTERN, SEMESTER–IV

Course details	Course code	Course title	Credits
Vertical–1(V1)			
Discipline Specific Core (DSC) Major Core Courses – (2T + 1P) x 2C = 6C	4(T)	As per Major Subjects groups Theory Botany/Physics/Chemistry/Zoology Subject	**4 C**
	2 (P)	As per Major Subjects groups Practical Botany/Physics/Chemistry/Zoology Subject	**2 C**
Major Elective Courses – (0C)	**-----**	**------**	**0 C**
Vertical – 2 (V2)			
Courses **1T+1P**	**2(T)+2(P)** As per Major Subjects groups (Botany/Physics/Chemistry/Zoology Subject)		**4 C**
Vertical–3(V3)			
Generic Elective(GE) / Open Elective (OE)	**(1P=2C)**	As per regular group	**2C**
Vertical–4(V4)			
Vocational Skill Courses (VSC) –(1T = 2C/P) (Any one from basket)	VSC-271-RE-PC-P	Pharmaceutical Chemistry-II	**2C**
	VSC-272-RE-ES-P	Energy Studies-II	
	VSC-273-RE-HM-P	Horticulture and Its Management -II	
	VSC-274-RE-AE-P	Applied Entomology-II	
	VSC-275-RE-DS-P	Diary Science-II	
Skill Enhancement Courses SEC	2(T/P)	As per regular group	**2C**
FP/OJT/CEP	2 (CEP)	As per regular group	**2 C**
Vertical–5(V5)			
Indian Knowledge Systems (IKS) –(1T=2C)(Anyone From basket)	---------	-------	**0C**
Ability Enhancement Courses (AEC)– (1T=2C)	-------	As per Regular syllabus	**2C**
Value Education Courses(VEC)	--------	---------	**0C**
Vertical–6(V6)			
FP/OJT /CEP	**-----**	**------**	**0C**
Co-curricular Courses (CC) – (1P=2C))(Anyone From basket)	CC-271-RE-SM-P	Soap Manufacturing -II	**2 C**
	CC-272-RE-RR-P	Radio Repairing - II	
	CC-273-RE-ND-P	Nursery Development- II	
	CC-274-RE-MLT-P	Medical Lab Technique-II	
	CC-275-RE-MMP-P	Milk and Milk Products-II	
Total Credits (V1+V2+V3+V4+V5+V6)			**22 C**

Exit Option: Award of UG Diploma (UG Diploma Course in As per Botany/Physics/Chemistry/Zoology Subject) **in Major and Minor with 44 Credits and an additional 4 Credits core NSQF course / Internship OR Continue with Major and Minor.**

Courses offered by the SYBSc Restructuring Pattern

Year	Semester	Course Code	Course Title
Vocational Skill Courses (VSC) –(1T = 2C/P) (Any one from basket)			
Vertical 4			
S.Y.B.Sc.	III	VSC-221-RE-PC-T	Pharmaceutical Chemistry-I
	III	VSC-222-RE-ES-T	Energy Studies-I
	III	VSC-223-RE-HM-T	Horticulture and Its Management -I
	III	VSC-224-RE-AE-T	Applied Entomology-I
	III	VSC-225-RE-DS-T	Diary Science-I
Co-curricular Courses (CC) –(1T=2C)			
S.Y.B.Sc.	III	CC-221-RE-SM-T	Soap Manufacturing -I
	III	CC-222-RE-RR-T	Radio Repairing - I
	III	CC-223-RE-ND-T	Nursery Development- I
	III	CC-224-RE-MLT-T	Medical Lab Technique-I
	III	CC-225-RE-MMP-T	Milk and Milk Products-I
Vocational Skill Courses (VSC) –(1T = 2C/P) (Any one from basket)			
S.Y.B.Sc	IV	VSC-271-RE-PC-P	Pharmaceutical Chemistry-II
	IV	VSC-272-RE-ES-P	Energy Studies-II
	IV	VSC-273-RE-HM-P	Horticulture and Its Management -II
	IV	VSC-274-RE-AE-P	Applied Entomology-II
	IV	VSC-275-RE-DS-P	Diary Science-II
Co-curricular Courses (CC) –(1P=2C)			
S.Y.B.Sc	IV	CC-271-RE-SM-P	Soap Manufacturing -II
	IV	CC-272-RE-RR-P	Radio Repairing - II
	IV	CC-273-RE-ND-P	Nursery Development- II
	IV	CC-274-RE-MLT-P	Medical Lab Technique-II
	IV	CC-275-RE-MMP-T	Milk and Milk Products-II

Courses offered by the SYBSc Restructuring Pattern

Year	Semester	Course Code	Course Title
Vocational Skill Courses (VSC) –(1T = 2C/P) (Any one from basket)			
Vertical 4			
S.Y.B.Sc.	III	VSC-221-RE-PC-T	Pharmaceutical Chemistry-I
	III	VSC-222-RE-ES-T	Energy Studies-I
	III	VSC-223-RE-HM-T	Horticulture and Its Management -I
	III	VSC-224-RE-AE-T	Applied Entomology-I
	III	VSC-225-RE-DS-T	Diary Science-I

Savitribai Phule Pune University, Pune

S.Y.BSc. Restructuring Pattern Syllabus (as per NEP-2020)

Syllabus from June 2025

SEMESTER- III

Course Code-VSC-221-RE-PC-T

Paper Title: Pharmaceutical Chemistry -I

Theory (Credit 2) No. of Hours: 30 Hours

Sr. No	Course Objectives	Course Outcomes
1.	To provide in depth knowledge of scientific and pharmaceutical chemistry	After completion of program, students will be able to have in-depth knowledge of basic concepts in pharmaceutical chemistry
2.	To train students in skills related to research, education, pharmaceutical and market.	Student will learn about process and get knowledge of pharmaceuticals that help in further education.
3.	To develop the good qualities of integrity, responsibility and self-confidence.	Students will become responsible and achieve self-confident.
4.	To familiarize with current and recent scientific and research development in the field of pharmaceutical industry.	Students will be able to apply the knowledge of pharmaceutical science in real life situations to solve the problems.
5.	To enrich knowledge through hand on activities and study tour.	Students develop aptitude of doing research through undertaking small projects and report writing.
6.	To instill safety practices and regulations	Students use safety practices and regulations inside the pharmaceutical industry.

Chapter I Introduction to Pharmaceutical Chemistry (10L)

- Introduction and Scope of various field of pharmaceutical science including, pharmaceutical chemistry, pharmaceutics, pharmacognosy, pharmacology,
- Important aspects of pharmaceutical chemistry, brief history of pharmacy, pharmacopeia names, meaning & contents, monograph in I.P.

a) Drug and Dosage form:

- Drug- Definition, ideal condition of drugs,
- Classification of drug,
- Sources of drug,
- Routes of drug administration- Oral, Parenteral, sublingual, inhalation and External, their merits & demerits.

b) Types of dosage forms

- Solid -tablets capsule, suppositories, pills.
- Semisolid – An ointment, paste, jellies creams.
- Liquid- clear liquid, suspensions, Emulsions, Lotion.
- Parenteral- solid, Liquid – merits & demerits.
- Novel drug delivery system.

Introduction and brief account of absorption, distribution, metabolism and excretion, Pharmacokinetics and pharmacodynamics study and factors affecting on them. Guidelines of good laboratory practices.

Chapter II Prescription, Pharmaceutical Aids, Diseases and Herbal Medicines. (8L)

a) Prescription and Pharmaceutical Aids:

- Prescription: Definition, parts of prescription, types of prescription, standard format of prescription,
- pharmaceutical aids- e.g. preservatives, antioxidants, emulsifying agents, stabilizing & suspending agents, and coloring and flavorings agents, sweetening agents with suitable examples of different compounds.

b) Some Common Diseases and Their Treatment:

- Introduction, classification of different diseases with their treatment.

c) Herbal medicines:

- Introduction,
- Local medicinal Plants: Azadiracta indica (neem), Cymbopogon citratus (lemon grass) Osmium sanctum (Tulsi), Curcuma longa (turmeric)
- biological source, active constituents and their uses.

Chapter III: Impurities in Pharmaceutical Substances (4L)

- Impurities commonly found in medicinal preparation,
- Sources of Impurities, effect of impurities and limit test for chlorides, sulphate, Iron and heavy metals. All the test as per IP.

Chapter IV: Study of Inorganic Pharmaceutical Compounds (8L)

Study of inorganic pharmaceutical compounds with respect to their preparation, important chemical and physical properties, principle of assay and uses.

A) **Gastro-Intestinal agents:**

a) **Acidifying agents**: Dilute Hydrochloric acid.

b) **Antacid**: - Aluminum hydroxide gels, Sodium bicarbonate, Milk of magnesia, Magnesium trisilicates.

c) **Protective & adsorbents**: -Kaolin, Bismuth sub carbonate.

B) **Topical agents**:

Protective: Talc, Zinc oxide, Calamine, Titanium dioxide.

i. **Antimicrobial**: Boric acid, Potassium parmagnate, Iodine, Chlorinated lime, Yellow mercuric oxide.
ii. **Astringents**: Alum, Zinc sulphate, Copper sulphate, Selenium sulphate.
iii. **Expectorants**: Ammonium chloride, Potassium iodide, Antimony potassium tartarate.
iv. **Dental product**: Sodium, fluoride, and calcium carbonate.
v. **Respiratory stimulants**: Ammonium chloride.
vi. **Antidote**: Sodium nitrite, Potassium parmagnate, Sodium thiosulphate.
vii. **Electrolyte replenishers**: Sodium chlorides, Sodium citrate, potassium chlorides, Calcium gluconate.
viii. **Hematinics**: Ferrous sulphate, Ferrous gluconate, Ferrous Fumarate, Ferric ammonium nitrate.

REFERENCE BOOKS:

1. Pharmacognosy and Phytochemistry: C. K. Kokate
2. Inorganic Medicinal Chemistry Block & Roche

3. Essential of Medical Pharmacology: K. D. Tripathi
4. Textbook of pharmacology: FSK Barar
5. Inorganic Pharmaceutical Chemistry M.L. Schroff
6. Pharmaceutical Chemistry Inorganic G. R. Chatwal
7. Practical Pharmaceutics R.S. Gaud and G.D. Gupta
8. Inorganic Pharmaceutical and Medicinal Chemistry J. S. Quadry
9. Indian Pharmacopeia (Vol.I/II)

SEMESTER- III

Course Category – Vocational Skill Course (VSC)

Course Code-VSC-222-RE-ES-T

Course Title: Energy Studies- I

[No. of Credits: 2 C] **[No. of Lectures: 30 L]**

Course Objectives

CO1. To Introduce Energy scenario in India along with the energy sources.
CO2. To study all types of energy sources and their impact on Environment.
CO 3.To study and aware various units of energy and their inter conversions.
CO 4. To aware the problems to be faced in Energy conversions.
CO 5. To study Energy crisis and its solution.

Credit-1 (15L)

Chapter- 1. Energy forms, Units and Conversion:

a) Energy: (4L)

- Definition,
- Different forms of energy- Potential Energy, Kinetic Energy, Mechanical Energy, Heat Energy, Electrical Energy, Chemical Energy, Magnetic Energy,
- Gravitational Energy (brief discussion of each form), work, power and energy.

b) Various units of energy: (2L)

- Calorie, joule, erg, BTU, kWh, Horse Power, electron Volt, inter conversion of energy units.

c) Law of conservation of energy: (3L)

- Laws of thermodynamics,
- Conversion of potential energy to electrical energy,
- Conversion of chemical energy into heat and electricity,
- Mechanical energy into electrical, electrical into mechanical and heat energies.
- Concept of fuel value and fuel values of various fuels.

Chapter- 2. Energy Sources – Conventional:

- Classification of energy sources (2L)
- Conventional and non-conventional,
- Conventional energy sources**. (4L)**
- Fossil Fuels (coal ,crude oil ,natural gas), formation of different stages of coal and their composition,
- Nuclear energy, Hydro power,
- Merits and demerits of conventional energy sources,
- Energy crisis, energy and pollution, global warming.

Credit 2: (15L)

Chapter- 3. Energy Sources – Non- Conventional (Renewable Energy Source (8L)

- Introduction,
- Solar, Wind, Biomass, Tidal, Geothermal, Ocean thermal energy, Wave energy, (Brief discussion on availability and technologies used to get energy from these resources),
- Structure and characteristics of the Sun, origin of solar energy, solar constant, solar insolation,
- Air mass, availability of solar energy on the earth, spectral distribution of terrestrial and

extra-terrestrial solar radiation.

- Nature of solar radiation (beam, diffuse and global),attenuation of solar radiation in atmosphere(absorption &scattering),
- Advantages and disadvantages of solar energy.

Chapter- 4. Photo thermal applications of solar energy: (7L)

- Introduction
- Modes of utilization of solar energy- a) photo thermal, b) photovoltaic, c) photochemical, Principles of photo thermal conversion, selective and non-selective coating,
- Solar collectors and their classification,
- Non concentrating type solar collector- flat plate collector,
- Photo thermal applications of solar energy, box type solar cooker, solar distillation, cabinet solar dryer, concentrating type solar collectors (Brief discussion and classification).

Reference Books:-

1. Non-conventional energy Resources :B.H. Khan (Tata McGraw-Hill Co.)
2. Solar Energy :S.P. Sukhatme (Tata McGraw-HillCo.)
3. Solar Energy Utilization: G.D Rai (Khana Publishers)
4. Encyclopedia of Energy 2 ndEdition : (Tata McGraw-HillCo.)
5. Energy resources: Andrew I. Simon (Pergamon Press)
6. Solar Energy: H.P. Garg
7. Solar Energy: G.N. Tiwari (Narosa publishing house)
8. Nuclear Physics:D.C.Tayal (Himalaya publication)
9. Energy Resources: Demand and conservation: Chaman Kashkari
10. Alternative energy sources: James P. Hartnet(Academic Press ,Newyork)

SEMESTER- III

Course Category – Vocational Skill Course (VSC)

Course Code-VSC-223-RE-HM-T

Course Title: Horticulture and Its Management-I

[No. of Credits: 2 C] **[No. of Lectures: 30 L]**

Course Objectives:

1: Understand the fundamentals of horticulture
2. Learn about different types of horticultural crops
3. Study horticultural practices and techniques
4. Explore the importance of horticulture in human life

Course Outcomes:

1: Students will be acquainted with the concept of Horticulture and its management.
2: They will understand the importance of horticulture in human life
3: Students will understand practices and techniques in horticulture and its management

Sr. No.	Topic Details	No. of Lectures
	Credit-I	**15L**
1.	**Chapter-1: Introduction and Principles of Horticulture** • Definition Scope of Horticulture • Importance of Horticulture in Human Life	**2L**
2.	**Chapter-2: Branches of Horticulture** • Pomology • Olericulture • Floriculture • Bonsai Culture • Landscape gardening	**3L**
3.	**Chapter-3: Modern Trends in Horticulture** • Greenhouse technology • Hydroponics and soilless cultivation • Organic horticulture • Precision horticulture	**3L**
4.	**Chapter-4: Site Selection, Soil, Climate management:** • Selection of site for horticultural crops • Type of soil • Physical and chemical properties of soil • Climate and its impact on horticultural crops • Soil preparation and management	**3L**
5.	**Chapter-5: Plant propagation Techniques:** • Definition • Types- • Vegetative (Asexual) 1. Natural: Creepers, Runner, Sucker, Tuber, Rhizome, Bulbs, Corms 2. Artificial vegetative propagation: Cutting, Layering, Grafting, Budding • Sexual Propagation: Seeds	**4L**

	• Tissue Culture	
	Credit-II	
6.	**Chapter-6: Horticultural Practices** • Irrigation and water management: Drip, sprinkler, Micro sprinkler, Flood, Ridges and Furrows, Surface, Automation of micro-irrigation • Fertigation and nutrition • Pruning and training • Pest and disease management	**5L**
7.	**Chapter-7: Weed Management:** • Definition and Concept • Economic importance of weeds • Weed management methods: Cultural, Biological and Chemical control (Systemic and Contact Herbicides)	**4L**
8.	**Chapter-8: Post-Harvest Management** • Definition and concept • Importance of post-harvest management • Harvesting and handling • Storage and packaging • Marketing and export	**4L**
9.	**Chapter-9: Government policies / Schemes for promoting fruit crops cultivation in India** • State Policies/ Schemes • Central Polices/Schemes	**2L**

References

- Fundamentals of Horticulture, Edmond, J.B., Sen., T.L., Andrews, F.S and Halfacre R.G, 1963. Tata McGraw Hill Publishing Co., New Delhi.
- Introduction to Horticulture, Kumar, N. 1990. Rajyalakshmi Publications, Nagarcoil, Tamilnadu.
- Basic Horticulture, Jitendra Sing, 2002. Kalyani Publishers, Hyderabad.
- Fundamentals of Fruit Production, Garner V R, Bradford F C and Hooker Jr. H D, 1957. McGraw Hill Book Co., New York.
- Plant Propagation. Principles and Practices, Hartman, HT and Kester,D.E.1976, Prentice Hall of India Pvt. Ltd. Bombay.
- Plant Propagation. Sadhu, M.K. 1996. New Age International Publishers, New Delhi. Propagation of Fruit Crops, Mukherjee, S.K. and Majumdar, P.K.1973.ICAR, New Delhi.
- Propagation of Tropical Fruit Trees, Ganner, R.J. and Choudari, S.A. 1972. Oxford & IBH Publishing Co., New Delhi.
- Propagation of Horticultural Crops: Principles and Practices, Sarma, R.R. 2002. Kalyani Publishers, New Delhi
- Textbook of Horticulture, K Manibhushan Rao, Macmillan, 2005
- Recent Trends in Post Harvest Technology And Management, Dr. Aloka Kumari, Dr Pranay Punj Pankaj, Dr.P. Baskaran, Munhalum Publication 2015
- Navigator for Horticulture, Nitin A. Nalage, Universal Prakashan Pune, 2014.
- Handbook of Biological Control and Horticulture Crops, Dr. J. S. Bohara, Agrotech Press, 2015.
- Horticulture, Dr. Ramchandra Nivrutti Sabale, Amol Prakashan Pune, 2000

SEMESTER- III

Course Code-VSC-224-RE-AE-T

Paper Title: Applied Entomology -I

Theory (Credit 2) No. of Hours: 30 Hours

Aims and Objectives:

1. Understanding Insect Biology and Ecology
2. Developing Pest Management Strategies
3. Utilizing Beneficial Insects
4. Minimizing Environmental Impact
5. Improving Human Well-being

Course Outcomes (COs):

CO1: Understanding of Entomological Principles
CO2: Knowledge of Insect Identification and Classification
CO3: Understanding of Insect Ecology and Behavior
CO4: Knowledge of Pest Management Strategies
CO5: Understanding of Insect-Borne Diseases
CO6: Application of Knowledge in Practical Settings

Detailed Syllabus:

Unit No.	Name of the Topic	Lectures Allotted
1.	**Introduction** ➢ Definition ➢ Branches of entomology: Agricultural, Medical, Forest, Forensic and Industrial entomology ➢ Economic importance of insect with reference to product, pollination, scavengers and food value.	04
2	**Taxonomy** ➢ Broad Classification of insect with example. ➢ Apterygotes: Distinguishing character with example. ➢ Pterygotes: Endopterygote and Exopterygote, distinguishing character with example.	05
3	**Body Organization** ➢ **Head:** Study of insect head and its appendage. Antennae: Basic structure and its types with example. Mouth parts of a generalized insect for example Grasshopper. ➢ **Thorax** Segmentation and Sclerites. Legs: Typical structure of leg and its modification. Wing**:** Structure of generalized wing including its region and venation Wing modification with example. ➢ **Abdomen and its Appendages**	10

4	**Study of Cockroach** ➢ Systematic position, Habit, Habitat, Distribution and External morphology, Digestive System and Reproductive System.	**05**
5	➢ **Mulberry silk worm:** Systematic position, Habit, Habitat, External morphology, life cycle, host plant of Mulberry silk worm. Harvesting, processing of silk.	**06**

References

1. General and applied entomology by little.
2. A text book of general and applied entomology by Nair.
3. Arthropod by Kotpal.
4. A general text book of entomology by Imms.
5. A text book of entomology by Ross.
6. A text book of entomology by B.V David, T.N Anantha Krishnan.

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SEMESTER- III

Course Category – Vocational Skill Course (VSC)

Course Code-VSC-225-RE-DS-T

Course/Paper Title: Dairy Science-I

[No. of Credits: 2 C] **[No. of Lectures: 30 L]**

Objectives: 1) To give applied Knowledge to the students
2) Introduction to Cattle breeds
3) Present Status of Dairy animal in India and World

Course Outcomes:

CO 1: To Remembering Common Definition used in Animal
CO 2: To Classify and Understanding Cattle Breeds.
CO 3: To Identify Buffalo breeds.
CO 4: To study Importance of animal products in human
CO5: To remembering Objectives of Housing.
CO6: To Classify feed stuff.

Theory (Credit-I) : 15 L

Chapter 1: Introduction to Animal Husbandry **(03)**
- Definition and Scope
- Importance in rural economy and food security
- Contribution to national GDP and employment
- Role in sustainable agriculture and mixed farming

Chapter 2: Housing of Dairy Animals **(03)**
- Importance of proper housing
- Site selection and layout of dairy farms
- Types of housing systems (loose housing, conventional barns)
- Ideal conditions: ventilation, drainage, space, and hygiene
- Seasonal management in housing

Chapter 3: Feeds and Feeding of Dairy Animals **(04)**
- Types of feeds: roughages, concentrates, supplements
- Nutrient requirements based on age, weight, and production
- Feeding methods: individual vs. group feeding
- Common feed resources and their nutritive value

Chapter 4: Cultivation of Fodder Crops **(05)**
- Importance of green fodder in dairy nutrition
- Classification: leguminous and non-leguminous fodders
- Major fodder crops: maize, sorghum, berseem, lucerne, napier grass
- Seasonal planning and rotation
- Harvesting, preservation (silage and hay making)

(Credit-2) : 15 L

Chapter 5: Ration Balancing **(03)**

- Definition and objectives
- Components of a balanced ration
- Steps in formulating balanced ration
- Use of software and mobile apps for ration balancing
- Economic impact of balanced feeding

Chapter 6: Cattle Breeds **(04)**

- Importance of breed selection and classification.
- Characteristics of good dairy and draught breeds
- Milch purpose breeds: - Sahiwal, Red Sindhi,Tharparkar & Gir.
- Dual purpose – Deoni & Kankrej.
- Draft purpose – Khillar,Dangi,Red kandhari & Gaolao.
- Exotic breeds – Holstein Friesian, Jersey & Brown Swiss.
- Cross breeds of Maharashtra – Phule Triveni & Holdeo.

Chapter 8: Buffalo Breeds **(04)**

- Importance of buffalo in Indian dairy sector
- Indigenous breeds: Murrah, Mehsana, Jaffarabadi, Nili-Ravi, Bhadawari
- Breed characteristics, milk production potential, and adaptability

Chapter 9: Routine Management Practices **(04)**

- Daily care of dairy animals (milking, grooming, cleaning)
- Deworming and vaccination schedule
- Heat detection and breeding
- Record keeping and health monitoring
- Calf management and colostrum feeding

List of Books:

1. Animal Husbandry - by G.C. Banarjee
2. Animal Nutrition - by G.C. Banarjee
3. Handbook of Dairy Science - by I.C.A.R.
4. Handbook of Agriculture - by I.C.A.R.
5. Text book of Animal Science Technology - H.S.C. Board

Courses offered by the SYBSc. Restructuring Pattern

Year	Semester	Course Code	Course Title
Co-curricular Courses (CC) –(1P=2C)			
S.Y.B.Sc	III	CC-221-RE-SM-T	Soap Manufacturing -I
	III	CC-222-RE-RR-T	Radio Repairing - I
	III	CC-223-RE-ND-T	Nursery Development- I
	III	CC-224-RE-MLT-T	Medical Lab Technique-I
	III	CC-225-RE-MMP-T	Milk and Milk Products-I

SEMESTER- III

Course Category – Co-curricular Course (CC)

Course Code-CC-221-RE- SM -T

Paper Title: Soap Manufacturing -I

Theory (Credit 2) No. of Hours: 30 Hours

Sr.No	Course Objectives	Course Outcomes
1.	To provide basic knowledge of scientific and industrial aspects in soap manufacturing.	Students will get depth knowledge of basic concepts in soap manufacturing.
2.	To create foundation for research and development in industry.	After completing the program, students will have developed interdisciplinary approach and can start small scale industry.
3.	To instill the good qualities of integrity, responsibility and self-confidence.	Students become responsible and self-confident.
4.	To increase employability skills among the students beyond a graduate's academic knowledge.	Students acquire employability skills with a graduate's academic knowledge
5.	To develop ethical values and good working practices.	Students aware about the safety practices and regulations inside the industry.
6.	To familiarize with current and recent scientific and development in the soap and detergents.	Students may apply the knowledge in real life situations.

Syllabus

Theory (Credit-I) : 15 L

Chapter- 1. Soap, Hand wash and Detergent: (4L)

- Introduction of soap and detergent: Historical background, definition,
- Classification of soap and detergent,
- Types and its mechanism,
- Saponification reaction,
- Difference between Hard soap and Soft soap.

Chapter- 2. Alignment of soap, Hand wash and detergents: (4L)

- Cleaning action of soap and detergent,
- Composition, hard and soft acid-base concept in soap and detergents.
- Hardness of soap and detergents, surfactants,
- Type of surfactant, action of soap and detergents,
- Industrial importance of Ca and Mg stearate.

Chapter-3.Raw Materials and Manufacturing Process of Soap, Hand wash and Detergents (4L)

- Introduction,
- Principle, raw material, soap-lyes, fats, oils (Triglycerides)(its different sources)
- Other additives- common salt, builder, fillers, anti-oxidants, colours, dyes, optical brightners.

Chapter-4. Raw materials for detergents: (3L)

- Introduction,
- Dodecyl benzene, sulfonating agent,

- Neutralizing agent, soda ash, caustic soda, ammonia, builders-foam, regulators, anti-redeposition,
- Oxygen releasing compound, chelating agents, hydro tropes, silicates, enzymes, sodium sulphate, sodium hypochlorite, NaCl, magnesium sulphate, insoluble inorganic fillers,
- Optical brightening agent, perfumes, colors and dyes.

(Credit-2) : 15 L

Chapter- 5. Manufacturing process of soap, Hand wash: **(5L)**

- Cold, semi boiled and full boiled,
- Plant and machinery for small scale soap
- Industry soap pan, crusher frames,
- Stamping machine, milling machine and mixing machine.

Chapter- 6. Manufacturing process of detergents **(5L)**

- Manufacturing process of dry detergent-blender process, agglomeration process, slurry method.

Chapter- 7. Introduction to shampoo: **(5L)**

- Introduction, principle, raw materials, water, detergent, foam booster, thickeners,
- Conditioning agents,
- Preservatives, modifier, special additives,
- Manufacturing process, mixing, cooling,
- Compounding, quality control check, foam stability and filling.

Reference books:

1) Hand book of Industrial Chemistry, 7th edition
2) Knowlton Jonh and Steven The Hand Book of Cosmetics Sscience and Technology
3) The handbook of Soap Manufacture by W.H. Simmons and H.A Appleton
4) Soap and Detergents SBP Board of Consultant and Engineers
5) Textbook of Chemical Technology, Volume I By S.D. Shukla
6) Shrives Chemical Process Industry, 5th edition, George Austin, 1984

SEMESTER- III

Course Category – Co-curricular Course (CC)

Course Code-CC-222-RE-RR-T

Course Title: Radio Repairing - I

[No. of Credits: 2 C] **[No. of Lectures: 30 L]**

Course Objectives:

CO 1). To understand the basic working principles of servicing tools and ability to use them
CO 2). To understand Identification of various electronic components
CO 3). To. understand the basic principles of various meter like multimeter and CRO
CO 4). To understand basic components of regulated power supply.
CO 5). To understand the concepts of amplifiers and oscillator
CO 6). To acquaint basic knowledge different parts of radio receiver
CO 7). To build and test AM/FM receiver
CO 8). To develop the skill related with fault finding and troubleshooting of radio receiver

Credit-I (15L)

Chapter -1 (Fundamentals of Radio)

a) Electronic Components: (3L)

- Active and passive components- identification, specification and measurement scheme,
- Transformer (Principle and types), diode, soldering gun, soldering materials, precautions while soldering, and printed circuit boards.

c) Power Supply:- (3L)

- Power supply block diagram,
- Regulated and unregulated, Diode as rectifier (half wave, full wave and bridge),
- Capacitor filter, Zener and IC voltage regulator (78xx/79xx).

c) Amplifiers and oscillators: (3L)

- Amplifier- definition and classification,
- Transistor as an amplifier, oscillator- basic principles and types.

d) Modulation and Demodulation: (3L)

- Definitions-modulations and demodulation, Need of Modulation,
- Types-amplitude modulation, frequency modulation and phase modulation.

e) Communication system: (3L)

- Modes of propagation–Ground wave, space wave, sky wave propagation.
- Classification of radio frequencies, satellite communication, DTH principle.

Credit-2 (15L)

Chapter -2 Radio Receivers:

a) Radio receiver: (3L)

- Block diagram of radio receiver and function of each block (microphone, preamplifier, mixer, local oscillator, automatic gain control, tuner, volume

control, and speaker).

b) A.M. Receiver: (3L)

- Study of A.M. receiver, building and testing of various stages in receiver, alignment of various coils, antenna and intermediate frequency transformer (IFT) using manual and electronic method.
- Method of servicing transistor and IC receivers.

c) F.M. Receiver and Fault Finding: (3L)

- Block diagram of F.M. Receiver,
- Working of F.M. receiver, method of servicing F.M. receiver, commonly occurring faults in radio receivers, trouble shooting and removing faults.

d) Audio/ Video Appliances: (3L)

- Multimedia, working principle of Cell phone communication.

e) Ham radio- (3L)

- Introduction to ham radio, transmitter and receiver

Reference Books:

1. Electronic components and materials - Madhuri Joshi
2. Basic Electronics – Grob
3. Fundamental Electronics – J.D. Ryder
4. Radio Engineering – M.C. Gupta
5. Consumer Electronics – S.D. Jaiswal
6. Basic Electronics and linear circuits – N.N. Bhargava
7. Principles of Electronics –V.K. Mehata
8. Radio and TV Communication - E.P.Terman
9. Principles of basic Electronics - Schuler
10. Element of radio servicing - Marus
11. Sound production – Oldson
12. Radio and Television – S.P. Sharma
13. Basic test instruments –Turner
14. Audio and Video system - Sharma
15. Transistor circuit approximation –Malvino
16. Data Manual – Bell Lab.
17. Transistor service manual - K.C. Agrawal

SEMESTER- III

Course Category – Co-curricular Course (CC)

Course Code-CC-223-RE-ND-T

Course Title: Nursery Development-I

[No. of Credits: 2 C] **[No. of Lectures: 30 L]**

Course Objectives:

- To equip students with the knowledge and practical skills necessary to establish, manage, and operate a successful plant nursery
- To understand propagation techniques, nursery layout and design.
- To understand plant health management, business planning, and marketing strategies.

Course Outcomes:

- The students will acquire knowledge and practical skills necessary to establish, manage, and operate a successful plant nursery
- They'll understand propagation techniques, nursery layout and design.
- They'll understand plant health management, business planning, and marketing strategies.

Sr. No.	Topic Details	No. of Lectures
	Credit-I	**15L**
1.	**Chapter-1: Introduction** • Definition, Importance and scope • Types of Nurseries: 1. Depending on time span: Temporary and Permanent 2. Depending on seedlings grown: Flower, Fruit, Vegetable, Ornamental, Medicinal and Aromatic Plant, Forest Plant, 3. Hi-Tech Nurseries	**3L**
2.	**Chapter-2: Nursery Planning and Design:** • Guidelines for nursery raising • Components of good nursery • General quality standards for nursery plants • Site selection, • Layout, • Infrastructure • Planning and scheduling of nursery activities	**4L**
3.	**Chapter-3: Nursery Inputs:** • Tools and implements • Containers • Growth Media and its preparation • Propagules: Seed, cutting, rootstock, scion, explants, etc. • Water source and fertilizers • Chemicals: Pesticides, fungicides, herbicides and plant growth regulators	**4L**
4.	**Chapter-4: Mother Plant Selection and Maintenance** • Criteria for Selection of Mother Plants,	**4L**

	• Planting of Mother Plants, • Maintenance of Mother Plant, • Mother bed and concept • Types of mother beds: Raised bed, Flat bed, sunken bed and polythene bags • Plant propagation structures: Shade net house, Glass/green house • Good practices of fruit collection, seed extraction and storage	
	Credit-II	**15 L**
5.	**Chapter-5: Ecofriendly Fertilizers** • Definition and concept • Importance and scope • Plant nutrients and their deficiency symptoms • Methods of preparations-BGA, Vermicompost • Applications	**4L**
6.	**Chapter-6: Plant Protection** • Seed treatment • Nursery diseases and their management • Nursery pest and their management • Integrated pest management and biopesticides application in nursery • Weed management in nursery	**4L**
7.	**Chapter-7: Nursery Records and Sales** • Record management • Spot selling/Local marketing • Online nursery information and sales system	**4L**
8.	**Chapter-8: Economics of Nursery Development** • Capital investment and returns in plant nurseries • Financial Resources for Nursery - Bank Loans from Government and Private Sector	**3L**

References:

- Rahudkar W.B., Bhujbal BG, Madhuri Sonawane, Hemraj Rajput, 2010, YCMOU,Textbook Publication No. AGR 227 Horticulture Nursery Management.
- Nursery Management in Horticultural Crops-Indian Council of Agricultural Research (ICAR)
- Manual on Forest Nursery and Plantation Techniques, Forest Research Institute (FRI), Dehradun
- Guidelines for establishing commercial nurseries with subsidies under NHB schemes, National Horticulture Board (NHB), Ministry of Agriculture Website: http://nhb.gov.in
- "Nursery Techniques for Fruit Crops" – TNAU
- "Greenhouse & Nursery Management" – PAU
- Textbook of Plant Propagation and Nursery Management, R. R. Sharma & Hare Krishna, IBDC publisher 2013

SEMESTER- III

Course Category – Co-Curricular Course (CC)

Course Code-CC-224-RE-MLT-T

Paper Title: Medical Laboratory Technique -I

Theory (Credit 2) **No. of Hours: 30 Hours**

Aims and Objectives:

1. Importance of the clinical test in pathological diagnosis.
2. Determine the various pathological disorders related to blood.
3. Demonstrate the theoretical knowledge and technical skills in the performance of routine Laboratory testing.
4. Demonstrate error recognition and the ability to integrate and interpret analytical data and establish a course of action to solve problem.
5. Communicate courteously and effectively with laboratory personnel, other health care Professionals, patients and the public.
6. Demonstrate laboratory practice standards in safety, professional behavior and ethical conduct.

Course Outcomes (COs):

CO1: Collect and prepare the sample.
CO2: Blood film preparation and staining of RBC, WBC.
CO3: Determination of Hb by haemoglobinometer method.
CO4: Determination of bleeding time and clotting time.
CO5: Different Blood test analysis related to blood

Syllabus:

Unit No.	Name of the Topic	Lectures Allotted
	Credit I =15 L	
1.	**Introduction to Medical Laboratory Technology and its Practices:** • Introduction, Scope and Branches. • Laboratory safety, Hygiene and Medical waste disposal	**04**
2	**Blood Group System and Transfusion:** • ABO and Rh blood group system and its importance Selection of blood donor, Blood donation and transfusion therapy. • Importance and benefits of blood donation and Precautions during blood transfusion	**04**
3	**Introduction to Hematology:** • Components of Blood and their functions, (WBCs, RBCs, Platelets) • Different Types of WBCs ,Normal values, Clinical relevance of abnormal values and **Hemoglobin**: -Chemistry, structure, function and normal value	**07**
	Credit II= 15 L	

4	**Blood Collection:** • Blood sample collection methods , Collection tubes and precautions • Bleeding and clouting time	**03**
5	**Heart and Its diagnostic techniques:** • Structure, function and abnormality Blood Pressure, Respiratory rate and pulse rate, BMR., Angiography, Angioplasty, ECG,	**04**
6	**Fundamentals of Blood Biochemistry:** • Biochemical composition of blood. (blood sugar, Urea, Cholesterol) Clinical relevance of abnormal values, Vitamins and their importance	**04**
7	**Blood Disorders and Infectious Diseases:** • Hemoglobin Disorders: **Anemia** • White Blood Cell Disorders :**Leukemia** • Bleeding and Clotting Disorders: **Hemophilia** • Blood parasitic diseases: **Malaria, Dengue,** Blood-borne infections: **HIV/AIDS, Hepatitis**	**04**

References

1. Textbook of Medical Physiology, Guyton and Hall. 12th edition.
2. Textbook of Parasitology. K.D. Chatterjee.
3. Blood science: Principles and Pathology, Andrew Blann, Nessar Ahmed, 1st edition
4. Textbook of Medical Laboratory Technology, Ramnik Sood
5. Medical Laboratory Technology (Volume I):BY Kanai, L Mukherjee and Swarajit Ghosh
6. Medical Laboratory Technology (Volume II):BY Kanai, L Mukherjee and Swarajit Ghosh
   Medical Laboratory Technology (Volume I):BY Kanai, L Mukherjee

SEMESTER- III

Course Category – Co-Curricular Course (CC)

Course Code-CC-225-RE-MMP-T

Paper Title: Milk and Milk Products -I

Theory (Credit 2) **No. of Hours: 30 Hours**

Objectives: 1) To give Skill Oriented Knowledge to the students.

2) To provide Basic Knowledge of Milk Processing.

3) Introduction to Clean and Safe milk production.

Course Outcomes:

CO 1: To remembering definition of Milk and milk products.
CO 2: To Compare Indian dairy product with Western dairy products.
CO 3:To applying Sanitation in Clean and safe milk production.
CO 4: To understand importance of food Nutritive value of Kheer,

Credit I= 15 L

Chapter 1: Introduction to Milk (03)

- Definition and composition of milk
- Types of milk: Cow, Buffalo, Goat, and others
- Factors affecting composition of milk
- Nutritional importance of milk in the human diet
- Physico-chemical properties of milk (density, pH, freezing point)

Chapter 2: Sanitation in Clean and Safe Milk Production (04)

- Importance of hygiene in milk production
- Sources of contamination in milk (animal, equipment, environment)
- Personal hygiene of milkers
- Clean milk production practices at farm level
- Cleaning and sanitization of dairy equipment
- Regulatory standards for milk safety (FSSAI, BIS)

Chapter 3: Dairy Microbiology (04)

- Introduction to microorganisms in milk
- Spoilage organisms and their effects
- Pathogenic microorganisms: Tuberculosis, Brucellosis, Salmonella
- Methods of microbial testing: MBR, SPC, Resazurin
- Pasteurization and its microbiological basis

Chapter 4: Introduction to Dairy Chemistry (04)

- Major constituents: Water, fat, proteins, lactose, and minerals
- Milk proteins: Casein and whey proteins
- Milk lipids: Types, structure, and role in flavor
- Enzymes and vitamins in milk
- Adulteration of milk and common detection methods

Credit II= 15 L

Chapter 5: Introduction to Dairy Products (05)

- Overview of dairy processing
- Flow diagram of milk reception to packaging
- Classification of dairy products: fluid, fermented, concentrated, and fat-rich
- Importance of value addition and processing in dairy industry

Chapter 6: Concentrated and Dehydrated Milk Products (05)

- Condensed milk and evaporated milk: types and preparation
- Milk powder: skimmed and whole milk powder
- Drying methods: spray drying and drum drying
- Packaging and storage of dried milk products
- Applications and advantages of dehydrated products

Chapter 7: Fermented Milk Products (05)

- Definition and types: curd, yogurt, lassi, buttermilk, kefir
- Microorganisms involved in fermentation
- Health benefits and probiotic importance
- Preparation process and quality control
- Packaging and shelf-life considerations

Text Book – Recommended:

1. Outlines of Dairy Technology – Sukmar DE.
2. Milk and properties-Strivatva S.M. 919930 Kalyani publishers. 1/1 RajendranagarVadhiana.
3. Milk and milk products – Winton and Winton (1993) Agrobios (India), Agro. House behindNasrani cinema. Chopsani road Jodhapur.
4. Milk Testing – Davis.J.G. Agribios (India) Agro house behind Nasrani cinema Chopsaniroad Jodhapur.
5. Chemistry of milk and milk products. Singh V.B. (1965) Asian publishers. New mandi,Muzaffaranagar.
6. Dairy in India. Gupta. W.A. (1997). Kalyani publisher 1/1 Rajendrangar Ludhaina

Courses offered by the SYBSc Restructuring Pattern

Year	Semester	Course Code	Course Title
Vocational Skill Courses (VSC) –(1T = 2C/P) (Any one from basket)			
S.Y.B.Sc	IV	VSC-271-RE-PC-P	Pharmaceutical Chemistry-II
	IV	VSC-272-RE-ES-P	Energy Studies-II
	IV	VSC-273-RE-HM-P	Horticulture and Its Management -II
	IV	VSC-274-RE-AE-P	Applied Entomology-II
	IV	VSC-275-RE-DS-P	Diary Science-II

SEMESTER- IV

Course Code-VSC-271-RE-PC-P

Paper Title: Pharmaceutical Chemistry-II

Theory (Credit 2) No. of Practical Hours: 60 Hours

Sr. No	Course Objectives	Course Outcomes
1.	To provide in depth knowledge of scientific and pharmaceutical chemistry	After completion of program, students will be able to have in-depth knowledge of basic concepts in pharmaceutical chemistry
2.	To train students in skills related to research, education, pharmaceutical and market.	Student will learn about process and get knowledge of pharmaceuticals that help in further education.
3.	To develop the good qualities of integrity, responsibility and self-confidence.	Students will become responsible and achieve self-confident.
4.	To familiarize with current and recent scientific and research development in the field of pharmaceutical industry.	Students will be able to apply the knowledge of pharmaceutical science in real life situations to solve the problems.
5.	To enrich knowledge through hand on activities and study tour.	Students develop aptitude of doing research through undertaking small projects and report writing.
6.	To instill safety practices and regulations	Students use safety practices and regulations inside the pharmaceutical industry.

PRACTICALS:

Sr. No.	Practical's	Practical Allotted
1.	Preparation and assay of boric acid.	1
2.	Preparation and assay of magnesium sulphate.	1
3.	Preparation and assay of copper sulphate.	1
4.	Preparation and assay of aluminum hydroxide gel.	1
5.	Preparation of calamine lotion.	1
6.	Preparation of buffer solutions.	1
7.	Limit test for Chloride and Sulphate.	1
8.	Limit test for Iron	1
9.	Preparation and assay of Ferrous Sulphate	1
10.	Preparation and assay of ammoniated mercury	1
11.	Preparation and assay of milk of magnesia.	1
12.	Preparation electrolyte powder.	1
13.	Preparation and assay of aspirin.	1
14.	Preparation lugol's, strong and weak iodine solution.	1

15.	Study tour to pharmaceutical industry and report writing	2

Note:

1. A student has to perform at list **any** fifteen experiments in semester and study tour and report writing.
2. In lieu of study tour students will have to perform two practicals.

Field Visit

The students shall be taken for an industrial visit to pharmaceutical industries to witness and understand the various processes of manufacturing of any of the common dosage forms viz. tablets, capsules, liquid orals, injectable, etc. Individual reports from each student on their learning experience from the field visit shall be submitted.

REFERENCE BOOKS:

1. Inorganic Medicinal Chemistry Block & Roche
2. Inorganic Pharmaceutical Chemistry M. L. Schroff
3. Pharmaceutical Chemistry Inorganic G. R. Chatwal
4. Practical Pharmaceutics R.S. Gaud and G.D. Gupta
5. Inorganic Pharmaceutical and Medicinal Chemistry J. S. Quadry
6. Indian Pharmacopeia (Vol.I/II)

SEMESTER- IV

Course Category – Vocational Skill Course (VSC)

Course Code-VSC-272-RE-ES-P

Course Title: Energy Studies- II

[No. of Credits: 2 C] **[No. of Practical Lectures: 60 hrs]**

S.Y.B.Sc. Physics

Course Objectives

CO1. To Introduce Energy scenario in India along with the energy sources.
CO2.To study all types of energy sources and their impact on Environment.
CO 3.To study and aware various units of energy and their interconversions.
CO 4. To aware the problems to be faced in Energy conversions.
CO 5. To study Energy crisis and its solution.

Practical's: (2 Credits)

Sr. No.	Name of Practical	No. of Practical
1.	To study different energy units and their interconversions relation (calorie, joule, erg, BTU, kWh, Horse Power, electron Volt).	1
2.	Determination of fuel value of wood.	1
3.	Determination of fuel value of charcoal/Cow dung.	1
4.	Preparation of Leclanche cell and determination of O/P power at different concentrations	1
5.	Preparation of Daniel cell and determination of .O/P power at different concentrations	1
6.	Calibration of thermocouple as thermometer and Determination of inversion temperature	1
7.	Determination of efficiency of conventional chullaha.	1
8.	Determination of efficiency of improved chullaha	1
9.	Study of solar constant	1
10.	Study of Box type solar cooker	1
11.	Study of cabinet solar dryer.	1
12.	Study of liquid heating flat plate collector	1
13.	Study of air heating flat plate collector.	1
14.	Study of solar still	1
15.	Study of Non Selective coatings (selectivity ratio)	1
16.	Study of Conversion of electrical energy into heat energy. Measurement of consumption of electrical energy by kilo watt hour(kW -h) meter	1
17.	**Field Visit /Study Tour:** Science center / hydropower station / small scale industry / energy park.	5

Note:- 1. A student should complete at least any 15 practicals.
2. In lieu of field visit, a student has to perform two practical's.

Reference Books:-

1. Non-conventional energy Resources: B.H. Khan (Tata McGraw-Hill Co.)
2. Solar Energy: S.P. Sukhatme (Tata McGraw-HillCo.)
3. Solar Energy Utilization: G.D Rai (Khana Publishers)
4. Encyclopedia of Energy 2nd Edition : (Tata McGraw-HillCo.)
5. Energy resources: Andrew I. Simon (Pergamon Press)
6. Solar Energy: H.P. Garg
7. Solar Energy: G.N. Tiwari (Nervosa publishing house)
8. Nuclear Physics: D.C.Tayal (Himalaya publication)
9. Energy Resources: Demand and conservation: Chaman Kashkari
10. Alternative energy sources: James P. Hartnet (Academic Press, New York)

SEMESTER- IV

Course Category – Vocational Skill Course (VSC)

Course Code-VSC-273-RE-HM-P

Course/Paper Title: Horticulture and Its Management-II

[No. of Credits: 2 C] **[No. of Practical Lectures: 60 L]**

Course Objectives:

1: Understand the fundamentals of horticulture
2. Learn about different types of horticultural crops
3. Study horticultural practices and techniques
4. Explore the importance of horticulture in human life

Course Outcomes:

1: Students will be acquainted with the concept of Horticulture and its management.
2: They will understand the importance of horticulture in human life
3: Students will understand practices and techniques in horticulture and its management

Sr. No.	Name of Practical	No. of Practical
1.	To understand tools and implements used in horticulture	1P
2.	To study natural vegetative propagation methods- Creepers, Runner, Sucker, Tuber, Rhizome, Bulbs, Corms	1P
3.	To study and perform artificial vegetative propagation method- Cutting (Soft wood/Semi hard wood and Hard Wood) with suitable example	1P
4.	To study and perform artificial vegetative propagation method- Budding (T- budding and Patch Budding) with suitable example	1P
5.	To study and perform artificial vegetative propagation method- Layering (Air, Mound) with suitable example	1P
6.	To study and perform artificial vegetative propagation method- Grafting (Approach and Stone) with suitable example	1P
7.	To perform bonsai technique in suitable plant	1P
8.	To perform hydroponic technique in suitable crop	1P
9.	To prepare slurry compost for horticultural crops	1P
10.	To calculate the correct dose of pesticide based on label recommendations for effective pest control	1P
11.	To perform the preparation of Bordeaux mixture and paste	1P
12.	Identification and management of nutritional disorders in fruit crops	1P
13.	To study physicochemical parameters- soil texture, pH and nutrient availability	1P
14.	To test water quality w.r.t. pH, turbidity and TDS	1P
15.	To determine optimal NPK dose for suitable horticulture crop	1P

Note:- 1. A student should complete at least any 15 practicals.
2. In lieu of field visit a student has to perform two practical's.

References:

- Plant Propagation. Sadhu, M.K. 1996. New Age International Publishers, New Delhi. Propagation of Fruit Crops, Mukherjee, S.K. and Majumdar, P.K.1973.ICAR, New Delhi.
- Propagation of Tropical Fruit Trees, Ganner, R.J. and Choudari, S.A. 1972. Oxford & IBH Publishing Co., New Delhi.
- Propagation of Horticultural Crops: Principles and Practices, Sarma, R.R. 2002. Kalyani Publishers, New Delhi
- Textbook of Horticulture, K Manibhushan Rao, Macmillan, 2005

SEMESTER- IV

Course Code-VSC-274-RE-AE-P

Paper Title: Applied Entomology- II

Practical (Credit 2) No. of Practical Hours: 60 Hours

Detailed Syllabus:

Unit No.	Name of the Topic	Lectures Allotted
1.	Methods of collection, preservation and identification of Insect **(D)**	**1**
2.	Study of beneficial insects: Honey bee, Silkworm, Lac insect, Termites and Locusts **(D)**	**1**
3.	Study of External morphology of cockroach **(D)**	**1**
4.	Temporary mounting of mouthparts, antenna, legs, cornea of Cockroach **(E)**	**1**
5.	Study of Digestive System of cockroach **(E)**	**1**
6.	Study of Reproductive System of cockroach **(E)**	**1**
7.	Study of different type of antennae in insects **(D)**	**1**
8.	Study of different types of Mouth parts in insect **(D)**	**1**
9.	Study of different type of wings modifications in insects **(D)**	**1**
10.	Study of insects abdominal appendages. **(D)**	**1**
11.	Study of life cycle of mulberry silk worm. **(D)**	**1**
12.	Study of digestive system of silk worm larva. **(E)**	**1**
13.	Study of spinnerets of silk worm larva. **(E)**	**1**
14.	A field visit/tour to observe the different insect stages and Report writing. **(Compulsory)**	**2**

Note:- 1. A student should complete at least any 15 practicals.
2. In lieu of field visit, a student has to perform two practical's.

References

7. General and applied entomology by little.
8. A text book of general and applied entomology by Nair.
9. Arthropod by Kotpal.
10. A general text book of entomology by Imms.
11. A text book of entomology by Ross.
12. A text book of entomology by B.V David, T.N Anantha Krishnan.

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SEMESTER- IV

Course Category – Vocational Skill Course (VSC)

Course Code-VSC-275-RE-HM-P

Course/Paper Title: Dairy Science-II

[No. of Credits: 2 C] **[No. of Practical Lectures: 60 L]**

Objectives: 1) To give applied Knowledge to the students.
2) Introduction to Cattle breeds
3) Present Status of Dairy animal in India and World

Course Outcomes:

CO 1: To Remembering Body parts of Cow.
CO 2: To Classify and Understanding Cattle Breeds.
CO 3: To Identify Buffalo breeds.
CO 4: To study Methods of milking**.**
CO5: To remembering Objectives of Housing.
CO6: To Classify feed stuff.

1: Study of familiarization with Dairy Farm Layout **(01)**
- Observe and draw layout of a model dairy farm.
- Identify different functional areas: shed, feed store, milking area, etc.

2: Identification of Breeds **(01)**
- Recognize and differentiate between common cattle and buffalo breeds using physical characteristics.
- Maintain breed profile charts.

3: Preparation of Animal Housing **(01)**
- Design a basic housing plan based on number of animals.
- Demonstrate bedding arrangement and ventilation assessment

4: Identification of Feeds and Fodders **(01)**
- Collect and classify various feed ingredients: dry, green, and concentrates.
- Assess quality of fodder by physical inspection.

5: study of formulation of Concentrate Mixture **(01)**
- Prepare a simple concentrate mix using locally available materials.
- Weigh and mix ingredients in proper ratios.

6: Preparation of Silage Making **(01)**
- Demonstrate process of silage preparation using pit or drum method.
- Identify signs of good and bad silage.

7: Preparation of Hay Making **(01)**
- Demonstrate cutting, drying, and storing of fodder to make hay.
- Observe color, smell, and texture of good hay.

8: Demonstration of Milking Techniques **(01)**
- Practice hand milking and machine milking.

- Follow hygienic practices before, during, and after milking.

9: Study of ration Balancing **(01)**
- Calculate nutrient requirements of a lactating cow.
- Prepare and demonstrate balanced ration using ration calculator or feed chart

10: Demonstration of Routine Management **(01)**
- Grooming, hoof trimming, bathing, and care of body parts.
- Perform basic daily care tasks under supervision.

11: Study of Vaccination and Deworming **(01)**
- Observe and record vaccination and deworming procedures.
- Learn vaccination schedule for common diseases.

12: Study of Heat Detection and Artificial Insemination (Observation) **(01)**
- Identify signs of estrus in cows and buffaloes.
- Observe AI technique in field/farm conditions.

13: Study of cultivation of Fodder Crops **(01)**
- Prepare seedbed and sow seeds of a selected fodder crop.
- Monitor growth stages and record observations.

14: Study of Calf Management **(01)**
- Observe and participate in feeding colostrum.
- Record birth weight, growth rate, and health status.

15: Study of Record Keeping and Health Monitoring **(01)**
- Maintain sample records: milk yield, health register, breeding records.
- Learn to fill formats for daily milk production and feed intake.
- (Hi-Tech Dairy Farm /Chilling plant/Dairy Industry/ Milk Collection center Visit is compulsory for the students and submit the visit report at the time of practical examination.)

***Note:** Student has to perform at list 15 practicals and study tour/field visit.

List of Books:

1. Animal Husbandry - by G.C. Banarjee
2. Animal Nutrition - by G.C. Banarjee
3. Handbook of Dairy Science - by I.C.A.R.
4. Handbook of Agriculture - by I.C.A.R.
5. Text book of Animal Science Technology -H.S.C. Board

Courses offered by the SYBSc Restructuring Pattern

Year	Semester	Course Code	Course Title
Co-curricular Courses (CC) –(1P=2C)			
S.Y.B.Sc	IV	CC-271-RE-SM-P	Soap Manufacturing -II
	IV	CC-272-RE-RR-P	Radio Repairing - II
	IV	CC-273-RE-ND-P	Nursery Development- II
	IV	CC-274-RE-MLT-P	Medical Lab Technique-II
	IV	CC-275-RE-MMP-T	Milk and Milk Products-II

SEMESTER- IV
Course Category – Co-curricular Course (CC)
Course Code-CC-271-RE- SM -P
Paper Title: Soap Manufacturing -II

Theory (Credit 2) **No. of Practical Hours: 60 Hours**

PRACTICALS:

Sr. No.	Practical's	Practical Allotted
1.	Preparation and determination of concentration of lye's (NaOH and KOH	1
2.	Laboratory scale preparation of laundry soap	1
3.	Preparation of liquid soap	1
4.	Preparation of transparent soap	1
5.	Preparation of shampoo	1
6.	Preparation of different shaving soap	1
7.	laboratory scale preparation of liquid detergent / Hand wash	1
8.	laboratory scale preparation of bath soap	1
9.	Preparation of paper soap	1
10.	Skin irritation test for soap	1
11.	Laboratory scale preparation of face wash	1
12.	Determination of alkali content in soap	1
13.	Determination and comparison of saponification value of oil	1
14.	Determination and comparison of acid value of coconut oil and jasmine oil	1
15.	Determination and comparison of acid value of soybeans oil and ground nut oil	1
16.	Study tour to soap and detergent industry and report writing.	2

NOTE:

1 A student has to perform at list any fifteen experiments and study tour / field visit and report writing is compulsory.

2 In lieu of study tour/field visit, students will have to perform two practical's.

Reference books:

a. *Hand book of Industrial Chemistry, 7th edition*
b. *Knowlton Jonh and Steven The Hand Book of Cosmetics Sscience and Technology*
c. *The handbook of Soap Manufacture by W.H. Simmons and H.A Appleton*
d. *Soap and Detergents SBP Board of Consultant and Engineers*
e. *Textbook of Chemical Technology, Volume I By S.D. Shukla*
Shrives Chemical Process Industry, 5th edition, George Austin, 1984

SEMESTER- IV

Course Category – Co-curricular Course (CC)

Course Code-CC-272-RE-RR-P

Course Title: Radio Repairing - II

[No. of Credits: 2 C] **[No. of Practical Lectures: 60 L]**

Course Objectives:

CO 1) to understand the basic working principles of servicing tools and ability to use them
CO 2) to understand Identification of various electronic components
CO 3) to understand the basic principles of various meter like multimeter and CRO
CO 4) to understand basic components of regulated power supply.
CO 5) to understand the concepts of amplifiers and oscillator
CO 6) to acquaint basic knowledge different parts of radio receiver
CO 7) to build and test AM/FM receiver
CO 8) to develop the skill related with fault finding and troubleshooting of radio receiver

List of Practical's:

1.	Identification and study of various active, passive electronic components and various servicing tools	1
2.	Study of multimeter (analog & digital)& its applications (measurement of AC/DC current and voltage,resistance, capacitance and testing electronic components).	1
3.	Study of solder gun and soldering & dis soldring practice.	1
4.	Study of full wave/ bridge rectifier with/ without filter.	1
5.	Study of voltage regulater (zener/ IC voltage regulator).	1
6.	Study of single stage transistor amplifier (BJT)	1
7.	Study of transistors characteristics (BJT)- CE mode	1
8.	Study of A.M modulation (modulator)	1
9.	Study of F.M. modulation (modulator)	1
10.	Study of function generator and uses of CRO.	1
11.	Study of front panel controls of given AM/FM radio receiver	1
12.	Building and testing of AM/FM radio receiver.	1
13.	Study of common faults in radio receiver and their remedies	1
14.	Fault finding and trouble shooting in radio receiver.	1
15.	Study of DTH alignment and connectivity to TV.	1
16.	Applications of cell phone.	1
17.	Frequency modulation.	1
18.	Amplitude modulation	1
19.	Field Visit/Study tour- TV/AM/FM radio station /community radio center / small Scale Electronic Industry	2

Note: -

1. A student has to perform at list any fifteen experiments and study tour / field visit and report writing is compulsory.
2. In lieu of study tour/field visit, students will have to perform two practical's
3. Field Visit/Study tour- TV/AM/FM radio station /community radio center / small Scale Electronic Industry**.**

Reference Books:

1. Electronic components and materials - Madhuri Joshi
2. Basic Electronics – Grob

3. Fundamental Electronics – J.D. Ryder
4. Radio Engineering – M.C. Gupta
5. Consumer Electronics – S.D. Jaiswal
6. Basic Electronics and linear circuits – N.N. Bhargava
7. Principles of Electronics –V.K. Mehata
8. Radio and TV Communication - E.P.Terman
9. Principles of basic Electronics - Schuler
10. Element of radio servicing - Marus
11. Sound production – Oldson
12. Radio and Television – S.P. Sharma
13. Basic test instruments –Turner
14. Audio and Video system - Sharma
15. Transistor circuit approximation –Malvino
16. Data Manual – Bell Lab.
17. Transistor service manual - K.C. Agrawal

SEMESTER- IV
Course Category – Co-Curricular Course (CC)
Course Code-CC-273-RE-ND-P
Course/Paper Title: Nursery Development-II

[No. of Credits: 2 C] **[No. of Practical Lectures: 60 L]**

Course Objectives:

- To equip students with the knowledge and practical skills necessary to establish, manage, and operate a successful plant nursery
- To understand propagation techniques, nursery layout and design.
- To understand plant health management, business planning, and marketing strategies.

Course Outcomes:

- The students will acquire knowledge and practical skills necessary to establish, manage, and operate a successful plant nursery
- They'll understand propagation techniques, nursery layout and design.
- They'll understand plant health management, business planning, and marketing strategies.

Sr. No.	Name of Practical	No. of Practical
1.	To study of tools and implements used in plant nursery management	1P
2.	To study different types of media for propagation of plants in nursery beds	1P
3.	To study seed treatments for breaking seed dormancy and inducing vigorous seedling growth	1P
4.	Preparation and application of plant growth regulator solutions for seed germination and vegetative propagation	1P
5.	Preparation of different nursery beds and sowing of seeds	1P
6.	To perform and practice different techniques of cutting and budding in raising plant saplings	1P
7.	To perform and practice different techniques of layering and grafting in raising plant saplings	1P
8.	To study micro propagation technique for any suitable ornamental crop and its subsequent hardening	1P
9.	To study common diseases and its management in nurseries	2P
10.	To study common insect pests and its management in nurseries	1P
11.	To study technique for Potting and Repotting for Ornamental plants.	1P
12.	To study uprooting/digging, labelling and packing of nursery plants	1P
13.	Economic analysis of nursery operations	1P
14.	Visit to Ornamental/Vegetable/ Medicinal/Fruit/ Flower Crop Nursery/ Tissue culture laboratory	1P

Note: -

1. A student has to perform at list any fifteen experiments and study tour / field visit and report writing is compulsory.
2. In lieu of study tour/field visit, students will have to perform two practical's

Reference

- Manual on Forest Nursery and Plantation Techniques, Forest Research Institute (FRI), Dehradun
- Guidelines for establishing commercial nurseries with subsidies under NHB schemes, National Horticulture Board (NHB), Ministry of Agriculture Website: http://nhb.gov.in
- "Nursery Techniques for Fruit Crops" – TNAU
- "Greenhouse & Nursery Management" – PAU
- Textbook of Plant Propagation and Nursery Management, R. R. Sharma & Hare Krishna, IBDC publisher 2013

SEMESTER- IV

Course Category – Co-Curricular Course (CC)

Course Code-CC-274-RE-MLT-P

Paper Title: Medical Laboratory Technique

Practical (Credit 2) **No. of Practical Hours: 60 Hours**

Syllabus:

Unit No.	Name of the Practical Topic	Practical Allotted
1.	Study of safety measures in laboratory (**D)**	**1**
2.	To determine the blood group. **(E)**	**1**
3.	To determine bleeding time and clotting time. **(E)**	**1**
4.	Estimation of Hemoglobin By Sahali's method **(E)**	**1**
5.	Study of Hemocytometer **(D)**	**1**
6.	Total count White blood cell (WBC). **(E)**	**1**
7.	Total count of Red blood cell (RBC) **(E)**	**1**
8.	Differential of count of WBC. **(E)**	**1**
9.	To Study Electrocardiogram (ECG) **(D)**	**1**
10.	To study pulse rate, respiratory rate and body mass index **(E)**	**1**
11.	To measure blood pressure. **(E)**	**1**
12.	To study blood for glucose test. **(E)**	**1**
13.	Physical Examination of Urine sample **(E)**	**1**
14.	To study the Blood Disorders and Infectious Diseases (any Four) **(D)**	**1**
15.	To visit a hospital or medical institute and submit a report on the functioning of clinical laboratories. **(Compulsory**)	**2**

Note.

1. A student has to perform at list any fifteen experiments and study tour / field visit and report writing is compulsory.
2. In lieu of study tour/field visit, students will have to perform two practical's

References

1. Textbook of Medical Physiology, Guyton and Hall. 12th edition.
2. Textbook of Parasitology. K.D. Chatterjee.
3. Blood science: Principles and Pathology, Andrew Blann, Nessar Ahmed, 1st edition
4. Textbook of Medical Laboratory Technology, Ramnik Sood
5. Medical Laboratory Technology (Volume I):BY Kanai, L Mukherjee and Swarajit Ghosh
6. Medical Laboratory Technology (Volume II):BY Kanai, L Mukherjee and Swarajit Ghosh
7. Medical Laboratory Technology (Volume I):BY Kanai, L Mukherjee

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SEMESTER- IV

Course Category – Co-Curricular Course (CC)

Course Code-CC-275-RE-MMP-P

Paper Title: Milk and Milk Products-II

Practical (Credit 2) **No. of Practical Hours: 60 Hours**

Objectives: 1) To give applied Knowledge to the students.
2) To provide Basic Knowledge of Milk Processing.
3) Introduction to Clean and Safe milk production.

Course Outcomes:

CO 1: To remembering definition of Milk and milk products.
CO 2: To Compare Indian dairy product with Western dairy products.
CO 3:To applying Sanitation in Clean and safe milk production.
CO 4: To understand importance of food Nutritive value of Kheer, Basundi

Practical's (Credit: 02=60L)

1. Study of Physical Examination of Milk (1)
   - Appearance, smell, taste, and color.
   - Measurement of density and specific gravity using lactometer.

2. Study of determination of Fat Content in Milk (1)
   - Gerber method (Cream separation technique).

3. Determination of SNF and Total Solids in Milk (1)
   - Using lactometer readings and standard formulae.

4. Demonstration of Milking Hygiene and Udder Sanitation (1)
   - Pre- and post-milking teat disinfection.
   - Use of clean milking equipment.

5. Demonstration of Cleaning and Sanitization of Dairy Equipment (1)
   - CIP (Clean-in-place) and manual cleaning.
   - Testing for cleaning efficacy (e.g., ATP swabs).

6. Study of Microbial Analysis of Raw and Pasteurized Milk (1)
   - Standard Plate Count (SPC).
   - Coliform count.

7. Detection of Adulterants and Preservatives in Milk (1)
   - Tests for starch, urea, detergent, formalin, etc.

8. Pasteurization Efficiency Test (1)
   - Phosphatase test.

9. Determination of pH of Milk (1)
   - Titration method and pH meter usage.

10. Detection of Protein Content (1)

11. Preparation of Paneer and Evaluation of Quality (1)
    - Coagulation of milk using acid; yield and texture analysis.

12. Preparation of Cream and Butter (1)
    - Cream separation and churning; measuring butterfat recovery.

13. Preparation of Khoa and Evaluation (1)
    - Heat desiccation method.

14. Demonstration of Spray Drying Process (1)
    - Drying milk to powder (theoretical/demo if no equipment).

15. Preparation of Curd, Lassi, and Yoghurt (1)
    - Inoculation, incubation conditions, sensory evaluation.

16. Visit of Milk Collection Centre /Chilling plant/Dairy Industry/ Milk products distribution Centre Visit is compulsory for the students and submit the visit report at the time of practical examination.) (2)

***Note:** Student has to perform at list any 15 practicals and study tour/visit is compulsory

References:

1. Outlines of Dairy Technology – Sukmar DE.
2. Milk and properties- Strivatva S.M. 919930 Kalyani publishers. 1/1 Rajendranagar Vadhiana.
3. Milk and milk products – Winton and Winton (1993) Agrobios (India), Agro. House behindNasrani cinema. Chopsani road Jodhapur.
4. Milk Testing – Davis.J.G. Agribios (India) Agro house behind Nasrani cinema Chopsani road Jodhapur.
5. Chemistry of milk and milk products. Singh V.B. (1965) Asian publishers. New mandi, Muzaffaranagar. Dairy in India. Gupta. W.A. (1997). Kalyani publisher 1/1 Rajendrangar Ludhaina