Government Science College, Vankal

Department of Zoology

Short Term Course

Course Code: STCZO01 **Course Name:** Apiculture **Duration:** 30 h

INTRODUCTION

This course provides comprehensive knowledge and practical skills in apiculture, an important area of agriculture with significant economic and pollination benefits. Students will learn about various honey bees species, beekeeping techniques, products and byproducts of apiculture, and the economic aspects of apiculture.

OBJECTIVES

- To help the student to become familiar with the significance of beekeeping as an economically viable industry.
- It will help them to understand the different species of honeybees, their biology, behaviour and role in pollination.
- To train the students to learn the techniques of honey bee rearing, optimization of techniques based on climate and geographical regions, and various measures to be taken to maximize the benefits
- To understand the significance of beekeeping in the diversification of agriculture for the rural communities to increase their income and create employment opportunities and at the same time to develop entrepreneurial skills required for self-employment in the beekeeping sector.

COURSE MODULES

Module: 1Biology of Bees (5 hours)

- Historical background of apiculture, classification and biology of honey bees, Social organization of bee colony,
- Behavioral patterns (bee dance, swarming).

Module 2: Rearing of Bees (10 hours)

- Artificial Bee rearing (Apiary), Beehives – Newton and Langstroth; Bee Pasturage; Selection of bee species for apiculture –Apiscerana indica, Apis mellifera;
- Bee keeping equipment,methods of extraction of honey (Indigenous and Modern) & processing;

- Apiary management - Honey flow period and lean period, effects of pollutants on honeybees.

Module 3: Diseases and Enemies (5 hours)

- Bee diseases control and preventive measures.
- Enemies of bees and their control**.**

Module 4: Bee Economy (10 hours)

- Products of apiculture industry (Honey, Bees Wax, Propolis, Royal jelly, Pollen etc.) and their uses.
- Modern methods in employing artificial Beehives for cross pollination in horticultural gardens- stationary and migratory bee keeping.

LEARNING OUTCOMES

Upon completion of the course, students will be able to:

1. Comprehend the various species of honey bees in India, their social organization and its importance.
2. Appreciate the opportunities and employment in apiculture – in public, private andgovernment sector.
3. Gain thorough knowledge about the techniques involved in bee keeping and honeyproduction.
4. Make various products and by-products obtained from beekeeping sectorand their importance.
5. Develop entrepreneurial skills necessary for self-employment in beekeeping sector.
6. Enhance collaborative learning and communication skills through practical sessions, teamwork, group discussions, assignments and projects.

REFERENCES

1. Singh, S. (1962). Beekeeping in India, Indian Council of Agricultural Research, New Delhi.

2.Mishra, R.C. (1995). Honeybees and their management in India. Indian Council of Agricultural Research, New Delhi

3.Prost, P. J. (1962). Apiculture. Oxford and IBH, New Delhi.

4.Rahman, A. (2017). Beekeeping in India. Indian Council of Agricultural Research, New Delhi

5.Gupta, J.K. (2016). Apiculture, Indian Council of Agricultural Research, New Delhi.

6.Bee Keeping Theory & Practice D.R. Kogonza

7.Keeping Honey Bees - Malcolm T. Santord & Richard E. Bonney

8.The Bee Keeper's Handbook- Diana Sammataro & Alphonse Avitabile

EVALUATION METHODS

- **Quizzes and Assignments (50%)**: To assess theoretical understanding.
- **Practical Exercises (50%)**: Hands-on activities or workshop

ISSUE OF MARKSHEET AND CERTIFICATE

The college shall publish the result after evaluation and with the recommendations of course coordinator at the end of programme.

1. After successful completion of the course, no marks will be given to students only grades will be given as per follows

Percentage Range of Marks (Theory + Practical)	**Remarks**
90-100	O
80-90	A
60-80	B
40-60	C
<40	F

COURSE COORDINATOR:

Dr. Rajesh Senma,
HoD, Zoology Department,
GSC Vankal.

Department of Botany
Government Science College, Vankal
Ta. Mangrol, Dist. Surat
AISHE Code: C- 46595

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Short Term Course

Introduction to Landscaping

Course Code: STCBO01

Course Title: Introduction to Landscaping

Course Duration: 30 Hours

Course Introduction

This short-term course provides a comprehensive introduction to landscaping, covering essential principles, design concepts, and practical techniques. Designed for beginners, it addresses the basics of landscape planning, plant selection, hardscaping, and maintenance, aiming to equip participants with the skills needed to design and maintain aesthetically pleasing and functional outdoor spaces.

Course Objectives

By the end of this course, participants will:

1. Understand the fundamental principles of landscape design.
2. Learn about site analysis and landscape planning.
3. Gain knowledge of plant selection and placement.
4. Develop skills in hardscaping and use of landscape materials.
5. Acquire techniques for maintaining landscapes.
6. Explore the environmental and sustainability aspects of landscaping.

Module Outline and Outcomes

Module 1: Introduction to Landscaping (5 hours)

- **Topics Covered:**
  - Overview of landscaping
  - Historical context and significance
  - Basic principles of landscape design
- **Outcome:**

- Students will be able to describe the scope and importance of landscaping and understand its fundamental principles.

Module 2: Site Analysis and Landscape Planning (6 hours)

- **Topics Covered:**
  - Conducting a site analysis
  - Understanding site conditions (soil, climate, topography)
  - Planning and designing a landscape layout

- **Outcome:**
  - Students will be able to perform a site analysis and develop a basic landscape plan.

Module 3: Plant Selection and Placement (6 hours)

- **Topics Covered:**
  - Criteria for selecting plants
  - Understanding plant characteristics and requirements
  - Planting techniques and placement strategies
- **Outcome:**
  - Students will gain knowledge of plant selection and learn how to effectively place plants in a landscape design.

Module 4: Hardscaping and Landscape Materials (6 hours)

- **Topics Covered:**
  - Introduction to hardscaping (paths, patios, walls, etc.)
  - Types of landscape materials (stone, wood, metal)
  - Techniques for incorporating hardscaping elements
- **Outcome:**
  - Students will understand the use of hardscaping in landscape design and learn techniques for using different materials.

Module 5: Landscape Maintenance (4 hours)

- **Topics Covered:**
  - Maintenance practices (watering, pruning, fertilizing)
  - Integrated pest management

- Seasonal maintenance tasks

- **Outcome:**
  - Students will acquire practical skills for maintaining landscapes to ensure their health and aesthetics.

Module 6: Environmental and Sustainability Considerations (3 hours)

- **Topics Covered:**
  - Sustainable landscaping practices
  - Water conservation techniques
  - Eco-friendly landscape design
- **Outcome:**
  - Students will explore sustainable landscaping practices and understand the importance of environmental considerations in landscape design.

Evaluation

1. **Quizzes (30%)** - Quizzes at the end of each module to assess understanding of key concepts.
2. **Practical Assignments (40%)** - Hands-on assignments involving site analysis, plant selection, and landscape design.
3. **Final Project (20%)** - A comprehensive landscape design project incorporating all course elements.
4. **Participation (10%)** - Active participation in discussions and practical sessions.

Recommended Reading

- "Principles of Landscape Design" by Norman K. Booth
- "Landscape Plants for Western Regions" by Bob Perry
- "Sustainable Landscaping: Principles and Practices" by Marietta Loehrlein

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Issue of Marksheet and Certificate

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Percentage Range of Marks (Theory + Practical)	Remarks
90-100	O
80-90	A
60-80	B
40-60	C
<40	F

Course Co-ordinator:

Dr .Meghna Adhvaryu,

HoD, Department of Botany,

GSC Vankal

Government Science College, Vankal

Department of Microbiology

Short Term Course

Course Code: STCMB01 **Course Name:** Analytical Instruments in Microbiology Lab **Duration:** 30 h

INTRODUCTION

The short term course on "Analytical Instruments in Micorbiology Lab" is an intensive program designed to equip participants with a comprehensive understanding of the various analytical instruments commonly used in microbiology laboratories. The course is of paramount importance for students pursuing studies in microbiology, biotechnology, biochemistry, and related fields. The course blends theoretical knowledge with practical hands-on experience to ensure that participants gain the skills needed to effectively operate and utilize these instruments in their microbiological. The knowledge and skills gained during the course will make students industry ready and enhance their research competency. By mastering these instruments, students can significantly enhance their career prospects and contribute to advancements in microbiology and related fields.

COURSE OBJECTIVES:

1. **Fundamental Understanding**: Provide a thorough understanding of the various analytical instruments used in microbiology labs.
2. **Instrument Operation**: Teach the principles and operational techniques of key analytical instruments.
3. **Application Skills**: Develop skills to apply these instruments in different microbiological investigations.
4. **Data Interpretation**: Enhance ability to interpret and analyze data generated by these instruments.
5. **Safety and Maintenance**: Promote best practices for the safe use and maintenance of laboratory instruments.

COURSE MODULES:

Module 1: Introduction to Analytical Instruments in Microbiology 2 h

- Overview of analytical techniques in microbiology
- Importance and applications of analytical instruments

Module 2: Spectroscopy 6 h

- Principles of spectroscopy
- Types: UV-Vis, Infrared (IR), Fluorescence spectroscopy
- Applications in microbiology (e.g., detection of biomolecules, quantification of microbial growth)
- Hands-on session: Operating a UV-Vis spectrophotometer

Module 3: Chromatography 6 h

- Principles of chromatography
- Types: High-Performance Liquid Chromatography (HPLC), Gas Chromatography (GC), Thin Layer Chromatography (TLC)
- Applications in microbiology (e.g., analysis of microbial metabolites)
- Hands-on session: Performing TLC analysis

Module 4: Electrophoresis5 h

- Principles of electrophoresis
- Types: Gel electrophoresis, Capillary electrophoresis
- Applications in microbiology (e.g., DNA, RNA, and protein analysis)
- Hands-on session: Running and analyzing gel electrophoresis

Module 5: Centrifugation 4 h

- Principles of centrifugation
- Types: Differential centrifugation, Density gradient centrifugation, Ultracentrifugation
- Applications in microbiology (e.g., cell fractionation, isolation of subcellular components)
- Hands-on session: Using a centrifuge for cell separation

Module 6: Microscopy 7 h

- Principles of microscopy
- Types: Light microscopy, Phase contrast microscopy, Fluorescence microscopy, Electron microscopy (SEM and TEM)
- Applications in microbiology (e.g., observation of microbial morphology, intracellular structures)
- Hands-on session: Using light microscopes

COURSE OUTCOMES:

By the end of this course, students will be able to:

1. **Knowledge**: Understand the principles and applications of various analytical instruments used in microbiology.
2. **Operation**: Confidently operate key analytical instruments in the microbiology lab.
3. **Application**: Apply these instruments to investigate and analyze microbiological samples.
4. **Data Analysis**: Interpret and analyze data generated from these instruments.
5. **Safety Practices**: Follow safety protocols and maintain instruments properly.

TEACHING METHODOLOGY:

- **Lectures**: Detailed lectures covering theoretical aspects of each instrument.
- **Hands-on Sessions**: Practical sessions for students to gain hands-on experience with each instrument.
- **Demonstrations**: Live demonstrations of instrument operations by instructors.

ASSESSMENT:

- **Quizzes**: Short quizzes to test understanding of theoretical concepts. Two quizzes during the course (60% marks of final marks)
- **Practical Exams**: Hands-on assessments to evaluate practical skills in operating instruments. (40% marks of final marks)
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REFERENCES:

1. "Principles and Techniques of Biochemistry and Molecular Biology" by Keith Wilson and John Walker
2. "Analytical Techniques in Microbiology" by Graham Walsh
3. "Fundamentals of Analytical Chemistry" by Douglas A. Skoog, Donald M. West, F. James Holler, and Stanley R. Crouch

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90-100	O
80-90	A
60-80	B
40-60	C
<40	F

COURSE COORDINATOR:

Dr. Chaitanya Jha,
HoD, Microbiology Department,
GSC Vankal.

Government Science College, Vankal

Department of Chemistry

Short Term Course

Course Code: STCCH01 **Course Name:** Forensic Chemistry **Duration:** 30 h

Forensic Chemistry (30 hours)

INTRODUCTION

Forensic Chemistry applies chemical principles and techniques to criminal investigations. It involves the analysis of physical evidence collected from crime scenes to help solve crimes and support legal processes. This course will cover fundamental concepts, analytical methods, and practical applications of forensic chemistry.

OBJECTIVES

- Understand the role of forensic chemistry in the criminal justice system.
- Apply chemical techniques to analyse various types of forensic evidence.
- Interpret analytical results to assist in criminal investigations.
- Develop skills in evidence collection, handling, and reporting.

COURSE MODULES

Module 1: Introduction to Forensic Chemistry

- Definition and Scope of Forensic Chemistry
- Historical Development
- The Role of Forensic Chemistry in Criminal Justice

Module 2: Fundamental Principles of Chemistry

- Basic Chemical Concepts
- Analytical Techniques Overview
- Instrumentation in Forensic Chemistry

Module 3: Crime Scene Management

- Evidence Collection and Preservation

- Chain of Custody
- Scene Documentation Techniques

Module 4: Forensic Toxicology
- Principles of Toxicology
- Drug and Poison Identification
- Analytical Methods for Toxicology

Module 5: Forensic Analysis of Drugs and Controlled Substances
- Drug Classification and Properties
- Analytical Techniques: Chromatography, Spectroscopy
- Case Studies and Interpretation

Module 6: Forensic Analysis of Trace Evidence
- Hair, Fibers, and Soil Analysis
- Techniques for Evidence Analysis
- Use of Microscopy and Spectroscopy

Module 7: Forensic Analysis of Explosives
- Types of Explosives and Their Chemistry
- Detection and Analysis Techniques
- Case Studies and Practical Applications

Module 8: Forensic Analysis of Firearms and Ammunition
- Firearm and Ammunition Chemistry
- Gunshot Residue Analysis
- Ballistics and Toolmark Analysis

Module 9: Forensic DNA Analysis
- DNA Structure and Function
- Techniques for DNA Profiling
- Interpretation of DNA Evidence

Module 10: Forensic Chemistry in Arson Investigations
- Chemistry of Combustion

- Analysis of Accelerants and Fire Debris
- Arson Investigation Techniques

Module 11: Forensic Analysis of Physical Evidence
- Bloodstain Pattern Analysis
- Impression Evidence (e.g., footwear, tire treads)
- Comparative Analysis Techniques

Module 12: Forensic Chemistry of Biological Evidence
- Analysis of Biological Fluids
- Detection and Quantification Techniques
- Handling and Preservation of Biological Evidence

Module 13: Forensic Digital Evidence
- Chemical Analysis of Digital Evidence (e.g., residue on devices)
- Data Recovery Techniques
- Legal Considerations and Procedures

Module 14: Contemporary Issues and Future Directions in Forensic Chemistry
- Advances in Forensic Technology
- Ethical and Legal Issues
- Emerging Trends and Research

LEARNING OUTCOMES

Upon completion of the course, students will be able to:

- Fundamental Principles: Understand the basic principles and techniques of forensic chemistry, including the role of chemical analysis in criminal investigations
- Analytical Techniques: Gain proficiency in various analytical methods used in forensic chemistry, such as chromatography (GC, HPLC), spectroscopy (IR, UV-Vis, NMR), and mass spectrometry.)

- Evidence Collection and Preservation

(Learn proper procedures for the collection, handling, and preservation of chemical evidence to maintain its integrity and validity in legal contexts)

- Identification of Substances

(Develop skills to identify and analyse substances commonly encountered in forensic cases, such as drugs, explosives, poisons, and trace evidence)

- Interpretation of Results

(Learn how to interpret and report analytical results clearly and accurately, including understanding the limitations and uncertainties of various techniques)

- Legal and Ethical Considerations

(Understand the legal and ethical responsibilities of forensic chemists, including the importance of maintaining impartiality and adhering to chain-of-custody protocols)

- Case Studies and Practical Application

(Apply forensic chemistry knowledge through case studies and practical exercises to solve simulated forensic scenarios and understand real-world applications)

REFERENCES

1.Forensic Chemistry: Fundamentals and Applications by Rajesh Kumar Sharma and Neeraj Kumar.

2. Forensic Chemistry: An Introduction by Bhanu Awasthi.

4. Forensic Science: An Introduction to Scientific and Investigative Techniques by P. A. White and B. L. Thomson.

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<40	F

COURSE COORDINATOR:

Dr. Parthiv Chaudhari,
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