Government Science College, Vankal

Department of Zoology

Short Term Course

Course Code: STCZO03 **Course Name:** Taxidermy **Duration:** 30 h

INTRODUCTION

Taxidermy is the art and science of preserving and mounting animal specimens for display or study. This course aims to provide a comprehensive understanding of the techniques, materials, and ethical considerations involved in taxidermy, with practical hands-on experience.

OBJECTIVES

- To introduce the history and principles of taxidermy.
- To understand the anatomy of various animals for accurate representation.
- To learn the different techniques and materials used in taxidermy.
- To gain practical skills in the preparation, preservation, and mounting of specimens.
- To explore ethical and legal considerations in taxidermy.

MODULES

Module 1: Introduction to Taxidermy (5 Hours)

- History and evolution of taxidermy
- Principles and purposes of taxidermy
- Overview of taxidermy tools and materials

Module 2: Anatomy and Physiology (5 Hours)

- Basic animal anatomy relevant to taxidermy
- Skeletal and muscular systems
- Skin and fur/feather structures
- Study of different animal species

Module 3: Preparation and Preservation Techniques (5 Hours)

- Skinning and fleshing techniques

- Tanning and curing hides
- Methods of preserving skins and specimens
- Dealing with different types of specimens (mammals, birds, reptiles, fish)

Module 4: Mounting Techniques (5 Hours)

- Creating armatures and forms
- Techniques for mounting specimens
- Positioning and posing animals for natural appearance
- Finishing touches: painting, detailing, and habitat creation

Module 5: Practical Hands-on Sessions (5 Hours)

- Step-by-step taxidermy project
- Individual and group work on specimens
- Supervised practice with guidance and feedback

Module 6: Ethical and Legal Considerations (5 Hours)

- Ethical issues in taxidermy
- Legal regulations and permits
- Conservation and sustainable practices
- Case studies and discussions

OUTCOMES

- Understand the historical context and principles of taxidermy.
- Recognize the anatomical features necessary for accurate specimen representation.
- Demonstrate practical skills in skinning, preserving, and mounting animal specimens.
- Apply ethical and legal standards in taxidermy practice.
- Complete a taxidermy project from start to finish.

REFERENCES

- Hornaday, W.T. (2004). *Taxidermy and Zoological Collecting*. Digital Scanning Inc.
- Brown, M. (2010). *Taxidermy Art: A Rogue's Guide to the Work, the Culture, and How to Do It Yourself*. Artisan.
- Clark, E. (1995). *The Complete Guide to Taxidermy*. Stackpole Books.
- Haynes, T. (2017). *Stuffed Animals: A Modern Guide to Taxidermy*. W.W. Norton & Company.

- National Taxidermists Association (www.nationaltaxidermists.com)

EVALUATION

- **Quizzes (30%)**: Short quizzes at the end of each module to assess understanding.
- **Assignments (30%)**: Written assignments on specific topics such as preparation techniques, ethical issues, or case studies.
- **Practical Project (40%)**: Completion of a taxidermy project, including documentation of the process and techniques used.

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 + Projects)	**Remarks**
90-100	O
80-90	A
60-80	B
40-60	C
<40	F

COURSE COORDINATOR:

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

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Short Term Course

Introduction to Basic Plant Tissue Culture

Course code: STCBO03

Course title: Introduction to Basic Plant Tissue Culture

Course Duration: 30 Hours

Course Introduction

This short-term course provides a foundational understanding of plant tissue culture, focusing on the essential techniques, applications, and theoretical background. Designed for beginners, it covers the principles of plant cell and tissue culture, methods for initiating and maintaining cultures, and the practical applications of this technology in research and industry.

Course Objectives

By the end of this course, participants will:

1. Understand the basic concepts and principles of plant tissue culture.
2. Learn about the types of tissue culture and their specific uses.
3. Gain proficiency in the techniques used to establish and maintain plant tissue cultures.
4. Explore the applications of plant tissue culture in plant breeding, genetic engineering, and conservation.
5. Acquire knowledge about the challenges and ethical considerations in plant tissue culture.

Module Outline and Outcomes

Module 1: Introduction to Plant Tissue Culture (5 hours)

- **Topics Covered:**
  - Overview and history of plant tissue culture
  - Basic principles and concepts
  - Laboratory requirements and safety
- **Outcome:**
  - Students will be able to describe the scope, significance, and historical context of plant tissue culture.

Module 2: Media Preparation and Sterilization Techniques (6 hours)

- **Topics Covered:**
  - Composition of tissue culture media
  - Preparation and sterilization methods
  - Role of plant growth regulators
- **Outcome:**
  - Students will understand how to prepare and sterilize culture media and the importance of plant growth regulators.

Module 3: Initiation of Cultures (6 hours)

- **Topics Covered:**
  - Explant selection and preparation
  - Aseptic techniques
  - Establishing cultures
- **Outcome:**
  - Students will gain proficiency in initiating plant tissue cultures using various explants.

Module 4: Types of Plant Tissue Culture (7 hours)

- **Topics Covered:**
  - Callus culture
  - Organ culture (shoot, root, and meristem)
  - Somatic embryogenesis and micropropagation
- **Outcome:**
  - Students will be able to differentiate between various types of plant tissue culture and their applications.

Module 5: Applications and Advances in Plant Tissue Culture (4 hours)

- **Topics Covered:**
  - Applications in plant breeding and genetic engineering
  - Conservation and propagation of endangered species
  - Advances and future trends in plant tissue culture
- **Outcome:**
  - Students will explore the practical applications and future potential of plant tissue culture technology.

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Module 6: Challenges and Ethical Considerations (2 hours)

- **Topics Covered:**
  - Common challenges in plant tissue culture
  - Ethical and environmental considerations
  - Quality control and troubleshooting
- **Outcome:**
  - Students will understand the challenges and ethical issues related to plant tissue culture practices.

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 media preparation, sterilization, and culture initiation.
3. **Final Exam (20%)** - A comprehensive test covering all course content.
4. **Participation (10%)** - Active participation in discussions and practical sessions.

Recommended Reading

- "Plant Tissue Culture: Techniques and Experiments" by Roberta H. Smith
- "Introduction to Plant Biotechnology" by H.S. Chawla
- "Plant Tissue Culture: An Introductory Text" by Sant Saran Bhojwani and Prem Kumar Dantu

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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,

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GSC Vankal

Government Science College, Vankal

Department of Microbiology

Short Term Course

Course Code: STCMB05 **Course Name:** Biofertilizer and Biopesticides **Duration:** 30 h

INTRODUCTION

This course offers a comprehensive overview of biofertilizers and biopesticides, focusing on their production, application, and role in sustainable agriculture. Students will explore the types, mechanisms, benefits, and challenges associated with these eco-friendly alternatives to chemical fertilizers and pesticides.

OBJECTIVES

- To understand the basic concepts and importance of biofertilizers and biopesticides.
- To explore various types of biofertilizers and biopesticides and their mechanisms of action.
- To learn about the production techniques and application methods.
- To evaluate the benefits and challenges of using biofertilizers and biopesticides in agriculture.
- To discuss the regulatory and safety aspects of biofertilizers and biopesticides.

COURSE MODULES

Module 1: Introduction to Biofertilizers and Biopesticides (6 hours)

- Definition and significance
- Historical background and development
- Comparison with chemical fertilizers and pesticides
- Environmental and economic benefits

Module 2: Types of Bio fertilizers (6 hours)

- Nitrogen-fixing biofertilizers (e.g., Rhizobium, Azospirillum)
- Phosphate-solubilizing biofertilizers (e.g., Pseudomonas, Bacillus)
- Potassium-mobilizing biofertilizers
- Plant growth-promoting rhizobacteria (PGPR)
- Mycorrhizalbiofertilizers

Module 3: Types of Biopesticides (6 hours)

- Microbial biopesticides (e.g., Bacillus thuringiensis, Trichoderma)
- Plant-incorporated protectants (PIPs)
- Biochemical biopesticides
- Beneficial insects as biopesticides

- Case studies of successful biopesticide applications

Module 4: Production Techniques (6 hours)

- Isolation and identification of effective strains
- Mass production techniques
- Formulation and quality control
- Storage and shelf-life management

Module 5: Benefits and Challenges (6 hours)

- Benefits to soil health and crop productivity
- Challenges in adoption and large-scale application
- Economic considerations and market potential
- Future prospects and innovations

EVALUATION

- **Assignments (20%)**: Regular assignments to assess understanding of theoretical concepts.
- **Mcq based two exams (80%)**: Hands-on sessions to evaluate practical skills in production and application techniques.

OUTCOMES

- Comprehensive understanding of biofertilizers and biopesticides.
- Ability to identify and produce various types of biofertilizers and biopesticides.
- Insight into the benefits and challenges of using biofertilizers and biopesticides in agriculture.

REFERENCES

1. SubbaRao, N.S. (1993). **Biofertilizers in Agriculture and Forestry**. Oxford & IBH Publishing Co. Pvt. Ltd.
2. Vessey, J.K. (2003). Plant growth promoting rhizobacteria as biofertilizers. **Plant and Soil**, 255, 571-586.
3. Glare, T.R., & O'Callaghan, M. (2000). **Bacillus thuringiensis: Biology, Ecology and Safety**. Wiley.
4. Glick, B.R., & Patten, C.L. (2003). **Molecular Biology of Plant Growth-Promoting Rhizobacteria**. Springer.
5. Thakore, Y. (2006). The biopesticide market for global agricultural use. **Industrial Biotechnology**, 2(3), 194-208.

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 COORDINATOR:

Dr. Nishant Junnarkar,
HoD, Microbiology Department,
GSC Vankal.

Government Science College, Vankal

Department of Chemistry

Short Term Course

Course Code: STCCH05	**Course Name:**	Chemistry of Petrochemicals	**Duration:** 30 h

Chemistry of Petrochemicals

INTRODUCTION

Petrochemicals are chemical products derived from petroleum and natural gas. They play a crucial role in the production of a wide range of materials and chemicals used in everyday life. This short-term course will provide participants with a comprehensive understanding of the chemistry behind petrochemicals, including their production, properties, and applications. Participants will explore the processes involved in converting raw petrochemical feedstocks into valuable products and gain insights into the industry's challenges and innovations.

OBJECTIVES

- Understand the fundamental chemistry of petrochemical feedstocks and products.
- Describe the key processes involved in petrochemical production.
- Analyse the properties and applications of various petrochemical products.
- Identify environmental and safety concerns associated with petrochemical processing.
- Evaluate recent advancements and future trends in the petrochemical industry.

COURSE MODULES

Module 1: Introduction to Petrochemicals

- Overview of petrochemical industry and its significance
- Classification of petrochemicals: primary, secondary, and specialty chemicals
- Key feedstocks: crude oil, natural gas, and their composition

Module 2: Basic Chemistry of Petroleum

- Composition and properties of petroleum
- Crude oil distillation and fractionation
- Major fractions and their applications

Module 3: Production of Olefins

- Chemistry and processes involved in olefin production
- Key olefins: ethylene, propylene, and butylenes

- Applications and industrial uses of olefins

Module 4: Production of Aromatics

- Chemistry and processes involved in aromatic hydrocarbon production
- Key aromatics: benzene, toluene, and xylenes
- Applications and industrial uses of aromatics

Module 5: Production of Synthetic Polymers

- Polymerization processes: addition and condensation polymerization
- Major synthetic polymers: polyethylene, polypropylene, polystyrene
- Applications and properties of synthetic polymers

Module 6: Production of Methanol and Derivatives

- Chemistry and processes of methanol production
- Methanol derivatives: formaldehyde, acetic acid
- Applications in various industries

Module 7: Production of Synthetic Fibers

- Chemistry and processes involved in fiber production
- Key fibers: nylon, polyester, and acrylic
- Applications and properties of synthetic fibers

Module 8: Petrochemical-Based Solvents and Additives

- Types and applications of petrochemical-based solvents
- Production and use of additives: plasticizers, stabilizers, and surfactants
- Environmental and safety considerations

Module 9: Environmental Impact and Sustainability

- Environmental issues related to petrochemical production
- Waste management and recycling strategies
- Sustainable practices and alternative feedstocks

Module 10: Safety and Handling of Petrochemicals

- Safety protocols and regulations in petrochemical processing
- Hazard identification and risk assessment
- Proper handling and storage practices

Module 11: Advances in Petrochemical Technology

- Recent technological advancements in petrochemical processing
- Innovations in catalytic processes and green chemistry
- Future trends and emerging technologies

Module 12: Case Studies and Industry Applications

- Detailed case studies of major petrochemical products and processes
- Analysis of real-world applications and industrial challenges

Learning Outcomes

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

- Petrochemical Basics
  (Understand the fundamental concepts and types of petrochemicals and their sources)
- Chemical Processes
  (Learn key processes used in petrochemical refining, such as cracking and reforming)
- Product Applications
  (Comprehend the diverse applications of petrochemicals in industries like plastics, pharmaceuticals, and fuels)
- Environmental Impact
  (Recognize the environmental challenges and sustainability issues associated with petrochemical production)
- Industry Trends
  (Gain insight into current trends and future developments in the petrochemical industry)

References

1. "Petrochemicals: The Rise of a Giant" by C. R. P. Thompson (Publisher: Wiley).

2. "Petroleum Refining: Technology and Economics" by James H. Gary and Glenn E. Handwerk (Publisher: CRC Press).

3. "Introduction to Petrochemicals" by Peter W. A. L. N. Stange (Publisher: Springer).

4. "The Chemistry of Petroleum Hydrocarbons" by S. G. P. McRae (Publisher: Elsevier).

5. "Handbook of Petrochemical Processes" by W. J. H. H. Martin (Publisher: CRC Press).

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

COURSE COORDINATOR:

Dr. Dharmesh Mahajan,
HoD, Chemistry Department,
GSC Vankal.

Government Science College, Vankal

Department of Physics

Short Term Course

Course Code: STCPHY01
Course Name: Introduction to Astronomy
Duration: 30 hours

Introduction

The short-term course on "Introduction to Astronomy" is an intensive program designed to provide participants with a comprehensive understanding of the fundamental concepts of astronomy, including the Big Bang theory and the origin of the universe. This course is essential for students pursuing studies in physics, astrophysics, space science, and related fields. The course combines theoretical knowledge with observational techniques, ensuring that participants gain the skills needed to explore and understand celestial phenomena. The skills acquired during the course will prepare students for academic research and industry roles in astronomy and space science, significantly boosting their career prospects and contributing to advancements in our understanding of the universe.

Course Objectives:

- Provide a thorough understanding of the basic concepts and principles of astronomy.
- Teach the techniques for observing celestial objects.
- Develop skills to use various astronomical instruments and tools.
- Enhance the ability to interpret and analyze astronomical data.
- Promote critical thinking and scientific inquiry in the study of the universe.

Course Modules:

Module 1: Introduction to Astronomy (4 hours)

- Overview of astronomy and its significance
- History and development of astronomical science
- The Big Bang theory and the origin of the universe

Module 2: The Solar System (8 hours)

- Structure and components of the solar system
- Planets, moons, asteroids, and comets
- Hands-on session: Using software to simulate the solar system

Module 3: Stars and Galaxies (8 hours)

- Life cycle of stars
- Types of stars and their properties
- Structure and types of galaxies
- Hands-on session: Observing stars and galaxies through telescopes

Module 4: Telescopes and Observational Techniques (10 hours)

- Types of telescopes: Optical, radio, and space telescopes
- Techniques for celestial observations
- Hands-on session: Setting up and using telescopes

Course Outcomes:

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

1. **Knowledge:** Understand the basic concepts and principles of astronomy.
2. **Observations:** Conduct celestial observations using various techniques.
3. **Instruments:** Use astronomical instruments and tools effectively.
4. **Data Analysis:** Interpret and analyze astronomical data.
5. **Scientific Inquiry:** Apply critical thinking and scientific inquiry to the study of astronomy.

Teaching Methodology:

- **Lectures:** Detailed lectures covering theoretical aspects of each module.
- **Hands-on Sessions:** Practical sessions for students to gain hands-on experience with observational techniques and instruments.
- **Demonstrations:** Live demonstrations of astronomical observations by instructors.

Assessment:

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

Recommended Books:

- Astrophysics: Stars and Galaxies by K. D. Abhyankar, Unievrsity Press
- Introduction to Cosmology by Jayant Narlikar, Cambridge University Press

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

Course Cordinator:

Dr. Hemal Vankar,
HoD, Physics Department,
GSC Vankal.

Government Science College, Vankal

Department of Mathematics

Short Term Course

Course Code: STCMT01 **Course Name:** Mathematical Proofs and Problem Solving **Duration:** 30 h

Mathematical Proofs and Problem Solving (30 hours)

INTRODUCTION

Mathematical proofs are essential for establishing the validity of mathematical statements. This course provides a foundational understanding of various proof techniques and problem-solving strategies. Emphasis is placed on fundamental methods and practical applications to build a strong base in mathematical reasoning.

OBJECTIVES

- Understand and apply fundamental proof techniques.
- Develop clear and rigorous mathematical proofs.
- Utilize basic problem-solving strategies to address mathematical challenges.
- Avoid common errors in mathematical reasoning.

COURSE MODULES

Week 1: Introduction to Mathematical Proofs (6 hours)

- **Understanding Mathematical Proofs:**Definition and importance of proofs, Overview of different types of proofs
- **Basic Proof Techniques:** Proof by direct reasoning, Proof by contradiction,Proof by contrapositive

Week 2: Core Proof Techniques (6 hours)

- **Proof by Induction:** Understanding and applying the principle of mathematical induction
- **Proof by Construction and Exhaustion:**Constructive proofs and proofs by enumeration

Week 3: Fundamental Problem-Solving Strategies (6 hours)

- **Basic Problem-Solving Methods:** Strategies for solving problems systematically, Techniques such as working backwards and considering special cases

- **Applying Proof Techniques to Problems:** Using proof techniques to solve basic mathematical problems

Week 4: Practice and Application (6 hours)

- **Practice with Proofs:** Guided practice problems focusing on fundamental proof techniques
- **Problem-Solving Sessions:** Group exercises and individual problems to apply proof and problem-solving strategies

Week 5: Review and Evaluation (6 hours)

- **Review Session:** Comprehensive review of key concepts and techniques, Discussion of common mistakes and troubleshooting
- **Final Assessment and Course Wrap-Up:** Written examination to assess understanding and application of course material, Summary and feedback

LEARNING OUTCOMES

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

1. Construct and understand fundamental mathematical proofs.

2. Apply basic problem-solving strategies to various mathematical problems.

3. Recognize and correct common errors in mathematical reasoning.

4. Communicate mathematical ideas clearly and effectively.

REFERENCES

1. "How to Prove It: A Structured Approach" by Daniel J. Velleman

2. "Introduction to Mathematical Thinking" by Keith Devlin

3. "The Art of Problem Solving" series by Richard Rusczyk

4. "Mathematical Proofs: A Transition to Advanced Mathematics" by Gary Chartrand, Albert D. Polimeni, and Patricia C. Edwards

EVALUATION METHODS

1. **Homework Assignments (30%)**: Regular problem sets focusing on fundamental proofs and problem-solving.

2. **Midterm Quiz (20%)**: Assessment of basic proof techniques and problem-solving methods.

3. **Final Exam (30%)**: Comprehensive test covering fundamental proof and problem-solving skills.

4.**Participation and Engagement (20%)**: Active involvement in lectures and practice sessions.

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

COURSE COORDINATOR:

Mr. Vanaraj D. Kagada,
HoD, Mathematics Department,
GSC Vankal.