Government Science College, Vankal

Department of Microbiology

Short Term Course

Course Code: STCMB08 **Course Name:** Mushroom Cultivation **Duration:** 30 h

Mushroom Cultivation

INTRODUCTION

This course provides comprehensive knowledge and practical skills in mushroom cultivation, an important area of agriculture with significant economic and nutritional benefits. Students will learn about various mushroom species, cultivation techniques, substrate preparation, pest management, and the economic aspects of mushroom farming.

OBJECTIVES

- Understand the biology and life cycle of different mushroom species.
- Learn various mushroom cultivation techniques.
- Acquire skills in substrate preparation and sterilization.
- Manage pests and diseases in mushroom cultivation.
- Explore the economic and business aspects of mushroom farming.

COURSE MODULES

Module 1: Introduction to Mushroom Cultivation (5 hours)

- History and significance of mushroom cultivation
- Types of edible and medicinal mushrooms
- Nutritional and health benefits
- Overview of the mushroom industry

Module 2: Biology of Mushrooms (5 hours)

- Fungal biology and life cycle
- Mushroom morphology and anatomy
- Spores, mycelium, and fruiting bodies
- Environmental conditions for growth

Module 3: Cultivation Techniques (10 hours)

- Selection of mushroom species
- Substrate preparation and sterilization
    - Straw, sawdust, compost, and other substrates
- Spawn production and inoculation
- Cultivation methods: indoor, outdoor, and greenhouse
- Harvesting techniques

Module 4: Pest and Disease Management (3 hours)

- Common pests and diseases in mushroom cultivation
- Integrated pest management (IPM) strategies
- Biological control methods
- Sanitation and hygiene practices

Module 5: Post-Harvest Handling and Marketing (3 hours)

- Post-harvest processing and storage
- Packaging and transportation
- Quality control and grading
- Marketing strategies and business planning

Module 6: Practical Applications and Case Studies (4 hours)

- Hands-on practice in substrate preparation, inoculation, and cultivation
- Field visits to mushroom farms

LEARNING OUTCOMES

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

- Identify and describe different species of edible and medicinal mushrooms.
- Apply appropriate cultivation techniques for various mushroom species.
- Prepare and sterilize substrates for mushroom growth.
- Implement effective pest and disease management strategies.
- Handle post-harvest processes and develop marketing plans for mushroom products.

REFERENCES

1. Chang, S. T., & Miles, P. G. (2004). Mushrooms: Cultivation, Nutritional Value, Medicinal Effect, and Environmental Impact. CRC Press.
2. Stamets, P. (2000). Growing Gourmet and Medicinal Mushrooms. Ten Speed Press.
3. Royse, D. J. (Ed.). (2013). Handbook of Mushroom Cultivation, Processing, and Production. CRC Press.
4. Hayes, W. A. (Ed.). (2008). Mushroom Cultivation: A Practical Approach. Central and Eastern European Committee for the Development of Agriculture.

EVALUATION METHODS

- **Quizzes and Assignments (50%)**: To assess theoretical understanding.
- **Practical Exercises (30%)**: Hands-on activities in substrate preparation, inoculation, and cultivation.
- **Case Study Analysis (20%)**: Evaluation of real-world mushroom cultivation scenarios.

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. 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. Anil Kumar Singh,
HoD, Microbiology Department,

GSC Vankal.

Government Science College, Vankal

Department of Chemistry

Short Term Course

Course Code: STCCH08 **Course Name:** Inorganic Qualitative Analysis **Duration:** 30 h

Introduction to Inorganic Qualitative Analysis

INTRODUCTION

Inorganic qualitative analysis is a branch of chemistry that involves the identification of inorganic substances based on their chemical properties. This course aims to provide foundational knowledge and practical skills for analysing inorganic compounds through qualitative methods. Participants will learn various techniques to identify cations and anions, understand reaction mechanisms, and apply systematic procedures for qualitative analysis.

OBJECTIVES

- Understand the principles and techniques of qualitative analysis in inorganic chemistry.
- Identify common cations and anions using systematic qualitative methods.
- Conduct qualitative tests safely and accurately in a laboratory setting.
- Interpret experimental results and identify unknown compounds through systematic analysis.
- Apply theoretical knowledge to practical problems in inorganic qualitative analysis.

COURSE MODULES

Module 1: Introduction to Inorganic Qualitative Analysis

- Overview of qualitative analysis
- Principles of chemical reactions used in analysis
- Safety protocols and lab equipment

Module 2: Systematic Qualitative Analysis - Basic Principles

- Systematic analysis approach
- Flowchart of analysis for cations and anions
- Preparation of reagents and solutions

Module 3: Identification of Cations - Preliminary Tests

- Grouping of cations
- Preliminary tests for the identification of common cations (e.g., Na^+, K^+, Ca^{2+}, Mg^{2+})

Module 4: Identification of Cations - Confirmatory Tests

- Detailed tests for specific cations
- Flame tests, color reactions, and precipitate formation

Module 5: Identification of Anions - Preliminary Tests

- Grouping of anions
- Preliminary tests for common anions (e.g., Cl\(^-\), SO\(_4^{2-}\), CO\(_3^{2-}\))

Module 6: Identification of Anions - Confirmatory Tests

- Detailed tests for specific anions
- Precipitation reactions and color changes

Module 7: Analysis of Mixtures Containing Cations

- Systematic approach to analyzing mixtures
- Separation techniques and confirmation of individual cations

Module 8: Analysis of Mixtures Containing Anions

- Systematic approach to analyzing mixtures
- Separation techniques and confirmation of individual anions

Module 9: Advanced Qualitative Techniques

- Use of complex reagents and techniques
- Spot tests and instrumental methods (e.g., spectrophotometry)

Module 10: Common Errors and Troubleshooting

- Identifying and correcting common errors in qualitative analysis
- Troubleshooting strategies

Module 11: Practical Laboratory Skills

- Hands-on practice of qualitative analysis
- Report writing and data interpretation

Module 12: Case Studies and Applications

- Application of qualitative analysis in real-world scenarios
- Case studies involving complex samples

LEARNING OUTCOMES

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

- Analysis Principles:Understand the fundamental principles and objectives of qualitative inorganic analysis

- Detection Methods:Learn techniques for identifying and separating metal ions and anions in mixtures
- Reagent Usage:Comprehend the role and application of various reagents in qualitative analysis
- Systematic Procedures:Master systematic approaches for qualitative analysis, including group separation and identification
- Problem-Solving Skills:Develop skills to interpret analytical results and troubleshoot common issues in qualitative analysis

REFERENCES

1. "Qualitative Analysis of Inorganic Compounds" by J. W. Munro and G. A. H. Smith (Publisher: Elsevier)
2. "Inorganic Chemistry: Principles of Structure and Reactivity" by James E. Huheey, Ellen A. Keiter, and Richard L. Keiter (Publisher: Pearson)
3. "Vogel's Textbook of Quantitative Chemical Analysis" by G. H. Jeffery, J. Bassett, J. Mendham, and R. C. Denney (Publisher: Pearson)
4. "Advanced Inorganic Chemistry: A Comprehensive Text" by F. A. Cotton, G. Wilkinson, C. A. Murillo, and M. Bochmann (Publisher: Wiley)
5. "Practical Inorganic Chemistry" by J. Derek Woollins (Publisher: Springer)

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. Kumar Gamit,
HoD, Chemistry Department,
GSC Vankal.

Government Science College, Vankal

Department of Physics

Short Term Course

Course Code: STCPHY04
Course Name: Integration of C-Language in Electronics
Duration: 30 hours

Introduction

The short-term course on "Integration of C-Language in Electronics" is an intensive program designed to equip participants with a comprehensive understanding of how to use C-language for programming microcontrollers and other electronic systems. This course is crucial for students pursuing studies in physics, engineering, electronics, computer science, and related fields. The course combines theoretical knowledge with practical hands-on experience, ensuring that participants gain the skills needed to effectively design, program, and test electronic systems using C-language. The skills acquired during the course will prepare students for industry roles and enhance their research competencies, significantly boosting their career prospects and contributing to advancements in electronics and embedded systems.

Course Objectives:

1. **Fundamental Understanding:** Provide a thorough understanding of the integration of C-language with electronics.
2. **Programming Skills:** Teach the principles of programming electronic systems using C-language.
3. **Prototyping Skills:** Develop skills to build and test electronic prototypes programmed in C.
4. **Data Interpretation:** Enhance the ability to interpret and analyze data from programmed electronic systems.
5. **Safety and Maintenance:** Promote best practices for the safe use and maintenance of electronic equipment.

Course Modules:

Module 1: Introduction to C-Language and Electronics (2 hours)

- Overview of C-language in electronics
- Importance and applications in various fields

Module 2: Basics of C-Language (6 hours)

- Syntax and structure of C-language
- Variables, data types, and operators
- Control structures: loops, conditionals, and functions
- Hands-on session: Writing basic C programs

Module 3: Microcontrollers and C-Language (6 hours)

- Introduction to microcontrollers (focus on Arduino Uno)
- Programming microcontrollers using C-language
- Hands-on session: Writing C programs for Arduino Uno

Module 4: Interfacing Electronics with C (5 hours)

- Interfacing sensors and actuators with microcontrollers
- Reading and writing data to electronic components
- Hands-on session: Interfacing a variety of sensors and actuators

Module 5: Advanced Programming Concepts (4 hours)

- Interrupts and timers in C
- Serial communication
- Hands-on session: Implementing advanced programming techniques

Module 6: Project Development and Testing (7 hours)

- Designing and developing a complete electronic project
- Testing and troubleshooting the project
- Hands-on session: Prototyping and testing a complete project

Course Outcomes:

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

1. **Knowledge:** Understand the principles of integrating C-language with electronics.
2. **Programming:** Write and debug C programs for electronic systems.
3. **Prototyping:** Build and test electronic prototypes programmed in C.
4. **Interfacing:** Interface microcontrollers with sensors and actuators using C.
5. **Data Analysis:** Interpret and analyze data from electronic systems programmed in C.
6. **Safety Practices:** Follow safety protocols and maintain electronic equipment properly.

Teaching Methodology:

- **Lectures:** Detailed lectures covering theoretical aspects of each module.
- **Hands-on Sessions:** Practical sessions for students to gain hands-on experience with programming and electronics.
- **Demonstrations:** Live demonstrations of programming and interfacing techniques 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 programming and electronics (40% of final marks).

Recommended Books:

- Programming In Ansi Cby E Balagurusamy, McGraw Hill Education
- Embedded C Programming and the Atmel AVR by Richard H. Barnett,Sarah Cox and Larry O'Cull
- Arduino Uno: A Hands-On Guide for Beginner by Agus Kurniawan

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.

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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 Cordinator:

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

Government Science College, Vankal

Department of Mathematics

Short Term Course

Course Code: STCMT04 **Course Name:** Introduction to Euclidean and Coordinate Geometry **Duration:** 30 h

Introduction to Euclidean and Coordinate Geometry

INTRODUCTION

Geometry forms the foundation of many mathematical concepts and applications. This course introduces B.Sc. Mathematics students to the essential principles of Euclidean and coordinate geometry. The course will cover basic geometric shapes, their properties, and how to use coordinate systems to solve geometric problems. By integrating theory with practical applications, students will gain a robust understanding of these fundamental topics.

OBJECTIVES

By the end of this course, students will:

- **Understand** the core concepts of Euclidean geometry, including properties of geometric shapes and theorems.
- **Apply** coordinate geometry techniques to analyze and solve geometric problems.
- **Develop** problem-solving skills through practical exercises and geometric proofs.
- **Explore** the connections between Euclidean geometry and coordinate systems.

COURSE MODULE (30 HOURS)

Module 1: Basics of Euclidean Geometry (6 hours)

Introduction to Euclidean Geometry: Definition and historical context, Fundamental concepts: points, lines, and angles.

Geometric Shapes and Properties: Triangles: types, properties, and theorems, Quadrilaterals: types, properties, and theorems, Circles: properties, theorems, and common constructions.

Module 2: Basic Theorems and Proofs (5 hours)

Geometric Proofs: Understanding and constructing geometric proofs, Proof techniques: direct proof, proof by contradiction.

Key Theorems: Pythagorean theorem, Properties of congruent triangles, Basic theorems related to circles (e.g., angles subtended by the same arc).

Module 3: Introduction to Coordinate Geometry (6 hours)

Cartesian Coordinate System: Plotting points on the Cartesian plane, Distance formula and midpoint formula

Equations of Lines and Circles

- Slope and equation of a line
- Intercepts and line equations
- Equation of a circle: standard form and general form

Module 4: Advanced Coordinate Geometry Concepts (6 hours)

Line and Circle Relationships

- Intersection of lines and circles
- Tangents and secants to a circle

Geometric Transformations

- Translation, rotation, reflection, and dilation
- Applications of transformations in coordinate geometry

Module 5: Problem Solving and Applications (5 hours)

Application of Euclidean Geometry

- Real-world problems involving geometric shapes
- Geometric constructions and applications

Application of Coordinate Geometry

- Solving problems involving lines and circles in the coordinate plane

- Application of coordinate geometry in various fields (e.g., computer graphics, physics)

Module 6: Review and Assessment (2 hours)

Review of Key Concepts

- Summary of Euclidean and coordinate geometry principles

Assessment

- Short quiz or test to evaluate understanding and application of course material

LEARNING OUTCOMES

By the end of this course, students will:

1. **Demonstrate** an understanding of basic concepts and theorems in Euclidean geometry.

2. **Apply** coordinate geometry techniques to solve problems involving lines and circles.

3. **Construct** and understand geometric proofs and theorems.

4. **Analyze** and solve geometric problems using coordinate systems.

5. **Integrate** knowledge from Euclidean and coordinate geometry to address real-world problems.

References

1. "Euclidean Geometry: A Guided Inquiry" by David M. Bressoud

2. "Coordinate Geometry" by Gordon Fuller and Norman C. K. McGraw

3. "Geometry: A Comprehensive Course" by Dan Pedoe

4. "Elementary Geometry from an Advanced Standpoint" by Edwin E. Moise

5. "Introduction to Geometry" by Harold R. Jacobs

EVALUATION METHODS:

1. Assignments (30%): Regular homework and problem sets to reinforce understanding and application of concepts.

2. Mid-Term Test (20%): An exam covering the first half of the course material to assess comprehension.

3. Class Participation (10%): Engagement in discussions, group activities, and practical exercises.

4. Project or Practical Work (20%): A project involving real-world applications of Euclidean and coordinate geometry principles, with a written report and presentation.

5. Final Exam (20%): A comprehensive exam covering all course modules to assess overall understanding.

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40-60	C
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COURSE COORDINATOR:

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