

**Course Title:** General Microbiology  
**Course Code:** FST-1108  
**Resource Person:** Wahab Nazir  
**Department:** Food Science and Technology

## **School of Food and Agricultural Sciences (SFAS) Vision**

SFAS endeavors to be a premier center of excellence, offering innovative, high-quality education and professional programs aimed at achieving academic and research excellence, enriching the lives of individuals and making a difference in the world of academia and industry, and to develop a society of professionals, who can contribute towards the betterment of their respective communities.

## **SFAS Mission**

SFAS Mission SFAS provides an intellectually rich, collaborative, research-focused and dedicated learning environment for students, faculty, and staff, while serving the community at various levels. SFAS at UMT has been established with the aim to integrate recent advances in food sciences/technology and agricultural innovations.

## **Program Learning Objectives (PLO's)**

Students graduating with BS Food Science and Technology shall be able to:

1. *Explain the basic principles of food sciences, and its multidisciplinary scope.*
2. *Explain the physical, chemical and biological properties of food and their effects on food safety, and sensory and nutritional quality.*
3. *Apply analytical techniques to characterize composition, and to identify physical, chemical and biological changes in foods.*
4. *Explain the effects of food processing, engineering, preservation, packaging, and storage on food safety and quality.*
5. *Identify the importance of food laws and regulations in ensuring safety and quality of the processed/manufactured foods.*
6. *Conduct applied research and use statistical tools in experimental design and data analysis.*
7. *Apply acquired knowledge to real world situations in food systems, components, production, and processes.*
8. *Apply critical thinking to professional problems.*
9. *Communicate effectively in both oral and written forms.*
10. *Develop organizational, teamwork, and leadership skills.*
11. *Demonstrate professional skills and thoughts of ethical, social integrity, and respect for diversity.*
12. *Demonstrate preparedness for continued reflective practice, and lifelong learning relevant to careers in food sciences.*

## Course Objectives (CLO's)

After the completion of this course, a student will be able to:

1. Provides a strong grounding in fundamental aspects of the basic biology of prokaryotic and eukaryotic cell
2. Explain the effect of the nutrients on the growth of the microbial cell
3. Understand the microorganism growth curve and factors affecting the growth curve
4. Differentiate between beneficial, pathogenic, and spoilage causing microbes (mainly bacteria)
5. Familiar with thermal and non-thermal techniques used for the sterilization purposes

## Learning Objectives

Sr#	Course Learning Objectives	Link with Program Learning Objectives
1.	Provides a strong grounding in fundamental aspects of the basic biology of prokaryotic and eukaryotic cell	Students will understand the role of cell and their components in the growth of biotic factors present in food
2.	Explain the effect of the nutrients on the growth of the microbial cell	Students will know the importance of nutrients in the growth of microbes and factors affecting their growth
3.	Understand the microorganism growth curve and factors affecting the growth curve	Students will be expected the importance of nutrients in the growth of microbes and factors affecting their growth
4.	Differentiate between beneficial, pathogenic and spoilage causing microbes (mainly bacteria)	Students will be able to identify the pathogenic or spoilage causing microbes from the beneficial to ensure the food safety
5.	Familiar with thermal and non-thermal techniques used for the sterilization purposes	Students will be able to utilize the different thermal and nonthermal techniques to reduce the growth or complete removal of harmful microbes during the processing and preservation of food

## Course Learning Outcomes

After successful completion of the course work, students have the skills to:

1. Identify the chemical components and cellular structure of unicellular and multicellular cell
2. Indicate the principles of bacterial nutrition
3. Demonstrate the process of bacterial cell division
4. Compare and distinguish the basic groups of microbes, including prokaryotic microbes (bacteria), viruses, and eukaryotic microbes
5. Draw a typical microbial growth curve, and predict the effect of different environmental conditions on the curve
6. Enumerate, grow, purify and characterize the beneficial microbes

## Teaching Methodology

### Interactive classes:

1. Use media to increase student engagement and improve learning outcomes.
2. Try adding metaphors to help students remember details.
3. Give students a real-world context with extra projects to reinforce skills.
4. Provide practical practice within your lessons. Making it relatable will do wonders.

### Case-based teaching:

### Class Participation

Positive, healthy, and constructive class participation will be monitored for each class. Particular emphasis will be given to participants during the presentation sessions. How the question is asked or answered will also be noted. Your behavior, as business executives in the class, will contribute to the class participation marks.

### Word of Advice

Assignments/ projects are very demanding and time-consuming. Since you might be exposed to the real corporate environment, the ensuing reality checks could be demoralizing and frustrating. So, you must learn to handle intragroup conflicts and any clash of interests. Unless you start working on the assignments/ projects right away from the very first day you are likely to miss the deadlines.

### Participant Responsibilities:

Students should be responsible enough to practice whatever they have learned during class sessions. They should also implement it in other subjects as well. They are expected to come prepared in the class.

## **Class activities:**

### **Presentations**

After careful analysis, the resource person will constitute the groups to achieve balanced heterogeneity among groups, for group assignments/projects and will have the final decision in this regard. Every member of the group is expected to be able to handle all aspects of the assignments. Groups are not allowed to choose presenters for various parts of the presentations; instead, resource person will nominate them. Individuals will be judged for their understanding of the topic through question handling. Q/A section of the presentations will weigh heavily for grading of assignments/ projects.

### **Class Discussions:**

During class, each student will work in a team on discussion questions. Teams will be assigned questions, allowed ten minutes for Internet research, and permitted five minutes to present their results. Points are earned by active participation with your team.

### **Applied Projects:**

This is a practical-based course. Regular attendance is the best predictor of success. Students will perform different practices with detailed instructions, teacher demonstrations, and video tutorials.

**STUDENTS ARE REQUIRED TO READ AND UNDERSTAND ALL ITEMS OUTLINED IN THE PARTICIPANT HANDBOOK**

### **Class Policy:**

#### **Be on Time**

You need to be at class at the assigned time. After minutes past the assigned time, you will be marked absent.

#### **Mobile phone Policy**

**TURN OFF YOUR MOBILE PHONE!** It is unprofessional to be texting or otherwise.

#### **Email Policy**

**READ YOUR EMAILS!** You are responsible if you miss a deadline because you did not read your email. Participants should regularly check their university email accounts regularly and respond accordingly.

### **Class Attendance Policy**

A minimum of 80% attendance is required for a participant to be eligible to sit in the final examination. Being sick and going to weddings are absences and will not be counted as present. You have the opportunity to use 6 absences out of 30 classes. Participants with less than 80% of attendance in a course will be given a grade 'F' (Fail) and will not be allowed to take end-term exams. International students who will be leaving for visas during the semester should not use any days off except for visa trips. Otherwise, they could reach short attendance.

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## **Withdraw Policy**

Students may withdraw from a course till the end of the 12th week of the semester. Consequently, grade W will be awarded to the student which shall have no impact on the calculation of the GPA of the student. A student withdrawing after the 12th week shall be automatically awarded an "F" grade which shall count in the GPA.

## **Moodle**

UMT –LMS (Moodle) is an Open-Source Course Management System (CMS), also known as a Learning Management System (LMS). Participants should regularly visit the course website on MOODLE Course Management system and fully benefit from its capabilities. If you are facing any problem using Moodle, visit <http://oit.umt.edu.pk/moodle>. For further query send your queries to [moodle@umt.edu.pk](mailto:moodle@umt.edu.pk).

## **Harassment Policy**

Sexual or any other harassment is prohibited and is constituted as a punishable offense. Sexual or any other harassment of any participant will not be tolerated. All actions categorized as sexual or any other harassment when done physically or verbally would also be considered as sexual harassment when done using electronic media such as computers, mobiles, internet, emails, etc.

## **Use of Unfair Means/Honesty Policy**

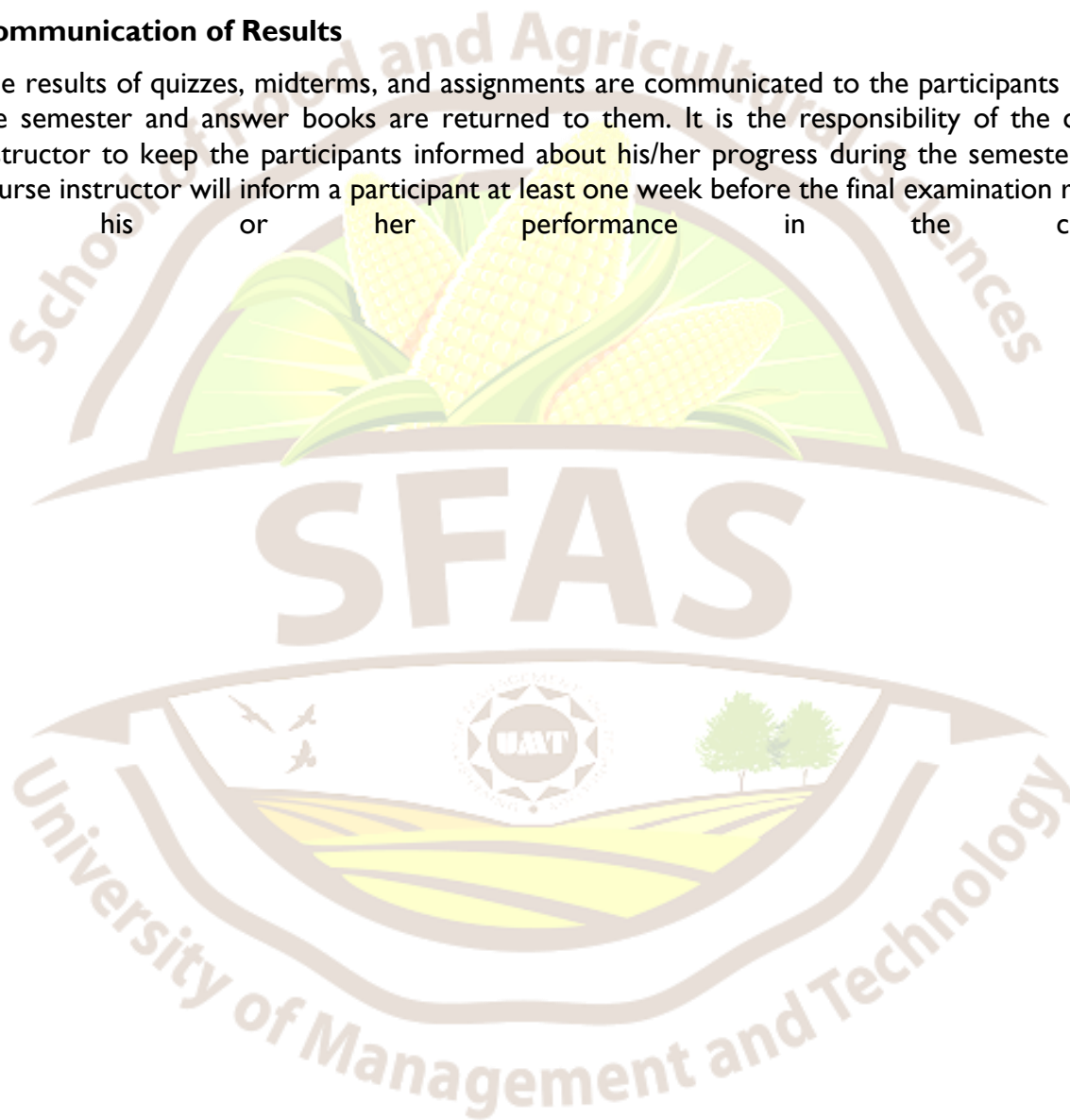
Any participant found using unfair means or assisting another participant during a class test/quiz, assignments or examination would be liable to disciplinary action.

## Plagiarism Policy

All students are required to attach a “Turn in” report on every assignment, big or small. Any student who attempts to bypass “Turn in” will receive an “F” grade which will count towards the CGPA. The participants submit the plagiarism report to the resource person with every assignment, report, project, thesis, etc. If a student attempts to cheat “Turn in”, he/she will receive a second “F” that will count towards the CGPA. There are special rules on plagiarism for final reports etc. all outlined in your handbook.

## Communication of Results

The results of quizzes, midterms, and assignments are communicated to the participants during the semester and answer books are returned to them. It is the responsibility of the course instructor to keep the participants informed about his/her progress during the semester. The course instructor will inform a participant at least one week before the final examination related to his or her performance in the course.



## Course Outline

**Course code:** FST-I108

**Course title:** General Microbiology

<b>Program</b>	BS Food Science and Technology
<b>Credit Hours</b>	3 (2-1)
<b>Duration</b>	16 Weeks
<b>Prerequisites (If any)</b>	General Science Biology
<b>Resource Person Name and Email</b>	Wahab Nazir <a href="mailto:wahab.nazir@umt.edu.pk">wahab.nazir@umt.edu.pk</a>
<b>Counseling Timing &amp; Room #</b>	3 hours per week
<b>Contact no.</b>	-
<b>Web Links</b>	-

**Director Programme Signature** \_\_\_\_\_

**Date** \_\_\_\_\_

**Dean's signature** \_\_\_\_\_

**Date** \_\_\_\_\_

## Grade Evaluation Criteria

Following is the criteria for the distribution of marks to evaluate final grade in a semester.

Marks Evaluation	Marks in percentage
Class Project/Presentation	15%
Quizzes	10%
Assignments	10%
Lab	20%
Mid-Term	20%
Final exam	25%
Total	<b>100%</b>

## Recommended Text Books:

1. Schmidt, T. M. (2019). *Encyclopedia of Microbiology*: Elsevier Science.
2. Jain, A., Agarwal, J., & Venkatesh, V. (2018). *Microbiology Practical Manual*, 1st Edition-E-Book: Elsevier Health Sciences.
3. Pommerville, J. C. (2014). *Fundamentals of Microbiology*: Jones & Bartlett Learning.
4. Hogg, S. (2013). *Essential Microbiology*: Wiley.
5. Tortora, G. J., Funke, B. R., & Case, C. L. (2013). *Microbiology: An Introduction*: Pearson.
6. Santos, D. M. (2011). *Recent Advances in Microbiology*: Apple Academic Press.
7. Willey, J. M., Sherwood, L., & Woolverton, C. J. (2011). *Prescott's Microbiology*: McGraw-Hill.



**Course:** General Microbiology

**Course Code:** FST-I108

No	Topics to be covered in the course	Learning Objective of this topic	Expected Outcomes from Students	Teaching Method	Assessment Criteria	Deadlines and Homework
1	Microorganisms and their respective place in the living world	To understand the microbes, their types, and their presence in the world To explain the importance of microbes in the living world	Differentiate the microbes from other living creature	Lecture Class Discussion	Question/ Answer session	Within a Week
2	Differentiation between pro- and eukaryotic cells	To describe the cell biology of the microbes To explain the difference between prokaryotic and eukaryotic cells.	Differentiate between the unicellular and multicellular organisms on a structural basis	Lecture Video tutorials	Class Discussion Lab Activity	Within a Week
3	Historical development of Microbiology and its scope	To understand the origin of microbes and their discovery To describe the history of the microbes	Understand the discovery and evolution of microbes according to environmental conditions	Lecture	Short Assignment	Within a Week
4	Microscopy: An outline of the principles and applications of light and electron microscope	To describe the discovery of microscope and its importance To understand the difference between light and electron microscope	To see the cell biology of the microbes by using a microscope	Lecture Video Tutorial	Lab Activity	Within a Week

5	Morphology, arrangement, and detailed anatomy of bacterial cell	<p>To describe the morphological characteristics of the microbes</p> <p>To familiar with the bacterial cell components and their functions</p>	<p>Differentiate between unicellular and multicellular cell components under microscope</p>	<p>Lecture</p> <p>Video Tutorial</p>	<p>Class Activity</p> <p>Quiz</p>	Within a Week
6	Bacterial taxonomy and nomenclature, the basis of classification of bacteria	<p>To understand the taxonomy and nomenclature of the microbes specifically bacteria</p> <p>To familiar with the different classes of bacteria</p>	<p>To classify bacteria based on cell structure</p>	<p>Lecture</p> <p>Video tutorial</p> <p>Book Study</p>	Lab Performance	Within a Week
7	Growth, nutrition (physical and nutritional requirement and nutritional types; sources of energy, C, N, H, O, S, P, H <sub>2</sub> O, trace elements, growth factors), and reproduction	<p>To understand the nutritional requirement of the microbes</p> <p>To familiar with the methods of the reproduction in unicellular microbes mainly focused on bacteria</p> <p>To understand the stages in the growth curve of the bacteria</p>	<p>To accelerate the growth in beneficial microbes by providing essential nutrients and vice versa</p>	<p>Lecture</p> <p>Class Discussion</p>	Class Activity	Within a Week
8	<b>Revision of Course/ Mid Exam</b>					
9	Growth, nutrition (physical and nutritional requirement and nutritional types; sources	To understand the nutritional requirement of the microbes	To accelerate the growth in beneficial microbes by providing	<p>Lecture</p> <p>Class Discussion</p>	Class Activity	Within a Week

	of energy, C, N, H, O, S, P, H <sub>2</sub> O, trace elements, growth factors) and reproduction.	To familiar with the methods of the reproduction in unicellular microbes mainly focused on bacteria  To understand the stages in the growth curve of the bacteria	essential nutrients and vice versa			
10	General methods of studying microorganisms: cultivation, isolation, purification, and characterization	To familiar with the different techniques used for the growth of microbes in the laboratory  To differentiate between types of microbes including bacteria and fungi based on their specific morphological characteristics	To cultivate, isolate, purify and characterize the microorganisms for their beneficial role	Lecture Lab Practical	Lab Performance  Quiz	Within a Week
11	Control of microorganisms by physical and chemical methods	To familiar with different chemical and thermal techniques to control the growth of spoilage causing or pathogenic microbes (e.g., bacteria)	To use autoclave and other techniques to sterilize the samples	Lecture Lab Practical	Class Assignment Lab Performance	Within a Week
12	Chemotherapeutic agents and antibiotics. Modes of action of antibiotics on microorganisms	To understand the role of chemical agents and antibiotics to reduce the growth of microorganisms	To utilize the different chemical agents to reduce the activity and growth of the disease-causing microbes	Lecture	Class Assignment	Within a Week
13	Basic properties of fungi, protozoa, and algae	To learn about the unicellular and multicellular fungi and other fresh bodies unicellular living organisms	To improve the knowledge about fresh	Lecture Video Tutorial	Lab Performance	Within a Week

			bodies unicellular organisms			
14	A brief introduction to the structure and propagation of viruses and bacteriophages	To familiar with the viruses and their types To understand the growth pattern of the viruses	To improve the knowledge about the lytic and lysogenic cycles of the virus propagation	Class Lecture Video Tutorial	Class Presentation	Within a Week
15	Class Presentations	To estimate student learning and progress in general microbiology	To develop communication skills and effective communication on industrial floors.	Class Participation	Class Presentation	Within a Week
16	Final Examination	Application of all the concepts learned in a general microbiology course	-	On-campus examination	Paper and viva	Within a Week

## Lab Component

During the course students will be able to perform the following practices in the laboratory:

1. Laboratory safety: containment and decontamination.
2. An introduction to microscopy: identification of parts of the microscope and their functions
3. Principles of Staining Procedures: Simple staining, Gram's staining, Acid-fast staining, cell-wall staining, flagellar staining, capsule staining, spore staining, and spirochaete staining.
4. Study of cell motility by hanging drop preparation.
5. Preparation and sterilization of bacteriological media and glassware.
6. Microbes inoculation techniques.
7. Study of colony characteristics of microorganisms.
8. Standard plate count technique (SPC).
9. Microbiological analysis of air.



**Any Notes or Comments**

