SYLLABUS FOR THE BATCH FROM YEAR 2025 TO 2026

FOR

Certificate in Fundamentals of Microbiological Processes and Quality Assurance

(Credit Based Evaluation and Grading System)

Semester: I

EXAMINATIONS: 2025-2026

Program Outcomes:

- **Fundamental Knowledge of Microbiology and Microbial Processes** – The students will gain a basic understanding of the scope and core concepts in microbiology and also gain an idea about various microbial processes.
- **Enhanced Technical Knowledge** – The program will enhance the practical knowledge of the students regarding various microbiological tools and techniques used in microbial processes.
- **Career Readiness & Employability** – The program will sensitize the students regarding the entrepreneurship opportunities in microbial processes, quality control and quality assurance requirements in various industries related to the field of microbiology, and the programme will enhance their employability prospects.

Department of Microbiology

GURU NANAK DEV UNIVERSITY AMRITSAR

Certificate in Fundamentals of Microbiological Processes and Quality Assurance (SEMESTER SYSTEM) under Directorate of Open & Distance Learning, Guru Nanak Dev University, Amritsar

Eligibility

- +2 in any stream with at least 45% marks in aggregate (40% for SC/ST candidates).
- Any student doing a Bachelor Degree, Master's Degree, M.Phil., Ph.D. from GNDU.

Semester-1

Paper Code	Subject	Marks			Credits
		Internal Assessment	End Term	Total	
ODFMP111T	**Basic Techniques in Microbiology**	30	70	100	4
ODFMP112T	**Microbial Processes**	30	70	100	4
ODFMP113T	**Microbial Quality Assurance**	30	70	100	4
ODFMP114P	**Project**			100	4
Total Marks & Credits				**400**	**16**

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Subject Name: Basic Techniques in Microbiology
Subject Code: ODFMP111T

Time: 03 Hours **Max. Marks: 100 Marks**

Internal Assessment: 30 Marks

End Term: 70 Marks

Instructions for the Paper-Setter/examiner:

1. Question paper shall consist of **Four sections**.
2. Paper setter shall set **Eight questions** in all by selecting **Two questions** of equal marks from each section. However, a question may have sub-parts (not exceeding four sub-parts) and appropriate allocation of marks should be done for each sub-part.
3. Candidates shall attempt **Five questions** in all, by at least selecting **One question** from each section and the **5th question** may be attempted from any of the **Four sections**.
4. The question paper should be strictly according to the instructions mentioned above. In no case a question should be asked outside the syllabus.

Section A

Definition and scope of Microbiology: Classification of Microorganisms (prokaryotic and eukaryotic organisms); General characteristics of bacteria, fungi (molds and yeasts) and viruses. Distribution of microbes in various environments

Section B

Basic tools and materials for working with microbiology: Autoclave, Laminar air flow, Incubator, Hot air oven, pH meter, Commonly used apparatus and glassware,

Tools to visualize microbes: Staining techniques, Bright field and Electron microscopy.

Section C

Cultivation in laboratory: Nutritional requirements of microorganisms, Media types and preparation; Sterilization of media

Getting pure culture: Isolation techniques: Pour plate, spread plate, streak plate, serial dilutions, Preservation and maintenance of cultures in the lab for further use in microbial processing.

Section D

Microbial growth and its measurement: Microbial growth, factors affecting the growth of microorganisms: pH, temperature, aeration, agitation, and oxygen requirements

Course Outcome: Students will be able to gain knowledge regarding the scope, general characteristics of microorganisms and basic techniques in microbiology.

Recommended books:

1. Stanier RY, Adelberg EA, and Ingraham JL. General Microbiology, 4th edn. Mac Millan Press.
2. Pelczar MJ, Chan ECS, and Krieg NR. Microbiology, 5th edn. McGraw Hill.
3. Prescott LM, Harley JP, and Kreig DA. Microbiology, WCB Publishers.

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Subject Name: Microbial Processes
Subject Code: ODFMP112T

Time: 03 Hours **Max. Marks: 100 Marks**
Internal Assessment: 30 Marks
End Term: 70 Marks

Instructions for the Paper-Setter/examiner:

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Section A

Introduction to microbial processes, Industrially important microbial processes, Outline of a microbial bioprocess, Entrepreneurship opportunities in microbiological processes, Artificial Intelligence (AI) in microbiology.

Section B

Microbial processes for enzymes and biofuels: Bioprospection of microorganisms for industrially important enzymes, Bioprocessing of agro-waste biomass to bioethanol

Section C

Microbial processes for sustainable agriculture: Biofertilizers (nitrogen fixing and phosphate solubilizing bacteria), biocontrol agents (bacterial and fungal), Mushroom cultivation.

Section D

Microbiology of functional foods: Probiotics, prebiotics and nutraceuticals, Microbial vinegar and wine production.

Course Outcome: Students will be able to gain knowledge regarding the microbial processes in general and specific to various industries, and entrepreneurship opportunities in microbial-based processes.

Recommended books and articles:

1. Casida LE. Industrial Microbiology. 2nd edn., New Age International, 2016, ISBN10:8122438024
2. Amritesh C. Shukla (Eds.). Entrepreneurship with microorganisms. 1st edn., Academic Press, 2023, ISBN 978-0-443-19049-0
3. Gupta VK et al. (Eds.). Microbial Functional Foods and Nutraceuticals. 1st edn., John Wiley & Sons Ltd., 2018, ISBN:9781119049012
4. Tsitou, VM et al. (2024). Microbiology in the era of artificial intelligence. Biotechnol. Biotechnol. Equip. 38(1). https://doi.org/10.1080/13102818.2024.2349587
5. Samantaray, B et al. (2023). Bioethanol production from agro-waste. Int. J. Green Energy, 21(6), 1398–1424. https://doi.org/10.1080/15435075.2023.2253871

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Subject Name: Microbial Quality Assurance
Subject Code: ODFMP113T

Time: 03 Hours **Max. Marks: 100 Marks**

Internal Assessment: 30 Marks

End Term: 70 Marks

Instructions for the Paper-Setter/examiner:

1. Question paper shall consist of **Four sections**.
2. Paper setter shall set **Eight questions** in all by selecting **Two questions** of equal marks from each section. However, a question may have sub-parts (not exceeding four sub-parts) and appropriate allocation of marks should be done for each sub-part.
3. Candidates shall attempt **Five questions** in all, by at least selecting **One question** from each section and the **5th question** may be attempted from any of the **Four sections**.
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SECTION-A

Basic Quality Control and Assurance concept. Determination of hazards -chemical, biological, and physical, Bio-hazardous waste-Methodology of disinfection, Autoclaving and incineration.

SECTION-B

Basic concepts of Good manufacturing practices (GMP), Good lab practices (GLP), Good distribution practices (GDP), Good clinical practices (GCP), Good control laboratory Practices (GCLP), Good agriculture practices (GAP), Good retail practices (GRP), and Good transport practices (GTP)

SECTION-C

Microbiological culture medium used in quality control, Hazard analysis and critical control point (HACCP). BIS and FSSAI: Introduction and standards for common foods and drinking water

SECTION-D

Methods to evaluate the microbial quality of products – MPN method, Rapid detection methods, LAL assay, ATP based method

Course Outcome: The students will learn about the basic protocols and procedures of quality control and good lab practices. They will gain insight into hazard analysis as well as methods to evaluate microbial quality of various samples.

Recommended books:

1. James M Jay, Martin J Loessner, David a Golden., Modern Food Microbiology, &7th edition Springer, USA
2. Adams MR and Moss MO. Food Microbiology, RSC publications, UK
3. Martin RA and Robert MJ. Fermentation and Food safety. Aspen publications, Maryland
4. Gilvbert J., Food packaging: Ensuring the safety and quality of food. Taylorand Francis, Basingstake, Hants, UK
5. Ray B and Bhunia A. Fundamentals Food Microbiology. CRC Publications, UK

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Subject Name: Project
Subject Code: ODFMP114P

Max. Marks: 100 Marks

Project

The students will be assigned projects and/or assignments related to microbiology