

# Faculty of Science

## Bachelor of Science (B.Sc.)

# **SUBJECT: B.SC. INDUSTRIAL MICROBIOLOGY**

## B.Sc. II Semester

## Paper- Minor 2

# Microbes in Environment and Health

## Course Outcomes

| Course Outcomes |                                                                           |                 |
|-----------------|---------------------------------------------------------------------------|-----------------|
| CO. No.         | Course Outcomes                                                           | Cognitive Level |
| CO 1            | To have knowledge of development of Industrial Microbiology.              | U, K            |
| CO 2            | To understand role and scope of Industrial Microbiology for human welfare | U               |

## **Credit and Marking Scheme**

|           | Credits | Marks    |          | Total Marks |
|-----------|---------|----------|----------|-------------|
|           |         | Internal | External |             |
| Theory    | 3       | 30       | 70       | 100         |
| Practical | 1       | 30       | 70       | 100         |
| Total     | 4       |          |          | 200         |

St. Aloysius College (Autonomous), Jabalpur, Madhya Pradesh

Department of Botany & Microbiology

Session 2025-2026

**Syllabus of Theory Paper**

**Part A Introduction**

|                                 |                     |                    |                         |
|---------------------------------|---------------------|--------------------|-------------------------|
| <b>Program:<br/>Certificate</b> | <b>Class: B.Sc.</b> | <b>Year: First</b> | <b>Session: 2025-26</b> |
|---------------------------------|---------------------|--------------------|-------------------------|

**Subject: Industrial Microbiology**

|                       |                                       |                                                                                                                                                |
|-----------------------|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                    | <b>Course Code</b>                    |                                                                                                                                                |
| 2.                    | <b>Course Title</b>                   | <b>Microbes in Environment and Health</b>                                                                                                      |
| 3.                    | <b>Course Type</b>                    | <b>Minor 2</b>                                                                                                                                 |
| 4.                    | <b>Pre-requisite (if any)</b>         | To study this course, a student must have had the subject <b>BIOLOGY</b> in class 12 <sup>th</sup> / certificate/ Diploma                      |
| 5.                    | <b>Course Learning outcomes (CLO)</b> | To have knowledge of development of Industrial Microbiology.<br><br>To understand role and scope of Industrial Microbiology for human welfare. |
| 6.                    | <b>Credit Value</b>                   | 3                                                                                                                                              |
| <b>7. Total Marks</b> | <b>Max. Marks: 30+70</b>              | <b>Min. Passing Marks: 35</b>                                                                                                                  |

**Part B Content of the Course**

**Total no. of Lectures- Tutorials-Practical (in hours per week) - L-T-P:45 hrs**

| <b>Unit</b> | <b>Topics</b>                                                                                                  | <b>No. of Lectures</b> |
|-------------|----------------------------------------------------------------------------------------------------------------|------------------------|
| 1           | Significant contributions by Indian sages and scientists to the understanding and development of microbiology. | 12                     |

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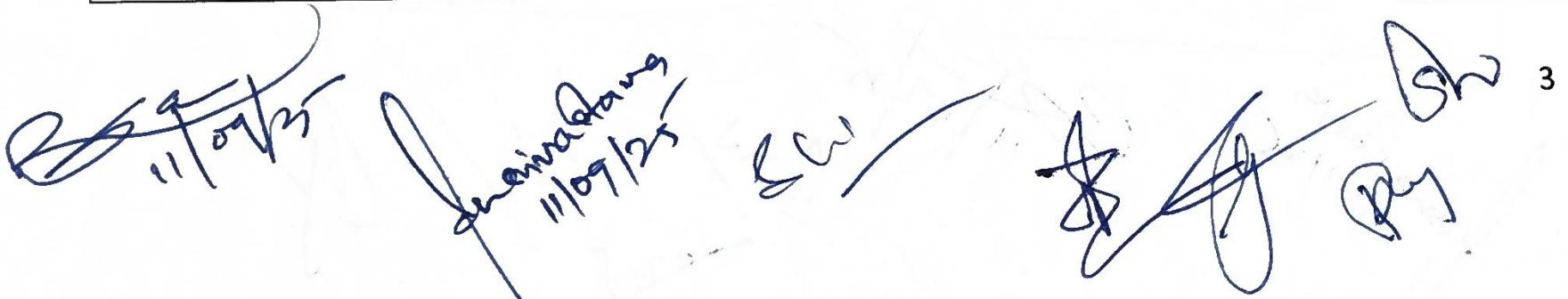
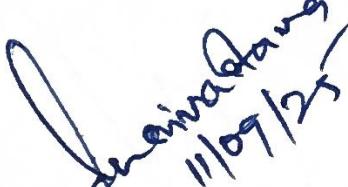
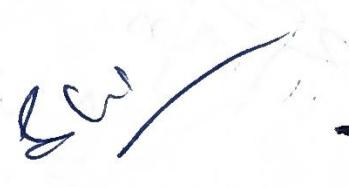
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|   | <p>Context of microbiology in ancient texts (Sushruta and Charaka). Contribution of modern Indian scientists in advanced microbiological research.</p> <p><b>Introduction to Microbes</b></p> <ul style="list-style-type: none"> <li>• Definition and types of microbes: Bacteria, Viruses, Fungi, Protozoa, Algae</li> <li>• Beneficial vs. Harmful microbes</li> <li>• Role of microbes in nature</li> </ul> <p><b>Activity:</b> Organize a quiz based on the topic</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |
| 2 | <p><b>Microbes in the Environment</b></p> <p><b>Microbial Ecology</b></p> <ul style="list-style-type: none"> <li>• Microbial diversity in soil, water and air</li> <li>• Role of microbes in biogeochemical cycles (Carbon, Nitrogen, Sulfur, Phosphorus)</li> <li>• Symbiotic relationships (Rhizobium &amp; leguminous plants, Mycorrhizae)</li> </ul> <p><b>Biodegradation &amp; Bioremediation</b></p> <ul style="list-style-type: none"> <li>• Microbes in waste management (sewage treatment, landfill degradation)</li> <li>• Biodegradation of pollutants (oil spills, plastic degradation, heavy metal detoxification)</li> <li>• Bioremediation case studies</li> </ul> <p><b>Microbes and Climate Change</b></p> <ul style="list-style-type: none"> <li>• Role of microbes in greenhouse gas production (methanogens)</li> <li>• Microbes in carbon sequestration (cyanobacteria, phytoplankton)</li> <li>• Impact of climate change on microbial ecology</li> </ul> <p><b>Activity:</b> Prepare Chart/Poster on the topic</p> | 11 |
| 3 | <b>Microbes in Human Health</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 11 |


  
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|  | <p><b>Human Microbiome</b></p> <ul style="list-style-type: none"> <li>• Normal flora of the human body</li> <li>• Importance of gut microbiota in digestion and immunity</li> </ul> <p><b>Pathogenic Microbes and Diseases</b></p> <ul style="list-style-type: none"> <li>• Bacterial diseases (Tuberculosis, Cholera, Typhoid)</li> <li>• Viral diseases (Influenza, Hepatitis, HIV/AIDS, COVID-19)</li> <li>• Fungal infections (Candidiasis, Ringworm)</li> <li>• Protozoan diseases (Malaria, Amoebiasis)</li> </ul> <p><b>Microbial Control Measures</b></p> <ul style="list-style-type: none"> <li>• Antibiotics and their mechanisms</li> <li>• Vaccines and immunization</li> <li>• Sterilization and disinfection</li> </ul> <p><b>Activity:</b> Organize a Scientific Talk Session</p> |
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|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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| 4 | <p><b>Microbes in Food and Industry</b></p> <p><b>Microbes in Food</b></p> <p>Fermented foods (Idli, Dosa, Dahi, Buttermilk, Cheese, Yoghurt)</p> <p>Probiotics and their health benefits</p> <p>Food spoilage and preservation methods</p> <p><b>Microbes in Biotechnology and Medicine</b></p> <p>Production of antibiotics (Penicillin)</p> <p>Role in vaccine production (Recombinant vaccines)</p> <p>Industrial applications (Ethanol production, Biogas, Enzymes)</p> <p><b>Activity:</b> Prepare Models on the topic</p> |
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**Keywords/Tags:** Use of Microbes in industry.

#### Part C- Learning Resources

##### Text Books, Reference Books, Other Resources

*Januvaranjan  
11/09/22*

### 1 Suggested Readings:

1. Dubey R. C. and D. K. Maheswari (2004). A text book of Microbiology, I<sup>st</sup> Edition; S. C. Chand and Company Ltd.
2. Sukshmjeevanu in Vedas: The Forgotten Past of Microbiology in Indian Vedic Knowledge, U. Kuhad, G. Goel, P. K. Maurya, R. C. Kuhad, Indian J Microbiol. <https://doi.org/10.1007/s12088-020-00911-5>

### 2. Suggestive digital platforms web links

<https://nptel.ac.in/courses/102/103/102103015/microbiology>

### Suggested equivalent online courses:

[https://www.researchgate.net/publication/325320951\\_VEDIC\\_MICROBIOLOGY\\_Microbiology\\_in\\_the\\_Vedas-\\_A\\_Revived\\_History](https://www.researchgate.net/publication/325320951_VEDIC_MICROBIOLOGY_Microbiology_in_the_Vedas-_A_Revived_History)

[https://www.researchgate.net/profile/Chakradhar-Frend/publication/325320951\\_VEDIC\\_MICROBIOLOGY\\_Microbiology\\_in\\_the\\_Vedas-\\_A\\_Revived\\_History/links/5df708d94585159aa4808738/VEDIC-MICROBIOLOGY-Microbiology-in-the-Vedas-A-Revived-History.pdf](https://www.researchgate.net/profile/Chakradhar-Frend/publication/325320951_VEDIC_MICROBIOLOGY_Microbiology_in_the_Vedas-_A_Revived_History/links/5df708d94585159aa4808738/VEDIC-MICROBIOLOGY-Microbiology-in-the-Vedas-A-Revived-History.pdf)

[http://krepublishers.com/02-Journals/JBD/JBD-07-0-000-16-Web/JBD-07-2-000-16-Abst-PDF/JBD-07-2-101-16-055-Padhy-S/JBD-07-2-101-16-055-Padhy-S-Tx\[3\].pmd.pdf](http://krepublishers.com/02-Journals/JBD/JBD-07-0-000-16-Web/JBD-07-2-000-16-Abst-PDF/JBD-07-2-101-16-055-Padhy-S/JBD-07-2-101-16-055-Padhy-S-Tx[3].pmd.pdf)

### Part D - Assessment and Evaluation

#### Suggested Continuous Evaluation Methods:

Maximum Marks: 100

Continuous Comprehensive Evaluation (CCE): 30 marks      Final Exam (UE): 70 marks

|                                                                              |                                                                                                                                                                                            |                                                       |
|------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| <b>Internal Assessment:</b><br>Continuous Comprehensive Evaluation (CCE): 30 | Class Test - 2<br><br>Assignment/ Presentation – 1<br><br>(3 CCE will be taken)                                                                                                            | 15 marks each (Best two will be considered)<br><br>30 |
| <b>External Assessment:</b><br>Final Exam: 70                                | <b>Section(A):</b> Objective type questions (1X5=5)<br><br><b>Section (B):</b> Short questions (200 words each/ 5X5=25)<br><br><b>Section (C):</b> Long questions (500 words each/ 8X5=40) | -70                                                   |

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Anupavastava

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