



Date :- 01/08/2024

### **NOTIFICATION**

Sub :- CBCS Syllabi of B. Sc. in Microbiology (Sem. I & II)

Ref. :- Decision of the Academic Council at its meeting held on 27/07/2024.

The Syllabi of B. Sc. in Microbiology (First and Second Semesters) as per **NATIONAL EDUCATION POLICY – 2020 (2024 Pattern)** and approved by the Academic Council as referred above are hereby notified for implementation with effect from the academic year 2024-25.

Copy of the Syllabi Shall be downloaded from the College Website ([www.kcesmjcollege.in](http://www.kcesmjcollege.in))

**Sd/-**  
**Chairman,**  
**Board of Studies**

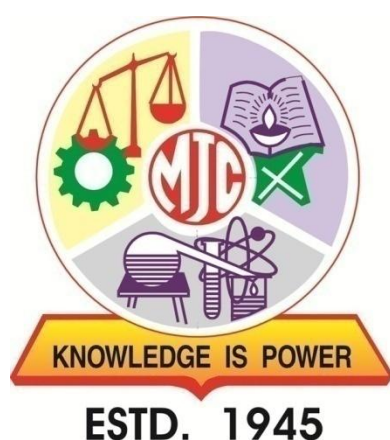
**To :**

- 1) The Head of the Dept., M. J. College, Jalgaon.
- 2) The office of the COE, M. J. College, Jalgaon.
- 3) The office of the Registrar, M. J. College, Jalgaon.

**Knowledge is Power**

Khandesh College Education Society's  
**Moolji Jaitha College, Jalgaon**  
An "Autonomous College"

Affiliated to  
Kavayitri Bahinabai Chaudhari  
North Maharashtra University, Jalgaon 425001



**STRUCTURE AND SYLLABUS**  
**B.Sc. Honors/Honors with Research**  
**(F.Y.B.Sc. Microbiology)**

**Under Choice Based Credit System(CBCS)**  
**and**  
**as per NEP-2020 Guidelines**

**[w.e.f.Academic Year:2024-25]**

## Preface

Skilled human resources is a prerequisite in higher education, and it is necessary to acquire a thorough knowledge of theoretical concepts and hands-on laboratory methods. The Moolji Jaitha College (Autonomous) has adopted a department-specific model as per the guidelines of UGC, NEP-2020 and the Government of Maharashtra. The Board of Studies in Microbiology and Biotechnology of the college has prepared the syllabus for the first-year undergraduate of Microbiology. The syllabus cultivates theoretical and practical know-how in different fields of microbiology. The contents of the syllabus have been prepared to accommodate the fundamental and applied aspects of various microbiology disciplines. Besides this, in the first year, the students will be enlightened about the skills related to microbial isolation, identification, and testing, which will enhance their employability.

The overall curriculum of three / four years covers general microbiology, biomolecules and microbial metabolism, molecular biology and microbial genetics, medical microbiology and immunology, industrial and applied microbiology, and environmental microbiology, and also covers various biotechniques. Furthermore, the syllabus is meticulously structured to cater to Microbiology's present and future needs of the Industrial Sector, research field, Environmental Area, Entrepreneurship, etc., ensuring that our graduates are well-prepared for real-world challenges. The curriculum strongly emphasises imparting hands-on skills, with more experiments that run hand-in-hand with theory. The detailed syllabus of each paper is appended with a list of suggested readings.

### Program Outcomes (PO) for B.Sc. Program:

Program outcomes associated with a B.Sc. degree are as follows:

1. Graduates should have a comprehensive knowledge and understanding of the fundamental principles, theories, and concepts in their chosen field of study.
2. Graduates should possess the necessary technical skills and competencies related to their discipline, including laboratory techniques and data analysis.
3. Graduates should be able to identify, analyze, and solve complex problems using logical and critical thinking skills. They should be able to apply scientific methods and principles to investigate and find solutions.
4. Graduates should be proficient in effectively communicating scientific information, both orally and in writing.
5. Graduates should have a basic foundation in research methods and be capable of designing and conducting scientific investigations.
6. Graduates should be able to work effectively as part of a team, demonstrating the ability to collaborate with others, respect diverse perspectives, and contribute to group projects.
7. Graduates should recognize the importance of ongoing learning and professional development. They should be equipped with the skills and motivation to continuously learn, adapt to new technologies and advancements in their field, and stay updated with current research.

### Program Specific Outcome PSO (B.Sc. Microbiology):

After completion of this course, students are expected to learn/understand the following:

|   |                                                                                           |
|---|-------------------------------------------------------------------------------------------|
| 1 | Isolation, identification and characterization of various microbes from diverse habitats. |
| 2 | Impact of various groups of microbes on atmosphere, plant, human and animal health.       |
| 3 | Principle and applications of various bio-analytical tools and techniques                 |
| 4 | Structure, properties, pathways and applications of biomolecules in various fields        |
| 5 | Biochemical mechanisms, regulation and application of enzymes in various sectors          |
| 6 | Applications of microbes in various fields such as agriculture, industry, medical etc.    |

### Multiple Entry and Multiple Exit options:

The multiple entry and exit options with the award of UG certificate/ UG diploma/ or three-year degree depending upon the number of credits secured;

| Levels | Qualification Title                                                          | Credit Requirements |         | Semester | Year |
|--------|------------------------------------------------------------------------------|---------------------|---------|----------|------|
|        |                                                                              | Minimum             | Maximum |          |      |
| 4.5    | UG Certificate                                                               | 40                  | 44      | 2        | 1    |
| 5.0    | UG Diploma                                                                   | 80                  | 88      | 4        | 2    |
| 5.5    | Three Year Bachelor's Degree                                                 | 120                 | 132     | 6        | 3    |
| 6.0    | Bachelor's Degree- Honours<br>Or<br>Bachelor's Degree- Honours with Research | 160                 | 176     | 8        | 4    |

### Credit distribution structure for Three/ Four year Honors/ Honors with Research Degree Programme with Multiple Entry and Exit

#### F.Y. B.Sc.

| Year (Level)                                                                                                                                    | Sem      | Subject-I (M-1)        | Subject-II (M-2)       | Subject-III (M-3)      | Open Elective (OE)   | VSC, SEC (VSEC) | AEC, VEC, IKS                                | CC, FP, CEP, OJT, RP | Cumulative Credits/Sem | Degree/ Cumulative Credit |
|-------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------------------|------------------------|------------------------|----------------------|-----------------|----------------------------------------------|----------------------|------------------------|---------------------------|
| I (4.5)                                                                                                                                         | I        | DSC-1(2T)<br>DSC-2(2P) | DSC-1(2T)<br>DSC-2(2P) | DSC-1(2T)<br>DSC-2(2P) | OE-1(2T)             | ---             | AEC-1(2T) (Eng)<br>VEC-1(2T) (ES)<br>IKS(2T) | CC-1(2T)             | 22                     | UG Certificate            |
|                                                                                                                                                 | II       | DSC-3(2T)<br>DSC-4(2P) | DSC-3(2T)<br>DSC-4(2P) | DSC-3(2T)<br>DSC-4(2P) | OE-2(2T)<br>OE-3(2P) | ---             | AEC-2(2T) (Eng)<br>VEC-2(2T) (CI)            | CC-2(2T)             | 22                     |                           |
|                                                                                                                                                 | Cum. Cr. | 8                      | 8                      | 8                      | 6                    | ---             | 10                                           | 4                    | 44                     |                           |
| Exit option: Award of UG Certificate with 44 credits and an additional 4 credits core NSOF course/ Internship OR Continue with Major and Minor. |          |                        |                        |                        |                      |                 |                                              |                      |                        |                           |

#### S.Y. B.Sc.

| Year<br>(Level)                                                                                                                                              | Sem          | Subject-I<br>(M-1)<br>Major*         |                   | Subject-II<br>(M-2)<br>Minor #      | Subject-III<br>(M-3) | Open<br>Elective<br>(OE) | VSC,<br>SEC<br>(VSEC)  | AEC, VEC,<br>IKS   | CC, FP,<br>CEP,<br>OJT/Int/RP | Cumulative<br>Credits/Sem | Degree/<br>Cumulative<br>Credit |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------------------------------|-------------------|-------------------------------------|----------------------|--------------------------|------------------------|--------------------|-------------------------------|---------------------------|---------------------------------|
|                                                                                                                                                              |              | Mandatory<br>(DSC)                   | Elective<br>(DSE) | (MIN)                               |                      |                          |                        |                    |                               |                           |                                 |
| 2<br>(5.0)                                                                                                                                                   | III          | DSC-5(2T)<br>DSC-6(2T)<br>DSC-7(2P)  | ---               | MIN-1(2T)<br>MIN-2(2T)<br>MIN-3(2P) | ---                  | OE-4(2T)                 | SEC-1(2T)              | AEC-3(2T)<br>(MIL) | CC-3(2T)<br>CEP(2)            | 22                        | UG<br>Diploma                   |
|                                                                                                                                                              | IV           | DSC-8(2T)<br>DSC-9(2T)<br>DSC-10(2P) | ---               | MIN-4(2T)<br>MIN-5(2P)              | ---                  | OE-5(2T)                 | SEC-2(2T)<br>SEC-2(2P) | AEC-4(2T)<br>(MIL) | CC-4(2T)<br>⊗ FP(2)           | 22                        |                                 |
|                                                                                                                                                              | Cum<br>. Cr. | 12                                   | ---               | 10                                  | ---                  | 4                        | 6                      | 4                  | 8                             | 44                        |                                 |
| Exit option: Award of UG Diploma in Major and Minor with 88 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major & Minor. |              |                                      |                   |                                     |                      |                          |                        |                    |                               |                           |                                 |

\* Student must choose one subject as a Major subject out of M-1, M-2 and M-3 that he/she has chosen at First year

#Student must choose one subject as a Minor subject out of M-1, M-2 and M-3 that he/she has chosen at First year (Minor must be other than Major)

⊗ OJT/Internship/CEP should be completed in the summer vacation after 4<sup>th</sup> semester

## T.Y. B.Sc.

| Year<br>(Level) | Sem          | Subject-I<br>(M-1)<br>Major                                                                           |                                      | Subject-II<br>(M-2)<br>Minor | Subject-III<br>(M-3) | Open<br>Elective<br>(OE) | VSC,<br>SEC<br>(VSEC)  | AEC,<br>VEC,<br>IKS | CC, FP, CEP,<br>OJT/Int/RP | Cumulative<br>Credits/Sem | Degree/<br>Cumulative<br>Credit |
|-----------------|--------------|-------------------------------------------------------------------------------------------------------|--------------------------------------|------------------------------|----------------------|--------------------------|------------------------|---------------------|----------------------------|---------------------------|---------------------------------|
|                 |              | Mandatory<br>(DSC)                                                                                    | Elective<br>(DSE)                    | (MIN)                        |                      |                          |                        |                     |                            |                           |                                 |
| 3<br>(5.5)      | V            | DSC-11(2T)<br>DSC-12(2T)<br>DSC-13(2T)<br>DSC-14(2P)<br>DSC-15(2P)                                    | DSE-1A/B<br>(2T)<br>DSE-2A/B<br>(2P) | ---                          | ---                  | ---                      | VSC-1(2T)<br>VSC-2(2P) | ---                 | OJT/Int (4)                | 22                        | UG<br>Degree                    |
|                 | VI           | DSC-16(2T)<br>DSC-17(2T)<br>DSC-18(2T)<br>DSC-19(2T)<br>DSC-20(2T)<br>IKS<br>DSC-21(2P)<br>DSC-22(2P) | DSE-3A/B<br>(2T)<br>DSE-4A/B<br>(2P) | ---                          | ---                  | ---                      | VSC-3(2T)<br>VSC-4(2P) | ---                 | ---                        | 22                        |                                 |
|                 | Cum<br>. Cr. | 24                                                                                                    | 8                                    | ---                          | ---                  | ---                      | 8                      | ---                 | 4                          | 44                        |                                 |
|                 |              | Exit option: Award of UG Degree in Major with 132 credits OR Continue with Major and Minor            |                                      |                              |                      |                          |                        |                     |                            |                           |                                 |

## Fourth Year B.Sc. (Honours)

| Year<br>(Level)                                                | Sem         | Major Core Subjects                                  |                                      | Research<br>Methodology<br>(RM) | VSC,<br>SEC<br>(VSEC) | OE  | AEC, VEC,<br>IKS | CC, FP,<br>CEP,<br>OJT/Int/RP | Cumulative<br>Credits/Sem | Degree/<br>Cumulative<br>Credit |
|----------------------------------------------------------------|-------------|------------------------------------------------------|--------------------------------------|---------------------------------|-----------------------|-----|------------------|-------------------------------|---------------------------|---------------------------------|
| IV<br>(6.0)                                                    | VII         | DSC-23(4T)<br>DSC-24(4T)<br>DSC-25(4T)<br>DSC-26(2P) | DSE-5A/B<br>(2T)<br>DSE-6A/B<br>(2P) | RM(4T)                          | ---                   | --- | ---              | ---                           | 22                        | UG<br>Honours<br>Degree         |
|                                                                | VIII        | DSC-27(4T)<br>DSC-28(4T)<br>DSC-29(4T)<br>DSC-30(2P) | DSE-7A/B<br>(2T)<br>DSE-8A/B<br>(2P) | ---                             | ---                   | --- | ---              | OJT/Int (4)                   | 22                        |                                 |
|                                                                | Cum.<br>Cr. | 28                                                   | 8                                    | 4                               | ---                   | --- | ---              | 4                             | 44                        |                                 |
| Four Year UG Honors Degree in Major and Minor with 176 credits |             |                                                      |                                      |                                 |                       |     |                  |                               |                           |                                 |

## Fourth Year B.Sc. (Honours with Research)

| Year (Level)                                                                  | Sem      | Major Core Subjects                    |                                | Research Methodology (RM) | VSC, SEC (VSEC) | OE  | AEC, VEC, IKS | CC, FP, CEP, OJT/Int/RP | Cumulative Credits/Sem | Degree/ Cumulative Credit       |
|-------------------------------------------------------------------------------|----------|----------------------------------------|--------------------------------|---------------------------|-----------------|-----|---------------|-------------------------|------------------------|---------------------------------|
| IV (6.0)                                                                      | VII      | DSC-23(4T)<br>DSC-24(4T)<br>DSC-26(2P) | DSE-5A/B (2T)<br>DSE-6A/B (2P) | RM(4T)                    | ---             | --- | ---           | RP(4)                   | 22                     | UG Honours with Research Degree |
|                                                                               | VIII     | DSC-27(4T)<br>DSC-28(4T)<br>DSC-30(2P) | DSE-7A/B (2T)<br>DSE-8A/B (2P) | ---                       | ---             | --- | ---           | RP(8)                   | 22                     |                                 |
|                                                                               | Cum. Cr. | 20                                     | 8                              | 4                         | ---             | --- | ---           | 12                      | 44                     |                                 |
| Four Year UG Honours with Research Degree in Major and Minor with 176 credits |          |                                        |                                |                           |                 |     |               |                         |                        |                                 |

**Sem-** Semester, **DSC-** Department Specific Course, **DSE-** Department Specific Elective, **OE/GE-** Open/Generic elective, **VSC-** Vocational Skill Course, **SEC-** Skill Enhancement Course, **VSEC-** Vocation and Skill Enhancement Course, **AEC-** Ability Enhancement Course, **IKS-** Indian Knowledge System, **VEC-** Value Education Course, **T-** Theory, **P-** Practical, **CC-** Co-curricular **RM-** Research Methodology, **OJT-** On Job Training, **FP-** Field Project, **Int-** Internship, **RP-** Research Project, **CEP-** Community Extension Programme, **ENG-** English, **CI-** Constitution of India, **MIL-** Modern Indian Language

- Number in bracket indicate credit
- The courses which do not have practical 'P' will be treated as theory 'T'
- If student select subject other than faculty in the subjects M-1, M-2 and M-3, then that subject will be treated as Minor subject, and cannot be selected as Major at second year.

## Details of F.Y. B.Sc. (Microbiology)

| Course                   | Course Type | Course Code | Course Title                             | Credits | Teaching Hours/ Week |     |       | Marks    |     |          |     |
|--------------------------|-------------|-------------|------------------------------------------|---------|----------------------|-----|-------|----------|-----|----------|-----|
|                          |             |             |                                          |         | T                    | P   | Total | Internal |     | External |     |
|                          |             |             |                                          |         |                      |     |       | T        | P   | T        | P   |
| Semester I, Level – 4.5  |             |             |                                          |         |                      |     |       |          |     |          |     |
| DSC-1                    | DSC         | MIB-DSC-111 | Fundamentals of Microbiology             | 2       | 2                    | --- | 2     | 20       | --- | 30       | --- |
| DSC-2                    | DSC         | MIB-DSC-112 | Practical course on Basic Microbiology   | 2       | ---                  | 4   | 4     | ---      | 20  | ---      | 30  |
| OE-1                     | OE          | MIB-OE-111  | Health and Human Microbiome              | 2       | 2                    | --- | 2     | 20       | --- | 30       | --- |
| Semester II, Level – 4.5 |             |             |                                          |         |                      |     |       |          |     |          |     |
| DSC-3                    | DSC         | MIB-DSC-121 | Basic Techniques in Microbiology         | 2       | 2                    | --- | 2     | 20       | --- | 30       | --- |
| DSC-4                    | DSC         | MIB-DSC-122 | Practical course on Microbial techniques | 2       | ---                  | 4   | 4     | ---      | 20  | ---      | 30  |
| OE-2                     | OE          | MIB-OE-121  | Microbial diseases and control           | 2       | 2                    | --- | 2     | 20       | --- | 30       | --- |
| OE-3                     | OE          | MIB-OE-122  | Practical course on Microbiology         | 2       | ---                  | 4   | 4     | ---      | 20  | ---      | 30  |

## Examination Pattern

### Theory Question Paper Pattern:

- 30 (External) +20 (Internal) for 2 credits
  - External examination will be of 1½ hours duration
  - There shall be 3 questions Q1 carrying 6 marks and Q2, Q3 carrying 12 marks each. while the tentative pattern of question papers shall be as follows;
  - Q1 Attempt any 2 out of 3 sub-questions; each 3 marks
  - Q 2 and Q3 Attempt any 3 out of 4 sub-question; each 4 marks.

### Rules of Continuous Internal Evaluation:

The Continuous Internal Evaluation for theory papers shall consist of two methods:

**1. Continuous & Comprehensive Evaluation (CCE):** CCE will carry a maximum of 30% weightage (30/15 marks) of the total marks for a course. Before the start of the academic session in each semester, the subject teacher should choose any three assessment methods from the following list, with each method carrying 10/5 marks:

- i. Individual Assignments
- ii. Seminars/Classroom Presentations/Quizzes
- iii. Group Discussions/Class Discussion/Group Assignments
- iv. Case studies/Case lets
- v. Participatory & Industry-Integrated Learning/Field visits
- vi. Practical activities/Problem Solving Exercises
- vii. Participation in Seminars/Academic Events/Symposia, etc.
- viii. Mini Projects/Capstone Projects
- ix. Book review/Article review/Article preparation
- x. Any other academic activity
- xi. Each chosen CCE method shall be based on a particular unit of the syllabus, ensuring that three units of the syllabus are mapped to the CCEs.

**2. Internal Assessment Tests (IAT):** IAT will carry a maximum of 10% weightage (10/5 marks) of the total marks for a course. IAT shall be conducted at the end of the semester and will assess the remaining unit of the syllabus that was not covered by the CCEs. The subject teacher is at liberty to decide which units are

to be assessed using CCEs and which unit is to be assessed on the basis of IAT.

The overall weightage of Continuous Internal Evaluation (CCE + IAT) shall be 40% of the total marks for the course. The remaining 60% of the marks shall be allocated to the semester-end examinations.

The subject teachers must communicate the chosen CCE methods and the corresponding syllabus units to the students at the beginning of the semester to ensure clarity and proper preparation.

### **Practical Examination Credit 2: Pattern (30+20)**

#### **External Practical Examination (30 marks):**

- Practical examination shall be conducted by the respective department at the end of the semester.
- Practical examination will be of 3 hours duration and shall be conducted as per schedule.
- Where an incubation condition is required, a practical examination shall be conducted for 2 consecutive days for 2 hours/day.
- There shall be 05 marks for journal and viva voce. A certified journal is compulsory to appear for practical examination.
- The external practical examination of SEC will be of 25 marks, and there will be no internal exam for SEC practical.

#### **Internal Practical Examination (20 marks):**

- Internal practical examination of 10 marks will be conducted by the department as per the schedule given.
- For internal practical examination, students must produce the laboratory journal of practicals completed along with the completion certificate signed by the concerned teacher and the Head of the department.
- There shall be continuous assessment of 30 marks based on student performance throughout the semester. This assessment can include quizzes, group discussions, presentations and other activities assigned by the faculty during regular practicals. For details, refer to internal theory examination guidelines.
- Finally, 40 (10+30) marks of performance of the student will be converted into 20 marks.

**F.Y.B.Sc.  
(Microbiology)  
Semester I**



**FYBSc (Microbiology)****Semester I****MIB-DSC-111: Fundamentals of Microbiology****Total Hours: 30****Credits: 2**

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |              |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>Course objectives</b> | <ul style="list-style-type: none"> <li>To understand the scope of microbiology</li> <li>To make the student aware of the history of microbiology</li> <li>Acquaint concepts related to prokaryotic cell</li> <li>To understand the microscopic techniques</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                     |              |
| <b>Course outcomes</b>   | After successful completion of this course, students are expected to: <ul style="list-style-type: none"> <li>Aware of the scope of subject and microbial diversity</li> <li>Know general pertinent to historical aspects related to microbiology</li> <li>Infer anatomy of prokaryotic cells and functions of various cell parts</li> <li>Aware of fundamentals of microscopy and staining techniques</li> </ul>                                                                                                                                                                                                                                                                         |              |
| <b>Unit</b>              | <b>Topic Particular</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Hours</b> |
| <b>Unit I</b>            | <b>Scope and diversity of microbiology</b> <ul style="list-style-type: none"> <li>Scope of microbiology in the various disciplines</li> <li>Concept of Prokaryotic and Eukaryotic cells</li> <li>Concept of microbial diversity with various examples</li> <li>General characteristics, morphological features, classification and significance of -Bacteria, Fungi, Algae, Protozoa and Viruses</li> <li>Other forms of microbes: Rickettsia, Mycoplasma, Actinomycetes, Archaeobacteria, Cyanobacteria</li> <li>Methods in microbial taxonomy</li> <li>Bionomical nomenclature and basic rules</li> </ul>                                                                              | 7            |
| <b>Unit II</b>           | <b>Historical developments</b> <ul style="list-style-type: none"> <li>Spontaneous generation (abiogenesis) – Concept and experimental evidence to disprove it</li> <li>Discovery of Microscope</li> <li>Germ theory of Fermentation</li> <li>Germ theory of Disease: Koch's and Revere's postulate</li> <li>Development of pure culture methods, solidifying agent (potato, gelatin, agar agar)</li> <li>Contribution(s) of the following scientists in the development of microbiology: Antonie von Leeuwenhoek, Louis Pasteur, Robert Koch, Alexander Fleming.</li> </ul>                                                                                                              | 8            |
| <b>Unit III</b>          | <b>Anatomy of Prokaryotic cell</b> <ul style="list-style-type: none"> <li>Ultra-structure of bacterial cell</li> <li>Cell size, shape and arrangement of bacteria</li> <li>Structure, function and chemical composition of the following               <ul style="list-style-type: none"> <li>Glycocalyx/capsule, flagella, pili, cell wall (with concept of spheroplasts, protoplasts, and L-forms), cell membrane, nucleoid mesosomes, plasmid, Ribosome, cytoplasmic inclusions (volutin granules, PHB granule, glycogen, carbohydrates, Magnetosomes, gas vesicles, carboxysomes, chlorosome and sulphur granules)</li> </ul> </li> <li>Endospore structure and formation</li> </ul> | 8            |
| <b>Unit IV</b>           | <b>Microscopy and staining</b> <ul style="list-style-type: none"> <li>Basics of microscopy: magnification, resolution, numerical aperture, illumination system.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 7            |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | <ul style="list-style-type: none"> <li>• Compound microscope: construction, principle with ray diagram, working, lens system, handling and care of the microscope</li> <li>• Oil immersion objective: importance and working</li> <li>• Concept and types of aberrations</li> <li>• Concepts of dye and stain (acidic and basic); mordant and fixative</li> <li>• Smear preparation and basics of staining techniques</li> <li>• Methods of staining: <ul style="list-style-type: none"> <li>○ Simple (Monochrome and Negative)</li> <li>○ Differential (Gram's and Acid fast)</li> <li>○ Other staining: capsule, spore, metachromatic granules etc.</li> </ul> </li> </ul> |  |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

#### References

- Tortora, G. J., Funke, B. R., & Case, C. L. (2008). Microbiology: An Introduction (9<sup>th</sup> ed.). Pearson Education, New Delhi.
- Talaro, K. & Chess, B. (2012). Foundations in Microbiology (8<sup>th</sup> ed.). The McGraw-Hill Companies, Inc., New York.
- Tortora, Funke, and Case (2010) Microbiology, 10<sup>th</sup> edition, Benjamin Cummings Inc., California.
- Patil U. K., Kulkarni, J. S., Chaudhari, A. B., & Chincholkar, S. B. (2016). Foundations in Microbiology, 9<sup>th</sup> edition, Nirali Prakashan, Pune
- Frobisher, M., Hindsill, Crabtree, and Goodheart, (1974). Fundamentals of Microbiology, 9<sup>th</sup> edition, WB Saunders's Co., USA.
- Dubey, R. C., & Maheshwari, D. K. (2005). Text Book of Microbiology, S Chand and Co, New Delhi

## FYBSc (Microbiology)

### Semester I

#### MIB-DSC-112: Practical course on Basic Microbiology

Total Hours: 60

Credits: 2

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |              |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>Course objectives</b> | <ul style="list-style-type: none"><li>To acquaint basic microbiological instruments and techniques</li><li>To study various microorganisms present in the ecosystem</li><li>To observe and learn the microbes using various staining techniques</li><li>To characterize the microbes using biochemical tests</li></ul>                                                                                                                                                           |              |
| <b>Course Outcomes</b>   | After successful completion of this course, students are expected to: <ul style="list-style-type: none"><li>Understand the basic microbial practices, instruments, appropriate protective and emergency procedures</li><li>Study the comparative characteristics of prokaryotes and eukaryotes</li><li>Learn theory and practical skills in microscopy, staining procedures and growth</li><li>Comprehend the various methods for the identification of microorganisms</li></ul> |              |
| <b>Sr. No.</b>           | <b>TopicParticular</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Hours</b> |
| 1                        | Microbiology Good Laboratory Practices, laboratory rules and first aid.                                                                                                                                                                                                                                                                                                                                                                                                          | 4            |
| 2                        | To study the principle, working and application of instruments (biological safety cabinets, autoclave, incubator, BOD incubator, hot air oven, light microscope, pH meter, Balance) used in the microbiology laboratory                                                                                                                                                                                                                                                          | 4            |
| 3                        | Acquainting basic microbiology techniques I: Types of laboratory glassware, Cleaning and washing of Glassware, biosafety measures, disinfection of working table and hands, biological waste Disposal, Use of Microbial culture and its storage                                                                                                                                                                                                                                  | 4            |
| 4                        | Acquainting basic microbiology techniques II: Preparation of culture media for bacterial cultivation, Cotton Plugging, Wrapping the items prior to sterilization, sterilization with autoclave, Aseptic handling (LAF/ Bunsen burner), preparation of plates and slants, inoculation of bacterial culture and inoculating needle, labelling of incubation material, preservation.                                                                                                | 4            |
| 5                        | Use and Care of Compound Microscope with functions of each part                                                                                                                                                                                                                                                                                                                                                                                                                  | 4            |
| 6                        | Study of microbes with using temporary mounts/ permanent slides <ul style="list-style-type: none"><li>Fungus e.g. <i>Rhizopus</i>/ <i>Penicillium</i>/ <i>Aspergillus</i>/ <i>Fusarium</i></li><li>Algae/BGA e.g. <i>Spirogyra</i>/ <i>Anabena</i>/ <i>Nostoc</i>/ <i>Cyanobacteria</i></li><li>Protozoans e.g. <i>Amoeba</i>/ <i>Entamoeba</i>/ <i>Paramecium</i>/ <i>Plasmodium</i></li></ul>                                                                                  | 4            |
| 7                        | Study of colony characteristics of different bacteria (e.g. <i>Escherichia coli</i> , <i>Staphylococcus aureus</i> )                                                                                                                                                                                                                                                                                                                                                             | 4            |
| 8                        | Study of motility of bacteria by hanging drop/ swarming growth                                                                                                                                                                                                                                                                                                                                                                                                                   | 4            |
| 9                        | Microscopic observation of Rhizobacteria from root nodules /mycorrhizal spores from soil                                                                                                                                                                                                                                                                                                                                                                                         | 4            |
| 10                       | Study of bacterial morphology using Monochrome Staining                                                                                                                                                                                                                                                                                                                                                                                                                          | 4            |
| 11                       | Study of morphological features of bacteria using Negative Staining                                                                                                                                                                                                                                                                                                                                                                                                              | 4            |

|    |                                                                     |   |
|----|---------------------------------------------------------------------|---|
| 12 | Study of Gram characteristics of bacteria (Gram's Staining)         | 4 |
| 13 | Study of acid-fast characteristics of bacteria (acid-fast staining) | 4 |
| 14 | Study the bacterial capsule using a suitable staining technique     | 4 |
| 15 | Study the bacterial endospore using a suitable staining technique   | 4 |

#### References

- Atlas, R. M. (1997). Principles of Microbiology, 2<sup>nd</sup> edition, W.M.T. Brown Publishers, Dubuque, USA.
- Cappucino, J & Sherman N.(2010) Microbiology:A Laboratory Manual, 9<sup>th</sup> edition, Pearson Education Limited, New Delhi.
- Parija, S.C. (2005). Text Book of Practical Microbiology,1<sup>st</sup> edition, Ahuja Publishing House, New Delhi.
- Dubey, R. C &Maheshwari D. K. (2004). Practical Microbiology,1<sup>st</sup> edition, S.Chand and Co., Delhi.
- Harley, J. P. & Prescott, L. M. (2002). Laboratory Exercises in Microbiology, 5<sup>th</sup> edition,The McGraw-Hill Co., NewYork.
- Benson, H. (2001). Microbiological Applications Lab Manual, 8<sup>th</sup> edition, The McGraw-Hill Companies, NewYork.
- Aneja, K.R.(1996), Experiments in Microbiology, 3<sup>rd</sup>edition,WishwaPrakashan, New Delhi.

# FYBSc (Microbiology)

## Semester I

### MIB-OE-111: Health and Human Microbiome

Total Hours: 30

Credits: 2

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                             |              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>Course objectives</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>To acquaint basic knowledge of human health and body defence</li> <li>To study a balanced diet and the concept of hygiene</li> <li>To learn different systems of the human body</li> <li>To get aware of microbes associated with human</li> </ul>                                                                                                                                   |              |
| <b>Course outcomes</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | After successful completion of this course, students are expected to: <ul style="list-style-type: none"> <li>Understand the importance of good health and immunity</li> <li>Aware of balanced nutrition and the importance of hygiene</li> <li>Get an understanding of different human systems and their functioning</li> <li>Comprehend the microbes associated with human</li> </ul>                                      |              |
| <b>Unit</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Topic particular</b>                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Hours</b> |
| <b>Unit I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Human Health</b> <ul style="list-style-type: none"> <li>Introduction to health and its determinants</li> <li>Immunity: the body's defence mechanism</li> <li>Types of immunity</li> <li>The cells and organs of the immune system</li> <li>Concept of antigen and antibody</li> </ul>                                                                                                                                    | 7            |
| <b>Unit II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Balance nutrition and hygiene</b> <ul style="list-style-type: none"> <li>Introduction to nutrition</li> <li>Types of nutrients – carbohydrates, fats, proteins, vitamins, minerals</li> <li>Balanced diet, Optimum and good nutrition, malnutrition</li> <li>Concept of hygiene</li> <li>Personal, community and medical hygiene</li> <li>Good practices for hygiene</li> <li>The consequence of poor hygiene</li> </ul> | 7            |
| <b>Unit III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Human Anatomy</b><br>General working knowledge of different anatomical systems/ parts of the body: Respiratory, Gastrointestinal, Central nervous system, Excretory system, Reproductive system, Special senses – skin, eye, ear                                                                                                                                                                                         | 8            |
| <b>Unit IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Human Microbiome</b> <ul style="list-style-type: none"> <li>Normal, resident and transient flora</li> <li>Concept of Pro and prebiotic</li> <li>The beneficial effect of normal flora</li> <li>Microflora of human body</li> <li>Microorganisms and infection</li> </ul>                                                                                                                                                 | 8            |
| <b>References</b> <ul style="list-style-type: none"> <li>Anantnarayan, P. &amp; Paniker, C. K. J., (2009), Textbook of Microbiology 8th Ed, Universities Press, Hyderabad.</li> <li>Atlas, R. M. (1995). Microorganisms in our world, Mosby Year Book Inc.</li> <li>Chakraborty, P. (2013). A text book of Microbiology, New Central Book, Agency, Delhi.</li> <li>Dey, N. C. &amp; Dey, T. K., (1999) Medical Bacteriology and Microbiology, 16th Ed, Allied Agency, Calcutta.</li> <li>Prescott, L. M., Hartley, J. P. &amp; Klein, D. A., (1993), Microbiology, 2<sup>nd</sup> Ed., W. M. C. Brown Publ, England.</li> <li>Tortora, G. J., Funke, B. R. &amp; Case, C. L., (2004), Microbiology, 8th Ed., Person Education (Low Price edition), Delhi.</li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                             |              |

**F.Y.B.Sc.  
(Microbiology)  
Semester II**

**FYBSc (Microbiology)**  
**Semester II**  
**MIB-DSC-121: Basic Techniques in Microbiology**

**Total Hours: 30**

**Credits: 2**

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |              |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>Course objectives</b> | <ul style="list-style-type: none"><li>• To acquaint students with basic concepts of microbial growth</li><li>• To get aware of interactions between microbes and the environment</li><li>• To illustrate the different methods of isolation and cultivation of microbes</li><li>• To elucidate the methods to control microbes</li></ul>                                                                                                                                                                                                                                                                                                                       |              |
| <b>Course outcomes</b>   | <p>After successful completion of this course, students are expected to:</p> <ul style="list-style-type: none"><li>• Aware aspects of bacterial growth and reproduction</li><li>• Learn various aspects of microbial environment adaptations and nutrient medium</li><li>• Understand various methods to cultivate microbes</li><li>• To relate control of microbes with an aseptic condition, disinfection and sterilization</li></ul>                                                                                                                                                                                                                        |              |
| <b>Unit</b>              | <b>Topic particular</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Hours</b> |
| <b>Unit I</b>            | <b>Basics of Microbial Growth and Reproduction</b> <ul style="list-style-type: none"><li>▪ Concept of growth and reproduction,</li><li>▪ Mechanism of binary fission, fragmentation, budding</li><li>▪ Mathematical expression for growth, growth rate and generation time (Illustration with problem).</li><li>▪ Typical growth curve of bacterial population and its significance, Diauxic growth</li><li>▪ Synchronous and continuous growth culture with applications</li><li>▪ Quantitative measurement of bacterial growth</li></ul>                                                                                                                     | <b>08</b>    |
| <b>Unit II</b>           | <b>Microbial growth and environmental factors, medium of growth</b> <ul style="list-style-type: none"><li>• Physical parameters: effect of pH, temperature, water activity, oxygen on growth and cultivation</li><li>• Types of bacteria, mode of their adaptations w.r.t. temperature, pH, Salt/solute and water activity, Oxygen requirement, Pressure.</li><li>• Media ingredients and types of media</li><li>• Classification of bacteria based on nutrition: phototroph and chemotroph</li></ul>                                                                                                                                                          | <b>07</b>    |
| <b>Unit III</b>          | <b>Isolation and cultivation of Microbes</b> <ul style="list-style-type: none"><li>• Enrichment methods for microbes</li><li>• Pure culture technique for bacteria - Streak, Pour plate, Spread plate</li><li>• Cultivation of anaerobes: roll tube method, anaerobic jar and anaerobic cabinet/chamber</li><li>• Cultivation of fungi and blue-green algae</li><li>• Cultivation of animal and plant viruses (living animals, embryonated eggs and cell line cultures), Cultivation of bacteriophage</li></ul>                                                                                                                                                | <b>07</b>    |
| <b>Unit IV</b>           | <b>Control of microbes</b> <ul style="list-style-type: none"><li>• Aseptic condition – necessity, methods (personal protection and aseptic inoculation) and application</li><li>• Concept of: antibiotics, antiseptic, sanitation, sanitizer, germicide, microbiocide, microbiostasis, fumigation.</li><li>• Concept of disinfectant and characters of an ideal disinfectant<ul style="list-style-type: none"><li>○ Mode of action and applications of phenolic compounds, alcohols, halogens, heavy metals compounds, dyes, detergents, quaternary ammonium compounds, and H<sub>2</sub>O<sub>2</sub>.</li></ul></li><li>• Concept of sterilization</li></ul> | <b>08</b>    |

|  |                                                                                                                                                                                                                                                                                                                                                                                              |  |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | <ul style="list-style-type: none"> <li>○ Physical methods: dry heat, moist heat and radiation</li> <li>○ Chemical methods - Ethylene oxide and formaldehyde</li> <li>○ Sterilization by filtration: membrane filter, LAF (HEPA)</li> <li>● Pasteurization - concept and methods</li> <li>● Control of microbes by low temperature, desiccation, osmotic pressure, surface tension</li> </ul> |  |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

#### References

- Black, J. G. (2008). Microbiology: Principles and Explorations, 7<sup>th</sup> edition, Prentice Hall, New Jersey.
- Madigan, M. T. & Martinko, J. M. (2014). Brock Biology of Microorganisms, 14<sup>th</sup> edition, Parker J. Prentice Hall International, Inc., New Jersey.
- Stanier, R. Y, Ingraham, J. L, Wheelis, M. L. & Painter, P. R. (2005), General Microbiology, 5<sup>th</sup> edition, McMillan, London
- Salle, S. J. (1974). Fundamental Principles of Bacteriology, 2<sup>nd</sup> edition, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
- Willey, J. M, Sherwood, L. M., & Woolverton, C. J. (2013) Prescott's Microbiology, 9<sup>th</sup> edition, McGraw Hill Higher Education, New Delhi.
- Patil, U. K, Kulkarni, J. S, Chaudhari, A. B. & Chincholkar, S. B. (2016) Foundation in Microbiology, 9<sup>th</sup> edition, Nirali Prakashan, Pune



**FYBSc (Microbiology)****Semester II****MIB-DSC-122: Practical Course on Microbial Techniques****Total Hours:60****Credits: 2**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                               |              |
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| <b>Course objectives</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>To know the staining procedures for bacterial structures</li> <li>To learn the isolation and cultivation techniques for bacteria</li> <li>To understand the microflora monitoring from air, water and soil</li> <li>To validate the instruments and evaluate the disinfectant</li> </ul>                                                                               |              |
| <b>Course Outcomes</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | After successful completion of this course, students are expected to: <ul style="list-style-type: none"> <li>Stain the bacterial structures using special staining techniques</li> <li>Use pure culture and selective techniques to enrich and isolate microorganisms.</li> <li>Enumerate microflora from different ecological samples</li> <li>Validate and evaluate instruments and disinfectant</li> </ul> |              |
| <b>Sr. No.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Topic Particular</b>                                                                                                                                                                                                                                                                                                                                                                                       | <b>Hours</b> |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Isolation of bacteria from enriched soil sample by streak plate technique                                                                                                                                                                                                                                                                                                                                     | 4            |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Isolation of bacteria from a water sample by spread plate technique                                                                                                                                                                                                                                                                                                                                           | 4            |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Determination of Colony Forming Unit (cfu) by pour plate method from soil/water sample                                                                                                                                                                                                                                                                                                                        | 4            |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Use of selective media for bacteria e.g. MacConkeys / EMB /SS agar                                                                                                                                                                                                                                                                                                                                            | 4            |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Slide culture technique for fungi                                                                                                                                                                                                                                                                                                                                                                             | 4            |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Study micro-flora of the air using settling velocity                                                                                                                                                                                                                                                                                                                                                          | 4            |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Effect of heavy metal (s) on the growth of bacteria and demonstration of oligodynamic action                                                                                                                                                                                                                                                                                                                  | 4            |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Biochemical characterization of bacteria using sugar fermentation (Mono and Di-saccharide)                                                                                                                                                                                                                                                                                                                    | 4            |
| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Biochemical characterization through IMViC test                                                                                                                                                                                                                                                                                                                                                               | 4            |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Biochemical characterization using H <sub>2</sub> S fermentation                                                                                                                                                                                                                                                                                                                                              | 4            |
| 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Effect of temperature on the growth of bacteria                                                                                                                                                                                                                                                                                                                                                               | 4            |
| 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Effect of pH on the growth of bacteria                                                                                                                                                                                                                                                                                                                                                                        | 4            |
| 13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Evaluation of skin disinfectant (alcohol/soap/Dettol) for disinfection                                                                                                                                                                                                                                                                                                                                        | 4            |
| 14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Preparation of standard solutions (Normal/ Molar/ Percentage)                                                                                                                                                                                                                                                                                                                                                 | 4            |
| 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Demonstration of bacterial growth by spectrophotometer                                                                                                                                                                                                                                                                                                                                                        | 4            |
| <b>References</b> <ul style="list-style-type: none"> <li>Atlas, R. M. (1997). Principles of Microbiology, 2<sup>nd</sup> edition, W.M.T. Brown Publishers.</li> <li>Cappuccino, J. &amp; Sherman, N. (2010). Microbiology: A Laboratory Manual, 9<sup>th</sup> edition, Pearson Education Limited, New Jersey.</li> <li>Parija, S. C. (2005). Text Book of Practical Microbiology, 1<sup>st</sup> edition, Ahuja Publishing House, New Delhi.</li> <li>Harley, J. P. &amp; Prescott, L. M. (2002). Laboratory Exercises in Microbiology, 5<sup>th</sup> edition, The McGraw-Hill Companies, London.</li> <li>Benson, H. (2001). Microbiological Applications Lab Manual, 8<sup>th</sup> edition, The McGraw-Hill Companies, New Delhi.</li> <li>Aneja, K. R. (1996). Experiments in Microbiology, 3<sup>rd</sup> edition, WishwaPrakashan, New Delhi.</li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                               |              |

**FYBSc (Microbiology)**  
**Semester II**  
**MIB-OE-121 Microbial diseases and control**

**Total Hours: 30**

**Credits 02**

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                |              |
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| <b>Course objectives</b> | <ul style="list-style-type: none"> <li>To know the concept of medical microbiology</li> <li>To study Bacterial and fungal diseases</li> <li>To learn about viral and protozoal diseases</li> <li>To make aware of control, prevention and treatment of diseases</li> </ul>                                                                                                                                     |              |
| <b>Course outcomes</b>   | After successful completion of this course, students are expected to: <ul style="list-style-type: none"> <li>Understand the fundamentals of medical microbiology</li> <li>Know diseases concerning the few bacterial and fungal causative agents</li> <li>Learn diseases concerning the few viral and protozoal causative agents.</li> <li>Deduce the control, prevention and treatment of diseases</li> </ul> |              |
| <b>Unit</b>              | <b>Topic particular</b>                                                                                                                                                                                                                                                                                                                                                                                        | <b>Hours</b> |
| <b>Unit I</b>            | <b>Concepts in medical microbiology</b> <ul style="list-style-type: none"> <li>Disease-causing agent</li> <li>Types of diseases – Acquired (infections, noninfectious), congenital,</li> <li>Infection: types, source and transmission</li> <li>Signs, symptoms and syndromes</li> <li>Microbial pathogenicity</li> <li>Diagnosis</li> <li>Prevention and treatment</li> </ul>                                 | 7            |
| <b>Unit II</b>           | <b>Bacterial and fungal disease</b><br>Diseases concerning the causative agent, pathogenicity, lab diagnosis, prevention and treatment <ul style="list-style-type: none"> <li>Enteric fever</li> <li>Pneumonia</li> <li>Dermatitis</li> <li>Candidiasis</li> </ul>                                                                                                                                             | 7            |
| <b>Unit III</b>          | <b>Viral and protozoal disease</b><br>Diseases with respect to the causative agent, pathogenicity, lab diagnosis, prevention and treatment <ul style="list-style-type: none"> <li>COVID-19</li> <li>Rabies</li> <li>Malaria</li> <li>Amebic dysentery</li> </ul>                                                                                                                                               | 8            |
| <b>Unit IV</b>           | <b>Control, prevention and treatment</b> <ul style="list-style-type: none"> <li>Vaccination – example and schedule</li> <li>Examples of chemotherapeutic agents – drugs, toxoids, interferons</li> <li>Antimicrobial agents examples – antibacterial, antifungal, antiprotozoal</li> <li>Concept of Multiple drug resistance</li> </ul>                                                                        | 8            |

**References**

- Anantnarayan, P., Paniker, C. K. J., (2009). Textbook of Microbiology 8thEd, Universities Press, Hyderabad.
- Atlas, R. M. (1995). Microorganisms in our world, Mosby Year Book Inc.
- Chakraborty, P. (2013). A textbook on microbiology, New Central Book, Agency, Delhi.
- Dey, N. C. & Dey, T. K., (1999). Medical Bacteriology and Microbiology, 16th Ed, Allied Agency, Calcutta.
- Prescott, L. M., Hartley, J. P. & Klein, D. A., (1993), Microbiology, 2<sup>nd</sup> Ed., W. M. C. Brown

Publ, England.

- Tortora, G. J., Funke, B. R. and Case, C. L., (2004), Microbiology, 8thEd., Person Education (Low Price edition), Delhi.
- Dubey, R. C., &Maheshwari, D. K. (2005). Text Book of Microbiology, S Chand and Co, New Delhi.

**FYBSc (Microbiology)**  
**Semester II**  
**MIB-OE-122 Practical course on Microbiology**

**Total Hours: 60**

**Credits 02**

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |              |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>Course objectives</b> | <ul style="list-style-type: none"> <li>To acquaint basic microbiological instruments and techniques</li> <li>To study various microorganisms present in the ecosystem</li> <li>To observe and learn the microbes using various staining techniques</li> <li>To characterize the microbes using biochemical tests</li> </ul>                                                                                                                                                                  |              |
| <b>Course Outcomes</b>   | <p>After successful completion of this course, students are expected to:</p> <ul style="list-style-type: none"> <li>Understand the basic microbial practices, instruments, appropriate protective and emergency procedures</li> <li>Study the comparative characteristics of prokaryotes and eukaryotes</li> <li>Learn theory and practical skills in microscopy, staining procedures and growth</li> <li>Comprehend the various methods for the identification of microorganisms</li> </ul> |              |
| <b>Sr. No.</b>           | <b>Topic Particular</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Hours</b> |
| 1                        | Microbiology Good Laboratory Practices, laboratory rules and first aid.                                                                                                                                                                                                                                                                                                                                                                                                                      | 4            |
| 2                        | To study the principle, working and application of instruments (biological safety cabinets, autoclave, incubator, BOD incubator, hot air oven, light microscope, pH meter, Balance) used in the microbiology laboratory                                                                                                                                                                                                                                                                      | 4            |
| 3                        | Acquainting basic microbiology techniques I: Types of laboratory glassware, Cleaning and washing of Glassware, biosafety measures, disinfection of working table and hands, biological waste Disposal, Use of Microbial culture and its storage                                                                                                                                                                                                                                              | 4            |
| 4                        | Acquainting basic microbiology techniques II: Preparation of culture media for bacterial cultivation, Cotton Plugging, Wrapping the items prior to sterilization, sterilization with autoclave, Aseptic handling (LAF/ Bunsen burner), preparation of plates and slants, inoculation of bacterial culture and inoculating needle, labelling of incubation material, preservation.                                                                                                            | 4            |
| 5                        | Use and Care of Compound Microscope with functions of each part                                                                                                                                                                                                                                                                                                                                                                                                                              | 4            |
| 6                        | Study of microbes with using temporary mounts/ permanent slides <ul style="list-style-type: none"> <li>Fungus e.g. <i>Rhizopus</i>/ <i>Penicillium</i>/ <i>Aspergillus</i>/ <i>Fusarium</i></li> <li>Algae/BGA e.g. <i>Spirogyra</i>/ <i>Anabena</i>/ <i>Nostoc</i>/ <i>Cyanobacteria</i></li> <li>Protozoans e.g. <i>Amoeba</i>/ <i>Entamoeba</i>/ <i>Paramecium</i>/ <i>Plasmodium</i></li> </ul>                                                                                          | 4            |
| 7                        | Study of colony characteristics of different bacteria (e.g. <i>Escherichia coli</i> , <i>Staphylococcus aureus</i> )                                                                                                                                                                                                                                                                                                                                                                         | 4            |
| 8                        | Study of motility of bacteria by hanging drop/ swarming growth                                                                                                                                                                                                                                                                                                                                                                                                                               | 4            |
| 9                        | Microscopic observation of Rhizobacteria from root nodules /mycorrhizal spores from soil                                                                                                                                                                                                                                                                                                                                                                                                     | 4            |
| 10                       | Study of bacterial morphology using Monochrome Staining                                                                                                                                                                                                                                                                                                                                                                                                                                      | 4            |
| 11                       | Study of morphological features of bacteria using Negative Staining                                                                                                                                                                                                                                                                                                                                                                                                                          | 4            |

|    |                                                                           |   |
|----|---------------------------------------------------------------------------|---|
| 12 | Study of Gram characteristics of bacteria (Gram's Staining)               | 4 |
| 13 | Isolation of bacteria from enriched soil sample by streak plate technique | 4 |
| 14 | Isolation of bacteria from a water sample by spread plate technique       | 4 |
| 15 | Study micro-flora of the air using settling velocity                      | 4 |

#### References

- Atlas, R. M. (1997). Principles of Microbiology, 2<sup>nd</sup> edition, W.M.T. Brown Publishers, Dubuque, USA.
- Cappucino, J & Sherman N.(2010) Microbiology: A Laboratory Manual, 9<sup>th</sup> edition, Pearson Education Limited, New Delhi.
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