AC   Item No.

UNIVERSITY OF MUMBAI

Revised Syllabus for T.Y.B.Sc.
Program: B.Sc.
Course: Microbiology (USMB)

(Credit Based Semester and Grading System with
effect from the academic year 2018 – 2019)

PREAMBLE

The Choice   Based Credit system was introduced by Mumbai University from 2016 - 2017. The process was initiated by restructuring the F.Y.B.Sc. syllabus and the paper pattern according to the CBCS pattern and its implementation in the same year i.e. 2016 - 17.

This was followed by revision of S.Y.B.Sc. syllabus and paper pattern in the year 2017 - 2018.

The revised S.Y.B.Sc. syllabus gave an opportunity to the Microbiology students to opt for Paper III of any subject other than Microbiology. Likewise S.Y.B.Sc. students of other subjects could opt for Microbiology Paper III. This gave them the option to choose from diversity of applied sciences.

 In continuation with this, the T.Y.B.Sc. syllabus is being revised in the year 2018 - 2019. The existing paper pattern will also be accordingly revised.

Keeping in tune with the revised syllabus, the committee has ensured that there is a continuous flow of information and latest advances in the subject imparted to the students. Hence some of the modules of the earlier syllabus have been upgraded, while some new modules have been added to the syllabus in order to bridge the knowledge gap of the learner from S.Y.B.Sc. to T.Y.B.Sc.

The syllabus is aimed at equipping the students with basic knowledge in various branches of Microbiology such as Microbial Genetics, Molecular Biology, Virology, Medical Microbiology, Immunology, Microbial Biochemistry and Industrial Microbiology. Additionally, it also makes students aware of interdisciplinary sciences such as Bioinformatics and Bioinstrumentation.

In all, the students offering Microbiology as a single major subject that is Six units pattern, will study eight courses of theory and practicals compulsory during Semester V and Semester VI together, while students opting for double major subject that is Three units pattern, will have four courses of theory and practicals compulsory during Semester V and Semester VI together.

The courses for six units will comprise of the following:

1) USMB 501 and USMB 601
2) USMB 502 and USMB 602
3) USMB 503 and USMB 603
4) USMB 504 and USMB 604

The courses for three units will comprise of the following:

1) USMB 501 and USMB 601
2) USMB 502 and USMB 602

T.Y.B.Sc. MICROBIOLOGY PRACTICALS
(SEMESTER-V)

Course Code: USMBP05
[Practicals Based on USMB501, Credits -1.5, Lectures- 60, Notional Periods-15]

1. UV survival curve – determination of exposure time leading to 90% reduction
2. Isolation of mutants using UV mutagenesis
3. Gradient plate technique (dye resistant mutant)
4. Replica plate technique for selection & characterization of mutants – auxotroph & antibiotic resistant
5. Isolation and detection of plasmid DNA.

Course Code: USMBP05
[Practicals Based on USMB502, Credits -1.5, Lectures-60, Notional Periods-15]

1. Acid fast staining.
2. Identification of *Candida* species using the germ tube test and growth on Chrom agar
3. To determine SLO and SLS activity of *S .pyogenes*
4. Study of standard cultures *E. coli, Klebsiella spp., Proteus spp., Pseudomonas spp., Salmonalla typhi, S. paratyphi A, S. paratyphi B, Shigella spp., S .pyogenes, S. aureus*
5. Identification of isolates obtained from pus, sputum, stool and urine by morphological, cultural and biochemical properties.
6. Antigen Preparation: O & H antigen preparation of Salmonella. Confirmation by slide agglutination

Course Code: USMBP06
[Practicals Based on USMB503; Credits-1.5, Lectures- 60, Notional Periods-15]

1. Isolation and study of Bioluminescent organisms
2. Study of oxidative and fermentative metabolism
3. Qualitative and Quantitative assay of Phosphatase
4. Study of Homo - Heterofermentations
5. Isolation and detection of Mitochondria
6. Glucose detection by GOD/POD

Course Code: USMBP06
[Practicals Based on USMB504, Credits -1.5, Lectures- 60, Notional Periods-15]

1. Alcohol Fermentation
   1.1. Preparation and standardization of yeast inoculums for alcohol fermentation
   1.2. Laboratory Alcohol fermentation using jaggery medium, calculation of efficiency of fermentation.

2. Determine the alcohol tolerance for yeast.
3. Determine the sugar tolerance for yeast.
4. Chemical estimation of sugar by Cole's ferricyanide method
5. Chemical estimation of alcohol
6. Production of amylase- detection, shake flask or solid substrate cultivation and detection (Qualitative).
7. Primary screening for antibiotic producers using Wilkin's agar overlay method.
8. Determination of antibiotic spectrum using agar strip / streak method.
9. Industrial Visit

TEXT BOOKS AND REFERENCE BOOKS
(SEMESTER V)

Course Code: USMB501

Text books:

1. Peter J. Russell (2006), "I Genetics-A molecular approach", 2nd edition.
2. Benjamin A. Pierce (2008), "Genetics a conceptual approach", 3rd edition, W. H. Freeman and company.
3. R. H. Tamarin, (2004), "Principles of genetics", Tata McGraw Hill.
4. D. Nelson and M. Cox, (2005), "Lehninger's Principles of biochemistry", 4th edition, Macmillan worth Publishers.
5. M. Madigan, J. Martinko, J. Parkar, (2009), "Brock Biology of microorganisms", 12th edition, Pearson Education International.
6. Fairbanks and Anderson, (1999), "Genetics", Wadsworth Publishing Company.
7. Prescott, Harley and Klein, "Microbiology", 7th edition Mc Graw Hill international edition.
8. Robert Weaver, "Molecular biology", 3rd edition. Mc Graw Hill international edition.
9. Nancy Trun and Janine Trempy, (2004), "Fundamental bacterial genetics", Blackwell Publishing
10. Snustad, Simmons, "Principles of genetics", 3rd edition. John Wiley & sons, Inc.

Reference books:

1. Benjamin Lewin, "Genes IX", Jones and Bartlett publishers.
2. JD Watson, "Molecular biology of the gene", 5th edition.

evolution of a specific protein in bacteria, predicting function of unknown protein from a new organism based on its homology)
   c. Six frame translation of given nucleotide sequence
   d. Restriction analysis of given nucleotide sequence
   e. Pair-wise alignment and multiple alignment of a given protein sequences
   f. Formation of phylogenetic tree
6. Animal cell culture (Demo)

Course Code: USMBP07
[Practicals Based on USMB602, Credits -1.5, Lectures-60, Notional Periods-15]

1. Demonstration of malarial parasite in blood films (Demo)
2. Selection and testing of antibiotics using the Kirby-Bauer method
3. Determination of MBC of an antibiotic.
4. Blood grouping – Direct & Reverse typing
5. Coomb's Direct test
6. Determination of Isoagglutinin titer
7. Demonstration experiments - Widal, VDRL

Course Code: USMBP08
[Practicals Based on USMB603; Credits-1.5, Lectures- 60, Notional Periods-15]

1. Detection of PHB producing bacteria
2. To study catabolite repression by diauxic growth curve.
3. Protein estimation by Lowry's method
4. Estimation of uric acid
5. Qualitative and Quantitative assay of Protease
6. Qualitative detection of Lipase
7. Study of breakdown of amino acids – Lysine decarboxylase and Deaminase activity
8. Study of Lithotrophs – Nitrosification and Nitrification

Course Code: USMBP08
[Practicals Based on USMB604, Credits -1.5, Lectures- 60, Notional Periods-15]

1. Bioassay of an antibiotic (Ampicillin / Penicillin)
2. Bioassay of Cyanocobalamin.
3. Perform immobilization of yeast cells for invertase activity - making of beads, Determination of activity and count by haemocytometer and viable count.
4. Plant tissue culture – Callus culture (Demo).
5. Sterility testing of injectable.
6. Chemical estimation of Penicillin
7. Estimation of phenol.
8. Industrial Visit

Modality of Assessment
Assessment pattern for theory

Scheme of Examination

The learner's Performance shall be assessed by conducting the Semester End Examinations with 100% marks

Semester End Theory Assessment - 100%   **100 marks**

1. Duration - These examinations shall be of **3 hours** duration.
2. Theory question paper pattern :-
    i. There shall be **five questions** each of **20** marks (with internal options)
    ii. Question one will be based on unit one, question two on unit two, question three on unit three and question four on unit four. Question five will have questions from all four units of the syllabus.
    iii. Each of the main questions one to four will be subdivided into two sub-questions "A" and "B". Sub-question "A" will have four questions (of 6 marks each) out of which any two will be attempted. Total marks allotted to sub-question "A" will be 12 marks. Sub-question "B" will be 'Do as directed (attempt eight out of twelve)'. Each question in Sub-question "B" will be of one mark each. Total marks allotted to "B" sub-question will be 8 marks. Main question five will have six questions (of 5 marks each) out of which any four will be attempted, total 20 marks.
    iv. All questions shall be **compulsory** with internal choice within the questions.
    v. The allocation of marks will depend on the weightage of the topic.

Passing Standard:

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course and 40% marks in **Semester End Examination (i.e. 40 out of 100) separately**, to pass the course and **minimum of Grade E** in each project, wherever applicable, to pass a particular semester.

Practical Examination Pattern:

External (Semester end practical examination):-

Sr.No.	Particulars/ paper	Marks
1.	Laboratory work	40
2.	Journal	05
3.	Viva	05

Semester V:

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.

In case of loss of Journal and / or Report, a Lost Certificate should be obtained from the Head of the Department / Co-ordinator of the department; failing which the student will not be allowed to appear for the practical examination.

Semester VI

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.

In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from the Head of the Department/ Co-ordinator of the department; failing which the student will not be allowed to appear for the practical examination.

Overall Examination and Marks Distribution Pattern

Course code	Practical Syllabus	Credits & lectures
USMBP05	Based on USMB501 and USMB502 of Semester V	Credits 3 (8 periods/week) = 120 periods/semester
USMBP06	Based on USMB503 and USMB504 of Semester V	Credits 3 (8 periods/week) = 120 periods/semester

Semester V

Course	USMB-501	USMB-502	USMB-503	USMB-504	Grand Total
Theory	100	100	100	100	400
Practicals	50	50	50	50	200

Semester VI

Course	USMB-601	USMB-602	USMB-603	USMB-604	Grand Total
Theory	100	100	100	100	400
Practicals	50	50	50	50	200

T.Y.B.Sc. Microbiology Practicals: Semester-V

Course code	Practical Syllabus	Credits & lectures
USMBP05	Based on USMB501 and USMB502 of Semester V	Credits 3 (8 periods/week) = 120 periods/semester
USMBP06	Based on USMB503 and USMB504 of Semester V	Credits 3 (8 periods/week) = 120 periods/semester

T.Y.B.Sc. Microbiology Practicals: Semester-VI

Course code	Practical Syllabus	Credits & lectures
USMBP07	Based on USMB601 and USMB602 of Semester VI	Credits 3 (8 periods/week) = 120 periods/semester
USMBP08	Based on USMB603 and USMB604 of Semester VI	Credits 3 (8 periods/week) = 120 periods/semester

COURSE WISE CREDIT ASSIGNMENT UNDER THE FACULTY OF SCIENCE

Program: B.Sc.
Course: Microbiology (USMB)

Course wise credit assignments under the faculty of science Type of Courses / Credits Assigned	First Year (Credit x No. of Courses)		Second Year (Credit x No. of Courses)		Third Year (Credit x No. of Courses)		Total Credit Value
	First Semester	Second Semester	Third Semester	Fourth Semester	Fifth Semester	Sixth Semester	
Core Courses (Theory)	04x03	04x03	06x02	06x02	2.5x04	2.5x04	68
Core Courses (Practicals)	02x03	02x03	03x02	03x02	1.5x04	1.5x04	36
Foundation course	02x01	02x01	02x01	02x01			08
Applied Component Courses (Theory)					02x01	02x01	04
Applied Component Courses (Practical)					02x01	02x01	04
Total	**20**	**20**	**20**	**20**	**20**	**20**	**120**