

UNIVERSITY OF MUMBAI



**Revised Syllabus for S.Y.B.Sc.
Program: B.Sc.
Course: MICROBIOLOGY (USMB)**

(Choice Based Credit System with effect from the
Academic year 2017-18)

Preamble

Choice Based Credit System (CBCS) was introduced by our University from the academic year 2016-2017. Objective is to create a curriculum where students are given a chance to learn course of their choice from other subjects, giving them opportunity to choose from a bouquet of Science Courses relevant to their curiosity and future career goal.

The process was initiated with restructuring of FYBSc syllabus according to this CBCS pattern and its implementation in year 2016-2017. As a continuation of this theme, the restructured syllabus of SYBSc is prepared as per the CBCS pattern. As a part of this theme, in SYBSc Paper III in all subjects is available to any BSc student irrespective of their subject combination. So students of any subject interested in Microbiology can opt for Paper III of Microbiology course. Likewise Microbiology Students can opt for Paper III of any subject available in their College. Since this paper is open to all students, 2 options are created to provide diversity of applied topics and choice for student and students can select any one option (provided it is offered by their college) relevant to their curiosity and future career goal.

S.Y.B.Sc Microbiology Syllabus (General Outline)
Revised for Choice Based Credit System
To be implemented from the Academic year 2017-18
Semester III

SEMESTER III			
Course Code	Title	Credits	Lectures / week
USMB-301 Theory	Biomolecules and Microbial taxonomy	2 Credits (45 lectures)	3
Unit-I	Estimation of Biomolecules	15 lectures.	1
Unit-II	Nucleic acid structure and chemistry	15 lectures.	1
Unit-III	Microbial Taxonomy	15 lectures.	1
USMB-302 Theory	Environmental Microbiology	2 Credits (45 lectures)	3
Unit-I	Air Microbiology	15 lectures.	1
Unit-II	Fresh Water & Sewage Microbiology	15 lectures.	1
Unit-III	Soil and Geo Microbiology	15 lectures.	1
USMB-303 Option A Theory	Introduction to Clinical Microbiology	2 Credits (45 lectures)	3
Unit-I	Basic Microbiology	15 lectures.	1
Unit-II	Common infectious diseases, Epidemiology and public health awareness	15 lectures.	1
Unit-III	Control of Microorganisms & Safety in Clinical Microbiology	15 lectures.	1
OR			
USMB-303 Option B	Basic and Advanced Microbiology	2 Credits (45 lectures)	3
Unit-I	Basics of Microbiology	15 lectures.	1
Unit-II	Physical and chemical agents for Microbial Control	15 lectures.	1
Unit-III	Basic r DNA technology and Bioinformatics	15 lectures.	1
USMBP-3	PRACTICALS	3 Credits	9
SECTION-1	Biomolecules and Microbial taxonomy (Practicals Based On Unit-I,II & III Of USMB-301)	1 Credit (45 lectures)	3
SECTION-2	Environmental Microbiology (Practicals Based On Unit-I,II & III Of USMB-302)	1 Credit (45 lectures)	3
SECTION-3 Any One Option	Option A: Introduction to Clinical Microbiology (Practicals Based On Unit-I,II & III Of USMB-303 Option A)	1 Credit (45 lectures)	3
	Option B: Basic and Advanced Microbiology (Practicals Based On Unit-I,II & III Of USMB-303 Option B)	1 Credit (45 lectures)	3

S.Y.B.Sc Microbiology Syllabus (General Outline)
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Semester IV

SEMESTER IV			
Course Code	Title	Credits	Lectures / week
USMB-401 Theory	Metabolism & Basic Analytical Techniques	2 Credits (45 Lectures)	3
Unit-I	Introduction To Metabolism & Bioenergetics	15 lectures.	1
Unit-II	Enzyme Kinetics	15 lectures.	1
Unit-III	Analytical techniques	15 lectures.	1
USMB-402 Theory	Applied Microbiology	2 Credits (45 Lectures)	3
Unit-I	Host defence and public health (Epidemiology of infectious diseases)	15 lectures.	1
Unit-II	Food Microbiology	15 lectures.	1
Unit-III	Dairy Microbiology	15 lectures.	1
USMB-403 Option A Theory	Fermented Foods, Food Sanitation and Microbial Ecology	2 Credits (45 lectures)	3
Unit-I	Fermented Foods	15 lectures.	1
Unit-II	Food Sanitation	15 lectures.	1
Unit-III	Microbial evolution and ecology	15 lectures.	1
USMB-403 Option B Theory	Advances & Applications Of Microbiology and Soft Skills	2 Credits (45 lectures)	3
Unit-I	Nanobiotechnology, Biofilms and biosensors with applications	15 lectures.	1
Unit-II	Scientific writing, research methodology and Biostatistics	15 lectures.	1
Unit-III	Biofertiliser, Biopesticide , Bioremediation	15 lectures.	1
USMBP-4	PRACTICALS	3 Credits	9
SECTION-1	Metabolism & Basic Analytical Techniques (Practicals Based On Unit-I,II & III Of USMB-401)	1 Credit (45 lectures)	3
SECTION-2	Applied Microbiology (Practicals Based On Unit-I,II & III Of USMB-402)	1 Credit (45 Lectures)	3
SECTION-3 Any One Option	Option A Fermented Foods, Food Sanitation and Microbial Ecology (Practicals Based On Unit-I,II & III Of USMB-403 Option A)	1 Credit (45 Lectures)	3
	Option B Advances & Applications Of Microbiology and Soft Skills (Practicals Based On Unit-I,II & III Of USMB-403 Option B)	1 Credit (45 Lectures)	3

USMB-303 Option A Theory	Introduction to Clinical Microbiology	2 Credits (45 lectures)	Self Study (45)
Unit-I	Basic Microbiology	15 lectures.	15
	1a. Microbial World & you: Microbes in our lives Types of Microorganisms	2	
	1b. Morphology and Physiology of Bacteria: Microscopy Staining – monochrome, differential and cytological Shape of Bacteria Bacterial Anatomy- Structure & function Growth and Multiplication of Bacteria Bacterial Growth Curve	5	
	1c. Culture Methods Methods of Isolating Pure Cultures Anaerobic Culture Methods (Anaerobic blood agar, Cooked meat media, Thioglycollate medium)	3	
	1d. Culture Media and Bacterial Growth Types of Media and examples of media like Nutrient agar, Sabouraud agar, MacConkeys agar. Study of morphological & cultural characteristics.	4	
	1e. Bacterial Taxonomy Nomenclature Type Cultures	1	
Unit-II	Common infectious diseases, Epidemiology and public health awareness	15 lectures.	15
	Part A: Common infectious diseases (10 Lectures)		
	2a. Skin Infections: Study of structure and functions of skin Study of skin infections caused by <i>Pseudomonas</i> , Acne & Measles	3	
	2b. Infections of Nervous system Study of structure and functions of nervous system Study of Tetanus & Rabies	2	
	2c. Infections of Respiratory systems Study of structure and function of respiratory system Study of pharyngitis, laryngitis, Sinusitis (learn terms only), Diphtheria and common cold	2	

	2d. Infections of Digestive system Study of structure and function of Digestive system Study of Typhoid fever, <i>E. coli</i> gastroenteritis, Hepatitis A, Rotavirus and Amoebiasis	3	
	Part B: Epidemiology and Public Health Awareness (5 Lectures)		
	2e. The Epidemiology of Infectious Diseases and Their Control Epidemiological terminology: Epidemiology, sporadic diseases, endemic diseases, Hyperendemic Diseases, Epidemic Diseases, Index Case, Pandemic Disease, Outbreak	1	
	2f. The Spread of Infection: Reservoirs of infection - Human reservoir, Animal reservoir, non-living reservoir Transmission of Disease- Contact transmission, Vehicle Transmission and vectors	2	
	2g. Public Health Measures For Control Of Disease: Control directed against reservoir, Transmission of the pathogens. Immunisation, Quarantine, Surveillance and pathogen eradication	2	
Unit-III	Control of Microorganisms & Safety in Clinical Microbiology	15 lectures.	15
	3a. Sterilization and disinfection Methods of sterilization: Dry heat: Hot air sterilizers Moist heat: Steaming at 100°C, Autoclave. Gas Sterilization: Ethylene oxide sterilizer, Gas plasma Sterilizing filters Sterilization by radiation	6	
	3b. Disinfectants: Disinfection of surfaces and spillages Disinfection of safety cabinets Discard jars Disinfection of rooms Disinfection of skin Testing of disinfectants	4	
	3c. Safety in Clinical Microbiology Chemical safety Fire safety Electrical safety Handling of compressed gases: Exposure control plan: Employee education and orientation, Disposal of hazardous waste, Standard precautions, Engineering controls: Laboratory Environment, Biological safety cabinet, Personal protective equipment, Post exposure control Classification of biologic agents based on hazard	5	

REFERENCES: USMB 303 Option A

1. Microbiology, An Introduction by Tortora, Funke & Case 9th and 11th edition, Pearson education.
2. Bailey and Scott's Diagnostic Microbiology, 11th edition Publ: Mosby
3. Anantnarayan & Paniker's Textbook of Microbiology, 8th Ed.
4. Mackie and McCartney Practical medical microbiology 14th edition. Publ: Churchill Livingstone
5. Brock biology of micro organism by Michael T Madigan. & John M Martinco. Pearson education.

Semester 4 Paper 3 USMB403 B

Option B Theory		(45 lectures)	(45)
Unit-I	Nanobiotechnology, Biofilms and biosensors with applications	15 lectures.	15
	1a. Nanobiotechnology Introduction of Nanobiotechnology & application in drug and gene delivery Types of nanomaterials- nanoparticles, nanocapsules, nanotubes, liposomes, nanogels, Dendrimers, Gold nanoparticles. (Definition and applications)	8	
	1.b Biofilms and biosensors with applications: Biosensors: Introduction, design, working and applications of biosensors Biofilms: Introduction of biofilms, Types of biofilms, Mechanism of formation of biofilms and applications of biofilms.	7	
Unit-II	Scientific writing, research methodology and Biostatistics	15 lectures.	15
	2.a Perception of Research Meaning of research P M Cook's definition of Research General characteristics of research Functions of research Specific characteristics of research Objectives of research Classification of research Steps of action research Characteristics of an investigator Difference between action research and fundamental research	5	
	2b. Scientific Writing The research report Need of research report General format of research report Mechanics of report writing Writing research abstract: Need of an Abstract Format of an abstract and Characteristics of a good abstract Writing research papers: Format of a research paper ,Advantages of a research paper	5	
	2c Basics of Biostatistics Introduction to Biostatistics Sample and Population Data presentation: Dot diagram, Bar diagram, Histogram, Frequency curve. Central Tendency: Mean, Median, Mode Summation, notations. Standard Deviation, Variance, Q-Test, t-Test	5	
Unit-III	Biofertiliser, BioPesticide , Bioremediation	15 lectures.	15
	3a. Biofertiliser Introduction of Biofertilizers. Different types of biofertilizers Mass production of Biofertilizers Application of Biofertilizers	8	

	<p>Azolla as cattle feed List of Biofertilizer production units Constraints in Biofertilizer Technology Biofertilizer strains developed</p>		
	<p>3b. Biopesticides Introduction of biopesticides Types of Biopesticides Basic requirements for establishment of Biopesticide units Technical Aspects of Biopesticides Major biopesticides produced and used in India Biopesticide formulations</p>	3	
	<p>3c. Bioremediation Introduction Principle of Bioremediation Factors affecting Bioremediation Microbial Populations used for Bioremediation processes Bioremediation strategies Advantages & Disadvantages of Bioremediation</p>	4	

REFERENCES: USMB 403 Option B

1. Bionanotechnology - Andrew and Waqar, One Central Press Ltd, UK., November, 2014.
2. Text book of Biotechnology by R C Dubey. 4th edition
3. Current Research, Technology & Education Topics in Applied Microbiology & Microbial Biotechnology. A Mendez Vilas Edition
4. Periodicum Biologorum., Vol 109,, No 2, 2007. Characteristics and Significance of Microbial Biofilm Formation Biofilms Importance and Applications. Indian Journal of Biotechnology, Vol8, April 2009, pp159-169.
5. www.WQPMAG.COM, March 2011
6. www.ianetwerk.nl Biofilm as New Biomaterial
7. Research Methodology, Yogesh Kumar Singh, New age International Publisher
9. Biostatistics. P.N. Arora, P.K. Malhan. Himalaya Publishing House.
8. Methods in biostatistics for medical & research workers. 6th edition. B.K. Mahajan. Jaypee brothers, Medical Publishers (P) ltd.
9. agritech.tnau.ac.in/org_farm/orgfarm_biofertilizertechnology.html
10. Biopesticides: An eco-friendly approach for pest control Journal of Biopesticides 3(1 Special Issue) 186 - 188 (2010) 186, Suman Gupta and A. K. Dikshit
11. Biopesticide Formulations, Possibility of Application and Future Trends Slavica Gašić and Brankica Tanović, Pestic. Phytomed. (Belgrade), 28(2), 2013, 97–102 Review paper
12. agritech.tnau.ac.in/farm enterprises
13. Bioremediation: Features, Strategies and applications, Shilpi Sharma.
14. Asian Journal of Pharmacy and Life Science ISSN 2231 – 4423, Vol. 2 (2), April-June, 2012. Available online on www.ajpls.com Review Article
15. Prescott and Harley 1075-79
16. Bioremediation - An Overview Jr. of Industrial Pollution Control 27(2)(2011) pp 161-168, V. Mary Kensa

MODALITY OF ASSESSMENT

Theory Examination Pattern:

Semester End Theory Assessment - 100%

Duration: 3 hrs

Total Marks for Every Paper: **100 Marks**

Total No of Questions: 5

Question No	Maximum Marks	Units Covered	Nature of Q	Internal Options	Example
1	20	All	Objective	None	all
2	20	All	Subjective	60%	4 out of 6
3	20	Unit 1	Subjective	100%	2 out of 4 Or 3 out of 6 Or 4 out of 8 Or 5 out of 10 etc
4	20	Unit 2	Subjective	100%	
5	20	Unit 3	Subjective	100%	

PRACTICAL EXAMINATION PATTERN

Semester end practical examination):- 50 Marks Per Section

Section-I based on course-1, Section-II based on course-2

& Section-III based on course-3 Option A or Option

Sr.No.	Particulars	Marks	Total
1.	Laboratory work (Section-I, II, III A or B)	40 + 40 + 40 =	120
2.	Journal (Section-I, II, III A or B)	05 + 05 + 05 =	015
3.	Viva (Section-I, II, III A or B)	05 + 05 + 05 =	015
Grand Total		50 + 50 + 50 =	150

PRACTICAL BOOK / JOURNAL

Semester III & IV

For each semester end practical Examination, 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 Head/ Co-ordinator / In-charge of the department; failing which the student will not be allowed to appear for the practical examination.

Overall Examination and Marks Distribution Pattern

Semester III

Course	USMB-301	USMB-302	USMB-303 Option A	O R	USMB-303 Option B	
	External	External	External		External	Total
Theory	100	100	100		100	300
Practical	50	50	50		50	150

Semester IV

Course	USMB-401	USMB-402	USMB-403 Option A	O R	USMB-303 Option B	
	External	External	External		External	Total
Theory	100	100	100		100	300
Practical	50	50	50		50	150