

UNIVERSITY OF MUMBAI

**Syllabus for B.Sc.Interdisciplinary
Course : MICROBIOLOGY**

(Credit Based Semester and Grading System with
effect from the academic year 2014–2015)

PREAMBLE

As per the perspective plan of the University which was approved by the Management Council on 11th September 2013 & subsequently by the Academic Council on 19th September 2013, University of Mumbai is going to offer B.Sc. Interdisciplinary programme under the category of Innovative programmes from the academic year 2014-2015. The main objective of this course is to make the learner well versed with all science disciplines as science graduate so that he/she can have scope in schools, banks or any offices as well as they can pursue post graduation in the major subject.

The Rational:

The basic thoughts and understanding in the programme of BSc with interdisciplinary science is, many or around 60 % students after their graduation leave higher education and opt for jobs. These jobs are in Government offices, Municipal Corporations, private companies or, in schools as teachers. They are absorbed as science graduates. Even when the students opt for management carriers they are considered as science graduates at entry level. Thus the specialization or the major subject does not have relevance unless the students want to pursue the carrier in the field of research or higher education. Similarly those who enter in jobs of teachers find it difficult to teach other science subjects as required, than the subject of specialization, because they are not exposed to those branches of science.

With all these requirements of job market University has decided to introduce the graduation course in science as BSc interdisciplinary science. In this a learner can take two subjects from science discipline at first year level, from among these one subject can be selected at Second Year and the same will be continued as major subject along with applied component for final year B. Sc. The learner will earn 70 credits as explained in this subject like the existing system. In first year instead of the third subject the learner can opt any subject from the prescribed modules and as per the availability in the college / institute where admitted. These modules can be called as interdisciplinary modules. At the second year level instead of the second minor subject the learner can opt the modules from the interdisciplinary modules. The foundation course is also modified for interdisciplinary science which includes topics like Law, Economics, Sociology, Political Science etc.

Thus the learner will earn 70 credits in the major subject as obtained by any student in current traditional method. The remaining 50 credits can be earned from the interdisciplinary courses. The modules of interdisciplinary courses can be from science branches or arts / commerce / law / fine arts branches

Considering the Interdisciplinary nature of the programme, the syllabus of F.Y.B.Sc. Microbiology course has been designed. Hence, all the basic concepts and basic techniques of Microbiology have been introduced at F.Y.B.Sc.level. Advance techniques and applied aspects of Microbiology are introduced at S.Y.B.Sc. level of this course. Modules of Semester-I are based on (i) the history of microbiology that includes contribution of scientists

from 16th century till 20th century & structural details of Prokaryotic Cell,(ii) basic technique used to observe the microorganisms in stained and unstained preparations,(iii) various physical & chemical methods used to control the microorganisms. Modules of Semester-II includes (i) the study of different groups of microorganisms such as- viruses,bacteria,rickettsia,chlamydia,actinomycetes,funghi,algae,protozoa,(ii) nutritional requirements of these organisms,their cultivation & growth in the laboratory and preservation for long term availability & use,

Modules of Semester-III are based on (i) the chemical composition of the cell that signifies the role of small molecules as well as macromolecules in forming the cell structure,(ii) recombinant DNA technology (genetic engineering) that deals with the techniques of DNA manipulation,(iii) role of microorganisms in relation to human health. Modules of Semester-IV covers the applied aspects of microbiology such as-(i) food & dairy microbiology that includes different types of spoilages, food-borne infections their prevention & preservation techniques, quality parameters for analysis of food & milk,(ii) water & sewage microbiology includes different water borne diseases & their prevention, water purification and sewage treatment methods, quality parameters for water & sewage analyses,(iii) industrial microbiology that highlights the role of microorganisms in the production of biologically active compounds like antibiotics, amino acids, vitamins etc. on an industrial scale.

F.Y.B.Sc. Interdisciplinary: Microbiology Syllabus (General Outline)

Designed for Credit Based Semester & Grading System

To be implemented from the Academic year 2014-15

(B.Sc. ID)	Bachelor of Science Interdisciplinary (Microbiology)	
	SEMESTER I	
Course Code	Title	Credits
USIDMB-101 Theory	GENERAL MICROBIOLOGY.	2 Credits (45 lectures)

Unit-I	Fundamentals of Microbiology	15 lectures.
Unit-II	Control of Microorganisms	15 lectures.
Unit-III	Microscopy and Staining	15 lectures.
USIDMBP-1	PRACTICALS	1 Credits
	GENERAL MICROBIOLOGY (Practicals Based On Unit-I,II & III Of USIDMB-101)	1 Credit (45 lectures)
	SEMESTER II	
USIDMB-201 Theory	MICROBIAL PHYSIOLOGY.	2 Credits (45 Lectures)
Unit-I	Study Of Different Groups Of Microorganisms	15 lectures.
Unit-II	Microbial nutrition, cultivation, isolation and preservation.	15 lectures.
Unit-III	Microbial Growth	15 lectures.
USIDMBP-2	PRACTICALS	1 Credits
	MICROBIAL PHYSIOLOGY. (Practicals Based On Unit-I,II & III Of USIDMB-201)	1 Credit (45 Lectures)

F.Y.B.Sc. Interdisciplinary : Microbiology Detail Syllabus

Designed for Credit Based Semester & Grading System

To be implemented from the Academic year 2014-15

	SEMESTER I	
Course Code	Title	Credits
USIDMB -101 Theory	GENERAL MICROBIOLOGY	2 Credits (45 lectures)

Unit-I	Fundamentals of Microbiology: History, Introduction & Scope Of Microbiology, Procaryotic Cell Struture	15 lectures.
	1.1 Introduction to Microbiology. 1.2 History of Microbiology Leeuwenhoek and his microscopes,Biogenesis Vs Abiogenesis,Germ theory of fermentation and disease,Koch's postulates,Antisepsis, Immunization 1.3 Scope of microbiology 1.4 Procaryotic cell structure: Ultrastructure-Flagella , pili, Glycocalyx. Cell wall, Cell membrane, Internal cell structure- Cytoplasm and Inclusions, Nucleus, PHB , ribosomes , volutin granules, Spores and cysts	01 04 01 09
	<ul style="list-style-type: none"> Reference:-Microbiology Concepts and Applications by Pelczar, Chan and Krieg, International edition 	
Unit-II	Control of Microorganisms	15 lectures.
	2.1 Definitions of terms used to describe processes for control of microorganisms 2.2 Physical agents for control of microorganisms (mode of action, advantages, disadvantages and applications)- High temperature-moist heat and dry heat, Low temperatures, Radiation, Osmotic pressure, dessication, physical removal of microorganisms- bacteriological filters 2.3 Chemical agents for control of microorganisms - mode of action, advantages, disadvantages and applications of all major groups of antimicrobial agents 2.4 Evaluation of chemical disinfectants 2.5 Chemotherapeutic antimicrobial agents – Types and examples 2.6 Biosafety in Microbiology – Types of biosafety equipment, biological containment and laboratory safety levels	01 07 04 01 01 01
	<ul style="list-style-type: none"> Reference:-Microbiology TMH 5th Edition by Michael J.Pelczar Jr., E.C.S. Chan ,Noel R. Krieg. 	

	<ul style="list-style-type: none"> • Reference:-Michael T.Madigan & J.M.Martin, Brock ,Biology of Microorganisms 12th Ed. International edition 2006 Pearson Prentice Hall 	
Unit-III	Microscopy & Staining	15 lectures.
	<p>3.1 Microscopy Brief History of microscopy, Optical Principal – Magnification, Numerical Aperture, Resolution Lenses and working of compound light microscope – Condenser and light systems, objectives lenses, Ocular lenses, binocular lenses.</p> <p>Principles of Dark field Microscopy, Phase contrast, Fluorescent Microscope and Confocal Microscope</p> <p>Electron microscope –a) Transmission Electron Microscope b) Scanning Electron Microscope</p> <p>3.2 Staining procedures Definition with examples of Fixatives, Mordants, Decolorizers</p> <ol style="list-style-type: none"> Simple (Monochrome) and differential staining – Gram stain Special staining (Cell wall, Capsule, Lipid granules ,Spores & Metachromatic granules) Specimen preparation in TEM 	<p>5</p> <p>2</p> <p>4</p> <p>4</p>
	<ul style="list-style-type: none"> • Reference:-Standard Book- Pelczar 5thedn • Reference:-Additional Books: Salle, Brock 11th edn 	
USIDMBP-1	PRACTICALS	1 Credit (45 Lectures)
Unit-I	<ol style="list-style-type: none"> 1.Assignment : Contribution of a Scientist in the field of Microbiology 2.Monochrome staining 3.Negative staining 	
Unit-II	<ol style="list-style-type: none"> 4.Instrumentation: Demonstration of working of autoclave, hot air oven, UV hoods, biosafety cabinets and use of bacteriological filters. 5.Effect of osmotic pressure and surfactant on bacterial growth. 6.Study of dyes and disinfectants by disc diffusion techniques 	

	7.Oligodynamic action 8.Demonstration of –Phenol Coefficient method for evaluation of a disinfectant	
Unit-III	9.Monochrome staining 10.Negative staining 11.Differential staining – Gram stain 12. Staining of specific structures of bacterial cell:- a. Cell wall staining b. Capsule staining c. Staining of Endospore d. Staining of Metachromatic Granules e. Staining of Lipid granules f. Flagella stain	
	SEMESTER II	
USIDMB -201 Theory	MICROBIAL PHYSIOLOGY	2 Credits (45 lectures)
Unit-I	Study Of Different Groups Of Microbes	15 lectures.
	1.1 Study of Bacterial cell structure and function.(An overview):-Chromosome, Plasma membrane, Cell wall, Capsule, Fimbriae, Flagella, capsule and endospore. 1.2 Study of Viruses:-Classification outline, General Characteristics, Structure of T4 Phage, cultivation. 1.3 Rickettsia:-General Characteristics, Diseases and vectors. 1.4 Chlamydia:-General Characteristics. 1.5 Actinomycetes:- General Characteristic, Classification and Signification. 1.6 Yeast and Molds:-Morphological Characteristics, cultivation, reproduction and Significance.(A Brief Outline to be given) 1.7 Algae:- Morphological Characteristics, cultivation, reproduction and Significance. .(A Brief Outline to be given) 1.8 Protozoa:- Morphological Characteristics, cultivation, reproduction and Significance. .(A Brief Outline to be given)	04 02 01 01 01 01 02 02
	Reference:-Prescott Harley Klein Microbiology 5th edition Reference:-Brock 11th edition	

	Reference:-Pelczar 5th edition	
Unit-II	Microbial Nutrition, Cultivation, Isolation & Preservation	15 lectures.
	2.1 Nutrition Nutritional requirements, Nutritional types of bacteria-	03 02
	2.2 Cultivation Types of media, Preparation of media Physical conditions required for growth	03 06
	2.3 Isolation Selective methods, Methods of isolating pure cultures Cultural characteristics	01
	2.4 Preservation Methods	
	Reference:-Microbiology- Pelczar, Chan and Krieg; 5th edition.	
Unit-III	Microbial Growth	15 lectures.
	3.1 Definition of growth, normal Growth cycle of bacteria.	03 01
	3.2 Transitional periods between growth phases, Synchronous growth	01
	3.3 Continuous culture of microorganisms	08
	3.4 Quantitative Measurement of bacterial growth	01
	3.5 Selection of a procedure to measure growth	01
	3.6 The relationship of turbidity measurements to direct expression of growth, Importance of quantitative measurement of growth	
	Reference:-Microbiology [international student edition, 5th ED, 1986, Mcgraw –Hill Book Company,] Authors: Michael Pelczar ,Jr; E.C.S. Chan; Noel Krieg;	
USIDMBP-2	PRACTICALS	1 Credit (45 Lectures)
Unit-I	1. Monochrome staining 2. Negative Staining 3. Gram's Staining 4. Staining of bacterial cell wall, endospore, capsule. 5. Permanent slides of Protozoa:(Amoeba, paramoecium)	

	6. Permanent slides of BGA:(Anabena, Nostoc, Rivularia, Oscillatoria) 7. Cultivation of yeasts on Sabouraud agar and bacteria on nutrient agar. 8. Fungal wet mounts and study of morphological characteristics.-Mucor and penicillium	
Unit-II	9.Role of nutrients in culture media. 10.Preparation and sterilization of media- nutrient broth, nutrient agar, Sabouraud's broth and agar; MacConkey's broth and agar. 11.Isolation from a mixed culture on a solid medium. 12.Preservation of cultures by- oil overlay; soil stock.	
Unit-III	13.Measurement of cell number by viable count technique, DMC 14.Determination of wet weight of cells[yeast] 15.Membrane filter count [demonstration]	

Modality of Assessment:

Theory Examination Pattern:

**A) Internal Assessment - 40%
40 marks.**

Theory

40 marks

Sr No	Evaluation type	Marks
1	One Assignment/Case study/Project	10
2	One class Test (multiple choice questions / objective)	20

3	Active participation in routine class instructional deliveries(case studies/ seminars//presentation)	05
4	Overall conduct as a responsible student, manners, skill in articulation, leadership qualities demonstrated through organizing co-curricular activities, etc.	05

B) External examination - 60 %

Semester End Theory Assessment - 60%

60 marks

- i. Duration - These examinations shall be of **two hours** duration.
- ii. Theory question paper pattern :-
 1. There shall be **four** questions each of **15** marks. On each unit there will be one question & fourth one will be based on all the three units.
 2. All questions shall be compulsory with internal choice within the questions. Each question will be of **30** marks with options.
 3. Questions may be sub divided into sub questions a, b, c & d only, each carrying **seven & half** marks **OR** a, b, c, d, e & f only each carrying **five** marks and the allocation of marks depends on the weightage of the topic.

Practical Examination Pattern:

(A)Internal Examination:-

There will not be any internal examination/ evaluation for practicals.

(B) External (Semester end practical examination) :- 50 Marks Per Semester

Sr.No.	Particulars	Marks	Total
1.	Laboratory work (Section-I + Section-II)	40	40
2.	Journal	05	05
3.	Viva	05	05

PRACTICAL BOOK/JOURNAL

Semester I:

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 Head / Co-ordinator / Incharge of the department ; failing which the student will not be allowed to appear for the practical examination.

Semester II

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 Head / Co-ordinator / Incharge of the department ; failing which the student will not be allowed to appear for the practical examination.

Overall Examination and Marks Distribution Pattern

Semester-I

Semester-II

Course	USIDMB-101			USIDMB-201		
	Internal	External	Total	Internal	External	Total

Theory	40	60	100	40	60	100
Practicals	-	50	50	-	50	50

