

Microbiology  
S Y BSc (11)

# 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**

<b>SEMESTER III</b>			
<b>Course Code</b>	<b>Title</b>	<b>Credits</b>	<b>Lectures / week</b>
<b>USMB-301</b> Theory	<b>Biomolecules and Microbial taxonomy</b>	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
<b>USMB-302</b> Theory	<b>Environmental Microbiology</b>	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
<b>USMB-303</b> Option A Theory	<b>Introduction to Clinical Microbiology</b>	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
<b>OR</b>			
<b>USMB-303</b> Option B	<b>Basic and Advanced Microbiology</b>	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
<b>USMBP-3</b>	<b>PRACTICALS</b>	3 Credits	9
SECTION-1	<b>Biomolecules and Microbial taxonomy</b> (Practicals Based On Unit-I, II & III Of USMB-301)	1 Credit (45 lectures)	3
SECTION-2	<b>Environmental Microbiology</b> (Practicals Based On Unit-I, II & III Of USMB-302)	1 Credit (45 lectures)	3
SECTION-3 Any One Option	Option A: <b>Introduction to Clinical Microbiology</b> (Practicals Based On Unit-I, II & III Of USMB-303 Option A)	1 Credit (45 lectures)	3
	Option B: <b>Basic and Advanced Microbiology</b> (Practicals Based On Unit-I, II & III Of USMB-303 Option B)	1 Credit (45 lectures)	3



	Taxonomic ranks Numerical Taxonomy	Brock 12 <sup>th</sup> 394 Prescott 8 <sup>th</sup> 448 -449 <i>stain?</i> Leo Prescott 7 <sup>th</sup> 479-480
	3b. Methods of analysis used in classification : [2 L] Phenotypic analysis (Morphological characteristics, Physiological and metabolic characteristics, Biochemical characteristics, Ecological characteristics, Fatty acid analysis)	Prescott 8 <sup>th</sup> 449-450 and Brock 12 <sup>th</sup> 385,386 Brock 12 <sup>th</sup> 386 (for FA analysis)
	3c. Genetic analysis [4 L] DNA-DNA hybridization DNA profiling Multilocus sequence analysis G+C ratio Genetic finger printing	Brock 12 <sup>th</sup> 387-389  Prescott 8 <sup>th</sup> 453
	3d. Amino acid sequencing [1L]	Prescott 8 <sup>th</sup> 455-456
	3e. Phylogenetic analysis [3 L] Nucleic acid sequencing Analysis of individual genes Multilocus gene sequence analysis - Whole genome sequence analysis	Prescott 7 <sup>th</sup> 485-486 Brock 12 <sup>th</sup> 389-390 3
	3f. Phylogenetic tree: Types [1 L]	Brock 12 <sup>th</sup> 377-381 and Prescott 8 <sup>th</sup> 456-458
USMB-302 Theory	<b>Environmental Microbiology</b>	<b>2 Credits (45 lectures)</b>
	<b>Unit I: Air Microbiology</b>	15 Lectures
Unit-I	1a. Aeromicrobiology [7 L]: Important airborne pathogens and toxins, Aerosols, nature of bioaerosols, aeromicrobiological pathway, microbial survival in the air, extramural aeromicrobiology, intramural aeromicrobiology	Maier 83-97
	1b. Sampling Devices for the Collection of Air Samples, Detection of microorganisms on fomites [3L] 1L	Not detailed Maier 149-154 <i>Salle</i>
	1c. Air Sanitation [2L] 3L	Salle 661-668
	1d. Air Quality Standards: [3L] 2L 1L	NAAQS Manual Volume I
	<b>Unit II : Fresh Water and Sewage Microbiology</b>	15 lectures.
	<b>Unit II (A) Fresh Water Microbiology: ( 7 Lectures)</b>	
	2a. Fresh water environments and micro-organisms found in Springs, rivers and streams, Lakes , marshes and bogs [3L]	Maier 110-115 Frobisher 683-687 690-693*
	2b. Potable water: Definition, water purification ,water quality standards and pathogens transmitted through water [2L] JSI	Frobisher 698-706 Prescott 1053(diagram)1052 (table)
Unit-II	2c. Microbiological analysis of water: [ 2L] Indicator organisms and their detection in water- Total Coliforms, Fecal Coliforms and <i>E. coli</i> , Fecal <i>Streptococci</i> , <i>Clostridium perfringens</i>	Prescott- 1054--1057 Maier 485-491
	<b>Unit II (B) Sewage Microbiology : ( 8 Lectures)</b>	
	2d Modern Waste Water treatment: Primary, Secondary and Tertiary Treatment [2L]	Maier 503-524 506-5111
	2e. The nature of wastewater and Monitoring of waste water treatment process(BOD,COD) [1L]	503-506
	2f. Removal of Pathogens by Sewage treatment Processes [1L]	511-513
	2g. Oxidation Ponds and Septic tanks [1L]	513-516
	2h. Sludge Processing [1L]	



<b>B. Sc. (Information Technology)</b>		<b>Semester – II</b>	
Course Name: Green Computing		Course Code: USIT205	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		<b>Hours</b>	<b>Marks</b>
Evaluation System	<b>Theory Examination</b>	2½	75
	<b>Internal</b>	--	25

Unit	Details	Lectures
I	<p><b>Overview and Issues:</b> Problems: Toxins, Power Consumption, Equipment Disposal, Company's Carbon Footprint: Measuring, Details, reasons to bother, Plan for the Future, Cost Savings: Hardware, Power.</p> <p><b>Initiatives and Standards:</b> Global Initiatives: United Nations, Basel Action Network, Basel Convention, North America: The United States, Canada, Australia, Europe, WEEE Directive, RoHS, National Adoption, Asia: Japan, China, Korea.</p>	12
II	<p><b>Minimizing Power Usage:</b> Power Problems, Monitoring Power Usage, Servers, Low-Cost Options, Reducing Power Use, Data De-Duplication, Virtualization, Management, Bigger Drives, Involving the Utility Company, Low-Power Computers, PCs, Linux, Components, Servers, Computer Settings, Storage, Monitors, Power Supplies, Wireless Devices, Software.</p> <p><b>Cooling:</b> Cooling Costs, Power Cost, Causes of Cost, Calculating Cooling Needs, Reducing Cooling Costs, Economizers, On-Demand Cooling, HP's Solution, Optimizing Airflow, Hot Aisle/Cold Aisle, Raised Floors, Cable Management, Vapour Seal, Prevent Recirculation of Equipment Exhaust, Supply Air Directly to Heat Sources, Fans, Humidity, Adding Cooling, Fluid Considerations, System Design, Datacentre Design, Centralized Control, Design for Your Needs, Put Everything Together.</p>	12
III	<p><b>Changing the Way of Work:</b> Old Behaviours, starting at the Top, Process Reengineering with Green in Mind, Analysing the Global Impact of Local Actions, Steps: Water, Recycling, Energy, Pollutants, Teleworkers and Outsourcing, Telecommuting, Outsourcing, how to Outsource.</p> <p><b>Going Paperless:</b> Paper Problems, The Environment, Costs: Paper and Office, Practicality, Storage, Destruction, Going Paperless, Organizational Realities, Changing Over, Paperless Billing, Handheld Computers vs. the Clipboard, Unified Communications, Intranets, What to Include, Building an Intranet, Microsoft Office SharePoint Server 2007, Electronic Data Interchange (EDI), Nuts and Bolts, Value Added Networks, Advantages, Obstacles.</p>	12

## SEMESTER I

Ability Enhancement Course 1 (FC I)  
Societal Awareness

COURSE CODE	TITLE	CREDITS	Notional Hours
USBT 107	Societal Awareness	2	
Course Objective : To acquaint the students with concepts of Societal Awareness			
Learning Outcome : To impart knowledge of Society and make students aware about the Problems in Society			
Unit I Overview of Indian Society	Understand the multi-cultural diversity of Indian society through its demographic composition: population distribution according to religion, caste, and gender; Appreciate the concept of linguistic diversity in relation to the Indian situation; Understand regional variations according to rural, urban and tribal characteristics; Understanding the concept of diversity as difference	15 Lectures	30 hrs
Unit II Concept of Disparity	<b>Concept of Disparity- I</b> Understand the concept of disparity as arising out of stratification and inequality; Explore the disparities arising out of gender with special reference to violence against women, female foeticide (declining sex ratio), and portrayal of women in media; Appreciate the inequalities faced by people with disabilities and understand the issues of people with physical and mental disabilities <b>Concept of Disparity-II</b> Examine inequalities manifested due to the caste system and inter-group conflicts arising thereof; Understand inter-group conflicts arising out of communalism; Examine the causes and effects of conflicts arising out of regionalism and linguistic differences	15 Lectures	30 hrs
Unit III The Indian Constitution and Significant Aspects of Political Processes	<b>The Indian Constitution</b> Philosophy of the Constitution as set out in the Preamble; The structure of the Constitution-the Preamble, Main Body and Schedules; Fundamental Duties of the Indian Citizen; tolerance, peace and communal harmony as crucial values in strengthening the social fabric of Indian society; Basic features of the Constitution <b>Significant Aspects of Political Processes</b> The party system in Indian politics; Local self-government in urban and rural areas; the 73rd and 74th Amendments and their implications for inclusive politics; Role and significance of women in politics	15 lectures	30 hrs

**Topics for Project Guidance: Growing Social Problems in India:**

- Substance abuse- impact on youth & challenges for the future
- HIV/AIDS- awareness, prevention, treatment and services
- Problems of the elderly- causes, implications and response
- Issue of child labour- magnitude, causes, effects and response
- Child abuse- effects and ways to prevent
- Trafficking of women- causes, effects and response



## SEMESTER II

### Ability Enhancement Course 2 (FC II) Globalization, Ecology and Sustainable Development

COURSE CODE	TITLE	CREDITS	Notional Hours
USBF 207	<b>Globalization, Ecology and Sustainable Development</b>	2	
<p>Course Objective : To acquaint the students with concepts of Globalization, Ecology and Environment</p> <p>Learning Outcome : To impart knowledge of Globalization make students aware about the Problems in Society</p>			
<b>Unit I</b> Globalisation and Indian Society and Human Rights	<p><b>Globalisation and Indian Society</b> Understanding the concepts of liberalization, privatization and globalization; Growth of information technology and communication and its impact manifested in everyday life; Impact of globalization on industry: changes in employment and increasing migration; Changes in agrarian sector due to globalization; rise in corporate farming and increase in farmers' suicides.</p> <p><b>Human Rights</b> Concept of Human Rights; origin and evolution of the concept; The Universal Declaration of Human Rights; Human Rights constituents with special reference to Fundamental Rights stated in the Constitution</p>	15 Lectures	30 hrs
<b>Unit II</b> Ecology and Sustainable Development	<p><b>Ecology and Sustainable Development</b> Importance of Environment Studies in the current developmental context; Understanding concepts of Environment, Ecology and their interconnectedness; Environment as natural capital and connection to quality of human life; Environmental Degradation causes and impact on human life; Sustainable development, concept and components; poverty and environment</p>	15 Lectures	30 hrs
<b>Unit III</b> Understanding and Managing Stress and Conflict in Contemporary Society	<p><b>Understanding Stress and Conflict</b> Causes of stress and conflict in individuals and society; Agents of socialization and the role played by them in developing the individual; Significance of values, ethics and prejudices in developing the individual; Stereotyping and prejudice as significant factors in causing conflicts in society. Aggression and violence as the public expression of conflict</p> <p><b>Managing Stress and Conflict in Society</b> Types of conflicts and use of coping mechanisms for managing individual stress; Maslow's theory of self-actualisation; Different methods of responding to conflicts in society; Conflict-resolution and efforts towards building peace and harmony in society</p>	15 lectures	30 hrs

*Topics for Project Guidance: Growing Social Problems in India:*

- Increasing urbanization, problems of housing, health and sanitation;
- Changing lifestyles and impact on culture.
- Farmers' suicides and agrarian distress.
- Debate regarding Genetically Modified Crops.
- Development projects and Human Rights violations.
- Increasing crime/suicides among youth.