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Microbiology
S Y BSc (1)

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)
till date

I/C Principal
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F.Y.

SEMESTER I

Ability Enhancement Course 1 (FC I)
Societal Awareness

COURSE CODE	TITLE	CREDITS	Notional Hours
USBT 107	**Societal Awareness**	2	

Course Objective : To aquaint the students with concepts of Societal Awarness
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	**Concept of Disparity- I** 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 **Concept of Disparity-II** 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	**The Indian Constitution** 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 **Significant Aspects of Political Processes** 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 [illegible]*

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SEMESTER II

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

COURSE CODE	TITLE	CREDITS	Notional Hours
USBT 207	**Globalization, Ecology and Sustainable Development**	2	

Course Objective : To aquaint the students with concepts of Globalization, Ecology and Environment
Learning Outcome : To impart knowledge of Globalization make students aware about the Problems in Society

Unit I Globalisation and Indian Society and Human Rights	**Globalisation and Indian Society** 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. **Human Rights** 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	15 Lectures	30 hrs
Unit II Ecology and Sustainbale Development	**Ecologyand Sustainbale Development** 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	15 Lectures	30 hrs
Unit III Understanding and Managing Stress and Conflict in Contemporary Society	**Understanding Stress and Conflict** 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 **Managing Stress and Conflict in Society** 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	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/suicide among youth.*

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B. Sc (Information Technology)		Semester – I	
Course Name: Communication Skills		Course Code: USIT105	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Unit	Details	Lectures
I	**The Seven Cs of Effective Communication:** Completeness, Conciseness, Consideration, Concreteness, Clarity, Courtesy, Correctness **Understanding Business Communication:** Nature and Scope of Communication, Non-verbal Communication, Cross-cultural communication, Technology-enabled Business Communication	12
II	**Writing Business Messages and Documents:** Business writing, Business Correspondence, Instructions Business Reports and Proposals, Career building and Resume writing. **Developing Oral Communication Skills for Business:** Effective Listening, Business Presentations and Public Speaking, Conversations, Interviews	12
III	**Developing Oral Communication Skills for Business:** Meetings and Conferences, Group Discussions and Team Presentations, Team Briefing. **Understanding Specific Communication Needs:** Communication across Functional Areas	12
IV	**Understanding Specific Communication Needs:** Corporate Communication, Persuasive Strategies in Business Communication, Ethics in Business Communication, Business Communication Aids	12
V	**Presentation Process:** Planning the presentations, executing the presentations, Impressing the audience by performing, Planning stage: Brainstorming, mind maps / concept maps, executing stage: chunking theory, creating outlines, Use of templates. Adding graphics to your presentation: Visual communication, Impress stage: use of font, colour, layout, Importance of practice and performance.	12

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Business Communication	Edited by Meenakshi Raman and Prakash Singh	Oxford University Press	Second	
2.	Professional Communication	Aruna Koneru	Tata McGraw Hill		

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

Unit	Details	Lectures
I	**Overview and Issues:** Problems: Toxins, Power Consumption, Equipment Disposal, Company's Carbon Footprint: Measuring, Details, reasons to bother, Plan for the Future, Cost Savings: Hardware, Power. **Initiatives and Standards:** 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.	12
II	**Minimizing Power Usage:** 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. **Cooling:** 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.	12
III	**Changing the Way of Work:** 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. **Going Paperless:** 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.	12

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IV	**Recycling:** Problems, China, Africa, Materials, Means of Disposal, Recycling, Refurbishing, Make the Decision, Life Cycle, from beginning to end, Life, Cost, Green Design, Recycling Companies, Finding the Best One, Checklist, Certifications, Hard Drive Recycling, Consequences, cleaning a Hard Drive, Pros and cons of each method, CDs and DVDs, good and bad about CD and DVDs disposal, Change the mind-set, David vs. America Online **Hardware Considerations:** Certification Programs, EPEAT, RoHS, Energy Star, Computers, Monitors, Printers, Scanners, All-in-Ones, Thin Clients, Servers, Blade Servers, Consolidation, Products, Hardware Considerations, Planned Obsolescence, Packaging, Toxins, Other Factors, Remote Desktop, Using Remote Desktop, Establishing a Connection, In Practice	12
V	**Greening Your Information Systems:** Initial Improvement Calculations, Selecting Metrics, Tracking Progress, Change Business Processes, Customer Interaction, Paper Reduction, Green Supply Chain, Improve Technology Infrastructure, Reduce PCs and Servers, Shared Services, Hardware Costs, Cooling. **Staying Green:** Organizational Check-ups, Chief Green Officer, Evolution, Sell the CEO, SMART Goals, Equipment Check-ups, Gather Data, Tracking the data, Baseline Data, Benchmarking, Analyse Data, Conduct Audits, Certifications, Benefits, Realities, Helpful Organizations.	12

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Green IT	Toby Velte, Anthony Velte, Robert Elsenpeter	McGraw Hill		2008
2.	Green Data Center: Steps for the Journey	Alvin Galea, Michael Schaefer, Mike Ebbers	Shroff Publishers and Distributers		2011
3.	Green Computing and Green IT Best Practice	Jason Harris	Emereo		
4.	Green Computing Tools and Techniques for Saving Energy, Money and Resources	Bud E. Smith	CRC Press		2014

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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

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	Taxonomic ranks Numerical Taxonomy	Brock 12th 394 Prescott 8th 448 -449 Prescott 7th 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 8th 449-450 and Brock 12th 385,386 Brock 12th 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 th 387-389 Prescott 8 th 453
	3d. Amino acid sequencing [1L]	Prescott 8th 455-456
	3e. Phylogenetic analysis [3 L] Nucleic acid sequencing Analysis of individual genes Multilocus gene sequence analysis - Whole genome sequence analysis	Prescott 7th 485-486 Brock 12th 389-390 3
	3f. Phylogenetic tree: Types [1 L]	Brock 12th 377-381 and Prescott 8th 456-458
USMB-302 Theory	**Environmental Microbiology**	**2 Credits (45 lectures)**
	Unit I: Air Microbiology	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]	Maier 149-154
	1c. Air Sanitation [2L]	Salle 661-668
	1d. Air Quality Standards: [3L]	NAAQS Manual Volume 1
	Unit II : Fresh Water and Sewage Microbiology	15 lectures.
	Unit II (A) Fresh Water Microbiology: (7 Lectures)	
Unit-II	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]	Frobisher 698-706 Prescott 1053(diagram)1052 (table)
	2c. Microbiological analysis of water: [2l] Indicator organisms and their detection in water- Total Coliforms, Fecal Coliforms and *E. coli*, Fecal *Streptococci*, *Clostridium perfringens*	Prescott- 1054--1057 Maier 485-491
	Unit II (B) Sewage Microbiology : (8 Lectures)	
	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]	521-523

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	2i. Disposal of treated waste water and biosolids.[2L]	516-518 523-524
Unit-III	**Unit III: Soil and Geo Microbiology:** 3a. Terrestrial Environment [2L] Soil- Definition, Composition, function , Textural triangle Types of soil microorganisms and their activities	15 lectures. Kolwzan 8,9,11-16,21-23
	3b. Methods of studying soil microorganisms: Sampling, Cultural methods, Physiological methods, Immunological methods, Nucleic acid based methods, Radioisotope techniques.[5L]	Maier
	3c. Biogeochemical Cycles: Carbon cycle, Nitrogen cycle, Sulphur cycle, Phosphorus Cycle, Iron cycle [6L]	Maier 289-317,P cycle Subba Rao 293-295,298
	3d. Soil Bioremediation [2L]	Kolwzan 29-32
USMB-303 Option A Theory	**Introduction to Clinical Microbiology [REFER TO SEPA**	**2 Credits (45 lectures)**
Unit-I	**Basic Microbiology** 1a. Microbial World & you: Microbes in our lives Types of Microorganisms	15 lectures. Tortora 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	Bailey & An 9th 11-13 Scale 5 14-15 15-16 16-23 23- 23-24
	1c. Culture Methods i) Methods of Isolating Pure Cultures ii) Anaerobic Culture Methods (Anaerobic blood agar, Cooked meat media, Thioglycollate medium)	ii) - Bailey 11 X i) - Anantnarayan. Ch-4 44-45 47-48 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.	Bailey, An Ch-4 39-45 4 Mackie-media comp.
	1e. Bacterial Taxonomy Nomenclature Type Cultures	Anantnarayan. Ch-7 1 54-54
Unit-II	**Common infectious diseases, Epidemiology and public health awareness** **Part A: Common infectious diseases (10 Lectures)** - Tortora 11 ed.	15 lectures.
	2a. Skin Infections: Study of structure and functions of skin Study of skin infections caused by *Pseudomonas*, 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, *E. coli* gastroenteritis, Hepatitis A, Rotavirus and Amoebiasis	3

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		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	Research Methodology: Yogesh Kumar Singh, New age International Publisher Book by eMail
		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 • Characteristics of a good abstract **Writing research papers** • Format of a research paper • Advantages of a research paper	Research Methodology: Yogesh Kumar Singh, New age International Publisher
		Statistical Data Analysis • Meaning of the terms Statistics and data • Methods of organising and presenting data • The Graphical Presentation of Ungrouped Data	Research Methodology: Yogesh Kumar Singh, New age International Publisher
	III	**Biofertiliser, BioPesticide , Bioremediation**	
		Biofertiliser Introduction of Biofertilizers. Different types of biofertilizers Mass production of Biofertilizers Application of Biofertilizers Azolla as cattle feed List of Biofertilizer production units in Tamil Nadu Constraints in Biofertilizer Technology Biofertilizer strains developed Economics Cost and availability of Biofertilizers	agritech.tnau.ac.in/org_farm/orgfarm_biofertilizertechnology.html Ms word document R. C. dubey

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		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	• Biopesticides: An eco-friendly approach for pest control Journal Biopesticides 3(1 Special Issue) 186 - 188 (2010) 186,Suman Gup and A. K. Dikshit • Biopesticide Formulations, Possibility of Application and Future TrendsSlavica Gašić and Brankica Tanović,Pestic. Phytomed. (Belgrade), 28(2), 2013, 97–102 Review paper • *agritech.tnau.ac.in/farm enterpri*
		Bioremediation Introduction Principle of Bioremediation:- Factors of Bioremediation:- Microbial Populations for Bioremediation processes Bioremediation strategies:- Advantages & Disadvantages of Bioremediation:	• Bioremediation: Features, Strategies and applications, Shilpi Sharma. • Asian Journal of Pharmacy and Life Science ISSN 2231 – 4423,Vol. 2 (2), April-June, 2012.Available online on www.ajpls.com Review Article • Prescott and Harley 1075-79 • Bioremediation - An Overview Jr. of Industrial Pollution Control 27(2)(2011) pp 161-168, V. Mary Kensa

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