

**Anekant Education Society's**  
**Tuljaram Chaturchand College,**  
 of Arts, Science & Commerce,  
 Baramati  
 (Autonomous Institute)  
**Syllabus (CBCS) for S. Y. B. Sc. Microbiology**  
 w.e.f.  
 June 2020

**COURSE STRUCTURE FOR S. Y. B. SC. MICROBIOLOGY (w.e.f. June2020)**

Sr. No.	Class	Semester	Code	Paper	Paper Title	Credit	Marks (I + E)
1	S.Y.B.Sc.	III	MICRO2301	Theory	Bacterial Systematics and Physiology	3	50 + 50
2	S.Y.B.Sc.	III	MICRO2302	Theory	Industrial and Soil Microbiology	3	50 + 50
3	S.Y.B.Sc.	III	MICRO2304	Practical	Practical course based on MICRO2301 and MICRO2302	2	50 + 50
4	S.Y.B.Sc.	IV	MICRO2401	Theory	Air and Water Microbiology	3	50 + 50
5	S.Y.B.Sc.	IV	MICRO2402	Theory	Bacterial Genetics	3	50 + 50
6	S.Y.B.Sc.	IV	MICRO2403	Practical	Practical course based on MICRO2401 and MICRO2402	2	50 + 50

**I:** Internal Examination  
**E:** External Examination

**SYLLABUS (CBCS) FOR S. Y. B. SC. MICROBIOLOGY (w.e.f. June2020)**Class: **S.Y.B.Sc. (Semester- III)**Paper Code: **MICRO-2301**Paper: **Theory**Paper Title: **Bacterial Systematics and Physiology**Credit: **3 Credits**

Credit No.	Topics	Lectures
I	<b>BACTERIAL SYSTEMATICS</b> a. Definition of species b. Chemotaxonomy c. Numerical taxonomy d. Genetic basis of taxonomy i. G + C content ii. DNA hybridization iii. Base sequence similarity ( Use of 16s rRNA databanks)	1 5 3 6
II	<b>BACTERIAL PHYSIOLOGY</b> a. Definitions of Metabolism, catabolism, anabolism, respiration and Fermentation. b. Metabolic pathways (with structures) EMP, HMP, ED, Phosphoketolase, Glyoxylate, TCA (with emphasis on amphibolism), Homofermentative and heterofermentative pathways. c. High Energy Compounds, Electron transport chain, Oxidative phosphorylation and Substrate level phosphorylation, Chemiosmotic hypothesis of ATP formation.	1 9 5
III	<b>BIOCATALYSTS</b> a. Introduction to Enzymes: Nature of active site, ribozymes, coenzymes, apoenzymes, prosthetic group and cofactors. b. Nomenclature & classification as per IUB (up to class level). c. Structure of active site; common amino acids at active site Models for catalysis – i. Lock and key ii. Induced fit iii. Transition state. d. Effect of pH & temperature, substrate concentration & enzyme concentration, activators and inhibitors of enzyme	2 3 5 5

**SYLLABUS (CBCS) FOR S. Y. B. SC. MICROBIOLOGY (w.e.f. June2020)**Class: **S.Y.B.Sc. (Semester- III)**Paper Code: **MICRO-2302**Paper: **Theory**Paper Title: **Industrial and Soil Microbiology**Credit: **3 Credits**

Credit No.	Topics	Lectures
I, II and III	<b>INTRODUCTION TO INDUSTRIAL MICROBIOLOGY</b>	
	a. Strains of industrially important microorganisms:	
	i. Desirable characteristics of industrial strain	2
	ii. Principles and methods of primary and secondary screening	3
	iii. Inoculum preparation.	2
	b. Equipment: Design of a basic Fermenter and its parts.	3
	c. Process Control and Monitoring of different fermentation parameters (temperature, pH, foam)	4
	d. Media for industrial fermentations:	7
	Constituents of media (Carbon source, nitrogen source, buffers, antifoam agents, precursors, inhibitors).	2
	e. Contamination: Sources, precautions, and consequences.	
	<b>SOIL MICROBIOLOGY</b>	
a. Soil microorganisms, composition and types of soil.	1	
b. Rhizosphere microflora and its role in the rhizosphere	2	
c. Role of microorganisms in composting and humus formation	2	
d. Role of microorganisms in following elemental cycles in nature Carbon, Nitrogen, Sulphur, Phosphorous.	6	
e. Degradation of cellulose, hemicelluloses, lignin and pectin	6	
f. Brief account of microbial interactions Symbiosis, Neutralism, Commensalism, Competition, Ammensalism, Synergism, Parasitism, and Predation	5	

**SYLLABUS (CBCS) FOR S. Y. B. SC. MICROBIOLOGY (w.e.f. June2020)**

Class: **S.Y.B.Sc. (Semester- III)**

Paper Code: **MICRO-2304**

Paper: **Practical**

Paper Title: **Practical course based on  
MICRO2301 and MICRO2302**

Credit: **2 Credits**

EXPT. No.	Topics	Hours
1	<b>Growth curve:</b> a. Absorbance measurement for bacterial culture b. Growth curve plotting by using computer software	4
2-7	<b>Biochemical characterization of bacteria:</b> a. Sugar utilization test (minimal medium + sugar) b. Sugar fermentation test c. IMViC d. Enzyme detection – Amylase, Gelatinase, Catalase, Oxidase e. Oxidative-fermentative test	2 2 4 10 4
8	<b>Primary screening of industrially important organisms:</b> a. Organic acid producing microorganisms OR b. Antibiotic producing microorganisms (crowded plate technique)	4

**SYLLABUS (CBCS) FOR S. Y. B. SC. MICROBIOLOGY (w.e.f. June2020)**Class: **S.Y.B.Sc. (Semester- IV)**Paper Code: **MICRO-2401**Paper: **Theory**Paper Title: **Air and Water Microbiology**Credit: **3 Credits**

Credit No.	Topics	Lectures
I	<b>AIR MICROBIOLOGY</b>	
	Air flora: Transient nature of air flora Droplet, droplet nuclei, and aerosols	2
	a. Air pollution: Chemical pollutants, their sources in air and effects on human health.	2
	b. Methods of Air sampling and types of air samplers i. Impaction on solids ii. Impingement in liquid iii. Sedimentation iv. Centrifugation	6
	c. Air sanitation: Physical and chemical methods d. Air borne infections	3 2
II	<b>WATER MICROBIOLOGY</b>	
	a. Types of water: surface, ground, stored, distilled, mineral and de-mineralized water	2
	b. Water purification methods, Bacteriological standards of potable water Maharashtra pollution control board (MPCB), Central pollution control board (CPCB), Bureau of Indian standards (BIS) World health Organization (WHO)	2
	c. Indicators of faecal pollution; i. <i>Escherichia coli</i> ii. <i>Bifidobacterium</i> iii. <i>Streptococcus faecalis</i> iv. <i>Clostridium perfringens</i> v. New indicators: <i>Campylobacter</i> and <i>Pseudomonas</i>	5
	d. Water borne Infections	1
	e. Bacteriological analysis of water for potability i. Presumptive coliform count ii. Confirmed test iii. Completed test iv. Eijkman test v. Membrane filter technique	5
III	<b>SEWAGE &amp; WASTE WATER</b>	
	a. Analysis of waste water i. Physic chemical parameters: pH, temperature, total solids, suspended solids, Chemical Oxygen Demand(C.O.D.) ii. Biological parameters: B.O.D. iii. Industrial water pollutants, their ecological effects and health hazards (Biomagnification and eutrophication)	3
	b. Methods of effluent treatment – Primary, secondary, tertiary treatment methods	10
	c. Recycling of waste water and sludge	2

**SYLLABUS (CBCS) FOR S. Y. B. SC. MICROBIOLOGY (w.e.f. June2020)**Class: **S.Y.B.Sc. (Semester- IV)**Paper Code: **MICRO-2402**Paper: **Theory**Paper Title: **Bacterial Genetics**Credit: **3 Credits**

Credit No.	Topics	Lectures
I	<b>UNDERSTANDING MOLECULES OF HEREDITY</b>	
	a. Discovery of transforming material (hereditary material): Griffith's Experiment.	2
	b. Evidence for nucleic acid as genetic material <ul style="list-style-type: none"> <li>i. Avery and MacLeod experiment</li> <li>ii. Gierer and Schramm / Fraenkel-Conrat &amp; Singer experiment (TMV virus)</li> <li>iii. Hershey &amp; Chase experiment</li> </ul>	4
	c. Prokaryotic genome organization.	1
	d. Basic structure of B form of DNA, Bonds involved in DNA, structure and properties of plasmid, type of plasmids.	7
	e. Comparative account of different forms of DNA.	1
II and III	<b>DNA REPLICATION AND EXPRESSION</b>	
	a. DNA replication <ul style="list-style-type: none"> <li>i. Messelson and Stahl's experiment (semiconservative)</li> <li>ii. Mechanisms of DNA replication: Semi-discontinuous, rolling circle model.</li> </ul>	7
	b. Gene organization and expression <ul style="list-style-type: none"> <li>i. What is Gene?</li> <li>ii. Properties of genetic code</li> <li>iii. Basic mechanism of transcription</li> <li>iv. Basic mechanism of translation</li> </ul>	10
	<b>MUTATIONS</b>	
	a. Spontaneous mutations <ul style="list-style-type: none"> <li>i. Mechanisms</li> <li>ii. Fluctuation test</li> </ul>	4
	b. Mechanisms of induced mutations <ul style="list-style-type: none"> <li>i. Base pair substitution (Transitions, Transversions), Base analogues (2-amino purine, 5-bromo uracil), HNO<sub>2</sub>, Alkylating agents (ethyl methyl sulphate)</li> </ul>	5
	ii. Frame shift mutations (Insertions and deletions), Intercalating agents (EtBr, acridine orange), UV rays.	3
	c. Types of mutations: Nonsense, Missense, Conditional lethal temperature sensitive.	1

## SYLLABUS (CBCS) FOR S. Y. B. SC. MICROBIOLOGY (w.e.f. June2020)

Class: **S.Y.B.Sc. (Semester- IV)**

Paper Code: **MICRO-2403**

Paper: **Practical**

Paper Title: **Practical course based on  
MICRO2401 and MICRO2402**

Credit: **2 Credits**

EXPT. No.	Topics	Hours
1	Air sampling using an air sampler & calculation of air flora from different locations with the knowledge of respective standards of bacterial & fungal counts.	4
2-3	<b>Bacteriological tests of potability of water</b> a. MPN, confirmed and completed test. b. Membrane filter technique (Demonstration)	8
4	<b>Determination of B.O.D.</b>	4
5	<b>Air Flora:</b> a. Diversity determination. b. Simpson index and settling velocity determination	4
6	<b>Identification of Any one bacterial isolates at least up to genus level from soil or air. (Preferably spore forming and pigmented bacteria).</b>	8
7	<b>Visits to</b> a. Water purification plant/ Sewage treatment plant/Effluent treatment plant/ Fermentation industry	2

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