RVS COLLEGE OF ARTS AND SCIENCE

Autonomous and Affiliated to Bharathiar University, Approved by AICTE

Sulur, Coimbatore – 641 402, Tamilnadu, India.

SCHEME OF EXAMINATIONS

B.Sc Microbiology 2023 – 2026

Sem.	Course Opted	Course Name	D	L	T	P	CIA	ESE	Marks	Credits
I	MIL - I	Tamil-I/Hindi-I / Malayalam – I/ French-I/Arabic- I	3	4	-	-	25	75	100	3
	ELN - I	English-I	3	4	-	-	25	75	100	3
	DSC – I	Fundaments of Microbiology and Microbial Diversity	3	4	-	4	25	75	100	6
			4				25	75		
	DSC – II	Basic Clinical Biochemistry	3	5	1	-	25	75	100	6
	NMS - I	Soft Skills – I	3	2	-	-	Grade			
	NCC	NCC/NSS/ SPORTS/CULTURALS	-	1	-	-	-	-	-	-
	LIB	Library	-	1	-	-	-	-	-	-
	Total				**26**				**400**	**18**
II	MIL-II	Tamil-II/Hindi-II/Malayalam – II/French-II/Arabic-II	3	4	-	-	25	75	100	3
	ELN - II	English-II	3	4	-	-	25	75	100	3
	DSC – III	Microbial Physiology and Metabolism	3	4	-	4	25	75	100	6
			4				25	75		
	DSC – IV	Bioinstrumentation	3	4	-	4	25	75	100	6
			4				25	75		
	NMS - II	Soft Skills - II	3	2	-	-	Grade			
	AECC - 1	Environmental Studies	3	1	-	-	100	-	100	1
	NCC	NCC/NSS/ SPORTS/CULTURALS	-	1	-	-	-	-	-	-
	LIB	Library	-	1	-	-	-	-	-	-
	Total				**29**				**500**	**19**

Semester	Course Opted	Course Name	D	L	T	P	CIA	ESE	Marks	Credits
III	MIL-III	Tamil-III/Hindi-III/Malayalam – III/French-III/Arabic-III	3	4	-	-	25	75	100	3
	ELN - III	English-III	3	4	-	-	25	75	100	3
	DSC – V	Immunology and Immunotechnology	3 6	4	-	4	25	75	100	6
	DSC – VI	Medical Bacteriology and Antibacterial Agents	3 6	4	-	4	25	75	100	6
	DSE - I	Elective- I	3	5	1	-	25	75	100	6
	NMS - III	Soft Skills - III	3	2	-	-	Grade			
	NCC	NCC/NSS/ SPORTS/CULTURALS	-	1	-	-	-	-	-	-
	Total				**35**				**500**	**24**
IV	MIL-IV	Tamil-IV/Hindi-IV/Malayalam – IV/French-IV/Arabic-IV	3	4	-	-	25	75	100	3
	ELN - IV	English-IV	3	4	-	-	25	75	100	3
	DSC – VII	Molecular Biology and Microbial Genetics	3 6	4	-	4	25 25	75 75	100	6
	DSC – VIII	Biostatistics	3	5	1	-	25	75	100	6
	DSE - II	Elective – II	3 6	4	-	4	25 25	75 75	100	6
	NMS - IV	Soft Skills - IV	3	2	-	-	Grade			
	AECC –2	Aptitude	3	3	-	-	100	-	100	3
	NCC – G I	NCC/NSS/ SPORTS/CULTURALS	-	1	-	-	-	-	-	-
	Total				**36**				**600**	**27**

Semester	Course Opted		Course Name	D	L	T	P	CIA	ESE	Marks	Credits
V	DSC – IX		Medical Mycology	3 9	4	-	4	25 25	75 75	100	6
	DSC – X		Food, Dairy and Probiotic Microbiology	3 9	4	-	4	25 25	75 75	100	6
	DSE-III		Elective-III	3 9	4	-	4	25 25	75 75	100	6
	DSE – IV		Elective - IV (EDC)	3	5	1	-	25	75	100	6
				Any ONE Group							
				Group A							
	SEC – G-A 1		Placement - College to Corporate I	3	2	-	-	50	-	50	2
	SEC – G–A 2		Placement - College to Corporate II	3	2	-	-	50	-	50	2
				Group B							
	SEC – G – B		Enterprise Resource Planning	3	4	-	-	100	-	100	4
				Total	**34**					**500**	**28**
VI	DSC – XI		Environmental and Agricultural Microbiology	3 9	4	-	4	25 25	75 75	100	6
	DSC – XII		Medical Parasitology	3 9	4	-	4	25 25	75 75	100	6
	DSE- V		Elective-V	3 9	4	-	4	25 25	75 75	100	6
	DSE – VI		Elective-VI	-	-	-	6	25	75	100	6

			TOTAL			30				400	24
	I-VI		ALCTA* Certification courses (online/Offline)			Extra Credits					4*
										2900	**140 +4* =144**

ABBREVIATIONS

MIL - Multi Indian/ International Languages
ELN - English
Discipline Specific Courses
Discipline Specific Elective Courses
EDC - Extra Disciplinary Course
NMS - Naan Muthalvan Scheme
AECC - Ability Enhancement Compulsory CoursesDSC -
SEC - Skill Enhancement Courses (Group A&B) DSE -
NCC - Non-Credit Course
ALCTA-Advanced Learner Course in Thrust Area

DSE I-Discipline Specific Elective Course I: (III Semester)

1. Cell Biology 2. Biosafety and Bioethics

DSE II-Discipline Specific Elective Course II: (IV Semester)

1.Vaccines and Health Management 2. Biodegradation and Bioremediation

DSE III- Discipline Specific Elective Course III: (V Semester)

1.Recombinant DNA technology 2. Industrial Microbiology

DSE IV-Discipline Specific Elective Course IV (EDC): (V Semester)

Extra Disciplinary Course (EDC) (List Enclosed)

DSE V- Discipline Specific Elective CourseV: (VI Semester)

1.Pharmaceutical Microbiology 2. Clinical laboratory Technology

DSE VI- Discipline Specific Elective Course VI: (VI Semester)

1. Project & Viva Voce 2. Industrial Exposure Training Report- Viva Voce

DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE) IV: (V- SEMESTER)								
DSE – IV - EXTRA DISCIPLINARY COURSE :(EDC)								
Course	**Course Name**	**L**	**T**	**P**	**CIA**	**ESE**	**Total**	**Credits**
One Course – From the Group								
B.A. English	Professional Communication	5	1	-	25	75	100	6
BBA	Entrepreneurship	5	1	-	25	75	100	6
BBA (CA)	Project Management	5	1	-	25	75	100	6
B.COM	Insurance and Risk Management	5	1	-	25	75	100	6
B.COM (CA)	Social Media Marketing	5	1	-	25	75	100	6
B.COM (IT)	E-Commerce	5	1	-	25	75	100	6
B.COM (PA)	Indian Tax System	5	1	-	25	75	100	6
B.COM (BA)	Digital marketing	5	1	-	25	75	100	6
BCA	Responsive Web Design	5	1	-	25	75	100	6
B.Sc., (CS)	Business Analytics	5	1	-	25	75	100	6
B.Sc., (IT)	Big Data Engineering	5	1	-	25	75	100	6

B.Sc., CSHM	Hospitality Management	5	1	-	25	75	100	6
B.Sc., ECS	Fundamentals of Digital Computers	5	1	-	25	75	100	6
B.Sc.,MATHS	Computational Mathematics	5	1	-	25	75	100	6
B.Sc., BC	Health Management	5	1	-	25	75	100	6
B.Sc., BT	Forensic Science	5	1	-	25	75	100	6
B.Sc., MB	Microbes – Health & Disease	5	1	-	25	75	100	6
B.Sc., N&D	Health and Life Style Disorders	5	1	-	25	75	100	6
BBA Logistics	International Logistics	5	1	-	25	75	100	6
B.Sc Psychology	Stress and Conflict Management	5	1	-	25	75	100	6
Total							**100**	**6**

Course Title: **FUNDAMENTALS OF MICROBIOLOGY AND MICROBIAL DIVERSITY (T)**	Course Code : 13A
Semester: **I**	Course Group : DSC – I
Teaching Scheme in Hrs (L: T:P): **4:0:0**	Credits : **04**
Map Code : C (THEORY – CONCEPTS)	Total Contact Hours: **60**
CIA : **25 Marks**	SEE # : **75 Marks**

No.	**Course Outcome (Cos)**	**POs & PSOs**	**Cl. Ses**	**CL**
CO1	Recognize the positive and negative role of microbes in the environment and daily life	PSO1	12	R
CO2	Pinpoint the control measures of microbes determining their resistance and sensitivity in the host and environment	PSO1	10	U
CO3	Distinguish the microbial culturing methods to interpret in the epidemiological situations	PSO1	10	U
CO4	Identify the techniques for observing the microbial world in the *in vitro* level	PSO1	10	Ap
CO5	Impart and demonstrate the small world with chromophores to differentiate under morphological characteristics	PSO1	10	Ap

UNIT-I (LECTURE HOURS:12)

History and Evolution of Microbiology, Classification – Three kingdom, five kingdom, six kingdom and eight kingdom. Microbial biodiversity: Introduction to microbial biodiversity- ecological niche. Basic concepts of Eubacteria, Archaebacteria and Eucarya. Conservation of Biodiversity.

UNIT-II (LECTURE HOURS:12)

General characteristics of cellular microorganisms (Bacteria, Algae, Fungi and Protozoa) and acellular microorganisms - (Viruses, Viroids, Prions), Differences between prokaryotic and eukaryotic microorganisms. Structure of Bacterial cell wall, cell membrane, capsule, flagella, pili, mesosomes, chlorosomes, phycobilisomes, spores, and gas vesicles. Structure of fungi (Mold and Yeast), Structure of microalgae.

UNIT-III (LECTURE HOURS:12)

Bacterial culture media and pure culture techniques. Mode of cell division, Quantitative measurement of growth. Anaerobic culture techniques

UNIT-IV (LECTURE HOURS:12)

Microscopy – Simple, bright field, dark field, phase contrast, fluorescent, electron microscope – TEM & SEM, Confocal microscopy, and Atomic Force Microscopy. Stains and staining methods.

UNIT-V (LECTURE HOURS:12)

Sterilization–moist heat - autoclaving, dry heat – Hot air oven, radiation – UV, Ionization, filtration – membrane filter and disinfection, antiseptic; Antimicrobial agents.

TEXT BOOKS:

T1. Pelczar.M. J., Chan E.C.S. and Noel. R.K. (2007). Microbiology. 7thEdition.,McGraw – Hill, New York.

T2. MICROBIOLOGY , Edition:1st , Mc Graw-Hill , Pelczar, Jr., Michael (2001)

T3. Tortora, G.J., Funke, B.R., Case,C.L. (2013). Microbiology. An Introduction 11thEdition., A La Carte Pearson.

T4. Salle. A.J (1992). Fundamental Principles of Bacteriology. 7thEdition., McGraw Hill Inc.New York. (1995)

T5. Boyd, R.F. (1998). General Microbiology,2ndEdition., Times Mirror, Mosby CollegePublishing, St Louis.

REFERENCE BOOKS:

R1. Jeffrey C. Pommerville., Alcamo's Fundamentals of Microbiology (9thEdition). Jones &Bartlett learning 2010.

R2. Stanier R.Y, Ingraham J. L., Wheelis M. L., and Painter R. R. (2010). General Microbiology, 5thEdition., MacMillan Press Ltd

R3 Madigan M.T., Martinko J.M., Stahl D.A, and Clark D. P. (2010). Brock - Biology of Microorganisms, 13th Edition Benjamin-Cummings Pub Co.

R4 Salle. A.J (1992). Fundamental Principles of Bacteriology. 7thEdition., McGraw Hill Inc.New York.

R5. Nester E., Anderson D., Roberts C. E., and Nester M. (2006). Microbiology-A Human Perspective, 5thEdition., McGraw Hill Publications

WEBSITES : https://www.cliffsnotes.com/study-guides/biology/microbiology/introduction-to-microbiology/a-brief-history-of-microbiology

https://www.keyence.com/ss/products/microscope/bz-x/study/principle/structure.jsp

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6604941/#

https://bio.libretexts.org/@go/page/9188

https://courses.lumenlearning.com/boundless-microbiology/chapter/microbial-nutrition/

Course Title : **FUNDAMENTALS OF MICROBIOLOGY AND MICROBIAL DIVERSITY (P)**	Course Code : 13P
Semester : **I**	Course Group : DSC – I
Teaching Scheme in Hrs (L:T:P) : **0:0:4**	Credits : **02**
Map Code : M (PRACTICAL EXPERIMENTS)	Total Contact Hours : **60**
CIA : **25 Marks**	SEE # : 75 **Marks**
Programme: **B Sc MICROBIOLOGY**	**# - Semester End Exam**

FUNDAMENTALS OF MICROBIOLOGY AND MICROBIAL DIVERSITY

1. Cleaning of glass wares, Microbiological good laboratory practice and safety. Sterilization and assessment of sterility– Autoclave, hot air oven, and membrane filtration.
2. Media preparation: liquid media, solid media, semi-solid media, agar slants, agar deeps, agar plates.
3. Preparation of basal, differential, enriched, enrichment, transport, and selective media preparation- quality control of media, growth supporting properties, sterility check of media.
4. Pure culture techniques: streak plate, pour plate, decimal dilution.
5. Culture characteristics of microorganisms: growth on different media, growth characteristics, and description. Demonstration of pigment production.
6. Microscopy: light microscopy and bright field microscopy.
7. Staining techniques: smear preparation, simple staining, Gram's staining and endospore staining.
8. Study on Microbial Diversity using Hay Infusion Broth-Wet mount to show different types of microbes, hanging drop.

Course Title : BASIC AND CLINICAL BIOCHEMISTRY **(T)**	Course Code
Semester : **I**	Course Group : DSC – II
Teaching Scheme in Hrs (L:T:P) : **0:0:4**	Credits : **02**
Map Code : C (THEORY – CONCEPTS)	Total Contact Hours : **60**
CIA : **25 Marks**	SEE # : 75 **Marks**
Programme: **B Sc MICROBIOLOGY**	**# - Semester End Exam**

No	**Course Outcome (Cos): After completion of this course, the students will be able to**	**POs & PSOs**	**Cl.Ses**	**CL**
CO1	Explain the structure, classification , biochemical functions and significance of carbohydrates and lipids	PO1 & PSO1	12	**R**
CO2	Differentiate essential and non-essential amino acids, biologically important modified amino acids and their functions, Illustrate the role, classification of Proteins and recognize the structural level organization of proteins, its functions and denaturation.	PO1 & PSO1	10	**U**
CO3	Assess defective enzymes and Inborn errors. Recognize diseases related to carbohydrate and lipid metabolism	PO1 & PSO1	10	**AN**
CO4	Discuss and evaluate the pathology of aminoacid metabolic disorders.	PO1 & PSO1	10	**E**
CO5	Appraise the imbalances of enzymes in organ function and relate the role of Clinical Biochemistry in screening and diagnosis	PO1 & PSO1	10	**E**

UNIT I **(LECTURE HOURS=12)**

Biomolecules -Carbohydrate – General properties, function, structure, classification– monosaccharides (Glucose, Fructose, Galactose), Oligoaccharides (Sucrose, Maltose, Lactose) and polysaccharides (Starch, Glycogen,) and biological significance. Lipids – General properties, functions, structure, classification (Simple, Derived and Complex), Cholesterol, LDL, HDL – biological significance.

UNIT II **(LECTURE HOURS=12)**

Biomolecules - Amino acids – General properties, functions, structure, classification and biological significance. Proteins– General structure, Properties, functions, classification and

biological significance.

UNIT III (LECTURE HOURS=12)

Disorders of Metabolism: Disorders of carbohydrate metabolism: diabetes mellitus,ketoacidosis, hypoglycemia, glycogen storage diseases, galactosemia and lactose intolerance. Disorders of lipid metabolism: hyperlipidemia, hyperlipoproteinemia, hypercholesterolemia, hypertriglyceridemia,sphingolipidosis.

UNIT IV (LECTURE HOURS=12)

Disorders of Metabolism: Disorders of amino acid metabolism:alkaptonuria, phenylketonuria, phenylalaninemia, homocystineuria, tyrosinemia, aminoacidurias.

UNIT V (LECTURE HOURS=12)

Evaluation of organ function tests: Assessment and clinical manifestations of renal, hepatic, pancreatic, gastric and intestinal functions.

Diagnostic enzymes: Principles of diagnostic enzymology. Clinical significance of aspartate aminotransferase, alanine aminotransferase, creatine kinase, aldolase and lactate dehydrogenase.

TEXT BOOKS

T1.Satyanarayana, U. and Chakrapani, U(2014).Biochemistry,4th Edition, Made Simple Publisher.
T2.Jain J L, Sunjay Jain and Nitin Jain (2016).Fundamentals of Biochemistry, 7th Edition, S Chand Company.
T3. AmbikaShanmugam's (2016). Fundamentals of Biochemistry for Medical Students, 8th Edition. Wolters Kluwer India Pvt Ltd.
T4. Vasudevan. D.M.Sreekumari.S, Kannan Vaidyanathan (2019). Textbook Of Biochemistry For Medical Students. Kindle edition, Jaypee Brothers Medical Publishers
T5. Jeremy M. Berg,LubertStryer, John L. Tymoczko, Gregory J. Gatto (2015). Biochemistry, 8th edition. WH Freeman publisher.

REFERENCES BOOKS

R1.AmitKessel&Nir Ben-Tal (2018). Introduction to Proteins: structure, function and motion. 2nd Edition, Chapman and Hall.
R2.David L. Nelson and Michael M. Cox (2017).Lehninger Principles of Biochemistry, 7th Edition W.H. Freeman and Co., NY.
R3.Joy PP, Surya S. and AswathyC (2015). Laboratory Manual of Biochemistry, Edition 1.,Publisher:Kerala agricultural university.
R4.Donald Voet, Judith Voet, Charlotte Pratt (2016). Fundamentals of Biochemistry: Life at the Molecular Level, 5th Edition, Wiley.
R5. LupertStyrer, Jeremy M. Berg, John L. Tymaczko, Gatto Jr., Gregory J (2019). Biochemistry. 9th Edition ,W.H.Freeman& Co. New York.

Web Resources

1. https://www.abebooks.com › plp
2. https://kau.in/document/laboratory-manual-biochemistry
3. https://metacyc.org
4. https://www.medicalnewstoday.com
5. https://journals.indexcopernicus.com

Course Title: **MICROBIAL PHYSIOLOGY AND METABOLISM (T)**	Course Code: 23A
Semester: **II**	Course Group : **DSCIII**
Teaching Scheme in Hrs (L: T:P): **4:0:0**	Credits: **4 Credits**
Map Code: D (THEORY – APPLICATION)	Total Contact Hours: **60**
CIA: **25 Marks**	SEE # : **75 Marks**
Programme: **B Sc., MICROBIOLOGY**	**# - Semester End Exam**

No	Course Outcome (Cos): After completion of this course, the students will be able to	POs & PSOs	Cl.Ses	CL
CO1	Recognize the nutritional requirements of microorganism	PO1& PS01	12	U
CO2	Determine the growth kinetics of microbes relevant to the nutrition	PO1& PS03	12	An
CO3	Emphasize the energy generation and synthesis of cellular components from the small molecules	PO1& PS03	12	An
CO4	Categorize the biosynthetic pathways in microbes	PO1& PS03	12	An
CO5	Determine the one carbon fixation mechanism and the nature of Microbial metabolism	PO1& PS03	12	An

UNIT I **(LECTURE HOURS: 12)**

NUTRITIONAL REQUIREMENTS OF MICROORGANISMS

Common nutrient requirements (Macro nutrient, micro nutrient and trace elements). Nutritional types of microorganisms. Requirements for Carbon, hydrogen and oxygen - photolithoautotroph, photoorganoheterotroph, chemolithoaututroph, chemoorganoheterotroph. Transport of nutrients- Diffusion (Passive and facilitated diffusion), Active transport (ABC transporters, uniport, symport and antiport mechanism), Group translocation (Phosphoenolpyruvate sugar phosphotransferase system).

UNIT II **(LECTURE HOURS: 12)**

GROWTH CURVE-Different phases of growth (Lag, log, stationary, death phase). Growth kinetics (Mean growth rate constant and determination of generation time). Open culture system. Continuous culture (Chemostat and turbidostatic). Factors influencing microbial growth, Solutes and water activity (Classification based on salt concentration and its adaptation), pH (Classification based on pH ranges and adaptation), Temperature (Classification based on temperature ranges), Oxygen concentration (Classification based on oxygen concentration and adaptation), Pressure (Classification based on pressure and adaptation), Radiation (Effect of UV radiation and visible light and adaptation).

UNIT III **(LECTURE HOURS: 12)**

AEROBIC RESPIRATION-Central metabolic pathways Embden Meyerhoff Parnas pathway, Hexose monophosphate pathway, Entner-Doudoroff pathway. Tri Carboxylic acid Cycle, Electron transport chain, oxidative phosphorylation, ATP generation. Anaerobic respiration-Inorganic

compounds as final electron acceptor (Nitrate, sulphate and carbon di oxide).

Fermentation-Alcoholic fermentation (Mechanism and end product formation), Lactic acid fermentation -Homo lactic and hetero lactic fermentation, Mixed acid fermentation (Mechanism and end product formation), Butanediol fermentation (Mechanism and end product formation)

UNIT IV **(LECTURE HOURS: 12)**

BIOSYNTHESIS OF CELL WALL-Gram positive cell wall structure and synthesis (Peptidoglycan, teichoic acid and lipoteichoic acid synthesis), Gram negative cell wall structure and synthesis (Peptidoglycan, lipopolysaccharide synthesis). Biosynthesis of nucleotides-Pyrimidine biosynthesis (Cytosine, thymine and uracil), Purine biosynthesis (Adenine and guanine). Sporulation-Endospore - Structure and stages in sporulation.

UNIT V **(LECTURE HOURS: 12)**

CARBON DIOXIDE FIXATION-Calvin cycle - Carboxysome, carboxylation, reduction and regeneration phase, Reductive TCA cycle - Enzymes involved and pathway, Photosynthesis-Light reaction in cyanobacteria (Photosynthetic pigments, oxygenic photosynthesis, photosystem I and II, cyclic and non-cyclic photophosphorylation).

Light reaction in green and purple bacteria - Anoxygenic photosynthesis. Bacteriochlorophylls, difference between green and purple bacterial photosynthesis and NAD reduction. Bioluminescence-Mechanism (Bioluminescent bacteria, symbiotic association, luciferase and emission of light).

TEXT BOOKS :

T1. Microbiology , Edition:7 , BROWN PUBLISHERS , Harley, J.P. AND C.A.Klein AND Prescott, L.M(2020)

T2. Microbial Physiology Edition :4 /Wiley-Liss, Inc./ Albert G. Moat, John W. Foster, Michael P. Spector 2002

REFERENCE BOOKS:

R1. Principles of Microbiology, Ronald M Atlas, MC Graw Hill Publishers, 2nd edition, 1996.

Course Title: **MICROBIAL PHYSIOLOGY AND METABOLISM (T)**	Course Code: 23P
Semester : **III**	Course Group : **DSC V**
Teaching Scheme in Hrs (L:T:P) : **0:0:4**	Credits : **2**
Map Code: D (THEORY – APPLICATION)	Total Contact Hours: **60**
CIA: 25 **Marks**	SEE # : **75 Marks**
Programme: **BSC-MICROBIOLOGY**	**# - Semester End Exam**

List of Practicals:

1. Indole production test Citrate utilization test
2. Growth curve
3. Effect of salt concentration on the growth of microorganism
4. Effect of pH on the growth of microorganism
5. Effect of temperature on the growth of microorganism
6. Carbohydrate fermentation
7. Triple sugar iron agar test
8. Methyl red test
9. Voges Proskauer test
10. Determination of cell wall inhibition by penicillin
11. Chlorophyll extraction from blue green algae

Practical Manual

Microbiology A Laboratory Manual 11th Edition (2016) (PDF) James G. Cappuccino

Course Title: **BIOINSTRUMENTATION (T)**	Course Code: 23B
Semester: **II**	Course Group : **DSC IV**
Teaching Scheme in Hrs (L: T:P): **4:0:0**	Credits : **4**
Map Code: D (THEORY – APPLICATION)	Total Contact Hours: **60**
CIA: **25 Marks**	:SEE#:**75 Marks**
Programme: **BSc MICROBIOLOGY**	**# - Semester End Exam**

No	Course Outcome (Cos): After completion of this course, the students will be able to	POs & PSOs	Cl.Ses	BLOOM'S TAXONOMY LEVEL
CO1	Exemplify the skill to measure the concentration of ions.	PO1& PS01	15	U
CO2	Determine the working of analytical instruments	PO1& PS01	10	Ap
CO3	Elucidate the concentration of solutes in a solution	PO1& PS01	10	Ap
CO4	Estimate the force of moving object leading to the separation of biomolecules	PO1& PS01	11	Ap
CO5	Separation and distribution of components between two phases and Analyse the activity of nuclear reaction in biosciences	PO1& PS01	14	An

UNIT I **(LECTURE HOURS: 15)**

pH STUDIES AND ELECTROCHEMISTRY INSTRUMENTATION

Basic instruments:pH meter- Principle, Instrumentation - glass and reference electrodes, (operation and calibration, Applications). Buffer solutions (Principles- Henderson- Hasselbalch equation,properties, buffering capacity, Example). pH indicator (Principles- change of color based on pH, Applications, examples). Conductivity meter (Principles, Instrumentation and Applications). Biosensor (Principle, types and applications) –Biochemical calculations- preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- Calculation of Normality ,PPM- Ammonium sulphate precipitation.Amphoteric substance (biochemical processes, biological processes)

UNIT II **(LECTURE HOURS: 10)**

MEASUREMENT OF BIOMOLECULES

Colorimetry (Principle-Beer's & Lamberts law - Role of concentration of chromogen, Thickness of solution, Instrumentation -Parts of instrument, Light source, Filter, Cuvette, Photocell).Operation (Operating rules, Warm up, Adjusting 100% Transmittance). Deviations of Beer Lamberts Law (Deviation due to instrument, Deviation due to sample). Spectrophotometry- Principle (Regions of electromagnetic radiation, Measurement of molecules, Rayleigh scattering). Instrumentation (Light source, Monochromator, Optical system, Phototube, recorder, Applications-Measurement of concentration of solute, Unknown biomolecule, rate of biochemical reactions). Infrared spectroscopy –Principle,Instrumentation and application.UV and Visible

spectroscopy - Regions of EMR, Percent transmittance, Absorption bands. Imaging techniques: ECG, EEG and PET scan radioisotopes - Principle, Instrumentation and application

UNIT III **(LECTURE HOURS: 10)**

SEPARATION OF BIOMOLECULES

Centrifugation- Basic principles (Stokes law, Centrifugal force, process of separation). Instrumentation (Components, Electric motor, Drive shaft, Rotor). Types (small bench top centrifuge,Large capacity refrigerated centrifuge, High speed centrifuge and Continuous flow centrifuge). Ultracentrifuge – Preparative(Principle,instrumentation) and analytical centrifuge(Principle,instrumentation). Methods of preparative centrifugation- Differential centrifugation (Sedimentation rate of particle, Different size, Different density). Density gradient centrifugation-Zonal centrifugation, Isopycnic centrifugation. ,Applications-Separation of antigen, antibody, Isolation of plasmid DNA, Harvest of Microbial cells, Detection of conformational changes.

UNIT IV **(LECTURE HOURS: 11)**

ISOLATION OF COMPOUNDS

Chromatography (Principle, Distinct phases, Mobile phase, Stationary phase). Paper chromatography-Preparation of sample, solvent development, detection and measurement and applications. Thin layer chromatography - Preparation of thin layer, sample application, plate development. Affinity chromatography - Biological interactions, Sample, ligand molecules, specific and nonspecific elution. Column chromatography (Commonly used matrices, packing of column, loading sample, detector and fraction collection). Ion exchange chromatography (Charged particles, cation and anion exchange resins, types, elution). Gel permeation chromatography (Separation on the basis of molecular size, shape, Gel preparation, storage). Gas chromatography (Instrumentation, stationary phase, mobile phase, carrier gas, FID, TC). High performance liquid chromatography (Instrumentation, Solvent reservoir, pumping system, injection port, column, detector, collection of eluents).

UNIT V **(LECTURE HOURS: 14)**

SEPARATION OF NUCLEIC ACIDS AND RADIATION

Electrophoresis (Principles, Electrophoretic Mobility, Electric field Strength, velocity of molecules), Instrumentation (Apparatus, Cathode, anode, Power supply). Types (Agarose Electrophoresis - Definition, Principle, Parts, Steps, Applications), SDS PAGE -Definition, Principle, Parts, Steps, Applications. Immunoelectrophoresis- Definition, Principle, Parts, Steps, Applications). Isoelectric focusing (Isoelectric point, Net charge, Applications)

Radioactivity (Atom, Isotope, Radioisotope- Mass number, Atomic number, Neutron, Proton, Electron). Types of radioactive decay (Decay by Negatron, positron, alpha particle, X ray, Gamma ray emission). Detection and measurement of radioactivity (Ionization of gases, excitation of solids, Liquids, Scintillation, Autoradiography). Uses of radioisotopes (Metabolic pathway, Radio dating, analytical applications).

.

Text Books

T1.Jayaraman J (2011). Laboratory Manual in Biochemistry, 2nd Edition. Wiley Eastern Ltd., New Delhi

.

T2.Ponmurugan. P and Gangathara PB (2012). Biotechniques.1st Edition. MJP publishers.
T3.Veerakumari, L (2009).Bioinstrumentation- 5 th Edition -.MJP publishers.
Upadhyay, Upadhyay and Nath (2002).
T4.Biophysical chemistry – Principles and techniques 3rd Edition. Himalaya publishing home.
Chatwal G and Anand (1989).
T5.Instrumental Methods of Chemical Analysis. S.Himalaya Publishing House, Mumbai.

References Books

R1.Rodney.F.Boyer (2000). Modern Experimental Biochemistry, 3rd Edition. Pearson Publication.
SkoogA.,WestM (2014).
R2.Principles of Instrumental Analysis – 14th Edition W.B.SaundersCo.,Philadephia.
N.Gurumani. (2006).
R3.Research Methodology for biological sciences- 1st Edition – MJP
Publishers .
R4.Wilson K, and Walker J (2010). Principles and Techniques of Biochemistry and Molecular Biology.7thEdition. Cambridge University Press .
R5.Webster, J.G. (2004). Bioinstrumentation- 4th Edition - John Wiley & Sons (Asia) Pvt.Ltd,Singapore.

Web Resources

W1.http://www.biologydiscussion.com/biochemistry/centrifugation/centrifugeintroduction-types- uses-and-other-details-with-diagram/12489
W2.https://www.watelectrical.com/biosensors-types-its-working-andapplications/
W3.http://www.wikiscales.com/articles/electronic-analytical-balance/ Page 24 of 75
W4.https://study.com/academy/lesson/what-is-chromatography-definition-typesuses.html
W5.http://www.rsc.org/learn-chemistry/collections/spectroscopy/introduction

Course Title: **BIOINSTRUMENTATION (P)**	Course Code: 23Q
Semester: **II**	Course Group : **DSC IV**
Teaching Scheme in Hrs (L:T:P): **0:0:4**	Credits : **2**
Map Code: H (PRACTICAL EXPERIMENTS)	Total Contact Hours: **60**
CIA: 25 **Marks**	SEE #:75 **Marks**
Programme: **BSc MICROBIOLOGY**	**# - Semester End Exam**

List of Practicals:

1. Buffer preparation
2. Determination of pH
3. Estimation of protein-Lowry *et al* method
4. Estimation of protein- Bradford's Method
5. Estimation of reducing sugar by DNS assay
6. Extraction of pigment from plant sample/ Algal sample
7. Paper Chromatography
8. Thin layer chromatography
9. Demonstration of Agarose gel electrophoresis
10. Demonstration of Sodium Dodecyl Sulphate- Polyacrylamide Gel Electrophoresis (SDS-PAGE)

Practical manual

1. Palanivel. P., A Separation technique- A laboratory Manual, McGraw- Hill Inc., Publishers.

Course Title: **IMMUNOLOGY AND IMMUNOTECHNOLOGY**	Course Code: 33 A
Semester: **III**	Course Group : DSC V
Teaching Scheme in Hrs (L:T:P): **4:0:0**	Credits : **4**
Map Code: D (THEORY – APPLICATION)	Total Contact Hours: **60**
CIA: **25 Marks**	SEE # : **75 Marks**
Programme: **B SC.,MICROBIOLOGY**	**# - Semester End Exam**

No	**Course Outcome (Cos): After completion of this course, the students will be able to**	**POs & PSOs**	**Cl.Ses**	**CL**
CO1	Review the types and functions of the cells & organs of the immune system	PO1 & PSO1	14	U
CO2	Describe the structure and reactions of the Immunogens	PO1 & PSO1	10	U
CO3	Analyze the production of antibody and the mechanism of the complement in our body	PO1 & PSO3	12	An
CO4	Sequence the hypersensitivity and immune response to infectious diseases	PO1 & PSO2	12	Ap
CO5	Practice the awareness of diagnosis and prophylaxis and other techniques.	PO1 & PSO2	12	Ap

UNIT I **(LECTURE HOURS: 14)**

INTRODUCTION OF IMMUNE SYSTEM

History and Theories of Immunology (Side chain theory and Clonal selection theory). Types of Immunity-Innate Immunity, Acquired Immunity (Differences, Examples). Cells of Immune System-Hematopoiesis, Lymphoid cells and Myeloid cells (Examples and Diagram). Organs of the Immune System-Primary and Secondary lymphoid organs (Thymus, Bone marrow, Lymph node, Spleen). Immunohematology-ABO Blood Grouping, Transfusions (Genetics and ABO Compatibility)

UNIT II **(LECTURE HOURS: 10)**

IMMUNOGENS, ANTIGENS AND ANTIBODIES-ANTIGENS

Antigens (Antigenicity, Properties, Immunogenicity versus Antigenicity, factors influencing immunogenicity). Epitopes (B cell and T cell epitopes). Haptens, Adjuvants (Definition and Role). Antibodies (Structure, Function, Types). Monoclonal Antibody Production (Hybridoma Technology). Properties (Antigen Antibody binding, Antibody affinity, Antibody avidity, Antibody specificity and cross reactivity).

UNIT III **(LECTURE HOURS: 12)**

COMPLEMENT SYSTEM

Complement (Structure, Components, properties and functions). Complement pathways and Biological consequences (Classical and Alternative pathways). Major Histocompatibility complex-MHC (Structure, functions and Classes of MHC). Transplantation-HLA and Tissue Transplantation (Immunological basis of Graft rejection, Tissue typing methods, Graft versus host reaction and reaction). Antigen Processing and

Presentation (Antigen presenting cells, Pathways-Cytosolic and Endocytic, Endogenous, Exogenous and Non -peptide antigens).

UNIT IV **(LECTURE HOURS: 12)**

HYPERSENSITIVITY AND AUTOIMMUNITY

Type I Hypersensitivity (Anaphylactic response, Explanation with diagram). Type II Hypersensitivity (Transfusion reactions, Hemolytic diseases of New born), Type III Hypersensitivity (Immune complex diseases and their types), Type IV Hypersensitivity (Delayed hypersensitivity reaction and explanation). Autoimmunity (Autoimmune disorders- Systemic and Localized).

UNIT V **(LECTURE HOURS: 12)**

IMMUNOLOGICAL TECHNIQUES AND THEIR PRINCIPLES

Precipitation and Agglutination (Precipitation reactions in fluids and gels, Passive agglutination and agglutination inhibition), ELISA (Principle, Procedure and Types), Radio Immunoassays (Definition, Procedure and Types), Immunodiffusion (Mancini and Ouchterlony Immunodiffusion), Immunoelectrophoresis (Counter current and Rocket Immunoelectrophoresis), Immunoprecipitation Reactions-ASO (Principle, Diagram).

TEXT BOOKS:

T1. Essential Immunology, Edition:4, Blackwell Scientific Publishers , Roitt I.M(1998)

T2. Immunology, Edition:2, W.H Freeman and Co Newyork , Kuby J (1997)

T3. Immunology and Microbiology Dulsy Fatima Saras publications. 2018

REFERENCE BOOKS:

R1. IMMUNOLOGY: An Introduction, Edition:4, Saunders College Publishing. Philadelphia, Tizzard R.I(1983)

R2. Review of Medical Microbiology, Edition:9, Lange review Series (NY: McGraw-Hill) , Levinson W (2006)

R3. The Immune System, Edition:2, New York: Current Trends/Garland , Levinson W (2006)

Course Title: **IMMUNOLOGY AND IMMUNOTECHNOLOGY (P)**	Course Code: 33 P
Semester: **III**	Course Group : **DSC V**
Teaching Scheme in Hrs (L: T:P): **0:0:4**	Credits : 02
Map Code: M (PRACTICAL – APPLICATION)	Total Contact Hours: **60**
CIA: **25 Marks**	SEE # : 75 **Marks**
Programme: **B Sc. MICROBIOLOGY**	**# - Semester End Exam**

List of Practicals:

1) Observation of Blood cells -RBC
2) Observation of Blood cells -WBC (TC& DC)
3) Cultivation of Bacterial antigen
4) Complement fixation test -Coombs test
5) Blood Grouping
6) ELISA
7) WIDAL - Qualitative test
8) WIDAL -Quantitative test
9) ASO
10) Single Radial Immunodiffusion
11) Counter current electrophoresis

REFERENCE BOOKS:

R1. PRACTICAL IMMUNOLOGY, 4th Edition Frank C. Hay, Olwyn M. R. Westwood,Wiley-Blackwell,2008

R2. LABORATORY MANUAL IN IMMUNOLOGY AND BIOTECHNOLOGY Ashish s Verma,S Chand publications, 2014.

R3. MICROBIOLOGY A LABORATORY MANUAL , Edition:12th , Benjamin-Cummings Publishing Company , James G. Cappuccino, and Natalie Sherman, 2020.

R4. LABORATORY-IMMUNOLOGY Jack Bradshaw, 2nd edition, Saunders college publishing ,1994

Course Title: MEDICAL BACTERIOLOGY AND ANTIBACTERIAL AGENTS **(T)**	Course Code: 33 B
Semester: **III**	Course Group : **DSC VI**
Teaching Scheme in Hrs (L: T:P): **0:0:4**	Credits : 04
Map Code: D (THEORY – APPLICATION)	Total Contact Hours: **60**
CIA: **25 Marks**	SEE # : 75 **Marks**
Programme: **B Sc. MICROBIOLOGY** **End Exam**	**# - Semester**

No.	Course Outcome (Cos)	PSOs	Cl. Ses	CL
CO1	Recognize the normal bacterial floras of human anatomical sites, and their role in competing the pathogenic microbes.	PSO1	12	R
CO2	Describe the Gram-positive bacterial pathogens' characteristics, epidemiology, pathogenesis, diagnosis, testing, and therapy.	PSO1	12	U
CO3	Discuss the role of enteropathogens impacting host health and their diagnosis and treatment method.	PSO1	12	U
CO4	Review the opportunistic, environmental and intracellular bacterial pathogens and their control as well as therapy	PSO1	12	U
CO5	Apply the methods of diagnosis in bacterial infection and drug of choice interpretation by *in vitro* approach	PSO1	12	Ap

UNIT: I **LECTURE HOURS :12**

INTRODUCTION TO MEDICAL MICROBIOLOGY- Medical microbiology and modern medical microbiology, Scope and importance of medical microbiology, Importance of Microbiology. Bacterial infection and pathogenic mechanism- Terms used in medical bacteriology, Bacterial virulence factors, Bacterial virulence factors. Normal Normal flora and protective mechanism- Importance of normal flora, Normal flora competing against invading pathogens. Normal flora of Skin, Gastrointestinal Tract (GIT), Urogenital tract, Conjunctiva.Opportunistic infections.

UNIT : II

GRAM POSITIVE BACTERIA **LECTURE HOURS :12**

Non-sporing cocci: *Staphylococcus aureus, Streptococcus pyogenes and Enterococcus faecalis*- General characteristics, epidemiology, pathogenesis and spectrum of diseases, Laboratory diagnosis, antimicrobial susceptibility testing and therapy. Non-sporing bacilli: *Corynebacterium diptheriae*, *Listeria monocytogenes* - General characteristics, epidemiology, pathogenesis and spectrum of diseases, Laboratory diagnosis, antimicrobial susceptibility testing and therapy. Sporing Bacilli: *Bacillus anthracis, Clostridium species (C. tetani, C. botulinum, C. perfringens, C.difficile).*

UNIT: III **LECTURE HOURS :12**

GRAM NEGATIVE BACTERIA

Enteric Gram-Negative Rods (Enterobacteriaceae members): (*Escherichia coli*, *Salmonella* serotypes (S.typhi and S.paratyphi) *Shigella* species, *Yersinia pestis*, *Enterobacter* species, *Klebsiella* species, and *Proteus* species - General characteristics, epidemiology, pathogenesis and spectrum of diseases, Laboratory diagnosis, antimicrobial susceptibility testing and therapy. Bacteria spreading through- Respiratory droplet (Coccobacilli-Haemophilus influenzae, *Bordella pertusis*,*Neisseria meningitidis*), Person to person contact (*Helicobacter pylori*), Sexually transmitted: *Neisseria gonorrhoeae*

UNIT: IV **LECTURE HOURS :12**

GRAM NEGATIVE BACILLI

Opportunistic bacteria: *Pseudomonas aeruginosa, Pseudomonas fluorescens,* - General characteristics, epidemiology, pathogenesis and spectrum of diseases, Laboratory diagnosis, antimicrobial susceptibility testing and therapy.

Environmental derived bacteria: V*ibrio cholerae,* Animal derived bacteria: *Campylobacter genus* (*C. jejuni* & *C. coli*), Tubercular bacilli: *Mycobacterium tuberculosis*, Non-tubercular bacilli: *Mycobacterium leprae,* Obligate intracellular bacteria: Coccobacilli-*Chlamydia species,* Cell wall deficient bacteria: *Mycoplasma species, Spirochetes: Treponema pallidum, Leptospira species.*

UNIT V **LECTURE HOURS :12**

LABORATORY DETECTION METHODS IN BACTERIAL INFECTIONS

Specimen collection and Transport, Macroscopic examination of specimens, Direct detection methods (Antigen detection and gram staining), Specimen processing- Aerobic and anaerobic method, Incubation condition and duration. Approach to identification-Examination of primary plates, subculture of isolates, Presumptive and definitive identification. Antimicrobial susceptibility testing and therapy.

Text Books

1. Ananthanarayan and Paniker's, Textbook of Microbiology, 12th Edition: 2020. Publisher- University Press (India) Private Limited.
2. Patricia M.Tille- Bailey and Scott’s Diagnostic Microbiology, 13th Edition: 2014. Publisher- ELSEVIER Mosby.

Reference Books

1. Baron S, Medical Microbiology. 4th Edition: 1996. National Library of Medicine-National Center for Biotechnology Information.Galveston (TX): University of Texas Medical Branch at Galveston; 1996.
2. /)
3.

WEB RESOURCE:

1. https://www.atsu.edu/faculty/chamberlain/Website/gallery.htm
2. (https://www.ncbi.nlm.nih.gov/books/NBK7994

Course Title: **MEDICAL BACTERIOLOGY AND ANTIBACTERIAL AGENTS (P)**	Course Code : 33 Q
Semester: **III**	Course Group : **DSC VI**
Teaching Scheme in Hrs (L:T:P): **0:0:4**	Credits :0**2**
Map Code: M (PRACTICAL– APPLICATION)	Total Contact Hours: **60**
CIA: 25 **Marks**	SEE # : 75 **Marks**
Programme: **B SC., MICROBIOLOGY**	**# - Semester End Exam**

List of Practicals:

1. Laboratory methods of identification of *Staphylococcus aureus*
2. Laboratory methods of identification of *Streptococcus pyogenes*
3. Laboratory methods of identification of *E. coli*
4. Laboratory methods of identification of *Klebsiella*
5. Laboratory methods of identification of *Salmonella*
6. Laboratory methods of identification of *Shigella*
7. Laboratory methods of identification of *Pseudomonas*
8. Antimicrobial susceptibility testing
9. Cultivation of anaerobes

Course Title : CELL BIOLOGY **(T)**	Course Code:
Semester : **III**	Course Group : DSE – I
Teaching Scheme in Hrs (L:T:P) : 5**:1:0**	Credits : **06**
Map Code: C (THEORY – CONCEPTS)	Total Contact Hours : **90**
CIA : **25 Marks**	SEE # : 75 **Marks**
Programme: **B Sc MICROBIOLOGY**	**# - Semester End Exam**

No.	Course Outcome (Cos)	POs & PSOs	Cl. Ses	CL
CO1	To know the cell organelles and locate its parts along with functions	PSO1	18	U
CO2	Differentiate the structure of prokaryotic and eukaryotic cell	PSO1	18	An
CO3	Explain the organization of protein sorting and transport	PSO1	18	Ap
CO4	To know the cell cycle and regulation	PSO1	18	Ap
CO5	Explain the communications of cells with other cells and to the environment.	PSO1	18	Ap

UNIT I (LECTURE HOURS: 18)

BASIC OF CELL: Cell as a basic unit (Definition of Cell), Discovery of the cells , Classification of cell types (Eukaryotic and Prokaryotic), Development of cell theory (Definition), Early chemical investigation in cell biology (methods involved). Prokaryotic and Eukaryotic cell organization (Function).

Activity: Preparation of chart describing the structure of prokaryotic and eukaryotic cell

UNIT II (LECTURE HOURS: 18)

CYTOPLASMIC COMPARTMENTS OF THE CELL: Structure and function of cytoplasmic compartments of the cell (ribosome and protein synthesis). Energy flow (through *mitochondrion*, chloroplast and photosynthesis). Vacuoles (function and types) peroxysomes (function), and Nuclear Internal organisation of the nucleus (chromosomes, functional domains and matrix).

Activity: Preparation of models describing the cell organelles and its function

UNIT III (LECTURE HOURS: 18)

PROTEIN SORTING AND TRANSPORT: Endoplasmic reticulum (function and Types) - Protein secretion (Steps Involved), Targeting (Steps Involved), Folding and processing in ER and export (Steps Involved). Golgi apparatus-(function) Mechanism of vesicular transport (Steps Involved) and Lysosomes (function Steps Involved).

Activity: Demonstration of the Activity of the protein sorting in a cell through models

UNIT IV (LECTURE HOURS: 18)

CELL DIVISION: Cell division in prokaryotes and eukaryotes: Cell cycle (Steps Involved and **Types** -mitosis, meiosis), **crossing over (**Definition, Steps Involved) and **characteristics of cancer**(tumor clonality, the development of tumors), **Apoptosis** (Definition, Steps Involved), **Stem cell**(definition and function) **, Prions** (definition)

Activity : Preparation of chart describing the division of cell in prokaryotes and eukaryotes

UNIT V (LECTURE HOURS: 18)

SPECIALIZED CELLS AND INTERACTION: Integrative and specialized cellular events(definition and function), cell-cell signalling, specialized cells nerve cells (definition and

function), sperm cells, microfilaments, microtubules, muscle cells(Functions). Cells of vision(definition and function), Nucleocytoplasmic interaction, cell cloning(definition and function).
Activity: Demonstration of specialized cell structure through models.

Text books

1. V.K Agarwal and P.S. Verma.1986. Cytology. Sixth Edition. S.Chand & Company Pvt Ltd, NewDelhi.
2. Prescott, L.M., Harley,J.P. and C.A.Klein.(2007).Microbiology 7th edition Wm, C.Brown publishers.

Reference books

1. Cooper,G.M.2000.Thecell-AMolecularapproach,Secondedition,ASMPress,Washington.
2. Alberts,B., D.Bray, J.Lewis, M.Raff, K. Roberts and J.D. Watson.1989. Molecular Biology of the Cell. Second edition. Garland Publishing, NewYork.
3. Ariel.G. Loewy, Philip siekevitz, John R. Menninger & Jonathan A. N. Gallant, 1991: Cell structure and function. Third edition. Saunders College publishing, London.

Course Title: **MOLECULAR BIOLOGY AND MICROBIAL GENETICS (T)**	Course Code : 33A
Semester:III	Course Group : **DSC-VII**
Teaching Scheme in Hrs (L:T:P): **4:0:0**	Credits : **4**
Map Code: D (THEORY – APPLICATION)	Total Contact Hours: **60**
CIA: **25 Marks**	SEE # : **75 Marks**
Programme: **B SC.,MICROBIOLOGY**	**# - Semester End Exam**

No	Course Outcome (Cos): After completion of this course, the students will be able to	POs &PSOs	Cl.Ses	CL
CO1	To remember the basis of DNA as genetic material of microbes and its application mechanism	PO1 & PSO2	15	U
CO2	To understand the role of RNA, transcription and genetic code	PO1 & PSO1	15	R
CO3	To understand the process of translation and post translational modification	PO1 & PSO1	15	R
CO4	To understand the gene regulation and operon concept	PO1 & PSO2	15	Ap
CO5	To understand the types of mutation and the natural repair mechanism	PO1 & PSO2	15	Ap

UNIT I **(LECTURE HOURS: 15)**

PROKARYOTIC NUCLEIC ACID-DNA

DNA as genetic material (Griffith experiment, Avery, Mc Leod, Mc Carty experiment and Blender experiment), **Structure of DNA** (Watson and Crick model of double stranded DNA) **Different forms of DNA** (A form, B form, C form and Z form)

REPLICATION MECHANISM

Meselson and Stahl experiment (Determination of mode of replication- semiconservative), **Mechanism and enzymes involved in replication** (Theoretical models of DNA replication, semiconservative replication, discontinuous replication, primer synthesis, elongation, summary of events at replication fork, termination, enzymology), **Models of replication** (D loop and rolling circle).

UNIT II **(LECTURE HOURS: 15)**

Prokaryotic nucleic acid-RNA-Structure of RNA (mRNA, rRNA, tRNA). **Mechanism of transcription**

RNA polymerase (Structure and function), **Initiation** (Role of promoters, open promoter complex formation), **Elongation (**Addition of nucleotides to growing chain, peptide bond formation), **Termination** (Rho dependent and Rho independent). **Genetic code-Salient features of genetic code** (Triplet code, degeneracy, Wobble hypothesis, universal nature etc.,).

UNIT III **(LECTURE HOURS: 15)**

TRANSLATION IN PROCARYOTES-Activation of amino acids (Charging of tRNA) **Initiation** (Role of initiation factors, preinitiation and initiation complex formation) **Elongation** (Positioning of second tRNA, peptide bond formation and translocation), **Termination** (Role of termination factors and

termination codons), **Post translational modifications** (Removal of formyl methionine, side chain modifications, formation of disulfide bonds, cleavage and rearrangement of polypeptide chain).

OPERON CONCEPT-Lac operon (Organization of lac operon genes, induction, negative and positive control), ***Trp* operon** (Organization, Repression, negative and attenuation control mechanism).

UNIT IV **(LECTURE HOURS: 15)**

Mutation-Types of mutation (Point, silent, neutral, missense, nonsense, reversion and suppressor mutation), **Occurrence of mutation** (Spontaneous and induced mutation) **Carcinogenicity test** (Ames test). **DNA repair-Light dependent repair** (Photo reactivation), **Light independent repair** (Excision, recombination and SOS repair).

UNIT V **(LECTURE HOURS: 15)**

GENETIC EXCHANGE

Transformation mechanism (Transformation of chromosomal and plasmid DNA), **Conjugation mechanism** (F+F- and Hfr cells, conjugation between F+ and F-, Hfr and F- and F' and F-), **Linkage mapping** (Interrupted matting experiment), **Transduction** (Generalized and specialized transduction), **Recombination** (Holiday model of recombination)

TEXT BOOKS:

T1 - Molecular Biology, Edition:1, Jones & Bartlett Publishers , David Freifelder 1986

T2 - Principles of genetics, Edition:6 , CM Brown publisher New York , Robert H Tamarin 2001

REFERENCE BOOKS:

R1 - Biochemistry, Edition:5 , W H Freeman and company , and Stryer 2002

R2 - Essentials of Genetics, Edition:4th , John Wiley and Sons Inc., New York , Cummings M R and Klug W S 1996

R3 - Principles of Genetics, Edition:8th, John Wiley and sons Inc., , Eldon John Gardner and Michael J Simmons and Peter Snustad 1992

Course Title: **MICROBIAL GENETICS (P)**	Course Code : 33P
Semester: **V**	Course Group : **DSC-VII**
Teaching Scheme in Hrs (L: T:P): 0**:0:4**	Credits : 2
Map Code: D (THEORY – APPLICATION)	Total Contact Hours: **60**
CIA: 25 **Marks**	SEE # : 75 **Marks**
Programme: **B SC.,MICROBIOLOGY**	**# - Semester End Exam**

List of Practical:

1. Isolation of genomic DNA from bacteria (*Escherichia coli*)
2. Isolation of total RNA from bacteria (*Escherichia coli*)
3. Isolation of plasmid DNA
4. Induction of Lac operon
5. Physical mutagenesis-UV irradiation
6. Chemical mutagenesis- EMS
7. Replica plating technique- Auxotrophic mutants
8. Gradient plate technique
9. Conjugation of compatible bacteria
10. Ames test for carcinogenesis test

REFERENCE BOOKS:

R1. Ashish s Verma Laboratory Manual in Immunology and Biotechnology, S Chand publications, 2014.

R2. Rajan S, Selvi Christy R experimental procedures in life sciences, 2015.

Course Title: STATISTICS	Course Code :
Semester: III :	Course Group : DSC VIII
Teaching Scheme in Hrs (L:T:P): **5:1:0**	Credits : 6 **Credits**
Map Code : -	Total Contact Hours : 90
CIA : **25 Marks**	ESE : **75 Marks**
Programme : **B SC.,MICROBIOLOGY**	**# - End Semester Exam**

Course Outcomes

No.	Course Outcome After completion of this course, the students will be able to	PSOs	Cl. Ses	CL
CO1	Learn about basic techniques for describing and visualizing data.	PSO1 ,PSO4	12L+6T	Understand
CO2	Understand the basic concepts of the probability.	PSO1 , PSO4	12L+6T	Understand
CO3	Learn about random variables and discrete and continuous probability distributions.	PSO1 ,PSO4	12L+6T	Understand
CO4	Apply normal and t distribution properties to estimate the population mean from samples.	PSO1 ,PSO4	12L+6T	Apply
CO5	Use the hypothesis testing to learn about the statistical inference.	PSO1 ,PSO4	12L+6T	Apply

UNIT – I **18 Hours**

Statistics Introduction: Basic concepts (Population and sample data).

Descriptive Statistics I: Summarizing data for a categorical variable - Summarizing data for a quantitative variable (Histograms, Stem and leaf) - Summarizing data using tables (Cross tabulation) - Mean, Median & Mode- Mean of grouped Frequencies.

UNIT – II **18 Hours**

Descriptive Statistics II: Measures of Variability (Z Score, Variance and Standard Deviation, Standard Deviation of Grouped Frequencies) - Bivariate relationships (Covariance, the Co-Variance Matrix, Understanding Correlations).

Introduction to Probability: Basic counting principles (Permutations Vs Combinations, Permutations, Combinations) – Joint and Marginal probabilities.

UNIT–III **18 Hours**

Discrete Probabilities Distributions: Basic Concepts (Random Variables, Discrete Random Variables, Discrete Random Variable Probabilities, Expected value) - Binomial distributions (Mean and Standard Deviation).

Continuous Probability Distribution: Uniform Distributions (Discrete and Continuous) - Probability Distributions (The Normal distribution, Standard Normal Distribution, t distribution).

UNIT – IV **18 Hours**

Sampling and Sampling Distribution: Inferential Statistics (Point Estimation, Sampling distributions, Standard error of the mean, Sample mean proximity to μ, Sample proportions).

Confidence Interval Estimation: Inferential Statistics **(**Confidence intervals - σ known; σ unknown).

UNIT – V **18 Hours**

Hypothesis Testing: Hypothesis Formulation (Introduction, The Null and Alternate Hypotheses, Examples, Type I and Type II Errors, Examples) - Hypothesis testing (Single sample with known σ, Examples, Alpha and p-values, Single sample t-test with unknown σ, Examples).

REFERENCES:

1. Brandon Foltz YouTube playlist, ”Statistics 101”.
2. Statistics for Management, Eighth Edition, Richard I. Levin, David S. Rubin, Masood H. Siddique, Sanjay Rastogi.
3. Open Intro Statistics (3rd Edition) by David M Diez, Christopher D Barr, Mine Cetinkaya (2017).

Course Title: **VACCINES AND HEALTH MANAGEMENT (T)**	Course Code :
Semester: IV	Course Group : **DSE-II**
Teaching Scheme in Hrs (L: T:P): 4**:0:0**	Credits : 04
Map Code: C (THEORY – CONCEPTS)	Total Contact Hours: **60**
CIA: 25 **Marks**	SEE # : 75 **Marks**
Programme: **B SC.,MICROBIOLOGY** **# - Semester End Exam**	

No	**Course Outcome (Cos): After completion of this course, the students will be able to**	**POs &PSOs**	**Cl.Ses**	**CL**
CO1	Review the types of vaccines and its mechanism of inducing immunity	PO1 & PSO2	15	U
CO2	Demonstrate the vaccination schedule for adults and travelers	PO1 & PSO1	15	A
CO3	Demonstrate the vaccination schedule for children and old age	PO1 & PSO1	15	A
CO4	Illustrate the child health management and vaccine risk and safety	PO1 & PSO2	15	A
CO5	Relate the importance of organization involved in vaccination and catch up vaccination	PO1 & PSO2	15	A

UNIT 1 : (LECTURE HOURS - 15)

VACCINES AND TYPES : Vaccination (History) Types of Vaccines- Live attenuated vaccines (Methods- UV inactivation solvent detergents ,use of chemical , advantage and disadvantage) Inactivated whole vaccines(killed) (Methods ,example ,advantage and disadvantage) Peptide vaccine and subunit vaccine (Methods ,example ,advantage and disadvantage) Recombinant vaccine (Methods ,example ,advantage and disadvantage) Conventional and modern vaccines route of administrations, mechanisms of inducing immunity (Intramuscular ,Subcutaneous, Oral and intranasal)

UNIT 2 : (LECTURE HOURS - 15)

VACCINATION SCHEDULE FOR ADULTS AND TRAVELERS VACCINE : Vaccination schedule for adults(male & female) (Vaccines, doses ,route ,site and age) Hepatitis B Vaccines (History, recommendation, dose, schedule , dosage, safety and side effect) MMR vaccine (Schedule, types dosage ,contraindications and precautions, safety) Tetanus vaccine (Schedule, types dosage, contraindications and precautions, safety) Varicella vaccine (Schedule, types dosage ,contraindications and precautions, safety) Vaccine for travelers, anticancer vaccine (WHO recommended Vaccines)

UNIT 3 : (LECTURE HOURS - 15)

VACCINATION SCHEDULE FOR CHILDREN AND OLD AGE: Vaccines for 50 – year - old adult (Schedule, vaccines ,dosage, route) Vaccine for 65 years (Schedule ,vaccines ,dosage,

route) Vaccine for health care workers (Schedule ,vaccines ,dosage, route) Vaccine for children(Birth to 6 years)(7 - 18 years)(19 years and older) (Schedule, vaccines ,dosage, route) Vaccine for pregnant women (Schedule ,vaccines ,dosage, route) Emergency vaccine (Emergency vaccine)

UNIT 4 : (LECTURE HOURS - 15)

HEALTH MANAGEMENT : Child health management (Integrated Management of Childhood Illness) General health (Pediatrics) Types of infection in children (Bacterial, viral, and parasitic infections) Growth and Development (Physical changes, as well as changes in behavior, emotions, and thinking) Nutrition and fitness (Healthy diet and exercise) Positive parenting (Definition, key components of Good parenting,5 principles of positive parenting. parenting skills during child vaccination)

UNIT 5 : (LECTURE HOURS - 15)

IMPORTANCE, ORGANISATION INVOLVED VACCINATION AND CATCH UP VACCINATION.: Importance of vaccination (Protect against serious diseases) International and national wide organizations-CDC, FDA (Significance and role) UNICEF, WHO (Significance and role) NIH, National safety council (Significance and role) India's vaccination regulatory system, Primary health center (Significance and role) Catch up vaccination. (Significance)

TEXTBOOKS

T1. Prasada Rao, J.V.R. 1999. Manual for Control of Hospital Associated Infections National AIDS Control organization. Ministry of Health and Family Welfare, Government of India, New Delhi.

T2. B Srilakshmi, 2012, Nutrition Science, 4th edition, New Age International (P) Limited, Publishers,India

REFERENCE BOOKS

R1. Chaudhri, A.K.(Editor) 1998. Tripathy, G.C.and D.Sharma – Common sense rules for wellbeing . Naval printing press, New Delhi

R2. Dunne, J.(Editor) 1997. Webb, M.,R, Scott and P.Beale – First aid manual . 7th Edition. Dorling Kindersley Ltd.,
London.

WEBSITES

W1.https://www.cdc.gov/pinkbook/hcp/table-of-contents/chapter-6-vaccine-administration.html

W2. https://www.chop.edu/vaccine-update-healthcare-professionals/newsletter/technically-speaking- know-7-rights-vaccine-administration

W3. https://www.sciensano.be/sites/default/files/14.30-14.44_koen_brusselmans_scisymp_08.12.2022.pdf

Course Title: **VACCINES AND HEALTH MANAGEMENT (P)**	Course Code :
Semester: IV	Course Group : **DSE-II**
Teaching Scheme in Hrs (L: T:P): 0:0:4	Credits : 02
Map Code: C (THEORY – CONCEPTS)	Total Contact Hours: **60**
CIA: 25 **Marks**	SEE # : 75 **Marks**
Programme: **B SC.,MICROBIOLOGY**	**# - Semester End Exam**

List of Practical: -

1. Aseptic handling and manipulation of bacterial cultures (Principle, procedure, observation and result)
2. CIP –clean in place and SIP-sterilization in place of process equipment (Principle, procedure, observation and result)
3. National Immunization Schedule for children, adult vaccine which included in the National immunization Program (Age, dosage, route and example
4. Cultivation of aerobic bacteria: conventional method and bioreactor technology (Principle, procedure, observation and result)
5. Cultivation of anaerobic bacteria: conventional method and bioreactor technology (Principle, procedure, observation and result)
6. Aseptic harvest of bacterial mass: Microfiltration and batch centrifugation (Principle, procedure, observation and result)
7. Preparation of vaccines for administration (Principle, procedure, observation and result)
8. Reconstitution of vaccines (Principle, procedure, observation and result)
9. Concentration, purification and sterile filtration of toxoids (Principle, procedure, observation and result)
10. Toxicity and potency evaluation (Principle, procedure, observation and result)
11. Preparation of diet chat for pre-school children (Principle, procedure, observation and result)
12. Prepare a chart for corona virus way of spreading, treatment and precaution

REFERENCE BOOKS

R1. Ashish S Verma Laboratory Manual in Immunology and Biotechnology, S Chand publications, 2014.

R2. Rajan S, Selvi Christy R Experimental Procedures in Life Sciences, 2015.

R3. B Srilakshmi, 2012, Nutrition Science, 4th edition, New Age International (P) Limited, Publishers,India