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 2024 – 2027

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-I	IKS-Traditional Medicine and Sustainable Agriculture Practice	3	2	-	-	Grade			
	NCC-II	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-II	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	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	4	-	4	25	75	100	6
			6				25	75		
	DSC – VIII	Virology	3	5	1	-	25	75	100	6
	DSE - II	Elective – II	3	4	-	4	25	75	100	6
			6				25	75		
	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	4	-	4	25	75	100	6
			9				25	75		
	DSC – X	Food, Dairy and Probiotic Microbiology	3	4	-	4	25	75	100	6
			9				25	75		
	DSE-III	Elective-III	3	4	-	4	25	75	100	6
			9				25	75		
	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 6	4	-	4	25 25	75 75	100	6
	DSC – XII	Medical Parasitology	3 6	4	-	4	25 25	75 75	100	6
	DSE- V	Elective-V	3 6	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 Course(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
IKS -Indian Knowledge System
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. 7th Edition.,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 11th Edition., A La Carte Pearson.

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

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

REFERENCE BOOKS:

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

R2. Stanier R.Y, Ingraham J. L., Wheelis M. L., and Painter R. R. (2010). General Microbiology, 5th Edition., 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. 7th Edition., McGraw Hill Inc.New York.

R5. Nester E., Anderson D., Roberts C. E., and Nester M. (2006). Microbiology-A Human Perspective, 5th Edition., 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 : **IKS-TRADITIONAL MEDICINE AND SUSTAINABLE AGRICULTURAL PRACTICE (T)**	Course Code:
Semester : I	Course Group :NCCI
Teaching Scheme in Hrs (L:T:P) : 2**:0:0**	Credits : **00**

Map Code : C (THEORY – CONCEPTS)	Total Contact Hours : **30**
CIA : **25 Marks**	SEE # : 75 **Marks**
Programme: **B Sc MICROBIOLOGY**	**# - Semester End Exam**

UNIT 1 : (LECTURE HOURS - 7)

DEFINING IKS –IMPORTANCE OF ANCIENT KNOWLEDGE: IKS corpus (inculcating socio-emotional intelligence) Introduction to traditional knowledge – Concepts,definition (critically analysis of the credibility of the Indian KnowledgeSystem (IKS) and indigenous resource inclusion at various levels) Nature, scope and importance (encompass a wide range of ancient wisdom, including traditional medicine, astrology, yoga, meditation,)

UNIT 2 : (LECTURE HOURS - 6)

ORGANIC FARMING AND SUSTAINABLE AGRICULTURE: Types –Panchakavya – Mulching-Composting- vermicomposting (process and its significance for sustainable agricultural practices) Biogas production (process and its significance as alternative fuel) Biopesticides (process and its role in integrated pest management(IPM) forsustainable agricultural practices) Conservation of wild varieties of plants (Biodiversity and genetic pool)

UNIT 3 : (LECTURE HOURS - 6)

HUMAN HEALTH AND OCCURRENCE OF KRIMIS IN ENVIRONMENT: Kshudarog in humans (Small pox, Jaundice). (Ethanopharmacological effect) Eradication through traditional medicinal plants- Neem,Amaranthus,Phyllanthus (Ethanopharmacological effect using phytomedicines) Elimination of gut pathogens through natural plant based derivatives . (Ethanopharmacological effect Using natural products.)

UNIT 4 : (LECTURE HOURS - 6)

AYURVEDA IN HEALTH MANAGEMENT: Eradication of bacteria ,fungi,virus , parasites using medicinal plants) –Thespesia populnea(Portia tree), Vilvam(Bael leaves), (Role of phtyochemical compounds in defense and protection against insects, fungi, diseases, and mammals.) Eradication of bacteria, fungi, virus , parasites using medicinal plants) –Thulasi ,Tuthi(Abutilon indicum) (Significance of phyto -chemical compounds to treat various ailments.) Eradication of bacteria ,fungi,virus , parasites using medicinal plants) –Betel leaves, Curry leaves (Natural home remedies usuingphytochemical compounds)

UNIT 5 : (LECTURE HOURS - 5)

TRADITIONAL SYSTEM OF ANIMAL AND MARINE DERIVED MEDICINES AND PREVENTIVE MEDICINES. :

Probiotics – Prebiotics –Postbiotics (Define with examples) seaweeds (Examples-marine algal pdts-) Bovine(Pasu), Equine products. (Preventive drugs -examples.)

WEBSITES

https://www.researchgate.net/publication/374022934_Indian_Knowledge_System_IKS_as_a_Significant_Corpus_of_Resources_Useful_for_Personal_and_Professional_Development

TEXTBOOKS

1. Vedic Microbiology(2020),Dubey,R.C,Motilal Banarsidass International

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**	

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**	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	PSOs	CL. Ses	CL
CO1	Exemplify the skill to measure the concentration of ions	PO1&PSO1	12	U
CO2	Acquire knowledge on spectroscopic techniques	PO1&PSO1	11	AP
CO3	Estimate the force of moving object leading to the separation of biomolecules	PO1&PSO1	12	AP
CO4	Separation and distribution of components between two phases	PO1&PSO1	11	AP
CO5	Illustrate molecular techniques in biological applications	PO1&PSO1	14	AP

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

pH STUDIES AND ELECTROCHEMISTRY INSTRUMENTATION : pH meter- (Principle, Instrumentation, glass and reference electrodes)- Buffer solutions (Principles, Henderson-Hasselbalch equation, properties, buffering capacity)- pH indicator (Principles, Applications, indicators used in microbiological media)- Conductivity meter (Electrical conductivity, Measurement, Instrumentation and Applications)- Sonicator (Components, process of operation, Methods of sonication)- Biosensor (Principle, components of biosensor, different types and uses)

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

MEASUREMENT OF BIOMOLECULES : Colorimetry (Principle, Instrumentation, Parts of instrument, Deviations of Beer Lamberts Law)- Spectrophotometry (Principle, Regions of electromagnetic radiation, Measurement of molecules) - Visible , UV and Infrared spectroscopy (Principle, Instrumentation, type of light sources and application) - NMR (Principle, nuclear magnets, energy of spinning nucleus, Instrumentation and application)- Spectrofluorimetry (Flourescence spectrometry, Flurometry, Flourescence) - Flame Photometry (Principle, Emission spectroscopy, Gas mixtures, and application)

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

SEPARATION OF BIOMOLECULES : Centrifugation techniques (Basic principles of centrifugation. Stokes law, Standard sedimentation coefficient, measurement of sedimentation co-efficient) - Instrumentation & Types of centrifuges (rotor and types, Low speed, High speed, Ultracentrifuge) - Methods of centrifugation (Principles, different methods, and applications) - Differential centrifugation (Principle, Sedimentation rate, role of size and density Applications) - Density gradient centrifugation (Principle, rate zonal and isopycnic centrifugation, Applications) - Ultracentrifugation (Instrumentation, Preparative ultracentrifugation, analytical ultracentrifugation)

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

ISOLATION OF COMPOUNDS : General principles of chromatography (Stationary phase and Mobile phase, Chromatographic Performance parameters, Types) - Paper Chromatography, Thin layer chromatography, (Preparation of sample, solvent development, detection and measurement and applications) - Affinity chromatography & Ion exchange chromatography (Biological interactions, Sample, ligand molecules, specific and nonspecific elution) - Gel permeation chromatography (Role of molecular size, shape, Gel preparation, storage) - Gas chromatography (Principle, Role of gases, Operation, applications) - High performance liquid chromatography (Principle, Instrumentation, pumping system, detector)

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

SEPARATION OF NUCLEIC ACIDS AND RADIATION : Electrophoresis (Principles, factors affecting Electrophoresis, Instrumentation) - Types (Agarose Electrophoresis, SDS PAGE, Applications) - Immunoelectrophoresis and Isoelectric focusing (Principle, Isoelectric point, Applications) - Radioactivity (Atom, Isotope, Radioisotope- Mass number, Atomic number) - 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

1. Sharma B. K. (2014). Instrumental Method of Chemical Analysis. Krishna Prakashan Media (P) Ltd.
2. Chatwal G. R and Anand S. K. (2014.) Instrumental Methods of Chemical Analysis. Himalaya Publishing House.
3. Mitchell G. H. (2017). Gel Electrophoresis: Types, Applications and Research. Nova Science Publishers Inc.
4. Holme D. Peck H. (1998). Analytical Biochemistry. (3rd Edition). Prentice Hall.
5. Jayaraman J. (2011). Laboratory Manual in Biochemistry. (2nd Edition). Wiley Eastrn Ltd., New Delhi.

REFERENCES BOOKS

1. Pavia D. L. (2012) Spectroscopy (4th Edition). Cengage
2. Skoog A. and West M. (2014). Principles of Instrumental Analysis. (14th Edition). W.B.Saunders Co., Philadephia.

3. Miller J. M. (2007). Chromatography: Concepts and Contrasts (2nd Edition) Wiley-Blackwell.
4. Gurumani N. (2006). Research Methodology for Biological Sciences. (1st Edition) MJP Publishers.
5. Ponmurugan P. and Gangathara P. B. (2012). Biotechniques. (1st Edition). MJP Publishers.

WEB RESOURCES

1. https://norcaloa.com/BMIA
2. http://www.biologydiscussion.com/biochemistry/centrifugation/centrifuge-introduction- types-uses-and-other-details-with-diagram/12489
3. https://www.watelectrical.com/biosensors-types-its-working-and-applications
4. http://www.wikiscales.com/articles/electronic-analytical-balance/
5. https://study.com/academy/lesson/what-is-chromatography-definition-types-uses

Course Title: **BIOINSTRUMENTATION METHODS AND ANALYSIS (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.