**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 |
| | | | 3 | | | | 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 |
| | | | 6 | | | | 25 | 75 | | |
| | DSC – IV | Bioinstrumentation | 3 | 4 | - | 4 | 25 | 75 | 100 | 6 |
| | | | 6 | | | | 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<br>6 | 4 | - | 4 | 25 | 75 | 100 | 6 |
| | DSC – VI | Medical Bacteriology | 3<br>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<br>6 | 4 | - | 4 | 25<br>25 | 75<br>75 | 100 | 6 |
| | DSC – VIII | Virology | 3 | 5 | 1 | - | 25 | 75 | 100 | 6 |
| | DSE - II | Elective – II | 3<br>6 | 4 | - | 4 | 25<br>25 | 75<br>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<br>9 | 4 | - | 4 | 25<br>25 | 75<br>75 | 100 | 6 |
| | DSC – X | Food, Dairy and Probiotic Microbiology | 3<br>9 | 4 | - | 4 | 25<br>25 | 75<br>75 | 100 | 6 |
| | DSE-III | Elective-III | 3<br>9 | 4 | - | 4 | 25<br>25 | 75<br>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<br>6 | 4 | - | 4 | 25<br>25 | 75<br>75 | 100 | 6 |
| | DSC – XII | Medical Parasitology | 3<br>6 | 4 | - | 4 | 25<br>25 | 75<br>75 | 100 | 6 |
| | DSE- V | Elective-V | 3<br>6 | 4 | - | 4 | 25<br>25 | 75<br>75 | 100 | 6 |
| | DSE – VI | Elective-VI | - | - | - | 6 | 25 | 75 | 100 | 6 |
| | | **TOTAL** | | | 30 | | | | 400 | 24 |
| | ALCTA * ( e-Learning in MOOC Platform ) | | | | 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.Food processing Technology 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 : **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.

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|---|---|
| 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

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|---|---|
| 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 | 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).

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## 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.1stEdition. MJP publishers.

T3.Veerakumari, L (2009).Bioinstrumentation- 5 thEdition -.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

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|---|---|
| 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** |

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.