J.J. College of Arts and Science (Autonomous)

Sivapuram, Pudukkottai - 622 422

PG and Research Department of Microbiology

B.Sc., Microbiology

Syllabus based on

TANSCHE Regulations on Learning Outcomes - Based Curriculum Frame Work for Under Graduate Education

[Those who Join 2023 - 2024 Onwards]

J.J. College of Arts and Science (Autonomous)

Sivapuram Post, Pudukkottai

Department of Microbiology

Programme Outcomes – UG (2023-2024)

PO1: Disciplinary Knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study.

PO2: Communication skills: Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.

PO3: Critical thinking: Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.

PO4: Problem solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.

PO5: Analytical reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.

PO6: Research-related skills: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation.

PO7: Cooperation/Team work: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team

PO8: Scientific reasoning: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.

PO9: Reflective thinking: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.

PO10: Information/digital literacy: Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.

PO11: Self-directed learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.

PO12: Multicultural competence: Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

J.J. College of Arts and Science (Autonomous)

Sivapuram Post, Pudukkottai

Department of Microbiology

Programme Specific Outcomes – UG (2023-2024)

PSO1: Disciplinary Knowledge: Understand the fundamental principles, concepts, and theories related to physics and computer science. Also, exhibit proficiency in performing experiments in the laboratory.

PSO2: Critical Thinking: Analyse complex problems, evaluate information, synthesize information, apply theoretical concepts to practical situations, identify assumptions and biases, make informed decisions and communicate effectively

PSO3: Problem Solving: Employ theoretical concepts and critical reasoning ability with physical, mathematical and technical skills to solve problems, acquire data, analyze their physical significance and explore new design possibilities.

PSO4: Analytical & Scientific Reasoning: Apply scientific methods, collect and analyse data, test hypotheses, evaluate evidence, apply statistical techniques and use computational models.

PSO5: Research related skills: Formulate research questions, conduct literature reviews, design and execute research studies, communicate research findings and collaborate in research projects.

PSO6: Self-directed & Lifelong Learning: Set learning goals, manage their own learning, reflect on their learning, adapt to new contexts, seek out new knowledge, collaborate with others and to continuously improve their skills and knowledge, through ongoing learning and professional development, and contribute to the growth and development of their field.

SEMESTER I

FUNDAMENTALS OF MICROBIOLOGY AND MICROBIAL DIVERSITY

Course Code: U1R3MBCC1	**Credit:** 5
Category: Core Course	**Hrs/Week:** 5, **Total Inst. Hrs:** 75
Nature of the Course: Skill Development	**Marks:** CIA: 25+ EXT: 75 = 100

Course Objectives

1. Learn the fundamental principles about different aspects of Microbiology including recent developments in the area.
2. Describe the structural organization, morphology and reproduction of microbes.
3. Explain the methods of cultivation of microbes and measurement of growth.
4. Understand the microscopy and other basic laboratory techniques – culturing, disinfection and sterilization in Microbiology.
5. Compare and contrast the different methods of sterilization.

Unit I: **15 hrs**

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: **15 hrs**

General characteristics and classification of cellular microorganisms (Bacteria - Bergy's manual (classification) Determinative Bacteriology- 9th Edition), Fungi (Alexopoulos), Algae (Fritch 1935) and Protozoa (Levine 1980) and acellular microorganisms - (Viruses, Viroids, Prions). Structure of Bacterial cell wall, cell membrane, capsule, flagella, pili, mesosomes, chlorosomes, phycobilisomes, spores, and gas vesicles.

Unit III: **15hrs**

Differences between prokaryotic and eukaryotic microorganisms. Structure of fungi (Mold and Yeast), Structure of microalgae. Bacterial culture media and pure culture techniques. Mode of cell division, Quantitative measurement of growth. Anaerobic culture techniques.

Unit IV: **15 hrs**

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: **15 hrs**

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

Course Outcomes		
CO	On completion of this course, students will;	
CO1	Study the historical events that led to the discoveries and inventions and understand the Classification of Microorganisms.	PO5, PO6, PO10
CO2	Gain Knowledge of detailed structure and functions of prokaryotic cell organelles.	PO10
CO3	Understand the various microbiological techniques, different types of media, and techniques involved in culturing microorganisms.	PO11
CO4	Explain the principles and working mechanism of different microscopes/ Microscope, their function and scope of application.	PO4, PO11
CO5	Understand the concept of asepsis and modes of sterilization and disinfectants**.**	PO4, PO11

Text Books

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

2. Willey J., Sherwood L., and Woolverton C. J., (2017). Prescott's Microbiology. 10th Edition., McGraw-Hill International edition.

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

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

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

Reference Books

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

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

3. Tortora, G.J., Funke, B.R. and, Case, C.L (2013). Microbiology-An Introduction, 11thEdition., Benjamin Cummings.

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

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

Web Resources

1. https://www.cliffsnotes.com/study-guides/biology/microbiology/introduction-to-microbiology/a-brief-history-of-microbiology
2. https://www.keyence.com/ss/products/microscope/bz-x/study/principle/structure.jsp
3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6604941/#
4. https://bio.libretexts.org/@go/page/9188
5. https://courses.lumenlearning.com/boundless-microbiology/chapter/microbial-nutrition/

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1					M	M				M	
CO2										M	M
CO3											S
CO4				M							S
CO5				M							S

PRACTICAL I - FUNDAMENTALS OF MICROBIOLOGY AND MICROBIAL DIVERSITY

Course Code: U1R3MBCC2P	**Credit:** 5
Category: Core Course – Practical I	**Hrs/Week:** 5
Nature of the Course: Skill Development	**Marks:** CIA: 40+ EXT: 60 = 100

Course Objectives

1. Acquire knowledge on Cleaning of glass wares, GLP and sterilization.
2. Gain knowledge on media preparation and cultural characteristics.
3. Learn the pure culture technique
4. Learn the microscopic techniques and staining methods.
5. Acquire knowledge on stain and staining methods

1. Microbiological good laboratory practice and safety.

2. Cleaning of glass wares.

3. Sterilization and assessment of sterility– Autoclave, hot air oven, and membrane filtration.

4. Media preparation: liquid media, solid media, semi-solid media, agar slants, agar deeps, agar plates.

5. Preparation of basal, differential, enriched, and enrichment media.

(i) Transport, and selective media preparation

(ii) Quality control of media

(iii) Growth supporting properties, sterility check of media

(iv) Serial dilution technique

6. Pure culture techniques: streak plate, pour plate.

7. Culture characteristics of microorganisms: growth on different media, growth characteristics, and description.

8. Demonstration of pigment production.

9. Microscopy: light microscopy and bright field microscopy.

10. Staining techniques: smear preparation, simple staining, Gram's staining and endospore staining.

11. Study on Microbial Diversity using Hay Infusion Broth

12. Wet mount to show different types of microbes

13. Hanging drop.

Course Outcomes		
CO	On completion of this course, students will;	
CO1	Practice sterilization methods; learn to prepare media and their quality control.	PO4, PO7, PO8, PO9, PO11
CO2	Learn streak plate, pour plate and serial dilution and pigment production of microbes.	PO4, PO7, PO8, PO9
CO3	Understand Microscopy methods, different Staining techniques and motility test.	PO4, PO7, PO8, PO9, PO11
CO4	Observe culture characteristics of microorganisms.	PO4, PO7, PO8, PO9
CO5	Study on Microbial Diversity using Hay Infusion Broth-Wet mount	PO4, PO7, PO8, PO9

Text Books

1. James G Cappucino and N. Sherman MB(1996). A lab manual Benjamin Cummins, New York 1996.

2. Kannan. N (1996). Laboratory manual in General Microbiology. Palani Publications.

3. Sundararaj T (2005). Microbiology Lab Manual (1st edition) publications.

4. Gunasekaran, P. (1996). Laboratory manual in Microbiology. New Age International Ld., Publishers, New Delhi.

5. R C Dubey and D K Maheswari (2002). Practical Microbiology. S. Chand Publishing.

Reference Books

1. Atlas.R (1997). Principles of Microbiology, 2nd Edition, Wm.C.Brown publishers.

2. Amita J, Jyotsna A and Vimala V (2018). Microbiology Practical Manual. (1st Edition). Elsevier India

3. Talib VH (2019). Handbook Medical Laboratory Technology. (2nd Edition). CBS

4. Wheelis M, (2010). Principles of Modern Microbiology, 1st Edition. Jones and Bartlett Publication.

5. Lim D. (1998). Microbiology, 2ndEdition, WCB McGraw Hill Publications.

Web Resources

1. http://www.biologydiscussion.com/micro-biology/sterilisation-and-disinfection-methods-and-principles-microbiology/24403.

2. https://www.ebooks.cambridge.org/ebook.jsf?bid=CBO9781139170635

3. https://www.grsmu.by/files/file/university/cafedry//files/essential_microbiology.pdf

4. https://microbiologyinfo.com/top-and-best-microbiology-books/

5.https://www.cliffsnotes.com/studyguides/biology/microbiology/introduction-to-microbiology/a-brief-history-of-microbiology.

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1				M			L	M	L		M
CO2				S			L	L	L		
CO3				S			M	M	L		M
CO4				S			M	L	L		
CO5				S			M	L	L		

BASIC AND CLINICAL BIOCHEMISTRY

Course Code: U1R3MBDSE1	**Credit:** 3
Category: Discipline Specific Elective-I	**Hrs/Week:** 4, **Total Inst. Hrs:** 60
Nature of the Course: Employability	**Marks:** CIA: 25+ EXT: 75 = 100

Course Objectives

1. Attain thorough knowledge on carbohydrates and lipids, their characteristic properties and organization in carrying out all the living functions which constitute the life.
2. Explain the biological activity of amino acids and proteins.
3. Identify the metabolic errors in enzymes of carbohydrates and lipids.
4. Describe the disorders in amino acid metabolism.
5. Interpret the consequences, biochemical, clinical features, diagnosis and treatment of metabolic diseases of day today life.
6.

Unit I: **12 hrs**

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: **12 hrs**

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

Unit III: **12 hrs**

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: **12 hrs**

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

Unit V: **12 hrs**

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.

Course Outcomes		
CO	On completion of this course, students will;	
CO1	Explain the structure, classification , biochemical functions and significance of carbohydrates and lipids	PO1
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
CO3	Assess defective enzymes and Inborn errors. Recognize diseases related to carbohydrate and lipid metabolism.	PO4, PO5, PO6
CO4	Discuss and evaluate the pathology of amino acid metabolic disorders.	PO4, PO5, PO6
CO5	Appraise the imbalances of enzymes in organ function and relate the role of Clinical Biochemistry in screening and diagnosis.	PO5, PO6, PO9

Text Books

1. Satyanarayana, U. and Chakrapani, U(2014).Biochemistry,4th Edition, Made Simple Publisher.

2. Jain J L, Sunjay Jain and Nitin Jain (2016).Fundamentals of Biochemistry, 7th Edition, S Chand Company.

3. Ambika Shanmugam's (2016). Fundamentals of Biochemistry for Medical Students, 8th Edition. Wolters Kluwer India Pvt Ltd.

4. Vasudevan. D.M.Sreekumari.S, Kannan Vaidyanathan (2019). Textbook Of Biochemistry For Medical Students. Kindle edition, Jaypee Brothers Medical Publishers

5. Jeremy M. Berg, LubertStryer, John L. Tymoczko, Gregory J. Gatto (2015). Biochemistry, 8th edition. WH Freeman publisher.

Reference Books

1. AmitKessel&Nir Ben-Tal (2018). Introduction to Proteins: structure, function and motion. 2nd Edition, Chapman and Hall.

2. David L. Nelson and Michael M. Cox (2017). Lehninger Principles of Biochemistry, 7thEdition W.H. Freeman and Co., NY.

3. Lupert Styrer, Jeremy M. Berg, John L. Tymaczko, Gatto Jr., Gregory J (2019). Biochemistry. 9thEdition ,W.H. Freeman& Co. New York.

4.. Donald Voet, Judith Voet, Charlotte Pratt (2016). Fundamentals of Biochemistry: Life at the Molecular Level, 5th Edition, Wiley.

5. Joy PP, Surya S. and AswathyC (2015). Laboratory Manual of Biochemistry, Edition 1., Publisher: Kerala agricultural university.

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

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	M										
CO2	M										
CO3				S	S	S					
CO4				S	S	S					
CO5					S	S			S		

BRIDGE MICROBIOLOGY

Course Code: U1R3MBFC	**Credit:** 2
Category: Foundation Course	**Hrs/Week:** 2, **Total Inst.Hrs:** 30
Nature of the Course: Skill Development	**Marks:** CIA: 25+ EXT: 75 = 100

Course Objectives:

1. Learn the introduction and scope of Microbiology
2. Describe the Microbial Taxonamy.
3. Explain the measurement of growth.
4. Understand the Cell Biology
5. Learn the basic instruments

Unit I: **6 hrs**

Introduction and Scope of Microbiology, Microorganisms – Types, Structure and Function.

Unit II: **6 hrs**

Microbial Taxonomy – Nomenclature, Taxonomic ranks, Structural Taxonomy, Numerical Taxonomy, Nucleic acid sequencing.

Unit III: **6 hrs**

Microbial Physiology – Microbial Growth (Batch, Continuous, Synchronous), Growth Curve, Nutrient requirements

Unit IV: **6 hrs**

Cell Biology – Cell as basic unit: Discovery of cells, Classification of cell types, Mechanism of Cell division – Mitosis & Mieosis.

Unit V: **6 hrs**

Basic Instruments – pH meter, Centrifuge – Preparative, Analytical and Ultra, Laminar Air Flow Chamber, Autoclave, Hot Air Oven and Inucbator.

Course Outcomes:

On completion of this course, the students will be able to

- Understand the introduction and scope of Microbiology
- Get knowledge on Microbial Taxonamy.
- Explain the measurement of growth.
- Understand the Cell Biology
- Learn the basic instruments

Text Books

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

2. Willey J., Sherwood L., and Woolverton C. J., (2017). Prescott's Microbiology. 10th Edition., McGraw-Hill International edition.

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

Reference Books

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

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

Web Resources

1. https://www.cliffsnotes.com/study-guides/biology/microbiology/introduction-to-microbiology/a-brief-history-of-microbiology
2. https://www.keyence.com/ss/products/microscope/bz-x/study/principle/structure.jsp
3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6604941/#

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1					M	M				M	
CO2										M	M
CO3											S
CO4				M							S
CO5				M							S

Non-Major Elective 1 - SOCIAL AND PREVENTIVE MEDICINE

Course Code: U1R3MBSEC1	**Credit:** 2
Category: Skill enhancement Course SEC - 1 (NME)	**Hrs/Week:** 2, **Total Inst. Hrs:** 30
Nature of the Course: Skill Development	**Marks:** CIA: 25+ EXT: 75 = 100

Course Objectives

1. Describe the concepts of health and disease and their social determinants
2. Summarize the health management system
3. Know about the various health care services
4. Outline the goals of preventive medicine
5. Gain knowledge about alternate medicine

Unit: Introduction to social medicine: **6 hrs**

History of social medicine-concepts of health and disease-social determinants of health and disease-Health and quality of life-Health information system- measures of population health-health policies.

Unit II: Health management: **6 hrs**

Applications of behavioral sciences and psychology in health management- nutritional programs for health management-water and sanitation in human health-national programs for communicable and non-communicable diseases- environmental and occupational hazards and their control.

Unit III: Preventive medicine: **6 hrs**

Introduction- role of preventive medicine- levels of prevention-Risk assessment in communities and vulnerable population –surveillance, monitoring and reporting of disease outbreaks - forecasting and control measures in community setting – early detection methods.

Unit IV: Prevention through alternate medicine: **6 hrs**

Unani, Ayurveda, Homeopathy, Naturopathy systems in epidemic and pandemic outbreaks. International health regulations.

Unit V: **6 hrs**

Infectious disease outbreak case studies and precautionary response during SARS and MERS coronavirus, Ebola and novel SARS-COV2 outbreaks.

Course Outcomes		
CO	On completion of this course, students will;	
CO1	Identify the health information system	PO1,PO5, PO6
CO2	Associate various factors with health management system	PO1,PO2, PO3,PO5, PO6, PO9
CO3	Choose the appropriate health care services	PO1,PO5, PO6
CO4	Appraise the role of preventive medicine in community setting	PO4,PO5, PO6
CO5	Recommend the usage of alternate medicine during outbreaks	PO1,PO5, PO6

Text Books

1. Park. K (2021). Textbook of preventive and social medicine, 26th edition. Banarsidas Bhanot publishers.
2. Mahajan& Gupta (2013). Text book of preventive and social medicine, 4thedition. Jaypeebrothers medical publishers.

3. Chun-Su Yuan, Eric J. Bieber, Brent Bauer (2006). Textbook of Complementary and Alternative Medicine. Second Edition. Routledge publishers.

4. Vivek Jain (2020). Review of Preventive and Social Medicine: Including Biostatics. 12th edition, Jaypee Brothers Medical Publishers.

5. LalAdarshPankaj Sunder (2011). Textbook of Community Medicine: Preventive and Social Medicine, CBS publisher.

References Books

1. Howard Waitzkin, Alina Pérez, Matt Anderson (2021). Social Medicine and the coming Transformation. First Edition. Routledge publishers.

2. GN Prabhakara (2010). Short Textbook of Preventive and Social Medicine. Second Edition. Jaypee publishers.

3. Jerry M. Suls, Karina W. Davidson, Robert M. Kaplan (2010).Handbook of Health Psychology and Behavioral Medicine. Guilford Press.

4. Marie Eloïse Muller, Marie Muller, MarthieBezuidenhout, KarienJooste (2006).Health Care Service Management. Juta and Company Ltd.

5. Geoffrey Rose (2008).Rose's Strategy of Preventive Medicine: The Complete.OUP Oxford.

Web Resources

1. https://www.omicsonline.org/scholarly/social--preventive-medicine-journals-articles-ppts-list.php
2. https://www.teacheron.com/online-md_preventive_and_social_medicine-tutors
3. https://www.futurelearn.com
4. https://www.healthcare-management-degree.net
5. https://www.conestogac.on.health-care-administration-and-service-management

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	S				S	S					
CO2	S	S		M	S	S			M		
CO3				M	S	S					
CO4	S			S	S	M					
CO5	S				S	S					

Semester II

MICROBIAL PHYSIOLOGY AND METABOLISM

Course Code: U2R3MBCC3	**Credit:** 5
Category: Core Course	**Hrs/Week:** 5, **Total Inst. Hrs:** 75
Nature of the Course: Skill Development	**Marks:** CIA: 25+ EXT: 75 = 100

Course Objectives

1. Study the basic principles of microbial growth.
2. Learn the Nutrition transport mechanism.
3. Understand the basic concepts of aerobic and anaerobic metabolic pathways.
4. Provide information on sources of energy and its utilization by microorganisms.
5. Study the different types of bacterial reproduction.

Unit I: **15 hrs**

Physiology of microbial growth: Batch – continuous - synchronous cultures; Growth Curve and measurement method (turbidity, biomass, and cell count). Factors influencing the microbial growth.

Unit II: **15 hrs**

Nutrition requirements - Photoautotrophs, Photoorganotrophs, Chemolithotrophs (Ammonia, Nitrite, Sulfur, Hydrogen, Iron oxidizing Bacteria), Chemoorganotrophs. Nutrition transport mechanisms – Simple, Passive facilitated diffusion , Active transport and Group Location.

Unit III: **15 hrs**

An overview of Metabolism - Embden Meyerhof Pathway, Entner-Doudoroff Pathway, Pentose Phosphate Pathway, Tricarboxylic Acid Cycle. Electron Transport Chain and Oxidative Phosphorylation. ATP synthesis. Fermentation-Homolactic Fermentation, Heterolactic Fermentation, Mixed Acid Fermentation, Butanediol Fermentation.

Unit IV: **15 hrs**

Photosynthesis - An Overview of chloroplast structure. Photosynthetic Pigments, Light Reaction- Cyclic and non-cyclic Photophosphorylation. Dark Reaction - Calvin Cycle. Bacterial Enzymes.

Unit V: **15 hrs**

Bacterial reproduction - Binary fission, Budding, Reproduction through conidia, cyst formation, endospore formation. Fungi asexual and sexual reproduction, Microalgae reproduction. Asexual and sexual reproduction of protozoa.

Course Outcomes		
Course Outcomes	On completion of this course, students will	
CO1	Describe the factors influencing the growth of microorganisms .	PO6, PO9
CO2	Know nutrition requirements and nutrition transport.	PO6, PO7, PO9
CO3	Describe anaerobic and aerobic energy metabolic pathways.	PO6, PO9
CO4	Explain the methods of nutrient uptake.	PO6, PO9
CO5	Elaborate on the process of bacterial reproduction.	PO6, PO9

Text Books

1. Schlegal, H.G. (1993). General Microbiology.,7th Edition, Press syndicate of the University of Cambridge.

2. RajapandianK.(2010). Microbial Physiology, Chennai: PBS Book Enterprises India.

3. MeenaKumari. S. Microbial Physiology, Chennai 1st Edition MJP Publishers 2006.

4. Dubey R.C. and Maheswari, S. (2003). A textbook of Microbiology, New Delhi: S. Chand & Co.

5. S. Ram Reddy, S.M. Reddy (2008). Microbial Physiology. Anmol Publications Pvt Ltd.

Reference Books

1. Robert K. Poole (2004). Advances in Microbial Physiology, Elsevier Academic Press, New York, Volume 49.

2. Kim B.H., Gadd G.M. (2008). Bacterial Physiology and Metabolism. Cambridge University Press, Cambridge.

3. Daniel R. Caldwell. (1995). Microbial Physiology & Metabolism Wm.C. Brown Communications, Inc. USA.

4. Moat, A.G and J.W Foaster (1995). Microbial Physiology, 3rd edition. Wiley – LISS, A John Wiley & Sons. Inc. Publications.

5. BhanuShrivastava. (2011). Microbial Physiology and Metabolism: Study of Microbial Physiology and Metabolism. Lambert academic Publication.

Web Resources

1. https://sites.google.com/site/microbial physiologyoddsem/teaching-contents
2. https://courses.lumenlearning.com/boundless-microbiology/chapter/microbial-Nutrition
3. https://onlinecourses.swayam2.ac.in/cec20_bt14/preview
4. http://web.iitd.ac.in/~amittal/2007_Addy_Enzymes_Chapter.pdf
5. https://www..frontiersin.org.microbial-physiology-and-metabolism

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1						M			M		
CO2						M	L		M		
CO3						M			M		
CO4						M			M		
CO5						M			M		

PRACTICAL II - MICROBIAL PHYSIOLOGY AND METABOLISM

Course Code: U2R3MBCC4P	**Credit:** 5
Category: Core Course – Practical II	**Hrs/Week:** 5
Nature of the Course: Skill Development	**Marks:** CIA: 40+ EXT: 60 = 100

Course Objectives

1. To Understand the growth requirements
2. To know the parameters for growth and bacterial characteristics
3. To aid identification of microorganisms by various biochemical test
4. To become familiar with biochemical test
5. To isolate microorganisms from the environment

1. Measurement of bacterial growth- Total Cell Count, Viable Cell Count & turbidity.
2. Effect of environmental factors on bacterial growth – pH, temperature
3. IMVIC – Test
   - (i) Indole
   - (ii) Methyl Red
   - (iii) Voges – Proskauer
   - (iv) Citrate Utilization
4. Carbohydrate fermentation
5. Mixed acid fermentation
6. Butanediol fermentation
7. Oxidase test
8. Catalase test
9. Nitrate reduction test
10. Starch hydrolysis
11. Casein hydrolysis
12. Urea hydrolysis
13. Gelatin liquefaction
14. H_2S production

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Describe hanging drop, wet mount preparation, semi-solid agar, Craigie's tube method.	PO6, PO7, PO8, PO9, PO11
CO2	Demonstrate Smear preparation, permanent specimen preparation, Capsular, and Acid-fast staining.	PO6, PO7, PO8, PO9, PO11
CO3	Explain antibiotic sensitivity testing: Disc diffusion test-quality control with standard strains.	PO6, PO7, PO8, PO9, PO11
CO4	Describe demonstration of the size of yeast, fungal filaments and protozoa.	PO6, PO7, PO8, PO9, PO11
CO5	Elaborate on the bacterial identification- morphological, physiological, and biochemical methods.	PO6, PO7, PO8, PO9, PO11

Text Books

1. James G Cappucino and N. Sherman MB (1996). A lab manual Benjamin Cummins, New York .

2. Kannan. N (1996).Laboratory manual in General Microbiology. Palani Publications.

3. Sundararaj T (2005). Microbiology Lab Manual (1st edition) publications.

4. Gunasekaran. P (2007). Laboratory manual in Microbiology. New age international publisher.

5. Elsa Cooper (2018). Microbial Physiology: A Practical Approach. Callisto Reference publisher.

Reference Books

1. DavidWhite., James Drummond., Clay Fuqua (2012) Physiology and Biochemistry of Prokaryotes. 4th Ed. Oxford University Press, New York.

2. Robert K. Poole (2004). Advances in Microbial Physiology, Elsevier Academic Press, New York, Volume 49.

3. Kim B.H., Gadd G.M. (2008). Bacterial Physiology and Metabolism. Cambridge University Press, Cambridge.

4. Dawes, I.W and Sutherland L.W (1992). Microbial Physiology (2nd edition), Oxford Blackwell Scientific Publications.

5. Moat, A.G and J.W Foaster, (1995). Microbial Physiology, 3rd edition. Wiley – LISS, A John Wiley & Sons. Inc. Publications.

Web Resources

1. https://sites.google.com/site/microbial physiologyoddsem/teaching-contents
2. https://courses.lumenlearning.com/boundless-microbiology/chapter/microbial-Nutrition
3. https://onlinecourses.swayam2.ac.in/cec20_bt14/preview
4. https://www.studocu.com/microbial-physiology-practicals
5. https://www.agr.hokudai.ac.jp/microbial-physiology

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1						M	L	M	L		M
CO2						M	M	L	M		L
CO3						L	M	M	L		M
CO4						L	M	M	M		M
CO5						M	M	M	M		M

BIOINSTRUMENTATION

Course Code: U2R3MBDSE2:1	**Credit:** 3
Category: Discipline Specific Elective II	**Hrs/Week:** 4, **Total Inst. Hrs:** 60
Nature of the Course: Employability	**Marks:** CIA: 25+ EXT: 75 = 100

Course Objectives

1. Understand the analytical instruments and study the basic principles in the field of sciences.
2. To gain knowledge about principles of spectroscopy
3. Understand the analytical techniques of Chromatography and electrophoresis
4. To understand the principle of different types of scans used in medical diagnosis
5. To gain information about the principles of radioactivity and its measurements

Unit I: **12 hrs**

Acids, bases, buffers; measurements- units of weights and volume; Preparation of solutions; calculation of concentration and methods of expressing concentration of solutions- normality and molarity solutions. Basic instruments- balances, pH meter, Laminar air flow chamber.

Unit II: **12 hrs**

Preparative and Analytical Centrifuges, Sedimentation analysis RCF, Density Gradient Centrifugation. **Colorimetry** – principle, Beer – Lambert's law – Applications.

Unit III: **12 hrs**

Theory and Application of UV and Visible Spectroscopy, Fluorescence Spectroscopy, MS, NMR, ESR, Atomic Absorption Spectroscopy, **Electrophoretic Techniques:** Theory and Application of PAGE, Agarose Gel Electrophoresis 2DE, Iso-electric Focusing,.

Unit IV: **12 hrs**

Theory and Application of Paper Chromatography, TLC, Gel Filtration Chromatography, Ion Exchange Chromatography, Affinity Chromatography, GLC, HPLC.

Unit V: **12 hrs**

Introduction to Radioisotopes and their Biological Applications, Radioactive Decay. Types and Measurement, Principles and Applications of GM Counter, Solid and Liquid Scintillation Counter, Autoradiography, Radiation Dosimetry.

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Gain knowledge about the basics of instrumentation.	PO1,PO4,PO11
CO2	Exemplify the structure of atoms and molecules by using the principles of spectroscopy.	PO4,PO10,PO11
CO3	Evaluate by separating and purifying the components.	PO4,PO7,PO11
CO4	Understand the need and applications of imaging techniques.	PO7,PO8,PO11
CO5	Categorize the working principle and applications of fluorescence and radiation.	PO10,PO11

Text Books

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

2. Ponmurugan. P and Gangathara PB (2012). Biotechniques.1stEdition. MJP publishers.

3. Veerakumari, L (2009).Bioinstrumentation- 5 thEdition -.MJP publishers.

4. Upadhyay, Upadhyay and Nath (2002). Biophysical chemistry – Principles and techniques 3rd Edition. Himalaya publishing home.

5. Chatwal G and Anand (1989). Instrumental Methods of Chemical Analysis. S.Himalaya Publishing House, Mumbai.

Reference Books

1. Rodney.F.Boyer (2000). Modern Experimental Biochemistry, 3rd Edition. Pearson Publication.

2. SkoogA.,WestM (2014). Principles of Instrumental Analysis – 14th Edition W.B.SaundersCo.,Philadephia.

3. N.Gurumani. (2006). Research Methodology for biological sciences- 1st Edition – MJP

Publishers .

4. Wilson K, and Walker J (2010). Principles and Techniques of Biochemistry and Molecular Biology.7thEdition. Cambridge University Press .

5. Webster, J.G. (2004). Bioinstrumentation- 4th Edition - John Wiley & Sons (Asia) Pvt.Ltd,Singapore.

Web Resources

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

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	L			M							S
CO2				L						M	S
CO3				L			M				S
CO4							S	S			S
CO5										M	S

HERBAL TECHNOLOGY

Course Code: : U2R3MBDSE2:2	**Credit:** 3
Category: Discipline Specific Elective II	**Hrs/Week:** 4, **Total Inst. Hrs:** 60
Nature of the Course: Skill Development	**Marks:** CIA: 25+ EXT: 75 = 100

Course Objectives

1. Impart knowledge of Indian Medicinal Plants and their applications in microbiology.
2. Promote the technical skills involved in preparation of different types of plant extracts.
3. Explain methods to analyze the antimicrobial activity of medicinal plants.
4. Acquire knowledge on cosmetic microbiology and role of microorganisms in cosmetics.
5. Gain insight into pharmacopeial microbial assays and biosafety.

Unit I: **12 Hrs**

Herbs, Herbal medicine - Indian medicinal plants: Scope and Applications of Indian medicinal plants in treating bacterial, fungal and viral diseases. Basic principles involved in Ayurvedha, Sidha, Unani and Homeopathy.

Unit II: **12 Hrs**

Collection and authentication of selected Indian medicinal plants: *Emblica officinalis, Withania somnifera, Phyllanthus amarus, Tinospora cordifolia, Andrographis paniculata, Piper longum, Ocimum sanctum, Azardirchata indica, Terminalia chebula, Allium sativum.* Preparation of extracts- Hot and cold methods. Preparation of stock solutions.

Unit III: **12 Hrs**

Antimicrobial activity of selected Indian medicinal Plants: - In vitro determination of antibacterial and fungal activity of selected whole medicinal plants/ parts – well-diffusion methods. MIC - Macro and micro dilution techniques. Antiviral activity- cell lines- cytotoxicity, cytopathic and non-cytopathic effect.

Unit IV: **12 Hrs**

History of Cosmetic Microbiology – Need for cosmetic microbiology, Scope of cosmetic microbiology, - Role of microbes in cosmetic preparation. Preservation of cosmetics. Antimicrobial properties of natural cosmetic products – Garlic, neem, turmeric, aloe vera and tulsi. Sanitary practices in cosmetic manufacturing - HACCP protocols in cosmetic microbiology.

Unit V: **12 Hrs**

Cosmetic microbiology test methods - Antimicrobial preservative efficacy, microbial content testing and biological toxicological testing. Validation methods - bioburden and Pharmacopeial microbial assays. Preservatives of cosmetics - Global regulatory and toxicological aspect of cosmetic preservatives.

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Identify the applications of Indian medicinal plants in treating diseases.	PO1, PO5
CO2	Identify and authenticate herbal plants.	PO6, PO7
CO3	Evaluate the antimicrobial activity of medicinal plants.	PO4, PO6, PO9
CO4	Describe the role of microorganisms and their metabolites in the preparation of cosmetics.	PO1, PO5, PO7
CO5	Validate procedures and biosafety measures in the mass production of cosmetics.	PO6, PO7

Text Books

1.Ayurvedic Formulary of India. (2011). Part 1, 2 & 3. Pharmacopoeia Commission for Indian Medicine and Homeopathy. ISBN-10:8190648977.

2.Panda H. (2004). Handbook on herbal medicines. Asia Pacific Business Press Inc. ISBN:8178330911.

3.Mehra P. S. (2019). A Textbook of Pharmaceutical Microbiology. Dreamtech Press. ISBN 13:9789389307344.

4.Geis P. A. (2020). Cosmetic microbiology: A Practical Approach. (3rd Edition). CRC Press. ISBN:9780429113697.

5.Brannan D. K. (1997). Cosmetic microbiology: A Practical Handbook. CRC Press.ISBN-10:0849337135.

References Books

1.Indian Herbal Pharmacopoeia (2002). Vol. I &II Indian Drug Manufacturers Association, Mumbai.

2.British Herbal Pharmacopoeia.(1990).Vol.I. British Herbal Medicine Association.ISBN: 0903032090.

3.Verpoorte R. and Mukherjee, P. K. (2010). GMP for Botanicals: Regulatory and Quality issues on Phytomedicines. In GMP for botanicals: regulatory and quality issues on phytomedicines. (2nd edition). Saujanya Books, Delhi.ISBN-10:81-900788-5-2/8190078852. ISBN-13:978-81-900788-5-6/9788190078856.

4.Turner R. (2013). Screening methods in Pharmacology. Elsevier. ISBN:9781483264233.

5.Cupp M. J. (2010). Toxicology and Clinical Pharmacology of Herbal Products (pp. 85-93). M. J. Cupp. Humana Press.Totowa, NJ, USA. ISBN-10:1617371904.

Web Resources

1.https://www.academia.edu/50236711/Modern_Extraction_Methods_for_Preparation_of_Bioactive_Plant_Extracts

2.https://www.nhp.gov.in/introduction-and-importance-of-medicinal-plants-and-herbs_mtl

3.https://pubmed.ncbi.nlm.nih.gov/17004305/

4.https://www.fda.gov/cosmetics/potential-contaminants-cosmetics/microbiological-safety-and-cosmetics

5.https://pubmed.ncbi.nlm.nih.gov/15156038/

Mapping with Programme Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14
CO1	M				S									
CO2						S	M							
CO3				S		S			M					
CO4	M				S		S							
CO5						M	S							

SERICULTURE

Course Code: U2R3MBSEC3:1	**Credit:** 2
Category: Skill Enhancement Course -SEC-3	**Hrs/Week:** 2, **Total Inst. Hrs:** 30
Nature of the Course: Entrepreneurship	**Marks:** CIA: 25+ EXT: 75 = 100

Course Objectives

1. Acquire knowledge on the concepts of origin, growth and study of Sericulture as science and scientific approach of mulberry plant.
2. Describe the morphology and physiology of silkworm.
3. Discuss effective management of silkworm diseases.
4. Demonstrate field skills in mulberry cultivation and silkworm rearing with an emphasis on technological aspects.
5. Demonstrate entrepreneurship abilities, innovative thinking, planning, and setting up small-scale enterprises.

Unit I: **6 hrs**

General introduction to Sericulture, its distribution in India. Botanical distribution and taxonomical characters of mulberry varieties and species. Biology of Mulberry plant and Mulberry crop cultivation and protection.

Unit II: **6 hrs**

Silkworm- biology-morphology of silkworm. Life cycle of silkworm- egg, larva, pupa, and moth.

Unit III: **6 hrs**

Silkworm pathology: Introduction to Parasitism, Commensalism, Symbiosis and Parasite relationship - Mulberry Silkworm Diseases: Introduction, types, Pebrine, Grasserie, Muscardine, Flacherie, Symptoms and Pathogens, Mode of Infection, Prevention and Control -Non – mulberry silkworm diseases: Pebrine, Bacterial and viral diseases. Brief Account of Pests and Predators of Silkworms, Nature of damage and control measures.

Unit IV: **6 hrs**

Rearing of silkworm. Cocoon assessment and processing technologies. Value added products of mulberry and silkworms.

Unit V: **6 hrs**

Entrepreneurship and rural development in sericulture:Planning for EDP, Project formulation, Marketing, Insectary facilities and equipments: Location, building specification, air conditioning and environmental control, furnishings and equipment, sanitation and equipment, subsidiary facilities.

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Discuss the overall aspects of Sericulture and the biology and varieties of mulberry plant.Creates awareness among students about the economic importance and suitability of Sericulture in Indian conditions.	PO1,PO5,PO7
CO2	Familiarize with the lifecycle of silk worm.	PO1, PO2
CO3	Explain common diseases of silkworm encountered during rearing, sources of infection, disease symptoms, pre-disposing factors and their management practices.	PO1, PO5
CO4	Attain thorough knowledge about the cultivation of mulberry, maintenance of the farm, seed technology, silkworm rearing, post cocoon techniques like stifling, reeling, and utilization of by-products.	PO7, PO8, PO10
CO5	Plan the facilities required for establishment of insectary. Competent to transfer the knowledge and technical skills to the Seri-farmers.Analyze the importance of sericulture in entrepreneurship development and emerge as potential entrepreneur.	PO5, PO7, PO8

Text Books

1. Ganga, G. and SulochanaChetty(2010). Introduction to Sericulture,, J., Oxford and IBH Pub. Co. Pvt. Ltd., New Delhi.

2. Dr. R. K. Rajan&Dr. M. T. Himantharaj(2005). Silkworm Rearing Technology, Central Silk Board, Bangalore.

3. Dandin S B, JayantJayaswal and Giridhar K (2010). Handbook of Sericulture technologies,Central Silk Board, Bangalore.

4. M. C. Devaiah, K. C. Narayanaswamy and V. G. Maribashetty(2010). Advances in Mulberry Sericulture,,CVG Publications, Bangalore

5. T.V.SatheandJadhav.A.D.(2021). Sericulture and Pest Management, Daya Publishing House.

Reference Books

1. S. Morohoshi (2001). Development Physiology of Silkworms 2ndEdition, Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi

2. Hamamura, Y (2001). Silkworm rearing on Artificial Diet. Oxford & IBH publishing Co., Pvt. Ltd. NewDelhi.

3. M.Johnson, M.Kesary (2019).Sericulture, 5th.Edition.Saras Publications.

4. Manisha Bhattacharyya (2019).Economics of Sericulture, Rajesh Publications.

5. Muzafar Ahmad Bhat, SurakshaChanotra, ZafarIqbalBuhroo, Abdul Aziz and Mohd.Azam (2020).A Textbook on Entrepreneurship Development Programme in Sericulture, IP Innovative Publication.

Web Resources

1. https://egyankosh.ac.in › bitstream
2. https://archive.org › details › SericultureHandbook
3. https://www.academic.oup.com
4. https://www.sericulture.karnataka.gov.in
5. https://www.silks.csb.gov.in

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	S				S		S				
CO2	M				S						
CO3	S				S						
CO4							S	S		S	
CO5					S		S	S			

VETERINARY MICROBIOLOGY

Course Code: U2R3MBSEC3:2	**Credit:** 2
Category: Skill Enhancement Course -SEC-3	**Hrs/Week:** 2, **Total Inst. Hrs:** 30
Nature of the Course: Employability	**Marks:** CIA: 25+ EXT: 75 = 100

Course Objectives:

1. To learn about spore forming bacteria and some important aerobes and anaerobes.
2. To learn general and pathogenic mycology.
3. To study viral properties, epidemiology, pathogenesis
4. To understand science and practice of vaccines
5. To provide training in essential diagnostic techniques.

Unit I **6 hrs**

Systematic study of following pathogenic bacteria: Gram positive cocci, family Micrococaceae, endospore forming Gram positive rods and cocci, family Bacillaceae genus Bacillus, Sporolactobacillus and Clostridium. Spirochetes. Family Spirochetaceae and other families like Spirillaceae, coryneform bacteria, Dermatophillaceae, Streptomycetaceae.

Unit II **6 hrs**

Systematic study of animal mycoses such as Aspergillosis, Candidiasis, Cryptococcosis, Epizootic Lymphangitis, Mycetomas, Sporotrichosis, Histoplasmosis, Blastomycosis, Coccidioidomycosis, Haplomycosis, Rhinosporidiosis, Zygomycosis, Mycotic Abortion, Mycotic Mastitis, Mycotic Dermatitis, Dermatophytoses, Mycotoxicosis etc.

Unit III **6 hrs**

New castle disease virus, canine distemper virus, rinderpest virus, PPR virus; infectious bursal disease virus; rotavirus, blue tongue virus, African horse sickness virus; rabies virus, ephemeral fever virus, borna virus.

Unit IV **6 hrs**

History of veterinary vaccinology. Vaccines: classification, comparison of major types. Components of various types of vaccines: immunogens, adjuvants, stabilizers, preservatives, vehicles. Vaccine qualities: definitions and methods of testing. Vaccine development: cost-effectiveness of preventive immunization programmes.

Unit V **6 hrs**

Diagnosis of infectious diseases: an overview. Principles of serodiagnostic: agglutination-reaction based tests, precipitation-reaction based tests, complement fixation test and enzyme immunoassays.

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Explain bacterial pathogenic microorganisms of veterinary significance	PO1,PO5,PO7
CO2	Identify the zoonotic aspects of microbial pathogens	PO1, PO2
CO3	Examine the viral diseases associated with animals	PO1, PO5
CO4	Justify the clinical specimens of infectious diseases.	PO7, PO8, PO10
CO5	Elaborate the veterinary vaccines	PO5, PO7, PO8

Text Books:

1. Glen Sonder J & Karen W Post 2005. Veterinary Microbiology: Bacterial and Fungal Agents of Animal Diseases. Cold Spring Harbor Lab. Press.
2. Prescot LM, Harley JP &Klen DA. 2005. Microbiology. Wm. C. Brown Publ.
3. Tortora GJ, Funke BR & Case CL. 2004. Microbiology: An Introduction. Benjamin/Cummins Publ.
4. Carter J & Saunders V. 2007. Virology: Principles and Applications. 1st Ed. Wiley.
5. Knipe DM, Howley PM, Griffin DE. 2006. Fields Virology. 5th Ed. Vols. I, II. Lippincott, Williams & Wilkins.

Reference Books:

1. Dodds WJ & Schulz R. (Eds). 1999. Veterinary Vaccines and Diagnostics. Vol. 41 (Advances in Veterinary Medicine) 1st Ed. Academic Press.
2. Levine MM, Kaper JB, Rappuoli R, Liu MA & Good MF. 2004. New Generation Vaccines. 3rd Ed. Marcel-Dekker.

3. Pastoret PP, Blancou J, Vannier C &Verschueren C. 1997. Veterinary Vaccinology. Elsevier.
4. Detrick B & Hamilton RG. (Eds). 2006. Manual of Molecular and Clinical Laboratory Immunology. 7th Ed. American Society for Microbiology.
5. Rose NR, Friedman H & Fahey JL. (Eds). 1986. Manual of Clinical Laboratory Immunology. American Society for Microbiology.
6. Weir DM. 1986. Handbook of Experimental Immunology. Vol. IV. Blackwell.

Web Resources

1. https://www.us.elsevierhealth.com/veterinary-microbiology-0378-1135.html
2. https://www.journals.elsevier.com/veterinary-microbiology/most-downloaded-articles
3. https://wcvm.usask.ca/departments/vet-micro.php

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	S				S		S				
CO2	M				S						
CO3	S				S						
CO4							S	S		S	
CO5					S		S	S			

NUTRITION & HEALTH HYGIENE

Course Code: U2R3MBSEC2	**Credit:** 2
Category: Skill Enhancement Course -SEC-2 (NME)	**Hrs/Week:** 2, **Total Inst. Hrs:** 30
Nature of the Course: Skill Development	**Marks:** CIA: 25+ EXT: 75 = 100

Course Objectives

1. Learn about nutrition and their importance
2. Make student understand the nutritional facts for a better life.
3. Learn information to optimize our diet
4. Impart knowledge on different health care programs taken up by India
5. Learn knowledge on different health indicators and types of hygiene methods

Unit I: **6 hrs**

Nutrition – definition, importance, Good nutrition, and mal nutrition; Basics of Meal Planning. Carbohydrates, Lipids, Proteins and Vitamins –functions, dietary sources, effects of deficiency. Macro and micro minerals –functions, effects of deficiency; food sources of Calcium, Potassium, and Sodium; food sources of Iron, Iodine, and Zinc. Importance of water– functions, sources, requirements and effects of deficiency.

Unit II: **6 hrs**

Nutrition for Life Cycle: Balanced diet - Normal, Pregnant, lactating women, Infancy, young children Adolescents, Adults, and the Elderly; Diet Chart; Nutritive value of Indian foods.

Unit III: **6 hrs**

Improper diets: Definition, Identification, Signs and Symptoms - malnutrition, under-nutrition, over-nutrition, Protein Energy Malnutrition, obesity; Nutritional Disease and Disorder - hypertension, diabetes, anemia, osteomalacia, cardiovascular disease.

Unit IV: **6 hrs**

Health-Education: Principles and Strategies. Health Policy & Health Organizations: Health Indicators and National Health Policy of Govt. of India; Functioning of various nutrition and health organizations in India.

Unit V: **6 hrs**

Hygiene – Definition; Personal, Community, Medical and Culinary hygiene; WASH (Water, Sanitation and Hygiene) programme. Rural Community Health: Village health sanitation & Nutritional committee.

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Learn the importance of nutrition for a healthy life	PO5, PO6, PO7, PO8, PO10
CO2	Study the nutrition for life cycle	PO5, PO6, PO7, PO8, PO10
CO3	Know the health care programmes of India	PO5, PO6, PO7, PO8, PO10
CO4	Learn the importance of community and personal health & hygiene measures	PO5, PO6, PO7, PO10
CO5	Create awareness on community health and hygiene	PO5, PO6, PO7, PO10

Text Books

1. Bamji, M.S., K. Krishnaswamy& G.N.V. Brahmam (2009) Textbook of Human Nutrition(3rd edition) Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
2. Swaminathan (1995)Food &Nutrition(Vol I, Second Edition) The Bangalore Printing &Publishing Co Ltd., , Bangalore
3. SK. Haldar(2022). Occupational Health and Hygiene in Industry. CBS Publishers.
4. Acharya, Sankar Kr, Rama Das, MinatiSen (2021). Health Hygiene and Nutrition Perception and Practices.Satish Serial Publishing House
5. Dass (2021).Public Health and Hygiene, Notion Press

References Books

1. VijayaKhader (2000)Food, nutrition & health, Kalyan Publishers, New Delhi
2. Srilakshmi, B., (2010)Food Science, (5th Edition) New Age International Ltd., New Delhi
3. Arvind Kumar Goel (2005). A College Textbook of Health &Hygiene,ABD Publishers
4. Sharma D. (2015).Textbook on Food Science and Human Nutrition.Daya Publishing House.

5. Revilla M. K. F., Titchenal A. and Draper J. (2020).Human Nutrition.
University of Hawaii, Mānoa.

Web Resources

1. National Rural Health Scheme:

https://nhm.gov.in/index1.php?lang=1&level=1&sublinkid=969&lid=49

2. National Urban Health Scheme:

https://nhm.gov.in/index1.php?lang=1&level=1&sublinkid=970&lid=137

3. Village health sanitation & Nutritional committee

https://nhm.gov.in/index1.php?lang=1&level=1&sublinkid=149&lid=225

4. Health Impact Assessment - https://www.who.int/hia/about/faq/en/

5. Healthy Living https://www.nhp.gov.in/healthylivingViewall

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1					S	M	M	M		S	
CO2					S	M	M	M		S	
CO3					S	M	M	M		S	
CO4					S	S	L			S	
CO5					S	S	M			S	