Department of Microbiology
Board of Studies Meeting

The minutes of the 22nd meeting of Board of Studies held on 26.10.2026 at 10.00 am through online mode - google meet.

Members Present:

S. No.	Name	Category
1	Dr. J. Rengaramanujam Professor and Head Department of Microbiology, Dr. N.G.P Arts and Science College, Coimbatore – 641 048	Chairman
2	Dr. M. Gnanadesigan – Assistant Professor, Department of Microbial Biotechnology, Bharathiar University, Coimbatore	VC Nominee
3	Dr. S. Murugan – Professor, Department of Biotechnology, Karunya University, Coimbatore.	Subject Expert
4	Dr. M. Kulandhaivel - Associate Professor, Department of Microbiology, Karpagam Academy of Higher Education, Coimbatore.	Subject Expert
5	Dr. C. Balakumar, General Manager – Technical Services, Velam Agri Services, Manupatti, Udumalpet – 642 112.	Industrial Expert
6	Mrs. V. Pradeepa, Tutor in Department of Microbiology, Nandha Medical College and Hospital, Perundurai, Erode.	Alumni
7	Dr. N. Kuppuchamy Part – I (Four Semester Language)	Co – Opted Member
8	Dr. A. Hazel Verbina Part – II (Four Semester Language)	Co – Opted Member
9	Dr. P. Chidambara Rajan Allied	Co – Opted Member
10	Dr. R. Ravikumar Allied	Co – Opted Member
11	Dr. S. S. Sudha	Member
12	Dr. N. Vidhya	Member
13	Dr. S. Senthil Prabhu	Member
14	Dr. A. M. Ramachandran	Member
15	Dr. C. Sasikala	Member
16	Dr. S. Karthik Sundaram	Member
17	Dr. R. Mahenthiran	Member

18	Dr. J. Devakumar	Member
19	Dr. V. Keerthana	Member
20	Jayasurya (PG)	Student Representative
21	Aadhitya (UG)	Student Representative

The HoD and Chairman of the Department of Microbiology welcomed and introduced all the members and appreciated them for their continuous support and contribution for the development of academic standard and enrichment of the syllabus.

The items of the agenda were taken one by one for discussion and the following resolutions were passed.

Item 22.1 *To review and approve the minutes of the previous meeting held on 02.04.2026.*

The chairman of the Board presented the minutes of the previous meeting held on *02.04.2026* and requested the members to approve. After brief discussion the following resolution was passed.

Resolution:

Resolved to approve the minutes of the previous meeting held on 02.04.2026.

Item 22.2: *To consider and approve the syllabi offered in II semester for students admitted in UG and PG from the academic year 2026 -27.*

The chairman presented the detailed scheme and syllabi for the students admitted in UG and PG from the academic year 2026-27.

Revision

B. Sc Microbiology		
Course Code	**Course**	**Reason**
26MBU2CA	**MICROBIAL PHYSIOLOGY**	Dr. Murugan recommended for the following corrections **Unit V:** The classification of amino acids has been revised to clarify the grouping of amino acids under the pyruvate family. The revised content specifies “Pyruvate Family (Alanine and Leucine) and Proline and Arginine” to improve conceptual clarity and avoid the incorrect inclusion of glutamic acid in the pyruvate family. **Case Study:** The existing case study has been

		modified to focus on microbial nutritional requirements, enabling students to apply their understanding of nutrient requirements and the nutritional factors influencing microbial growth, thereby strengthening their analytical and problem-solving skills.
26MBU2CP	**MICROBIAL PHYSIOLOGY AND BIOINSTRUMENTATION**	The Board has recommended following corrections and modifications have been incorporated into the practical syllabus **Experiment VII:** The citrate utilization test has been removed from Experiment VII, as it is already included as part of the IMViC tests in Experiment III. This modification eliminates repetition and allows the practical syllabus to accommodate a wider range of relevant experimental techniques. **Experiment VIII:** Sodium chloride (NaCl) has been incorporated into the experiment to investigate the influence of salt concentration on microbial physiology, ionic balance, osmotic regulation, and microbial growth and to understand under varying environmental conditions. **Experiment X:** The gradient layering experiment has been removed and replaced with buffer Preparation and pH Meter to be aligned with course outcomes. It is essential for studying the effects of pH on microbial growth and conducting reliable laboratory experiments.

M. Sc Microbiology		
Course Code	**Course Code**	**Course Code**
26MBP2CB	**IMMUNOLOGY AND IMMUNOTECHNIQUES**	Dr. Murugan and Dr. Gnanadesigan recommended incorporating a case study in Unit V that integrates the first line of defence mechanisms covered in Unit I with the concept of vaccination, using a real-life exposure scenario. The case study provides an application-oriented learning approach without duplicating the existing theoretical content, thereby enhancing

		students' conceptual understanding and promoting the application of immunological principles to real-world situations in alignment with outcome-based education objectives.
26MBP2DA	**BIONANOTECHNOLOGY**	Dr. Kulanthaivel and Ms. Pradeepa recommended the following corrections and modifications into the syllabus to enhance its scientific relevance and align it with contemporary developments in bionanotechnology. **Unit I:** Scale-up Feasibility has been introduced to bridge the gap between laboratory-scale nanoparticle synthesis and industrial-scale production to understand optimization, reproducibility, and commercial manufacturing challenges. **Unit II:** The topics Microfluidic Synthesis and Solid Lipid Nanoparticles (SLNs) have been incorporated to familiarize students with contemporary nanoparticle synthesis techniques and their applications in drug delivery to improve industrial relevance of the syllabus. **Unit III:** Dynamic Light Scattering (DLS) and Zeta Potential Analysis have been introduced to strengthen students' understanding of nanoparticle characterization supporting nanomaterial quality assessment and formulation development. **Unit IV:** The topics Diabetic Wound Healing and Nano-pesticides and Nano-fertilizers have been included to highlight the biomedical and agricultural applications of nanotechnology, emphasizing tissue repair, sustained bioactive release, targeted delivery, and sustainable agricultural practices. **Unit V:** The topic Regulatory Frameworks: CDSCO and USFDA Guidelines has been introduced to familiarize students with regulatory requirements for nanopharmaceutical development, safety evaluation, and commercialization, including regulatory pathways and ecotoxicity risk assessment. Further, the following case studies have been incorporated into Units IV and V to promote application-oriented learning:

		Case Study 1: Liposomal Amphotericin B (AmBisome®) in Targeted Antifungal Therapy – This case study enables students to understand the application of liposomal drug delivery systems in antifungal therapy and relate nanocarrier principles to clinically established formulations. **Case Study 2: Green-Synthesized Iron Oxide Nanoparticles for Industrial Dye Wastewater Treatment** – This case study encourages students to evaluate the environmental applications, treatment efficiency, sustainability, cost-effectiveness, and health and safety considerations of nanotechnology-based pollution control. The Board noted that these modifications enhance the scientific and industrial relevance of the syllabus, incorporate contemporary advancements in bionanotechnology, and promote outcome-based learning through practical applications, regulatory awareness, and case-study-based analysis.

After discussion the following resolution was passed.

Resolution:

Resolved to approve the above mentioned new scheme and syllabus for the UG and PG students admitted for the academic year 2026-27.

Item 22.3: *To review and approve the syllabi for IV Semester for the students admitted in UG and PG from the academic year 2025-26.*

The chairman presented the detailed syllabus for the IV semester. The members deliberated in detail about the modification required. After discussion it is unanimously decided to adopt the following changes.

B.Sc. Microbiology		
Course Code	**Course**	**Reason**
25MBU4SA	**RECOMBINANT DNA TECHNOLOGY**	The board recommended the following changes **Unit I:** The enzymes alkaline phosphatase, polynucleotide kinase, terminal transferase, and

		nucleases have been added to the syllabus to strengthen students' understanding of the enzymatic tools involved in recombinant DNA technology, including vector dephosphorylation, nucleic acid labelling, terminal tailing, and DNA manipulation. **Unit II:** The topic "Development of Genomic DNA Library" has been revised as "Construction of Genomic DNA and cDNA Libraries" to adopt standard terminology and provide students with a comprehensive understanding of genomic and complementary DNA library preparation.

M.Sc. Microbiology		
Course Code	**Course**	**Reason**
25MBP4CA	**FERMENTATION TECHNOLOGY**	Dr. Gnanadesigan and Dr. Rengaramanujam recommended incorporating process monitoring, microbial strain performance evaluation, inoculum quality assessment, media optimization, productivity calculations, process troubleshooting, quality control, and Good Manufacturing Practices (GMP) to develop their technical and problem-solving skills, for employability in fermentation-based industries.
25MBP4CB	**BIOETHICS, BIOSAFETY AND IPR**	Dr. Senthilprabhu and Dr. Rengaramanujam recommended replacing the existing case study in Unit III, titled "How many genetically modified (GM) vegetables are available in the market in your area? Create awareness about their pros and cons," with "Bt Brinjal Moratorium – Application of the Cartagena Protocol and DBT Biosafety Guidelines

		and Rules for Storage of Hazardous GMOs." This modification enables students to understand the regulatory framework governing genetically modified organisms promoting critical analysis of biosafety regulations and their application in biotechnology research and practice.

After discussion the following resolution was passed.

Resolution:

Resolved and approved the syllabus of 2025-26 batch with modification for UG and PG students admitted from the academic year 2025-26.

Item 22.4: *To review and approve syllabi for the VI Semester for students admitted in UG from the academic year 2024-25.*

The chairman presented the detailed syllabus for the VI semester. The members deliberated in detail about the modification required. After discussion it is unanimously decided to adopt the following changes.

B.Sc. Microbiology		
Course Code	**Course**	**Reason**
24MBU6CP	**ENVIRONMENTAL AND INDUSTRIAL MICROBIOLOGY**	Dr. A. M. Ramachandran and Dr. Balakumar recommended incorporating the following modifications into the practical syllabus to strengthen competencies and enhance the industrial relevance of the microbiology curriculum. **Experiments 11 and 12: Enhancement of Pharmaceutical Quality Control Experiments** – The pharmaceutical quality control practicals have been revised to include membrane filtration as a method for sterility testing and to expand Microbial Limit Testing (MLT) to cover both raw materials and finished products.

		Experiment 13: Replacement of Plant Callus Induction with Single Cell Protein (SCP) Production – The existing experiment on plant callus induction has been replaced with Single Cell Protein (SCP) Production from Yeast Using Agro-Industrial Waste. It familiarizes students with submerged fermentation, the utilization of agro-industrial waste for value-added product development, cell harvesting, and quantitative protein estimation using the Lowry method.
24MBU6DB	**ENTREPRENEURIAL MICROBIOLOGY**	The Board noted that the following corrections and modifications have been incorporated into the syllabus. **Unit I:** The topic BioE3 Economy has been incorporated to familiarize students with India's BioE3 Policy, its focus on high-performance biomanufacturing, and the development of the bioeconomy. **Unit II:** The topics Probiotics, Smart Proteins, and Industrial Biocatalysts have been incorporated to reflect emerging opportunities in functional foods, synbiotics, alternative proteins, and industrial bioprocessing. **Unit III:** The topics Liquid Biofertilizer Consortia and Vesicular-Arbuscular Mycorrhiza (VAM) have been included to familiarize students with contemporary biofertilizer formulations and their commercial applications. **Unit IV:** Second-Generation (2G) Bioethanol and Biofuel Policies have been incorporated to emphasize the conversion of lignocellulosic biomass

		and agricultural residues into biofuels. These additions familiarize students with waste-to-energy technologies, sustainable feedstock utilization, and the industrial applications of bioethanol production, while highlighting emerging opportunities in biorefineries and the biofuel sector. **Unit V:** The topics Technology Readiness Levels (TRLs) and Technology Transfer have been introduced to help students assess the technological maturity of innovations, from laboratory research to commercial application. **Case Study 1: Yakult Danone India and Kombucha Start-ups** – This case study focuses on the commercialization of probiotic and fermented beverages, emphasizing market entry strategies, microbial strain stability, cold-chain distribution, and commercial-scale production. It enables students to understand the practical challenges involved in translating microbial products into viable business ventures. **Case Study 2: Biocon (Kiran Mazumdar-Shaw) and the Neem/Turmeric Patent Battles** – The existing case study on mushroom cultivation has been replaced, as its primary emphasis was on small-scale agricultural production and business expansion, with comparatively limited coverage of biotechnology entrepreneurship and intellectual property protection. The revised case study introduces students to biotechnology enterprise development through Biocon and examines the Neem and Turmeric patent controversies in the context of intellectual property rights, patent

		protection, traditional knowledge, and the commercialization of biological resources. This modification broadens students' understanding of innovation management and entrepreneurship in the biotechnology sector.
24MBU6DD	**MICROBIAL FUEL TECHNOLOGY**	Dr. Kulanthaivel and Ms. Pradeepa recommended incorporating the following modifications into Unit II **Unit II:** The topics covering first-, second-, and third-generation biofuels, biomass-to-biofuel value chains, circular bioeconomy, and bioenergy career opportunities have been included to familiarize students with different biofuel production pathways, sustainable resource utilization, and emerging employment opportunities in the bioenergy sector.
24MBU6DE	**PERSPECTIVES ON MICROBIOLOGY LAB ACCREDITATION**	Dr. Murugan and Dr. Rengaramanujam recommended incorporating the following modifications into Units IV and V to strengthen the practical and professional relevance of the syllabus. Topics related to laboratory safety, biosafety practices, regulatory compliance, Laboratory Information Management Systems (LIMS), data management, quality assurance practices, and laboratory accreditation requirements have been included to enhance students' understanding of the operational, regulatory, and quality management aspects of microbiology laboratories. These modifications are intended to strengthen students' technical competencies and prepare them for professional roles in accredited testing and research laboratories.

After discussion the following resolution was passed.

Resolution:

Resolved and approved the syllabus of 2024-25 batch with modification for UG students admitted from the academic year 2024-25.

Item 21.5: *To approve the panel of examiners for Question paper setting and evaluation of answer scripts for the Even semester of the academic year 2026-27.*

The Chairman presented the panel of Examiners for question paper setting, question paper scrutiny and conduct of practical and theory of examinations are Submitted to CoE for Exam related work.

Resolution:

Resolved to approve the panel of examiners for question paper setting and evaluation of answer scripts for the even semester of the academic year 2026-2027.

Finally, the Chairman thanked all the members for their cooperation and contribution in enriching the syllabus with active participation in the meeting and sought the same spirit in the future also. The meeting was closed with formal vote of thanks proposed by Dr. J. Rengaramanujam, Head and Chairman – Microbiology.

Date: 26.10.2026

(Dr. J. Rengaramanujam)
BoS Chairman/HOD
Department of Microbiology
Dr. N. G. P. Arts and Science College
Coimbatore - 641 048

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Syllabus Revision

Faculty: Biosciences **Board:** Microbiology

Semester: II

Course Code/ Name: 26MBU2CA/MICROBIAL PHYSIOLOGY

Unit	Existing	Changes
I	Nutritional requirement Common nutritional requirement-macro elements, micro elements and trace elements. Nutritional requirements of Microorganisms- Autotrophs, Heterotrophs, Chemotrophs, Copiotrophs and Oligotrophs - Nutrition uptake by cell wall- Passive and Facilitated diffusion, Active transport, Group translocation.	cell membrane
II	Growth of Bacteria Growth factors - Growth curve - Microbial growth-Batch culture, Continuous, Semi continuous, Synchronous and Biphasic growth - Calculation of generation time - Estimation of Microbial growth: Microscopic count, Turbidometric assay and TVC - Factors influencing microbial growth	Turbidimetric Total Viable Count Diauxic growth
III	Respiration and Energy Production Aerobic respiration - EMP and its alternative pathways (HMP shunt and ED pathways) - TCA cycle – Electron transport – Energy generation via Oxidative and Substrate level phosphorylation - Calculation of ATP in aerobic cellular processes - Glyoxylate cycle - β oxidation of fatty acids	
IV	Anaerobic Respiration Anaerobic respiration – Methanogens - Sulphur and nitrogenous compounds and CO2 as final electron Acceptor - Fermentation – Alcoholic, Propionic, lactic and Mixed acid fermentation - Oxygenic and anoxygenic photosynthesis in bacteria.	
V	Biosynthesis of amino acid, Lipid and Cell wall Biosynthesis of amino acids (Pyruvate family – Alanine, Leucine and Glutamic acid family) - Lipids (Phospholipids and Archaeal lipids) - Biosynthesis of bacterial cell wall.	Glutamate family-Proline, Arginine

	Case study: Consider that you have isolated a rod-shaped bacterium from a water sample that has the potential of producing a valuable compound. You have to identify the nutritional requirement of the organism that could enable a faster multiplication of the organism that could make the organism having potential for commercialization.	Case study: A rod-shaped bacterium isolated from a water sample produces a commercially valuable compound. Design a strategy to determine its nutritional requirements and optimise its growth to maximise yield.

PERCENTAGE OF SYLLABUS REVISED: 10

COURSE FOCUS ON:

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

Syllabus Revision

Faculty: Biosciences **Board: Microbiology**

Semester: II

Course Code/ Name: 26MBU2CP / MICROBIAL PHYSIOLOGY AND BIOINSTRUMENTATION

Experiments	Existing	Changes
I	Measurement of Microbial growth – Haemocytometer Measurement of Microbial growth – Bacterial growth curve	Experiment I & II Merged
II	Use of colorimeter/spectrophotometer, Beer-Lambert law	New experiment added
III	IMViC Test	
IV	Catalase test and Oxidase test	
V	Preferential sugar utilization and H_2S production test – TSI	
VI	Starch hydrolysis, Casein hydrolysis test, Gelatin liquefaction	
VII	Urease, ~~Citrate utilization tes~~t and Nitrate Reduction	

	Test	
VIII	Effect of pH and Temperature on microbial growth #	Nacl
IX	Preparation of Buffers - Acidic, neutral and alkaline range	
X	~~Density Gradient Centrifugation – Sucrose Gradient~~	Use and calibration of a pH meter
XI	Separation of amino acids - Thin Layer and paper Chromatography	
XII	Extraction of chlorophyll pigments from plant/algae	
XIII	Estimation of Protein - Lowry et al., method	
XIV	Estimation of sugars - DNSA method	

PERCENTAGE OF SYLLABUS REVISED: 10
COURSE FOCUS ON:

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

Syllabus Revision

Faculty: Biosciences **Board: Microbiology**
Semester: II
Course Code/ Name: 26MBP2CB / IMMUNOLOGY AND IMMUNOTECHNIQUES

Unit	Existing	Changes
I	**History and Scope of Immunology** Historical background and scope of Immunology, Defence mechanisms of human body - First line defence – Anatomical and Physiological barriers – Second line defence – Fever, inflammation and Phagocytosis – Third line defence – Cells and organs of immune system.	
II	**Immunity & Types** Immunity – types of immunity – Natural, acquired, specific and non-specific, cell mediated and humoral, active and passive immunity. Antigens - properties, Epitopes, haptens, adjuvant, cross reactivity. Antibodies - properties, structure (primary & secondary) and	

	isotypes. Diversity and specificity. Anti-antibodies. Complement pathway.	
III	**Antigen-Antibody reactions** Serology - Antigens and antibody reactions - Introduction and classification of antigens and antibody reactions - Agglutination and precipitation reaction. Strength of antigen and antibody binding - affinity & avidity. Therapeutic applications of monoclonal antibodies and Complement fixation reaction. Immunofluorscence, RIA, RAST, ELISA and Flow cytometry - RT- PCR.	
IV	**Lymphocyte Response** Response of B-cell and T-cell to antigens. B-cell and T-cell products. Hyper sensitivity - Type I, II, III and IV – MHC antigens - types and functions. Immunity to infectious diseases - Viral, bacterial and protozoan.	
V	**Transplantation Immunology** Transplantation immunology - Tissue transplantation and grafting - Mechanism of graft acceptance and rejection - HLA typing - Tumor immunology - Immunodeficiency disorders - Primary (SCID) and Secondary (AIDS) and auto immunity. Vaccines - Types and vaccination methods. ~~Case Study on vaccines for Covid'19~~.	**Case Study: First Line Failure to Third Line Protection - A COVID Exposure Case.**

PERCENTAGE OF SYLLABUS REVISED: 10
COURSE FOCUS ON:

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

Syllabus Revision

Faculty: Biosciences **Board: Microbiology**

Semester: VI

Course Code/ Name: 26MBP2DA / BIONANOTECHNOLOGY

Unit	Existing	Changes
I	**Introduction to bionanotechnology** History – concept and future prospects – application in Life Sciences.Terminologies – nanotechnology, bionanotechnology, nanobiomaterials,biocompatibility, nanomedicine, nano tube, nanowires, quantum dots, nanocomposite, nanoparticles, nanosensors, nanofiber, Dendrimeter. Emergence of Bionanotechnology.	Scale-up Feasibility
II	**Synthesis of nanoparticles** Synthesis - Top-down approach and bottom-up approach -Types of nanoparticles production - principle and mechanism of synthesis – physical - Sonicator, Ball mill, ablation, ~~evaporation-condensation~~; chemical - reducing method -chemical reduction, irradiation, electrochemical, photoreduction; biological - microbes, plants. Green synthesis	Microfluidic-assisted synthesis and bio-inspired lipid- based nanocarriers (Liposomes & Solid Lipid Nanoparticles)
III	**Characterization of Nanoparticles** Physical and chemical properties of nanoparticles. Characterization– UV-Vis spectroscopy, particle size analyzer, Electron Microscopy – HRTEM, SEM, AFM, EDS, XRD. Other tools and techniques required for bionanotechnology: X- Ray crystallography, FTIR, NMR.	DLS and Zeta Potential Analysis
IV	**Applications of bionanotechnology** Targeted drug delivery, biosensors and biomarkers, food and agriculture, DNA nanotech, nanoviricides, tissue engineering, gene delivery. Antibacterial activities of nanoparticles. Toxicology in nanoparticles – Dosimetry. Molecular nanotechnology – nanomachines – collagen.	Diabetic Wound Healing Hydrogels and Nano-pesticides/Nano-fertilizers. Case Study : Liposomal Amphotericin B (AmBisome®) in Targeted Antifungal Therapy
V	**Merits and demerits of nanoparticles** Health and safety implications from nanoparticles: Health issues – Environmental issues – Need for regulation – Societal implications - Possible military applications – Potential benefits and risks for developing countries – Intellectual property issues.	CDSCO/USFDA Regulatory Approval Frameworks for Nanomedicine. Case Study: Green-Synthesized Iron Oxide Nanoparticles for Industrial Dye

	Bioinformatic tools in nanotechnology: molecular modeling, docking and computer assisted molecular design. ~~Case study- Merits and demerits of any two nanoparticles in health and environment safety~~	Wastewater Treatment

PERCENTAGE OF SYLLABUS REVISED: 13
COURSE FOCUS ON:

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

Syllabus Revision

Faculty: Biosciences **Board: Microbiology**
Semester: IV
Course Code/ Name: 24MBU4SA / RECOMBINANT DNA TECHNOLOGY

Unit	Existing	Changes
I	**Introduction to rDNA Technology** History and Scope of rDNA technology - Restriction modification system - Gene manipulating enzymes – Restriction Enzymes – Discovery, types and mode of action, DNA Polymerases I,II & III, Taq polymerase, Klenow fragment - Ligases - Methylases - Reverse transcriptase. Applications of Gene cloning.	Alkaline phosphatase, polynucleotide kinase, terminal transferase, nucleases.
II	**Isolation of Purified Polynucleotide** Isolation and Purification of DNA (Chromosomal and Plasmid)- Isolation and Purification of RNA - Chemical Synthesis of DNA – ~~Development~~ of Genomic DNA Library and cDNA Library.	Construction

III	**Vectors** Plasmid based Vectors - Natural vectors – pSC101, pSF2124 and pMB1.Artificial vectors - pBR322 & pUC. Phage based Vectors- λ phage and M13. Hybrid Vectors - Phagemid, Phasmid and Cosmid. Artificial chromosomes - BACs; -Eukaryotic vectors –YAC, Shuttle vectors.	
IV	**Gene Transfer Techniques** ~~Bio~~chemical methods - calcium phosphate, DEAE dextran mediated, Lipofection. Physical methods - Electroporation, Microinjection, Particle bombardment, Ultra. Biological - Viral mediated transduction.	Chemical methods Transformation of bacteria ($CaCl_2$ heat shock)
V	**Screening and Characterization of recombinant DNA** Screening: Direct - Antibiotic resistance, *lacZ* complementation (Blue-white selection), plaque phenotype; Indirect: Immunochemical detection - Nucleic acid hybridization, Blotting - Dot and Colony Blott~~ing~~. Chromosome walking. Chromosome jumping. Case study: In 2020 there was a viral pandemic disease that shook the entire world. Design a recombinant product that could have tackled the virus by developing immunity in individuals, in the form of an active or passive vaccine.	Dot blot and colony blot Chromosome walking and chromosome jumping.

PERCENTAGE OF SYLLABUS REVISED: 10

COURSE FOCUS ON:

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

Syllabus Revision

Faculty: Biosciences **Board: Microbiology**

Semester: IV

Course Code/ Name: 25MBP4CA/ Core - XVI FERMENTATION TECHNOLOGY

Unit	Existing	Changes
I	**Introduction to Fermentation Process** The range of fermentation process - Microbial biomass, Enzymes, Metabolites, Recombinant products, Transformation processes - Component parts of Fermentation process – Fermentor types – Bioreactors for Aerobic fermentation - Stirred Bioreactors - Reactors for immobilized cells - Heat exchange, Stirring and Mixing, Gas exchange and Mass transfer..	Fermentation process monitoring using pH, temperature, dissolved oxygen and foam sensors. Basic principles of process control and interpretation of fermentation parameters. Cleaning-in-place (CIP), sterilization-in-place (SIP) and contamination prevention.
II	**Industrially important Microorganisms** Isolation (Primary and Secondary screening), Preservation and Strain improvement (Mutation, Recombination, Regulation, Gene technology and Use of Genetic methods.	Selection of high-producing microbial strains using productivity and stability criteria. Introduction to adaptive laboratory evolution and CRISPR-based strain improvement. Quality assessment of preserved cultures and detection of contamination. Basic interpretation of microbial screening and strain-performance data.
III	**Upstream processing** Development of Inoculum for Fermentation process – Media for Industrial Fermentation – Formulation, Optimization and Sterilization, Various stages in Upstream (Inoculum preservation, Growth of the inoculum, Fermenter preculture and Production fermentation).	Inoculum quality assessment: purity, viability, growth and suitability for production. Basic experimental design for fermentation media optimization. Raw-material quality checks and documentation of media preparation. Aseptic transfer, contamination prevention and troubleshooting during inoculum scale-up.
IV	**Fermentation Types and Cultures** Batch, Continuous, Fed-batch - Basic Growth Kinetics -Submerged and Solid state Fermentation – Downstream Processing - Recovery and Purification of Intracellular and Extracellular Products (Flocculation, Flotation, Filter systems, Centrifugation, Disintegration, Chromatography, Extraction, Crystallization, Precipitation and Drying).	
V	**Microbial production of Commercial Products** Microbial production of Organic acids (Citric acid and Acetic acid), Enzymes (Amylase and Protease), Aminoacids (Lysine and Glutamic acid), Antibiotics (Penicillin, Streptomycin and Griseofulvin), Vitamins (Riboflavin,	Industrial applications of recombinant microbial products, including selected therapeutic proteins and vaccines. Basic quality-control parameters for fermentation products: identity, purity, potency and microbial contamination. Introduction to Good

	Cyanocobalamine and Ascorbic acid) - Biosynthesis of Ergot alkaloids – Microbial transformation - Steroids and Sterols, Non-steroid compounds, Antibiotics and Pesticides. Case Study: A fermentation plant finds that its production strain is losing viability. How can inoculum preservation help?	Manufacturing Practices (GMP), batch records and traceability. Fermentation waste management, effluent treatment and resource-efficient production.

PERCENTAGE OF SYLLABUS REVISED: 25
COURSE FOCUS ON:

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

Syllabus Revision

Faculty: Biosciences **Board: Microbiology**
Semester: IV
Course Code/ Name: 25MBP4CB / BIOETHICS, BIOSAFETY AND IPR

Unit	Existing	Changes
I	**Introduction to Intellectual Property Rights** Concepts of IPR - Definition and importance of IPR- Designs - Trademarks - Trade secrets - Domain name – Geographical indications - Copy Rights - Evolution of patent law - History of Indian patent system - International conventions and treaties.	
II	**Patents** Classification of patents by WIPO - Classification of patents in India - Categories of patent - Special patent - Patenting of biological products - Patentable and non-patentable inventions in India and abroad - Rights of patent holder and co-owner - Infringement of patent rights and offenses - Biodiversity and IPR - Bioinformatics patenting - Gene Patenting. Case study on Patenting Process Overview.	

III	**Introduction to Biosafety** Risk assessment - Cartagena protocol on biosafety – Capacity building - Biosafety guidelines in India evolved by DBT - Rules for the storage and manufacture of hazardous microorganisms and GMO - Bio safety management. Biosafety Regulations and Frameworks.	Case Study: Bt Brinjal Moratorium - Application of Cartagena Protocol and DBT Biosafety Guidelines and Rules for Storage of Hazardous GMOs.
IV	**Biological Agents** Classification of biological agents - Categories of bio hazardous waste - Labelling and disposal. General safety - Permit for the movement and import of GMOs – Biosafety issues of products developed by rDNA technology – Ecological safety assessment of recombinant organisms - Web based information on biosafety of GMOs. Emergency response plans for accidental exposure and spills.	
V	**Bioethics** Bioethics in research – cloning and stem cell research, Human and animal experimentation, animal rights/welfare, Agricultural biotechnology - Genetically engineered food, environmental risk, labeling and public opinion. Sharing benefits and protecting future generations - Protection of environment – Biopiracy. ~~Case Study: How many genetically modified (GM) vegetables are available in the market in your area? Create awareness about their pros and cons.~~	

PERCENTAGE OF SYLLABUS REVISED: 10
COURSE FOCUS ON:

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment	✓	Constitutional Rights/ Human Values/ Ethics

Syllabus Revision

Faculty: Biosciences **Board: Microbiology**

Semester: VI

Course Code/ Name: 24MBU6CP / ENVIRONMENTAL, AND INDUSTRIAL MICROBIOLOGY (Core Practical VI)

Existing	Changes
1. Microbial air monitoring by settle plate method.	
2.Microbial analysis of water by membrane filtration method.	
3.Estimation of BOD of waste water.	
4.Microbial degradation of synthetic dyes (Under DBT Star status scheme)	
5.Isolation of free-living nitrogen fixer – Azotobacter, symbiotic nitrogen fixer - Rhizobium from root nodule and Phosphate solubilizer - Pseudomonas sp.	
6.Isolation of VAM spores from rhizosphere soil.	
7.Production of Biofertilizer (Under DBT Star status scheme)	
8.Immobilization of microbial cells - sodium alginate.	
9.Alcohol production and estimation – wine.	
10.Production and assay of extracellular enzyme - amylase.	
11.Sterility checking of pharmaceutical products - open inoculation method.	11. Membrane Filtration method
12.Microbial limit test for a pharmaceutical product.	12. Microbial limit test (MLT) for raw material and finished pharmaceutical product.
~~13.Callus development from plant – Demonstration (Under DBT Star status scheme)~~	13.Production of Single Cell Protein (SCP) from Yeast Biomass (*Saccharomyces cerevisiae*) using Agro-Industrial Waste Substrates and Quantitative Estimation of Crude Protein (Lowry et al). (Under DBT Star Status Scheme).

PERCENTAGE OF SYLLABUS REVISED: 13

COURSE FOCUS ON:

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

Syllabus Revision

Faculty: Biosciences **Board: Microbiology**

Semester: VI

Course Code/ Name: 224MBU6DB / ENTREPRENEURIAL MICROBIOLOGY

Unit	Existing	Changes
I	**Introduction to Entrepreneurship** Entrepreneur development activity – Government, private and NGOs contributions to entrepreneurs- risk assessment - Generation of project – project identification –preparation of project report- Establishment of small scale industries.	BIRAC (BIG Grant), MoE YUKTI Portal, Startup India, Seed Fund Scheme, and NITI Aayog Atal Incubation Centers (AICs)
II	**Entrepreneurship in Microbiology** Microbial cells as fermentation products – Baker's yeast, ~~food and feed yeasts~~, yoghurt and cheese, bacterial insecticides, legume inoculants, algae (Spirulina). Enzymes as fermentation products – Bacterial and Fungal amylases, proteases, pectinases, invertases and other enzymes.	Probiotic and Synbiotic health formulations. (*Spirulina* and *Chlorella* smart proteins). Other Industrial Biocatalysts. Case Study : Yakult Danone India / Kombucha Start-ups
III	**Mushroom and biofertilizer production** Mushroom cultivation and composting – Agaricus campestris, Agaricus bisporus, and Volvariella volvaciae; preparation of compost, filling tray beds, spawning, maintaining optimal temperature, casing, watering, harvesting and storage. Biofertilizers – Historical background – Chemical fertilizers versus biofertilizers – Organic farming – Rhizobium sp., Azospirillum sp and Azotobacter sp.	Carrier-based vs. Liquid biofertilizers (Consortia of *Rhizobium* sp, *Azospirillum* sp, and *Azotobacter* sp and VAM bio-inoculants)

IV	**Large scale production of breweries** Brewing: Beer and wine – media components, preparation of medium, Microorganisms involved, maturation, carbonation, packaging, keeping quality, contamination, by products. production of Industrial alcohol-ethanol-Fermentation Economics	Second-Generation (2G) bio-ethanol from lignocellulosic waste – Fermentation Economics and National Biofuel Blending Policies
V	**Patents for Entrepreneurs** Patents and secret processes –procedure of patenting, composition, subject matter and characteristics of a patent, inventor, infringement, cost of patent – patents in India and other countries. ~~Case study: Ms. Kavita Joshi, a postgraduate in microbiology from Uttarakhand, decided to start a small mushroom cultivation unit in her hometown near Dehradun. With rising consumer demand for nutritious, protein-rich foods, she identified Oyster mushrooms (Pleurotus spp.) as a suitable crop. She started with a pilot unit producing 30–40 kg/month, using pasteurized straw in polyethylene bags. Initial sales at local markets were encouraging. She soon gained interest from nearby restaurants and organic food stores and began exploring how to scale up~~	Technology Readiness Levels (TRL 1–9) and Commercial Technology Transfer Protocols. Case Study: Biocon (Kiran Mazumdar-Shaw) & The Neem / Turmeric Patent Battles

PERCENTAGE OF SYLLABUS REVISED: 13
COURSE FOCUS ON:

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

Syllabus Revision

Faculty: Biosciences **Board: Microbiology**

Semester: VI

Course Code/ Name: 24MBU6DD / DSE III: MICROBIAL FUEL TECHNOLOGY

Unit	Existing	Changes
I	**Introduction to Microbial Fuels** Overview, classification, historical development and principles of microbial fuels-Traditional biomass systems, including gobar gas, and Indian bioenergy applications-Environmental and economic significance of microbial fuels-Indian bioenergy policies and rural bioenergy applications-First-, second- and third-generation biofuels: feedstocks, benefits and limitations-Biomass-to-biofuel value chains and the concept of a circular bioeconomy-Overview of bioenergy careers, industrial sectors and relevant technical skills	First-, second- and third-generation biofuels: feedstocks, benefits and limitations-Biomass-to-biofuel value chains and the concept of a circular bioeconomy-Overview of bioenergy careers, industrial sectors and relevant technical skills
II	**Bioethanol Production** Ethanol production using Saccharomyces cerevisiae and relevant bacteria -Traditional Indian fermentation practices and locally available substrates-Physical, chemical and biological pretreatment of lignocellulosic biomass- Enzymatic hydrolysis of cellulose and hemicellulose; role of cellulases and hemicellulases-Fermentation inhibitors and their management during lignocellulosic ethanol production-Introduction to consolidated bioprocessing and microbial strain improvement-Basic fermentation data interpretation and troubleshooting of low ethanol yield	Enzymatic hydrolysis of cellulose and hemicellulose; role of cellulases and hemicellulases-Fermentation inhibitors and their management during lignocellulosic ethanol production-Introduction to consolidated bioprocessing and microbial strain improvement-Basic fermentation data interpretation and troubleshooting of low ethanol yield.
III	**Biogas Production** Anaerobic digestion-hydrolysis, acidogenesis, acetogenesis and methanogenesis- Microbial communities and metabolic pathways-Agricultural waste, food waste and wastewater sludge as feedstocks-Small-scale and industrial biogas plant design, operation, applications and limitations-Co-digestion of organic wastes and selection of compatible feedstocks-Process indicators: pH, alkalinity, volatile fatty acids, total solids and volatile solids-Biogas	Co-digestion of organic wastes and selection of compatible feedstocks-Process indicators: pH, alkalinity, volatile fatty acids, total solids and volatile solids-Biogas composition, hydrogen sulphide removal, carbon dioxide removal and biomethane upgrading-Digestate management, nutrient recovery and reuse-Common process failures, contamination risks and corrective measures.

	composition, hydrogen sulphide removal, carbon dioxide removal and biomethane upgrading-Digestate management, nutrient recovery and reuse-Common process failures, contamination risks and corrective measures	
IV	**Biodiesel and Algal Fuels** Microorganisms used in biodiesel production, including microalgae-Lipid accumulation and cultivation of microalgae in open ponds and photobioreactors-Lipid extraction and transesterification-Strategies to improve algal biomass and lipid yield- Screening and selection of oleaginous microorganisms and microalgae-Utilization of wastewater and nutrient-rich waste streams for algal cultivation- Biodiesel quality parameters: viscosity, acid value, density and oxidation stability-Algal biorefineries: integrated production of fuels and valuable co-products.	Screening and selection of oleaginous microorganisms and microalgae-Utilization of wastewater and nutrient-rich waste streams for algal cultivation-Biodiesel quality parameters: viscosity, acid value, density and oxidation stability-Algal biorefineries: integrated production of fuels and valuable co-products.
V	**Biohydrogen and Emerging Microbial Fuel Technologies** Microbial pathways for hydrogen production (dark fermentation, photo-fermentation) - Role of photosynthetic bacteria and cyanobacteria in biohydrogen production - Design and optimization of microbial fuel cells (MFCs) – Electrogenic bacteria and electron transfer mechanisms in MFCs - Integration of microbial fuel technologies for sustainable energy solutions - Future trends and innovations in microbial fuels research **Case Study:** Integrated Microbial Waste-to-Energy Technology: An Anaerobic Digestion of Dairy Farm Waste for Biogas Production and the Application of Microbial Fuel Cells for Wastewater Treatment and Bioelectricity Generation.	Case Study: Integrated Microbial Waste-to-Energy Technology: An Anaerobic Digestion of Dairy Farm Waste for Biogas Production and the Application of Microbial Fuel Cells for Wastewater Treatment and Bioelectricity Generation.

PERCENTAGE OF SYLLABUS REVISED: 40

COURSE FOCUS ON:

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability	✓	Innovations
✓	Intellectual Property Rights		Gender Sensitization
✓	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

Syllabus Revision

Faculty: Biosciences **Board: Microbiology**

Semester: VI

Course Code/ Name: 24MBU6DE / PERSPECTIVES ON MICROBIOLOGY LAB ACCREDITATION

Unit	Existing	Changes
I	Introduction to laboratory accreditation Definition and importance of laboratory accreditation, overview of accreditation bodies at national (NABL – National Accreditation Board for Testing and Calibration Laboratories; BIS – Bureau of Indian Standards) and international levels (ILAC – International Laboratory Accreditation Cooperation; ISO/IEC 17025) -The role and importance of accreditation in ensuring quality and reliability.	
II	Quality management system Components of QMS (Quality Management System) - development and implementation of QMS in microbiology labs - quality assurance guidelines from relevant regulatory agencies. Standard operating procedures (SOPs) for specific microbiological tests in soil, water, and food samples.	
III	Quality Control (QC) techniques Routine QC practices in microbiology- Use of reference materials and calibration Standards - Internal quality control protocols. Conducting internal and external audits – checklist, procedures, and reporting. AI tools for compliance verification (ISO, GLP, CLIA) in auditing.	
IV	Safety and compliance in laboratory procedures Safety Protocols and emergency procedures-	Laboratory Safety and Good Practices Basic laboratory safety guidelines - personal

IV	Safety and compliance in laboratory procedures Safety Protocols and emergency procedures- regulatory compliance requirements for microbiology laboratory at different biosafety levels -environmental and ethical considerations associated with different laboratories	Laboratory Safety and Good Practices Basic laboratory safety guidelines - personal protective equipment - safe handling of microorganisms and biological samples - sterilization and disinfection practices - biomedical waste management - basic biosafety principles, emergency procedures - and ethical and environmental responsibilities in microbiology laboratories.
V	Laboratory information management system Data reporting and traceability -ensuring data accuracy and security- Databases for sharing -comparison of inter-laboratory protocols and data. Case Study: Visit Kovai Medical Centre and Hospital, Coimbatore, microbiology laboratory and submit your observations as report.	Laboratory Records, Data Management and Reporting Introduction to laboratory information management systems (LIMS) - maintenance of test reports and laboratory records - data accuracy and confidentiality - sample identification and traceability - basic digital record keeping, preparation of microbiological test reports, and the importance of data sharing and comparison of laboratory results. Case Study: A microbiology laboratory preparing for NABL accreditation found errors in SOPs, QC records, sample traceability, and safety practices. The laboratory introduced a QMS, LIMS, internal audits, and improved biosafety procedures to address these gaps. How would you evaluate the laboratory's accreditation readiness and recommend corrective measures?

PERCENTAGE OF SYLLABUS REVISED: 40
COURSE FOCUS ON:

✓	Skill Development	✓	Entrepreneurial Development
✓	Employability		Innovations
	Intellectual Property Rights		Gender Sensitization
	Social Awareness/ Environment		Constitutional Rights/ Human Values/ Ethics

Date: 26.10.2026

(Dr. J. Rengaramanujam)
BoS Chairman/HOD
Department of Microbiology
Dr. N. G. P. Arts and Science College
Coimbatore - 641 048

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Department of Microbiology
Board of Studies Meeting

The minutes of the 22nd meeting of Board of Studies held on 26.10.2026 at 10.00 am through online mode - google meet. The following members were Present.

S. No.	Name	Category	Attendance Status
1	Dr. J. Rengaramanujam Professor and Head Department of Microbiology, Dr. N.G.P Arts and Science College, Coimbatore – 641 048	Chairman	Present
2	Dr. M. Gnanadesigan – Assistant Professor, Department of Microbial Biotechnology, Bharathiar University, Coimbatore	VC Nominee	Present
3	Dr. S. Murugan – Professor, Department of Biotechnology, Karunya University, Coimbatore.	Subject Expert	Present
4	Dr. M. Kulandhaivel - Associate Professor, Department of Microbiology, Karpagam Academy of Higher Education, Coimbatore.	Subject Expert	Present
5	Dr. C. Balakumar, General Manager – Technical Services, Velam Agri Services, Manupatti, Udumalpet – 642 112.	Industrial Expert	Present
6	Mrs. V. Pradeepa, Tutor in Department of Microbiology, Nandha Medical College and Hospital, Perundurai, Erode.	Alumni	Present
7	Dr. N. Kuppuchamy Part – I (Four Semester Language)	Co – Opted Member	Present
8	Dr. A. Hazel Verbina Part – II (Four Semester Language)	Co – Opted Member	Present
9	Dr. P. Chidambara Rajan Allied	Co – Opted Member	Present
10	Dr. R. Ravikumar Allied	Co – Opted Member	Present
11	Dr. S. S. Sudha	Member	Present
12	Dr. N. Vidhya	Member	Present
13	Dr. S. Senthil Prabhu	Member	Present
14	Dr. A. M. Ramachandran	Member	Present
15	Dr. C. Sasikala	Member	Present
16	Dr. S. Karthik Sundaram	Member	Present
17	Dr. R. Mahenthiran	Member	Present
18	Dr. J. Devakumar	Member	Present
19	Dr. V. Keerthana	Member	Present
20	Jayasurya (PG)	Student Representative	Present
21	Aadhitya (UG)	Student Representative	Present

BoS Chairman/HOD
Department of Microbiology
Dr N. G. P. Arts and Science College
Coimbatore - 641 048

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