



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

	KADI SARVA VISHWAVIDYALAYA					
	B.SC MICROBIOLOGY SEMESTER - 6 SCHEME					
Subject Code	Course	Instructions Hrs / week	Examination			Credit
			Internal	University Exam	Total	
CMB -601	Molecular Biology and Genetic Engineering	3	30	70	100	3
CMB -602	Water Microbiology	3	30	70	100	3
CMB -603	Microbial Diversity	3	30	70	100	3
CMB -604	Applied Microbiology	3	30	70	100	3
FCG-601	(University Elective) Basic English – VI	2	15	35	50	2
EGC-601	(Generic Elective - Institute elective) Personality Development & Interview Skills	2	50	00	50	2
SE MB-601 A	(Discipline Specific Specialization) Food Microbiology-IV	2	50	00	50	2
SE MB-601 A	(Discipline Specific Specialization) Pathology-IV					
PMB-601	Microbiology Practical-VI	12	0	200	200	6
Total		30	235	515	750	24



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

CMB-601. Molecular Biology and Genetic Engineering

RATIONALE: This course is designed to enable students to acquire the basic understanding of microbial gene cloning and their genome organization as well as the major applications of genetic engineering.

LEARNING OUTCOMES:

- Enabling the students to know and understand the basics of gene transfer techniques and process in microorganisms.
- Study the various applications and techniques in Genetic engineering.

TEACHING AND EVALUATION SCHEME: The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Term examinations for 30 marks and End Term Examination conducted by University examination for 70 marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
CMB-601	Molecular Biology and Genetic Engineering	3	48	30	70	100

COURSE CONTENT

Unit 1 Number of lectures: 12 Weightage: 25%

Genetic Engineering and Gene cloning

- Overview and strategies of genetic engineering (1h)
- Enzymes used in Genetic Engineering- Restriction Endonucleases, DNA Ligases, S1 Nucleases, Alkaline Phosphatase, Reverse Transcriptase, Poly Nucleotide Kinase-(3h)
- Gene Library- Genomic Library, c-DNA Library.(2h)
- Vectors- Plasmid, λ Phage, Cosmid and Yeast, *Agrobacterium* mediated gene transfer.(3h)
- Techniques for selection of Recombinants: Direct Selection, Insertional Inactivation method, blue-white selection, colony hybridization. (3h)



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

Unit 2	Number of lectures: 12 Weightage: 25%
Techniques in Molecular Biology	
• Polymerase chain reaction-Mechanism and application(3h) • Introduction to RAPD, RFLP, AFLP(1h) • Nucleic acid hybridization techniques- Southern, Northern, Western and Dot blots. (3h) • DNA finger printing.(3h) • DNA Sequencing- Maxam Gilbert and Sanger method (2h)	

Unit 3	Number of lectures: 12 Weightage: 25%
Applications and Biohazards of Genetic Engineering	
• Introduction of Transgenic plants, animals, microbes and their Applications (3h) • IPR.-overview, forms of protection- patent, copyright,trademark and trade secret (4h) • Biosafety guidelines, Recombinant DNA safety guidelines(2h) • Biohazards and ethical issues of genetic engineering.(3h)	

Unit 4	Number of lectures: 12 Weightage: 25%
Applications of Bioinformatics in Molecular Biology	
• Introduction to Biolinformatics(2h) • Nucleic acid database NCBI, EMBL,DDBJ (4h) • Protein database- Swiss prot (1h) • Sequence similarity Search using BLAST (2h) • Potential and applications of Bioinformatics(3h)	

REFERENCES

1. A textbook of Biotechnology, Authors- R.C. Dubey
2. Cell Biology, Genetics,Molecular biology, Evolution and Ecology Author- Verma and Agrawal
3.Bioinformatics Author-Higgins and Taylor

SUGGESTED REFERENCES

1. Current protocols in molecular biology. 2000. Ausbelet. Al.
2. Molecular cloning Vol. 1-III. Sambrook& Russel. 2001. CSH press.
3. Molecular genetics of bacteria J.W. Dale 1994 John Wiley &Sones.
4. Molecular Cell Biology (W.H. Freeman) by Lodish, Berk, Zippursky.
5. Current protocols in molecular biology. 2000. Ausbelet. Al.



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

6. Molecular cloning Vol. 1-III. Sambrook& Russel. 2001. CSH press.
7. Principles of gene manipulation. 1994. Old & Primrose, Blackwell Scientific Publications.
8. Molecular Cloning. 3 volumes.Sambrose and Russell, 2000.CSH Press.
9. Genome analysis. Four volumes. 2000. CSH Press.
10.Bioinformatics Authors- Baxevanis

INSTRUCTION STRATEGIES

1. Interactions with the students to understand the level of students
2. Explaining & discussing the major terminologies related to genetics and immunology.
3. Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Power point presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
4. Assistance in solving of questions from our question bank.
5. Assistance in solving of questions asked in national entrance exams like CSIR –NET / other Universities.

TEACHING AND EXAMINATION

UNIT	Examination Scheme %Weightage	Teaching Scheme No. of Lecture
Unit 1	25	12
Unit 2	25	12
Unit 3	25	12
Unit 4	25	12
Total	100	48



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

CMB-602 Water Microbiology

RATIONALE: This course is designed to enable students to acquire knowledge of the aquatic ecosystem and water Microbes

LEARNING OUTCOMES:

- Enabling the students to know and understand the basics of water microbiology
- Study the various applications and techniques in waste management

TEACHING AND EVALUATION SCHEME: The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term examinations for 30 marks and End Term Examination conducted by University examination for 70 marks.

Subject Code	Subject Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Hrs.		Max Marks			
				Theory Per Week	Mid Term	End Term	
CMB-602	Water Microbiology	3	3	3	30	70	100

COURSE CONTENT

Unit 1 Fresh and Marine Water microbiology		Number of lectures: 12
• Aquatic Environment(2h) • Microbial habitats in aquatic environment(2h) • Distribution of microorganisms in aquatic environment(2h) • Deep Sea Hydrothermal Vents(2h) • Productivity of Aquatic Ecosystem(2h) • Eutrophication and Biomagnification (2h)		Weightage: 25%
Unit 2		Number of lectures: 12
Microbiology of DrinkingWater		Weightage: 25%
• Sources of water and its contamination(2h) • Drinking water standards (1h) • Microbial indicators of fecal pollution • Coliforms as indicators(1h) • Methods of differentiation: IMViC test and Elevated temperature test(1h)		



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

- Microbial indicators other than coliforms (2h)
- Quantitative analysis: Standard plate count (1h)
- Qualitative analysis: Multiple tube fermentation method (Presumptive, confirm & completed test), MPN, Membrane filter technique, Defined substrate test, Presence- Absence test (3h)
- Nuisance organisms in water: Slime forming bacteria, Iron & Sulfur bacteria and Algae (2h)

Unit 3

Number of lectures: 12

Weightage: 25%

Waste Water Treatment-I

- Types and characterization of waste water (1h)
 - Primary treatment
 - Physical and Chemical methods. (2h)
 - Removal of suspended solids (micro straining, coagulation and filtration) (2h)
 - Removal of dissolved solids (adsorption on activated carbon, solvent extraction, ion exchange, reverse osmosis, electro dialysis) (2h)
 - Secondary treatment.
 - Aerobic and Anaerobic Treatments (2h)
 - Trickling Filters, Activated sludge treatment, Lagoons, septic tanks (3h)

Unit 4

Number of lectures: 12

Weightage: 25%

Waste Water Treatment-II

- Tertiary or advance techniques:
 - Definition & sources of tertiary waste water: Chlorination, Disinfection, UV radiation, ozonation (2h)
 - Removal of nitrogen (ammonia, stripping, nitrification & denitrification) (1h)
 - Removal of phosphorous (biological phosphorus removal) (1h)
 - Chemical oxidation (recovery of materials from processed effluents) (1h)
- Advanced waste Water Treatments : RBC, UASBR, Anaerobic fluidized bed reactor. (2h)
- Solid waste treatment (1h)
- Composting and landfills. (2h)
- Concepts of water recycling (1h)
- Waste water standards (1h)



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

REFERENCES

1. Microbiology, Author- Pelczar, ECS Chan and Krieg
2. Principles of Microbiology Author- Atlas, R.M.
3. Microbial Ecology-Authors- Fundamentals and applications Authors- Atlas, R.M. and Bartha
4. Environmental Biotechnology – Basic Concepts and applications – Authors-Indu Shekhar Thakur

SUGGESTED REFERENCES

1. Wastewater Treatment, Authors – Arceivala
2. Standard methods for the examination of water and waste water Authors- S. Clesceri APHA

INSTRUCTION STRATEGIES

1. Interactions with the students to understand the level of students
2. Explaining & discussing the major terminologies related to water Microbiology
3. Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Power point presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
4. Assistance in solving of questions from our question bank.
5. Assistance in solving of questions asked in national entrance exams like CSIR –NET / other Universities.

TEACHING AND EXAMINATION

UNIT	Examination Scheme % Weightage	Teaching Scheme No. of Lecture
Unit 1	25	12
Unit 2	25	12
Unit 3	25	12
Unit 4	25	12
Total	100	48



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

CMB-603 Microbial Diversity

RATIONALE: This course is designed to enable students to acquire basic understanding of the microbial diversity in the world, their habitat and their metabolic diversity.

LEARNING OUTCOMES:

- Understand the concept of classification and diversity of the bacteria.
- Develop an understanding of the biodiversity their functionality and the applications of it.
-

TEACHING AND EVALUATION SCHEME: The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term examinations for 30 marks and End Term Examination conducted by University examination for 70 marks.

Subject Code	Subject Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Hrs.		Max Marks			
				Mid Term	End Term		
CMB- 602	Microbial Diversity	3	3	3	30	70	100

COURSE CONTENT

		Number of lectures: 12 Weightage: 25%
Unit 1: Biodiversity and Evolution		
• Introduction of biodiversity, Types of Biodiversity-Genetic, Species and Ecosystem(2h) • Value of biodiversity with reference to microorganisms.(1h) • Loss of Biodiversity(1h) • Conservation of Biodiversity-Insitu and Exsitu (2h) • Microbial biodiversity as index of environmental change. (1h) • Species concept (1h) • Early Earth and Origin and Diversification of life, (1h) • Microbial Evolution and Origin of microbial Life :RNA world and Endosymbiosis theory(2h) • Phylogenetic tree of microorganisms. (1h)		



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

Unit 2 Methods of assessing Microbial biodiversity 1. Microscopic methods : Microbial diversity assessment by various microscopic methods: Basic light microscopy, Confocal laser microscopy, Phase contrast, Electron microscopy, Atomic Force Microscope, Scanning laser Microscope(4h) 2. Physiological and Nutritional Diversity: Cultivation methods, (2h) Axenic Culture, Modeling microbial nutrition for cultivation., Gaseous requirements, Use of selective, differential and enrichment culture techniques. (2h) 3. Molecular and genomic methods:Molecular context of microbial diversity, Importance of DNA and rRNA sequence comparison(1h), molecular hybridization technique and determination of GC content(1h), FISH(1h), FAME(1h)	Number of lectures: 12 Weightage: 25%
Unit 3 Functional Diversity of bacteria 1. Morphological and cellular diversity a. Diversity in major cell shape and grouping(2h) b. Diversity in ultrastructure of cell with reference to cell envelope, cell membrane, cell wall, surface appendages, other cell organelles, inclusions and spore. (3h) 2. Metabolic diversity a. Diversity in heterotrophic metabolism : Anaerobic and Aerobic respiration, Electron transport chain metabolism (2h) 3. Extremophilic Diversity : Thermophiles, Acidophiles, Halophiles, Alkalophiles and Methanogens (2h)	Number of lectures: 12 Weightage: 25%
Unit 4 Biodiversity in Eukaryotic and acellular forms Eukaryotic Microorganisms: 1. General characteristics – Definition, Introduction to major divisions and Economic importance , Major Diversity groups, classification. a. Protozoans(1h) b. Slimemolds(1h) c. Fungi(2h) d. Algae(2h) e. Lichens as consortium of algae and fungi(1h) Akaryotic Microorganisms: 2. General characteristics – Definition, Structure, Major Diversity groups. a. Viruses: Plant and Animal Virus (3h) b. Bacteriophage (Lysogeny and Lytic Cycle) (2h) c. Virions and Prions(1h)	Number of lectures: 12 Weightage: 25%



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

REFERENCES

1. Brock's Biology of the microorganisms. Authors- Michael ,Madign and Martinko
2. Microbiology, Authors-PelczarMJ,ChanE.C.S.,KrigNRMcGrowHill
4. GeneralMicrobiology, Authors- StanierRY,Ingram,Eheelies,MLPainterMacMillanIndia
5. Microbiology (Authors-Prescott, L.M., Harley, J.P., Klein. DA., Y McGraw Hiil. International Ed
6. Biodiversity Conservation Authors- Maiti and Maiti

SUGGESTED REFERENCES

1. Microbialecolgy, Authors-RCampbell JohnWileyandSonsNY
2. MicrobialdiversityFormsandfunctions, Authors-OladeleOgunstian Blackwellpublishing
3. Microbial Ecology, Authors- Atlas & Bartha.

INSTRUCTION STRATEGIES

1. Interactions with the students to understand the level of students
2. Explaining & Discussing the major terminologies related to Microbiology
3. Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Power point presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
4. Assistance in solving of questions from our question bank.

TEACHING AND EXAMINATION

UNIT	Examination Scheme %Weightage	Teaching Scheme No. of Lecture
Unit 1	25	12
Unit 2	25	12
Unit 3	25	12
Unit 4	25	12
Total	100	48



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

CMB-604 Applied Microbiology

RATIONALE: This course is designed to enable students to acquire the applications of microbiology in the various field of the science.

LEARNING OUTCOMES:

- Enabling the students to know and understand the advantages of the microorganisms in the sciences.
- Study the various applied areas of the microbiology.

TEACHING AND EVALUATION SCHEME: The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Term examinations for 30 marks and End Term Examination conducted by University examination for 70 marks.

Subject Code	Subject Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Hrs.		Max Marks			
				Mid Term	End Term		
CMB 604	Applied Microbiology	3	3	3	30	70	100

COURSE CONTENT

Unit 1 umber of lectures: 12Weightage: 25% Microorganisms in Agriculture • Biofertilizers- Nitrogen fixers, (2h) PSB,KSB, PGPR, Siderophores and Mycorrhiza. (2h) • Biopesticides- Biopesticides based on fungi (<i>Trichoderma sp.</i>), bacteria (<i>Bacillus thuringensis</i> toxin) and viruses. (3h) • Genetically modified crops. (2h) • Bioconversion of Agrocclulosic waste to Value added products: Bioethanol, (1h) Biodiesel, (1h) Biogas technology, Microbial hydrogen production (1h), Concept of gasohol. (1h), Organic acids(1h)	
Unit 2 Number of lectures: 12Weightage: 25% Geomicrobiology • Microbial leaching of copper and uranium. (3h) • Biorecovery of petroleum- MEOR(3h). • Bioremediation of Petroleum products and Xenobiotic compounds (2h) • Biodeterioration- leather and paint, (1h) paper and textile (1h),rubber and Fuel(1h).	



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

Unit 3	Number of lectures: 12 Weightage: 25%
Advanced Microbiology	
• Immobilization of enzymes, cells and applications of immobilized enzymes. (3h) • Biosensors (2h) and Biochips (2h). • Microbial Biopolymers – Biodegradable plastics. (3h) • Biofilms formation: merits and demerits(2h)	

Unit 4	Number of lectures: 12 Weightage: 25%
Statistical Techniques used in Microbiology	
• Introduction of Biostatistics, Definition and Scope (2h) • Collection of data ,Sampling (2h) • Classification of Data- Tabulation and Graphical Representation (2h) • Measure of Central Tendency: Mean, Median and Mode (Merits and Demerits)(4h) • Measures of Dispersion: Standard Deviation and Variance (2h)	

REFERENCES:

1. Industrial Microbiology, Author- G. Reed.
2. Industrial Microbiology, Author- Agarwal AndParihar.
3. Biology of Industrial Microorganisms, Author- A.L. Demain.
4. Comprehensive biotechnology, Authors- Murray Moo Young.
5. Bioremediation Authors- Martin Alexander
6. Microbial Ecology Authors- Atlas and Bartha
7. Biostatistics Authors S. Prasad
8. A textbook of Biotechnology Authors- R.C. Dubey\

SUGGESTED REFERENCES:

1. Textbook of Industrial Microbiology, Author- A. H. Patel.
2. Comprehensive biotechnology, Authors- Murray Moo Young.

INSTRUCTION STRATEGIES

1. Interactions with the students to understand the level of students



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

2. Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Power point presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
3. Assistance in solving of questions from our question bank.
4. Assistance in solving of questions asked in national entrance exams like CSIR –NET / other Universities.

TEACHING AND EXAMINATION

UNIT	Examination Scheme % Weightage	Teaching Scheme No. of Lecture
Unit 1	25	12
Unit 2	25	12
Unit 3	25	12
Unit 4	25	12
Total	100	48



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

FCG 601-Basic English – VI

RATIONALE: This course is designed tenable students to acquire basic understanding of English grammar. The course would help students to fortify their knowledge of English and strengthen their basic communication abilities.

LEARNING OUTCOMES:

- Understand the functions and usage of sentence framing, sentence correction and synthesis the sentences
- Develop language skills of reading through filling in appropriate words in blanks, correcting errors, choosing correct forms, etc.
- Acquire interest in English language and literature through textbook lessons.
- Acquire writing skill through developing story.
- Acquire the speaking skill through speeches.

TEACHING AND EVALUATION SCHEME: The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term examinations for 15 marks and End Term Examination conducted by University examination for 35 marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
FCG - 602	Basic English – VI	2	24	15	35	50

Unit 1:	Number of lectures:8	Weightage 33%
Lesson2: Between the Mosque Lesson7: My Financial Career Lesson8: Speech on Indian Independence Poem14: The World is Too Much with us Poem 15 :Success is Counted Sweetest Poem16: I, Too, Sing America The Joy of Reading selected Prose & Poetry		



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

Unit 2: Grammar	Number of lectures: 4	Weightage 17%
- Transformation, Correction (prepositions, Tenses, Concord) - Synthesis of Sentences - Avoiding Common errors in English Grammar		
Unit 3:	Number of lectures: 8	Weightage 33%
• Questionnaire (on current Issues i.e. Social, political, Educational) • Components of Questionnaire		
Unit 4 Preparing Speeches	Number of lectures: 4	Weightage 17%
- Introducing Chief Guest - Farewell Speech - Speech on annual functions - Mourning the Death of VIP - Speech on Republic Day		

REFERENCES

1. High School English Grammar – Wrenn & Martin
2. Contemporary English Grammar – David Green

INSTRUCTION STRATEGIES

1. Interactions with the students to understand the level of students
2. Explaining & discussing English language structures.
3. Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Powerpoint presentation), Notes, Question Banks, References and Reprints/ Copy of Articles, Models, Diagrams
4. Assistance in solving of questions from our question bank.

TEACHING AND EXAMINATION

UNIT	Examination Scheme	Teaching Scheme
Unit 1	33	8
Unit 2	17	4
Unit 3	33	8
Unit 4	17	4
Total	100	24



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

EGC 601- Personality Development & Interview Skills

RATIONALE: This course is designed to enable students to acquire basic understanding of the components of professional communication, the skills required for the same and practice them.

LEARNING OUTCOMES:

- To build confidence for communicating in English and create interest for the life-long learning of English language
- To describe and characterize spoken English both from the grammatical and the discourse perspectives.
- To draw comparisons between oral and written language through the use of representative oral and written language.

TEACHING AND EVALUATION SCHEME:

The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term examinations for 15 marks and End Term Examination conducted by University examination for 35marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hr S.	Max Marks		
				Mid Term	End Term	
EGC- 601	Personality Development & Interview Skills	2	24	50	--	50

COURSE CONTENT

Unit – I Self Development and Communication:	Number of lectures: 12
	Weightage: 50%
(a) Professional Etiquettes	
(b) Goal Setting	
(c) Time Management	
(d) Stress Management	



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

Unit – IIA. Writing Skills	Number of lectures: 06	Weightage: 25%
(a) Resume writing (Application Que)		
(b) Report Writing (Application Que)		
(c) E-mail etiquettes		
Unit II B. Interview Skills		Weightage: 25%
(a) Types of Interview		
(b) Preparation of an Interview		
(c) Effective guidelines for an interview		

RECOMMENDED READING:

1. V. Sasikumar : A Course in Listening and Speaking – I, Cambridge Uni. Press
2. G. Taylor: English Conversation Practice, Tata Mcgraw-Hill Publishing Co. Ltd.
3. Wrenn & Martin: High School English Grammar & Composition, S, Chand Pub.
4. Kumar S and Lata P Communication Skills 2011: New Delhi Oxford University Press

INSTRUCTION STRATEGIES

1. Interaction with the students to understand the level of students.
2. Teaching the topics included in the syllabus with the help of tool like Power point presentation, Notes, References, Copy of Articles, Models, diagram

TEACHING AND EXAMINATION

UNIT	Examination Scheme % Weightage	Teaching Scheme No. of Lecture
Unit 1	50	12
Unit 2	50	12
Total	100	24



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

EMB 601 A Food Microbiology IV

RATIONALE: This course is designed to enable students to acquire basic understanding of the various bacterial fermentation processing for food preparation

LEARNING OUTCOMES:

- To impart knowledge of fermented food and beverages
- The knowledge of microorganisms involved in food processing and its importance

TEACHING AND EVALUATION SCHEME: The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis End Term Examination conducted by University examination for 50 marks.

Subject Code	Subject Title	Credits	Theory +Practical	End term Exam(Internal)		Total Marks
			Hrs.	Theory	Practical	
EMB- 601 A	Food Microbiology IV	2 (1 hr Theory+ 2 hrPractical hr	36	20	30	50

COURSE CONTENT

Weightage: 50%

Microbiology of cheese and beverage fermentation.

- Microbiology of fermented milk products (acidophilus milk, yoghurt).(1.5hr)
- Role of microorganisms in beverages – tea and coffee fermentations. (1.5hr)
- Starter cultures their biochemical activities, production and preservation of the following fermented foods. (1.5hr)
- Soy sauce fermentation by Moulds(2hr)
- Fermented vegetables – Saurkraut(2 hr)
- Production and application of Bakers Yeast(2hr)
- Application of microbial enzymes in food industry(1.5hr)



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

LIST OF EXPERIMENTS: (24 hours and 100% weightage)

• Production and estimation of lactic acid by Lactobacillus Sp. Or Streptococcus Sp.(3hr)
• Extraction and estimation of diacetyl.(3hr)
• Sauerkraut fermentation(4hr)
• Isolation of food poisoning bacteria from contaminated foods, Dairy products(4hr)
• Extraction and detection of afla toxin for infected foods.(3hr)
• Preservation of potato/onion by UV radiation(3hr)
• Production of fermented milk by Lactobacillus acidophilus.(4hr)

REFERENCES:

1. Food Microbiology. 2nd Edition By Adams
2. Food Microbiology : Fraizer
3. Biotechnoogy: Food Feermentation Microbiology, Biochemistry and Technology Volume 2 by Joshi.
4. Fundamentals of Dairy Microbiology by Prajapati.
5. Essentials of Food Microbiology. Edited by John Garbult. Arnold International Students Edition
6. Dairy Microbiology by Robinson. Volume II and I.
7. Microbiology of Fermented Foods. Volume II and I. By Brian J. Wood.ElsieverAppliedScience Publication.
8. Microbiology of Foods by John C. Ayres. J. OrwinMundt. William E. Sandinee. W. H. Freeman and Co.
9. Microbiology of Fermented Foods. Volume II and I. By Brian J. Wood.Elsiever Applied Science Publication.

TEACHING AND EXAMINATION

UNIT	Examination Scheme %Weightage	Teaching Scheme No. of Lecture
Unit 1	40	12
Unit 2	60	12
Total	100	24



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

EMB-601B Pathology – IV

RATIONALE: This course is designed to enable students to acquire basic understanding of the Biochemistry of human body

LEARNING OUTCOMES:

- Various biochemical mechanism of body.
- Gain knowledge about the biomolecules and its estimation process.

TEACHING AND EVALUATION SCHEME: The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis End Term Examination conducted by University examination for 50 marks.

Subject Code	Subject Title	Credits	Theory+ Practical	End term Exam(Internal)		Total Marks
			Hrs.	Theory	Practical	
EMB- 601 B	Pathology – IV	2 (1 hr Theory+ 2 hr Practical)	36	20	30	50

COURSE CONTENT

Number of lectures: 12

Chemical Pathology

- Body amino acid pool, dynamic state of body proteins, inter-organ transport of amino acids, nitrogen balance, glucogenic and ketogenic amino acids.(3hr)
- Digestion and absorption of carbohydrates, Glycolysis: Reactions, regulation in brief, energetic(3hr)
- Digestive enzymes in the various sections of the digestive system including the exocrine functions of the liver and pancreas(3hr)
- Digestion and absorption, transport and storage, fatty acid synthesis, fatty acid oxidation pathways.(3hr)



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

List Of Experiments (24 hours and 100%weightage)

• To Determine Sugar in blood (4hr)
• To Determine Urea (4hr)
• To Perform Bile salt test(4hr)
• To Estimation of bilirubin (4hr)
• To Estimate Lipid profile(4hr)
• To Estimate Uric acid (4hr)

REFERENCES:

1. Atlas of Histopathology – Ivan Damjanov
2. Color Atlas of Basic Histopathology – Clara Milikowski, Irwin Berman
3. Histology for pathology – Stawy E. Mills
4. Histopathology – Guy Orchard, Brian Nation
5. Theory and Practice of Histological Techniques – John D. Bancroft, Marilyn Gamble

TEACHING AND EXAMINATION

Course Content	Examination Scheme %Weightage	Teaching Scheme No. of Lecture
Theory	40	12
Practical	60	24
Total	100	36



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

Microbiology Practical- VI

RATIONALE: This course is designed to enable students to acquire basic understanding of the microbiological physiology and nutrition and its metabolic diversity.

LEARNING OUTCOMES:

- Understand the concept of various analytical techniques used for Microbiology
- Develop an understanding of fermentation technology and genetics.
- To study the various environmental parameters affecting the water and waste water analysis.

TEACHING AND EVALUATION SCHEME: The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. General viva-voce will be conducted to analyze the knowledge of the student.

Subject Code	Subject Title	Credits	Practical		Total Marks
			Hrs.	Max Marks	
PMB- 601	Microbiology Practical-VI	6	12	200	200

LIST OF EXPERIMENTS

1. To isolate Halophilic bacteria.
2. To isolate Thermophilic bacteria.
3. To Isolate and Cultivate Yeast and study the diversity.
4. To isolate and cultivate of Fungi : <i>Mucor sp.</i> , <i>Rhizopus sp.</i> , <i>Aspergillus sp.</i> , <i>penicillium sp.</i> , <i>Neurospora sp.</i> , <i>Fusarium sp.</i> , <i>Penicillium sp.</i> , <i>Alternariya sp.</i> , <i>Helminthosporium sp.</i> , <i>Curvulariya sp.</i>
5. Algae: Study of algae present in pond water. Study of permanent slides of Algae: <i>Spirogyra</i> , <i>Spirullina</i> and <i>Nostoc</i>
6. Protozoa: Study of presence of protozoa in pond water. Study of permanent slides of Protozoa: <i>Amoeba</i> , <i>Euglena</i> and <i>Paramecium</i> .
7. Isolation and Identification of Gram Negative Bacteria: <i>E.coli</i> , <i>Enterobacter sp.</i> , <i>Pseudomonas sp.</i> , <i>Salmonella sp.</i> , <i>Proteus sp.</i>



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

8. Isolation and Identification of Gram Positive Bacteria: <i>Staphylococcus sp.</i> , <i>Bacillus sp.</i>
9. To study various water sampling techniques and sample preservation
10. To Determine Total Solids (TS), Total Dissolved Solids (TDS) and Total Suspended Solids(TSS).
11. To estimate Hardness from given water sample
12. To Estimate Dissolved Oxygen (DO) from the given water sample.
13. To Estimate Biological Oxygen Demand (BOD) from the given water sample.
14. To Estimate Chemical Oxygen Demand (COD) from the given water sample.
15. To Estimate $\text{PO}_4\text{-P}$ from the given water sample.
16. To Estimate $\text{NO}_2\text{-N}$ from the given water sample.
17. To Estimate $\text{NH}_3\text{-N}$ from the given water sample.
18. To Estimate Chloride from the given water sample.
19. To Estimate Sulfate from the given water sample.
20. To study microbiological analysis of water by SPC
21. To study coliforms test from water
22. Bacteriological analysis of water by Most Probable Number (MPN) technique.
23. To isolate Bacteriophage from Sewage
24. To isolate Pesticide degrading microorganisms.
25. To isolate Dye degrading microorganisms.
26. To isolate Petroleum degrading microorganisms.
27. To study Immobilization of enzymes and cells



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

B.Sc. MICROBIOLOGY Semester- VI
PMB-601 Microbiology Practical- VI
Practical Examination Skeleton (3 Days Examination)

TIME : 10 TO 5

TOTAL MARKS 200

Day-1

EX 1 Write the Principle , Requirement and Procedure for the given experiment and perform. 25

1. To isolate Halophilic bacteria.
2. To isolate Thermophilic bacteria.
3. To Isolation and Cultivation of Yeast
4. To isolation and cultivation of Fungi

EX 2 Write the Principle , Requirement and Procedure for the given experiment and perform. 30

1. Isolation and Identification of Gram Negative Bacteria: *E.coli*, *Enterobacter sp*, *Pseudomonas sp*, *Salmonella sp*, *Proteus sp*.
2. Isolation and Identification of Gram Positive Bacteria: *Staphylococcus*, *Bacillus sp*.

Ex- 3 Write the Principle , Requirement and Procedure for the given experiment and perform 25.

1. To isolate Pesticide degrading microorganisms.
2. To isolate Dye degrading microorganisms.
3. To isolate Petroleum degrading microorganisms.
4. To study Immobilization of enzymes/Cells

Day-2

Ex- 4 Write the Principle , Requirement and Procedure for the given experiment and perform. 25

1. To Estimate Dissolved Oxygen (DO) from the given water sample.
2. To Estimate Biological Oxygen Demand (BOD) from the given water sample.
3. To study microbiological analysis of water by SPC
4. To study coliforms test from water
5. Bacteriological analysis of water by Most Probable Number (MPN) technique.

EX 5 Write the Principle , Requirement and Procedure for the given experiment and perform. 25

1. To estimate Hardness from given water sample
2. To Estimate $\text{PO}_4\text{-P}$ from the given water sample.



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

3. To Estimate $\text{NO}_2\text{-N}$ from the given water sample.
4. To Estimate $\text{NH}_3\text{-N}$ from the given water sample.
5. To Estimate Chloride from the given water sample.
6. To Estimate Sulfate from the given water sample.
7. To Determine Total Solids (TS), Total Dissolved Solids (TDS) and Total Suspended Solids(TSS).

Day-3

EX 6 Write the Principle , Requirement and Procedure for the given experiment and perform.

15

1. Economic Importance of algae *Spirogyra*, *Spirulina* and *Nostoc*
2. Economic Importance of Protozoa *Amoeba*, *Euglena* and *Paramecium*.
3. Estimation of Chemical Oxygen Demand (COD) from the given water sample.

EX 7 Spotting

20

EX 8 Viva (can Taken in any one of the day)

20

EX 9 Journal (10) and Slide Box (5)

15

EX- 7 Spotting

20 Marks

Spot No.	Question	Marks
1	Identify the part of Instrument and give its use.	1
2	Identify the glassware/plasticware /lab accessories and give its use.	1
3	Definition	1
4	Full Name/ Full Form	1
5	Fill in the blank/ statistical formula	1
6	Give the use of Chemical /Dye/Reagent	1
7	Give the use of Chemical /Dye/Reagent	1
8	Give formula of _____ (Water analysis practicals)	1
9	Give examples of two Halophiles/Thermophiles/pesticides degraders/dye degraders/ petroleum degraders	1
10	Name the disease caused by <i>E.coli/Enterobacter/Salmonella/Pseudomonas/ Proteus/S.aureus/ Bacillus sp.</i>	1



KADI SARVA VISHWAVIDYALAYA
B.Sc Microbiology Semester 6 Syllabus (W.E.F. June 2019)

11	Identify the growth and name medium	1
12	Give the composition of _____ medium	1
13	Identify the slides Algae/ Protozoa/Fungi	1
14	How will you prepare _____ Solution/Reagent?	1
15	Give the principle of _____ (Biochemical test/ Medium)	1
16	Give the principle of instrument.	1
17	How will you sterilize the specimen?	1
18	Give Economic Importance of Fungi/ Yeast /Algae /Protozoa	1
19	Give the contribution of Scientist	1
20	Give the contribution of Scientist	1