



ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ

GULBARGA UNIVERSITY Jnana Ganga, KALABURAGI-585 106

Phone: 08472-263202, Fax: 08472-263206, E-mail: registrargug@rediffmail.com

ವಿದ್ಯಾಮಂಡಲ ವಿಭಾಗ



ಕ್ರ.ಸಂ.ಗುವಿಕ/ವಿಮವಿ/ಬಿಟಎಸ್/2020-21/ ೩೨

ದಿನಾಂಕ: ೨/೧/೨೦೨೧

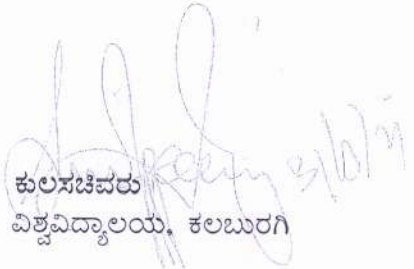
ಅಧಿಸೂಚನೆ

ವಿಷಯ : ಎಂ.ಎಸ್ಸಿ ಸೂಕ್ಷ್ಮ ಜೀವಶಾಸ್ತ್ರ ಕೋರ್ಸಿನ I ರಿಂದ IVನೇ ಸೆಮಿಸ್ಟರ್‌ನ ಪಠ್ಯಕ್ರಮ ತಿದ್ದುಪಡಿ ಮಾಡಿ ಪರಿಷ್ಕರಿಸಿದ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸ್ನಾತಕೋತ್ತರ ಅಧ್ಯಯನ ಮಂಡಳಿ ಸಭೆ ದಿನಾಂಕ 23.11.2020
2. ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಗೊತ್ತುವಳಿ ಸಂಖ್ಯೆ 18 ದಿನಾಂಕ 23.02.2021
3. ಕುಲಪತಿಗಳ ಅನುಮೋದನೆ ದಿನಾಂಕ 20.03.2021

ಉಲ್ಲೇಖ (2) ರಲ್ಲಿನ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್‌ನ ಸಭೆಯ ಗೊತ್ತುವಳಿ ಸಂಖ್ಯೆ 18 ನ್ನು ಅನುಷ್ಠಾನಗೊಳಿಸುತ್ತ; ಎಂ.ಎಸ್ಸಿ ಸೂಕ್ಷ್ಮಜೀವಶಾಸ್ತ್ರ ಕೋರ್ಸಿನ ವಿಷಯದ I ರಿಂದ IVನೇ ಸೆಮಿಸ್ಟರ್‌ವರೆಗಿನ ಪಠ್ಯಕ್ರಮದಲ್ಲಿ ತಿದ್ದುಪಡಿ ಮಾಡಿ, ಸ್ನಾತಕೋತ್ತರ ಅಧ್ಯಯನ ಮಂಡಳಿ ಸಭೆಯ ಅನುಮೋದನೆ ನೀಡಿದ್ದು ಹಾಗೂ 2020-21ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಪೂರ್ವಾನ್ವಯವಾಗುವಂತೆ ಜಾರಿಗೊಳಿಸಿದೆ.

ಈ ಮಾಹಿತಿಯನ್ನು ಸಂಬಂಧಪಟ್ಟ ಶಿಕ್ಷಕರ ಹಾಗೂ ವಿದ್ಯಾರ್ಥಿಗಳ ಗಮನಕ್ಕೆ ತರಲು ಸೂಚಿಸಲಾಗಿದೆ. ಪಠ್ಯಕ್ರಮದ ವಿವರವನ್ನು ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್‌ಸೈಟ್ www.gug.ac.in ದಿಂದ ಪಡೆಯಬಹುದು.


ಕುಲಸಚಿವರು
ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ

ಗೆ,

1. ಮುಖ್ಯಸ್ಥರು, ಸೂಕ್ಷ್ಮಜೀವಶಾಸ್ತ್ರ ಅಧ್ಯಯನ ವಿಭಾಗ, ಗು.ವಿ. ಕಲಬುರಗಿ

ಪ್ರತಿಗಳು:

1. ಡೀನ್‌ರು, ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ ನಿಕಾಯ, ಗು.ವಿ.ಕಲಬುರಗಿ ರವರ ಮಾಹಿತಿಗಾಗಿ.
2. ಕುಲಸಚಿವರು, (ಮೌಲ್ಯಮಾಪನ) ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ ರವರ ಮಾಹಿತಿಗಾಗಿ.
3. ನಿರ್ದೇಶಕರು, ಪಿಎಂಇಬಿ, ಗು.ವಿ. ಕಲಬುರಗಿ ರವರ ಮಾಹಿತಿಗಾಗಿ.
4. ವಿಶೇಷಾಧಿಕಾರಿಗಳು, ವಿದ್ಯಾಮಂಡಲ ವಿಭಾಗ, ಗುವಿಕ ರವರ ಮಾಹಿತಿಗಾಗಿ.
5. ಮುಖ್ಯಸ್ಥರು, ಗಣಕಕೇಂದ್ರ ಗು.ವಿ.ಕಲಬುರಗಿ ರವರ ಮಾಹಿತಿ ಹಾಗೂ ವೆಬ್‌ಸೈಟ್‌ನಲ್ಲಿ ಪ್ರಕಟಿಸಲು ತಿಳಿಸಿದೆ.
6. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿ/ಕುಲಸಚಿವರ ಆಪ್ತ ಸಹಾಯಕರು ಗು.ವಿ. ಕಲಬುರಗಿ ಮಾಹಿತಿಗಾಗಿ



GULBARGA UNIVERSITY
DEPARTMENT OF MICROBIOLOGY
M.Sc. DEGREE (SEMESTER) COURSE UNDER CBCS SCHEME
SCHEME OF TEACHING AND EXAMINATION
 (Effective from the academic year 2020-21 and onwards)

PAPER	Teaching	Examination	Marks	IA	Credits
	Hours/week	Hours			
I SEMESTER:					
1.1 HC Fundamentals of Microbiology	4	3	80	20	4
1.2 HC Biochemistry and Microbial Enzymology	4	3	80	20	4
1.3 HC Bacteriology	4	3	80	20	4
1.4 SC Virology and Mycology	4	3	80	20	4
1.5 Practical Based on paper 1.1	4	3	40	10	2
1.6 Practical Based on paper 1.2	4	3	40	10	2
1.7 Practical Based on paper 1.3	4	3	40	10	2
1.8 Practical Based on paper 1.4	4	3	40	10	2
II SEMESTER:					
2.1 HC Microbial Physiology and Metabolism	4	3	80	20	4
2.2 HC Microbial Genetics and Molecular Biology	4	3	80	20	4
2.3 SC Environmental Microbiology	4	3	80	20	4
2.4 OE Microbes in Human Welfare	4	3	80	20	4
2.5 Practical Based on paper 2.1	4	3	40	10	2
2.6 Practical Based on paper 2.2	4	3	40	10	2
2.7 Practical Based on paper 2.3	4	3	40	10	2
2.8 Practical Based on paper 2.4	4	3	40	10	2
III SEMESTER:					
3.1 HC Recombinant DNA Technology	4	3	80	20	4
3.2 HC Immunology and Immunotechnology	4	3	80	20	4
3.3 SC Food and Dairy Microbiology	4	3	80	20	4
3.4 OE Microbes and Environment	4	3	80	20	4
3.5 Practical Based on paper 3.1	4	3	40	10	2
3.6 Practical Based on paper 3.2	4	3	40	10	2
3.7 Practical Based on paper 3.3	4	3	40	10	2
3.8 Practical Based on paper 3.4	4	3	40	10	2
IV SEMESTER:					
4.1 HC Fermentation Technology and Bioprocess Engineering	4	3	80	20	4
4.2 HC Medical Microbiology and Diagnostics	4	3	80	20	4
4.3 HC Project - Dissertation	4	3	90	20	4
4.4 SC Agricultural Microbiology	4	3	80	20	4
4.5 Practical Based on paper 4.1	4	3	40	10	2
4.6 Practical Based on paper 4.2	4	3	40	10	2
4.7 Project colloquium and Viva	4	3	30	10	2
4.8 Practical Based on paper 4.4	4	3	40	10	2
TOTAL MARKS (I TO IV SEMESTERS)			1920	480	96
HC – Hard core, SC – Soft core, OE – Open Elective					

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Chairman
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 Department of Microbiology
 Gulbarga University, Kalaburagi-587101

Paper-2.1 HC: Microbial Physiology and Metabolism

1. Microbial Nutrition: Classification of organisms based on Carbon source, energy source and electron source, Macro and Micronutrients. **4h**
2. Microbial growth: Phases of growth, factors influencing growth, Measurement of growth, Continuous and Synchronous growth. **4h**
3. Microbial Photosynthesis: Light Energy, Photolysis of Water, Photosynthetic Pigments, Cyclic and Non-Cyclic Photophosphorylation, Calvin's Cycle. **4h**
4. Biological Oxidation: Electron Transport System, Oxidative Phosphorylation, Mechanism and Inhibitors of oxidative phosphorylation. Energetics of Oxidative Phosphorylation. **4h**
5. Fermentation Reactions: Types of fermentation reactions, Homo and Heterofermentation pathways; Alcohol and Lactic acid fermentation pathways. **2h**
6. Bioenergetics: Laws of thermodynamics, Free energy, Enthalpy, Entropy, High energy compounds, Oxidations and Reductions, Redox potential. **4h**
7. Carbohydrate metabolism: Glycolysis-significance, energetics and regulation. Glycogenesis, glycogenolysis, gluconeogenesis-Significance, regulations; TCA cycle-significance, energetics and regulations. Glyoxylate cycle. Amphibolic nature of TCA cycle. HMP shunt. **8h**
8. Lipid Metabolism: Fatty acid oxidation (β -oxidation), energetics of palmitic acid oxidation. Ketone bodies, ketogenesis, utilization of ketone bodies, overproduction of ketone bodies (Ketonemia, ketonuria, ketosis), extra mitochondrial biosyntheses of long fatty acids (palmitate), significance and regulation. Synthesis of triacylglycerols, metabolism of phospholipids and glycolipids. Biosynthesis and degradation of cholesterol. **10h**
9. Metabolism of amino acids: Transamination, deamination, decarboxylation; Urea cycle - regulation. Metabolism of ammonia; Synthesis and degradation of Glycine, phenylalanine and Tyrosine, Synthesis and degradation of Sulfur containing amino acids. **8h**
10. Nucleotide metabolism: Synthesis of IMP, AMP and GMP, Salvage pathway for purines, degradation of purine nucleotides. Biosynthesis and degradation of pyrimidine nucleotides. **6h**

Reference Books :

1. Albert Lehninger, 1983; Biochemistry, 2nd Ed. Kalyani Publ.
2. Harper, 1971; Physiological Chemistry-Diagnostic Methods and Clinical Pathology..
3. Powar and Dhaginawala, 1994; Biochemistry, Himalaya Publ. House, New Delhi
4. Albert GM & Toter JM, 1995; Microbial Physiology, Wiley-Liss, Inc., USAI
5. Moat A g and FASTER JW, 1985; Microbial Physiology, John Wiley & Sons, New York.
6. Doelle S W, 1975; Bacterial Metabolism, Academic Press, New York
7. Dewes I.W. & Southerland JW, 1976; Microbial physiology, Halsted Press, New York.
8. Rose AH, 1976, Chemical Microbiology-An Introduction to Microbial Physiology, Butterworths, Co. Ltd.
9. Zubey, 1994; Principals of biochemistry, W.C. Brown Publ. Oxford.
10. Caldwell, DR, 1995; Microbial Physiology & Metabolism, Brown Publ.
11. Oren A. and R.T.Papke, 2010; Molecular Physiology of microorganisms, Caister, Academic Press
12. Berg JM JL Tymoczko & L Stryer, 2011; Biochemistry, International Edition.

Paper-2.2 HC: Microbial Genetics and Molecular Biology

1. Historical Preview of Genetics: Development of microbial genetics, contributions of various scientists, time line of the development of microbial genetics Chemical basis of heredity; early concepts of genes; discovery of the chemical basis of heredity - experimental evidences, Mendelian principles and classical genetics. Genetic concepts, use of microorganisms in genetic studies. 4 h
2. Genomic structure and organization: Organization of genetic material - Genome organization in viruses, bacteria and eukaryotes. Interrupted genes, gene clusters. Structure of nucleosome, chromatin and chromosome. 4 h
3. Genetic recombination: In bacteria; transformation, conjugation, competence, lysogeny, generalized and restricted transduction, sexduction, fine structure mapping, recombination in viruses 5 h
4. Transposable elements: Replicative transposition, Nonreplicative transposition, Excision and transposase-mediated rearrangements, Insertion sequences, transposons, and integrons. Regulation of transposition, Use of transposons, Chromosomal rearrangements, Transposons and evolution. 5 h
5. Mutations: Types of mutations, null, leaky, and conditional mutations, mutations as random or adaptive events; Mutagenic agents - physical, chemical and biological; molecular basis of mutations; Mutants - isolation, selections, screening and enrichments, Uses of mutants. Reversion and suppression - Reversion assays - Ames Test. 4 h
6. Structure of nucleic acids: Structure of DNA and its elucidation, structural polymorphism in DNA, extra-chromosomal DNA, Structure of RNA 3 h
7. Systems that safeguard DNA: DNA repair mechanisms - photo reactivation, mismatch repair, recombination repair, SOS repair. 3 h
8. Replication of DNA, evidence of semi-conservative replication, Mechanism and enzymology of DNA replication, Regulation of DNA replication, Replication of RNA. 3 h
9. Transcription: Biosynthesis of RNA in prokaryotes and eukaryotes, DNA dependent RNA polymerase, initiation, elongation and termination of transcription, Post transcriptional processing - removal of intron transcripts, addition of 5' cap and 3' poly A tail, processing of mRNA, rRNA and tRNA, Reverse transcription. 5 h
10. Genetic code and translation: Elucidation and salient features of genetic code, wobble concept, Involvement of ribosome in translation, ribosome structure, initiation, elongation and termination of polypeptide chain synthesis in prokaryotes and eukaryotes, extra ribosomal factors, post translation modifications of proteins, ribosome cycle. 5 h
11. Regulation of gene expression: Enzyme induction and repression, constitutive expression and housekeeping genes, Operon concept, negative and positive regulation, catabolite repression, regulation of lac Operon, trp Operon, arabinose Operon, divergent Operon, attenuator regulation, translational regulation, feedback inhibition. 5 h
12. Gene silencing: Transcriptional - genomic imprinting, paramutation, transposon silencing, histone modifications, position effect; Post transcriptional - RNA interference, RNA silencing. 4 h

Reference Books

1. William Hays, 1980: The genetics of bacteria and their viruses, CBS Publ, New Delhi.
2. Jenkins JB, 1995: Genetics, Houghton Mifflin Co., Boston.
3. Strickberger MW, 1990: Genetics MacMillan Publ. Co. Inc, New York.
4. Stent GS & Calendar R, 1978: Molecular Genetics, Freeman & Co., San Francisco.
5. Benjamin Lewin, 2005, Genes - VIII, John Wiley & Sons, New York
6. Watson JD et al, 2004: Molecular biology of the Gene, Pearson Education India
7. Hartwell LH et al, 2000: Genetics - from Genes to Genomes, McGraw Hill Publ.,
8. Griffith Miller et al, 1996: An introduction to Genetic Analyses, Freeman & Co., NY.
9. Maloy, Cronan & Freifelder, 1994: Microbial Genetics, Jones & Bartlett Series.
10. Streps UN & Yasbin RE, 2005, Modern Microbial Genetics, Wiley Blackwell Publ.

Paper-2.3 SC: Environmental Microbiology

1. Introduction: Origin, Concept and Development of Environmental Microbiology. 2 h
2. Microbial Community: Ecosystem, habitat and niche. Concept and dynamics of microbial population and community. Structure and functions of microbial communities. Ecological succession. 4 h
3. Microbial diversity: Diversity of microorganisms in different environments. Conventional and molecular methods of studying microbial diversity. Microbes in extreme environments. Extremophiles - Psychrophilic, thermophilic, acidophilic, alkalophilic, halophilic and barophilic. Mechanism of adaptation in extremophilic microorganism. 6 h
4. Water Pollution: Sources, Characteristics of water pollutants, health hazards due to water pollution. Standard water quality criteria, Water quality testing (MPN technique). Eutrophication - causes, consequences and prevention. 6 h
5. Waste water treatment: Primary-physical processes; Secondary-biological treatment by fixed biofilm systems (trickling filters, RBC, fluidized bed reactors), suspended systems (activated sludge process, oxidation lagoons, anaerobic digesters, septic tank); Tertiary- Filtration (sand beds & membrane filters) chlorination, ozonization, radiation and reverse osmosis. 8 h
6. Air pollution and Radiation hazards: Sources and characteristics of air pollutants; Health hazards due to air pollution: Green house gases and green house effect. Ozone hole and acid rain. Radiation hazards and safety measures - sources, effect of radiations and safety measures. 4 h
7. Soil pollution: Sources and characteristics of soil pollutants. Effects of soil pollution on human health and crop productivity. 2 h
8. Solid waste management: Handling and treatment of solid wastes. Sludge handling and disposal- sludge processing, screening, dewatering, thickening, conditioning; stabilization-aerobic and anaerobic digestion (biomethanogenesis). Handling of biohazard and hospital wastes. 4 h
9. Microbiological indicators: Concept and significance. Microbiological indicators of water and air pollution. 2 h
10. Biodegradation of xenobiotics: Microbial degradation of pesticides, polycyclic aromatic hydrocarbons, natural and synthetic polymers (cellulose, pectin, lignin, detergents, plastics). 6 h
11. Microbial remediation: Concept and scope of bioremediation. Methods and types of bioremediation of contaminated soil and water using microorganisms. 2 h
12. Microbial leaching: Origin and concept. Mechanism and role of microorganisms in recovery of important minerals - Iron, Copper and Gold. 4 h

Reference Books:

1. Brock T.D. Principles of Microbial Ecology. Prentice Hall Publ. Co. Philadelphia.
2. Martin Alexander. Microbial Ecology. John Willey & Sons, New York.
3. Atlas & Bertha. 1998. Microbial Ecology. 3rd Ed.
4. Gabriel Britton. 1994, Wastewater Microbiology. John Willey & Sons, New York.
5. Ralph Mitchell. 1995, Environmental Microbiology, Wiley Liss, New York.
6. Criston J. Hurst, Manual of Environmental Microbiology. ASM Publ., New York.
7. Felteher, M. & Grey TRG. 1987. Ecology of Microbial Communities, Cambridge Univ. Press.
8. Rose R.D. Air Pollution & Industry. Reinhold Co., New York.
9. Metcalf and Eddy. 1991. Waste Water Engineering. McGraw Hill Int. Publ.
10. APHA. 1994, Standard Methods. 17th Ed., American Public Health Association

Paper- 2.4: OE: Microbes in Human welfare

1. introduction to microorganisms: Definition. Discovery of microorganisms. Spontaneous generation vs. biogenesis. Contributions of Aton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister and Alexander Fleming. Types – viruses, mycoplasma, rickettsiae, bacteria, fungi, actinomycetes, algae and protozoa; General characteristics, structure and reproduction of microorganisms. 4 h
2. Distribution of microorganisms: In air, water and soil; On and in the bodies of plants and animals. 2 h
3. Appearance of microorganisms: Microscopic observations- Cell size, shape and arrangement, glycocalyx, capsule, flagella, endoflagella, fimbriae and pilli. Cell wall: Composition and detailed structure of Gram-positive and Gram-negative cell walls. Different types of microscopes, different shapes and sizes of microorganisms, staining properties, staining of cells organelles and inclusion bodies. 4 h
4. Isolation and cultivation of microorganisms: Sterilization methods (physical and chemical); Media – preparation, ingredients and types; Pure culture techniques. 4 h
5. Identification of microorganisms: Cultural and microscopic characters; Biochemical properties; Taxonomy of microorganisms. 4 h
6. Preservation of microorganisms: Methods of maintenance and preservation of microbial cultures – slant cultures, glycerol cultures, refrigeration and lyophilization; Culture collection centers 4 h
7. Microbes and Environment: Elemental and nutrient recycling, biogeochemical cycles; Esthetics loss of the environment - algal blooms, degradation of structures like buildings, pipelines etc. 5 h
8. Microbes in Agriculture: Role of microorganisms in soil fertility and crop productivity; Biological nitrogen fixation; Phosphate solubilization; Mycorrhiza; Plant growth promoting rhizobacteria; Composting. Causative agents and symptoms of major plant diseases. 5 h
9. Microorganisms and Food: Fermented food and food products; Nutritative and medicinal value of fermented foods; Probiotics and nutraceuticals; Production of various fermented foods- curds, yogurt, cheese and beverage; Principals of food spoilage and contamination. 5 h
10. Microorganisms and human Health – Role of microorganisms in human health; Action of antibiotics to combat microbial diseases; Microbial vaccines as prophylactic measures; Concepts and principals of immunity to microbial infections; Major human diseases caused by important microbial pathogens. 5 h
11. Microorganisms and Industry: Microbial fermentations; Bioprocess engineering; Raw materials: Types of fermenters and fermentations; Production of antibiotics, enzymes, organic acids and pigments. 6 h
12. Other activities of microorganisms: Microorganisms as models for life on earth; Universal lessons from microorganisms to human welfare; Microorganisms and social change. 2 h

Reference Books:

1. Roger Y. Stanier, 1987, General Microbiology, MacMillan Publ.
2. Lammart JM, 2006; Techniques in Microbiology – a student handbook, amzon.com.
3. Madigan MT et al, 2008; Brock – Biology of Microorganisms, amzon.com.
4. Atlas RM, 1995; Principles of Microbiology, Mosby Yearbook Missouri
5. Pelezar, Chan & Kreig, 1982; Microbiology, McGraw Hill Book Co, New York
6. Frazier WC & Westhof DC; Food Microbiology, 3rd Ed., Tata McGraw Hill.
7. Doyle PM et al; Food Microbiology - Fundamentals & Frontiers, 2nd Ed., ASM Press
8. Atlas & Bertha, 1998, Microbial Ecology, 3rd Ed.
9. Ralph Mitchell, 1995, Environmental Microbiology, Wiley Liss, New York.
10. Subba Rao, 2000, Soil Microbiology, 4th Ed, Oxford & IB