RANI DURGAVATI VISHWAVIDYALAYA, JABALPUR
SYLLABUS PRESCRIBED FOR THE DEGREE OF MASTER OF SCIENCE IN MICROBIOLOGY
(Academic Session 2011 – 2012 & Onwards)
[UNDER SEMESTER EXAMINATION AT PG LEVEL ORDINANCE NO 79 & 156]

This brochure of the programme for the M.Sc. degree in Microbiology consists of three parts, viz., (A) Information from the relevant Ordinance(s) / Statutes, (B) Scheme of examination and (C) Courses of study.

(A) INFORMATION FROM THE RELEVANT ORDINANCE (S)/STATUTES

1. DURATION OF THE COURSE

M.Sc. Microbiology will be a full time two-year programme to be covered in four semesters, each of six months duration. The I year of the programme will complete the I and II semesters, and the second year will complete the third and fourth semesters.

2. ADMISSION TO THE COURSE

The number of seats shall be in accordance with the directives by the University. A candidate, who after having secured the B.Sc. degree with at least 45 % marks from a recognized university with a subject of Life Science, shall be eligible for admission to the course. The admission to the course will be on the basis of the merit and according to guidelines from the University and Government of Madhya Pradesh. After the term-end examination at the end of each semester, the student will be provisionally admitted to the next semester. Each semester will be followed by a break not exceeding 15 days.

3. TUITION AND OTHER FEES

The admitted candidate shall pay the course fee in addition to the tuition fee and such other fees as prescribed by the University.

4. PROGRAM OF THE STUDY

There will be **four** theory papers along with **two** practicals in each semester except for the 4th semester where every student will carry out and submit a dissertation.

The syllabus for the theory and practical examination will be prescribed by the Board of Studies in Microbiology, R.D. University, Jabalpur.

5. INTERNAL ASSESSMENT (CONTINUOUS COMPREHENSIVE EVALUATION SYSTEM)

Written tests: - There will be a mid semester examination of one & half hour duration for each paper having **fifteen** marks. These tests will be conducted for each of the papers by the teachers conducting the course concerned, the result will be declared within a week from the date of the test.

Students Participation in the Course:

The student whose attendance is less than 75 % will not be allowed to appear in the term end examination and he/she will be declared fail in that semester.

6. Term –End Examination: There shall be term (semester) examination at the end of first, second, & third semester. The semester examination will be held every year normally in December and June or on the dates declared in the academic calendar of the Department / University. A student seeking admission to a semester examination will submit through the Head of the Department his / her application on the prescribed form along with required examination fee, etc. to the Registrar of the University. Every student will appear in four respective theory papers and two practical examinations in first, second, & third semesters except for the fourth semester. In the fourth semester, every student will be allotted dissertation work in lieu of four theory papers. Allotment of

the dissertation will be done by a committee comprising of the Dean of Faculty of Life Science, Head of Department of Biological Science, one Professor and one Reader of the Department by rotation according to seniority. The students can be permitted to pursue their dissertation work out of the Department / University at the institutions / Universities duly recognized by a statutory body. In such cases, there will be two supervisors, one from the parent department and another from the place where the student completes his/her dissertation work.

The dissertation will be evaluated by the external examiner who has expertise in the concerned subject. For the purpose of holding viva-voce, the supervisor will be the internal examiners along with the external examiner who has evaluated the dissertation.. The scheme of marks for evaluating the various components of the dissertation will be followed as given in the syllabus.

7. Condition for a Pass: For passing the examination in each semester, a candidate must have secured a minimum of 34% marks in each Theory paper and Internal Assessment and 40% marks in each Practical and project/assignment/seminar separately. The students who do not pass a semester examination shall get an opportunity to appear in the subsequent examination of that semester in the papers in which they have failed. Provided, any student who fails in two consecutive semesters will not be given privileges of this clause. Meanwhile, they will be allowed to keep term (ATKT) in the next semester. For passing in a semester examination ,a candidate must also secure at least 40% marks of a semester.

A candidate shall be eligible for ATKT provided he / she obtains 34% marks in at least two theory papers individually, permitted to go to next semester. However, if a candidate fails in aggregate of marks can appear in any one of the theory papers to clear it with the examination of next semester.

In addition to the semester examination, a candidate shall not be given more than two chances to clear his ATKT in theory paper / practical. If he/she fails to fulfill this condition, he/she shall have to appear in the full semester examination as a fresh.

- If a candidate who fails in not more than two papers **(**Theory/ Practical/ Internal Assessment/ Project**)** in any one semester examination but clears all the remaining papers of the examination, he/ she will be **"Allowed to keep the term"** i.e. **ATKT** and will be promoted to the next semester.
- If a candidate fails to clear more than two papers out of eight papers (four of first semester and four of second semester), then he/ she shall be permitted to appear as a Ex-student. At any given time in each semester, the student shall not be allowed to carry more than two papers as ATKT.
- The students admitted in first semester and if they get ATKT in any two papers **(**Theory/ Practical/ Internal Assessment/ Project**)** of first semester shall be entitled to appear in ATKT examination along with the regular examination of third semester.
- A candidate who fails or is absent in internal assessment of any paper / project work will be treated as having ATKT in a paper, and he/ she will be allowed to complete the same during the examination of concerned semesters.
- The students who have passes all the papers **(**Theory/ Practical/ Internal Assessment/ Project**)** of first and second semesters will be entitled to admission in the fourth semester.
- If a student failed in the theory examination of any semester and get minimum passing marks in Practical/ Internal Assessment/ Project, then he/ she will be exempted from reappearing in Practical/ Internal Assessment/ Project work in the next semester. The marks of Practical/ Internal Assessment/ Project work of such candidate will be carried forward in the next examination.
- **There will be no provision for revaluation.** However the candidates can apply for Re-totalling in one subject per semester.

No candidate shall be allowed to appear in the Semester Examination unless one has:

1. Attended at least 75% of the lectures and practical delivered.
2. Paid all the fee due.
3. Obtained "**NO DUES"** certificate from the concerned Department/institution.

8. RESULT

The result of the candidate will be declared on the basis of aggregate of marks obtained by him/her in all the semester examinations taken together. The division shall be awarded on the basis of marks obtained in Internal Assessment and University examination (Theory and Practical both) taken together.

60% or above – First Division
48% or above – Second Division
Above 40% but less than 48% Third Division

9 A candidate is required to complete the entire course of postgraduate degree within a maximum period of three years from the session of first admission necessarily.

10 Grace of one mark will be awarded for passing in each semester and for improvement in division in the final semester by Vice Chancellor.

11. In matters of admission, attendance, examinations and in all other matters not provided in this ordinance, the courses shall be governed by the provisions of the relevant ordinances of the same in the university so far as they are not incongruous with the provisions of this ordinance.

12.In case of any dispute/ambiguity, the ruling of the Vice-Chancellor shall be final and binding.

(B) SCHEME OF EXAMINATION

FIRST SEMESTER

Number & Title of the course	**Max. Marks**	**Min. Marks for Passing**	Min. Aggr. Marks For Passing
(A) THEORY PAPERS			
I Bacteriology	35	12	
II Mycology	35	12	
III Virology	35	12	
IV Microbial Biochemistry	35	12	
(B) PRACTICALS **I (based on Course I & II)** **II(based on course III & IV)**	 50 50	 20 20	
(C)INTERNAL ASSESSMENT /			
CCE *4 Written Test based on each course (each of 15 marks)	60	5 in each test	
Project/Assigment/Seminar	50	20	
TOTAL	**350**	**----------**	**140**

* Candidate has to pass in each test separately

SECOND SEMESTER

Number & Title of the course	**Max. Marks**	**Min. Marks for Passing**	**Min. Aggr. Marks For Passing**
(A) THEORY PAPERS			
V Molecular Biology and Recombinant DNA Technology	**35**	**12**	
VI Biostatistics and Computer Application	**35**	**12**	
VII Microbial Genetics	**35**	**12**	
VIII Microbial Metabolism	**35**	**12**	
(B) PRACTICALS I (based on Course V & VI) II(based on course VII & VIII)	 **50** **50**	 **20** **20**	
(C)INTERNAL ASSESSMENT			
CCE *4 Written Test based on each course (each of 15 marks)	**60**	**5 in each test**	
Project/Assigment/Seminar	**50**	**20**	
TOTAL	**350**	**----------**	**140**

* Candidate has to pass in each test separately

THIRD SEMESTER

Number & Title of the course	Max. Marks	Min. Marks for Passing	Min. Aggr. Marks For Passing
(A) THEORY PAPERS			
IX Environmental Microbiology	**35**	**12**	
X Industrial & Food Microbiology	**35**	**12**	
XI Medical Microbiology	**35**	**12**	
XII Agricultural Microbiology	**35**	**12**	
(B) PRACTICALS I (based on Course XI & X) II(based on course XI & XII)	 **50** **50**	 **20** **20**	
(C)INTERNAL ASSESSMENT			
CCE *4 Written Test based on each course (each of 15 marks)	**60**	**5 in each test**	
Project/Assigment/Seminar	**50**	**20**	
TOTAL	**350**	**----------**	**140**

* Candidate has to pass in each test separately.

FOURTH SEMESTER

DISSERTATION	Max Marks	Min. Marks for Passing	Min. Aggr Marks For Passing
A. Valuation		**80**	
(i) Language & Presentation	**50**		
(ii) Review of Literature	**50**		
(iii) Methodology	**50**		
(iv) Analysis & interpretation of Result	**50**		
B. Viva-Voce EXTERNAL **C. Viva-Voce INTERNAL**	**100** **50**	**60**	
Total	**350**		**140**

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COURSES OF STUDY IN M.Sc. MICROBIOLOGY

FIRST SEMESTER
Course No. I: Bacteriology

UNIT-I

History, scope and development of bacteriology, sterilization, isolation, enrichment, pure culture and staining techniques, systematic study of bacteria; morphological, physiological, biochemical and serological studies, genetic characterization, identification & classification chart.

UNIT-II

Habitat, structure, reproduction & classification of bacteria (morphological, biochemical, serological, chemical and molecular aspects), Actinomycetes, *Mycoplasma, Rickettsiae, Chlamydiae* and their significance.

UNIT-III

The photosynthetic bacteria; cyanobacteria, green bacteria, halobacteria and their economic importance. Methanogenic bacteria and their significance. Chemoautotrophs and Methylotrophs; nitrifying bacteria, sulfur oxidizers, iron bacteria, hydrogen bacteria and their economic importance.

UNIT-IV

Enterobacteriaceae and related organisms, their morphological & physiological characters, genetic interrelationship, taxonomic sub-division & their importance in human health. Myxobacteria, cytophage group, filamentous & gliding chaemoheterotrophs & filamentous sulphur oxidizing bacteria.

UNIT-V

Gram positive spore forming bacteria; unicelluar endospore formers- *Bacillus, Clostridia.*
Miscellaneous bacteria; lactic acid bacteria, Micrococci, Corynebacteria, Mycobacteria.

Course No. II: Virology

UNIT-I

General virology: History and development of virology, origin, distinctive properties, ultrastructure and chemistry of viruses. virus related agents (viroids, prions), significance of viruses.

UNIT-II

General methods for isolation, identification, characterization and cultivation of viruses:
Methodology for isolation, adsorption, One-step growth and burst size of virus. Determination of titre value, isolation of phage resistant strain, cultivation and maintenance of plant, animal and bacterial / cyanobacterial viruses. identification of viruses by physical, chemical and serological techniques.

UNIT-III

Bacterial/ cyanobacterial viruses: Structure and multiplication of lytic and lysogenic bacteriophage. Significance of lysogeny. Brief account of M13, Mu, T4 and λ, history, structure, genetics and life cycle of cyanophages, significance of bacteriophages and cyanophages.

UNIT-IV

Plant viruses: classification and nomenclature, structure and multiplication of plant viruses with special reference to TMV, cauliflower mosaic virus, effect of viruses on plants. Some common viral diseases of plants (TMV, CMV, leaf Curl of papaya). Transmission of plant viruses and control of viral diseases of plants.

UNIT-V

Animal viruses: Classification and nomenclature of animal and human viruses. Brief account of Adeno-, Herpes, Hepatitis, HIV and other oncogenic viruses. Prevention, treatment and control of viral diseases. Viral vaccines including DNA vaccines and interferons.

Course No. III: Mycology

UNIT-I

Status of fungi in the living world, general features of fungi and fungus like organisms; recent trends in the classification of fungi; physiology and growth of fungi; nutritional and environmental factors affecting growth; saprotrophs, parasites and mutualistic symbionts; physiology of reproduction in fungi, phylogeny of fungi.

UNIT-II

Fungal diversity-major taxonomic group, structure, reproduction, life cycle and significance of the following representatives:

i) Gymnomycota-general account – cellular slime moulds (*Dictyostelium*), plasmodial slime moulds (Myxomycetes).
ii) Mastigomycota- *Coelomomyces, Lagenidlum, Achlya, Phytophthora, Peronospora, Plasmodiophora.*
iii) Amastigomycota- Zygomyocotina- *Mucor, Syncephalastrum, Blakeclea, Cunninghamella, Entomophthora.*

UNIT-III

Fungal diversity contd. structure, reproduction, life cycle and significance of the following representatives:

i) Ascomycotina- *Taphrina, Emericeilla, Chaetomium, Morchella, Neurospora, Claviceps, Erysiphae.*
ii) Basidiomycotina- *Puccinia, Melamspora, Ustilago, Polyporus, Lycoperdon, Ganoderma.*
iii) Deutromycotina- *Fusarium, Cercospora, Curvularia, Beauveria, Microsporum, Phoma, Collectotrichum.*

UNIT-IV

Fungal genetics:

i) Life cycle and sexual process in fungi; structure and organization of fungal genomes (mitochondrial genes, plasmids and transposable elements, virus and viral genes).
ii) Genetic variations in fungi- nonsexual variations-haploidy, heterokaryosis, parasexuality; sexual variations- mating or breeding systems- homothallism and heterothallism, mutation, physiological specialization; strain improvement.

UNIT-V

Fungi and biotechnology: production of alcoholic beverages, antibiotics, organic acids, ergot alkaloids; the cultivation of fungi for food-mushrooms, myco protein and mycofoods; role of fungi in agriculture and forestry- mycorrhizae and their application, mycopesticides, mycotoxins, conservation of fungal germplasm.

Course No. IV: Microbial Biochemistry

UNIT- I

Structure of water and its solvent properties. Acid base pH and buffer: mono-, bi- and polyprotic buffer. Free energy and spontaneity of reactions. ATP and other phosphorylated compound with their free energy of hydrolysis, phosphoryl group transfer; biological oxidation reductions reaction; coupled reaction and oxidative phosphorylation, inhibitors and uncouplers.

UNIT – II

Enzyme classification, specificity, active site. Enzyme kinetics Michealis Menton equation, determination of kinetic parameters. Bi-substrate reaction and their kinetics. Enzyme inhibition and kinetics. allosteric enzyme, kinetics, and allosteric regulation of phosphofructo kinase

UNIT – III

Structure and chemistry of macromolecules: proteins, carbohydrates and lipids; protein folding; structure and chemistry of bimolecules such as antibiotics; pigments, vitamins as coenzymes; lipid analysis by GLC and mass spectrometry; oligosaccharide and polysaccharide analysis.

UNIT – IV

Biosignaling- Molecular mechanism of signal transduction; gated ion channels, nicotinic- acetyl choline receptor; receptor enzyme- the insulin receptor; G- proteins and cyclic AMP;
membrane transport- biomembrane, nutrient transport across membranes, active and passive diffusion, symport, antiport and uniport, Na^+ K^+ pumps and their metabolic significance.

UNIT – V

Chromatographic technique- paper and TLC, gel filtration, ion-exchange, affinity; HPLC SDS-PAGE, isoelectric focusing, Westerns blotting; protein sequencing, mass spectrometry, MALDI-TOF– MS.

SECOND –SEMESTER

Course No. V: Molecular Biology and Recombinant DNA Technology

UNIT – I

Nucleic acids as genetic information carriers: DNA structure, melting of DNA; superhelicity in DNA, linking number and topological properties; DNA replication., general principle, various modes of reading, continuous and discontinuous synthesis, asymmetric & dimeric nature of DNA polymerase III & simultaneous synthesis of DNA leading and lagging strands, polymerase and exonuclease activities, eukaryotic DNA polymerases; Mechanism of action of topoisomerases, ligases.

UNIT – II

Initiation of replication and construction of replication fork in test tube; retroviruses and their unique mode of DNA synthesis; relationship between replication and cell cycle in prokaryotes and eukaryotes; inhibitors of DNA replication (blocking precursor synthesis, nucleotide polymerization altering DNA structure).

UNIT III

Transcription: general principles, basic apparatus types of RNA polymerase; steps: initiation, elongation and termination, inhibitors of RNA synthesis, polycistronic and monocistronic RNA's; control of transcription by interaction by interaction between RNA polymerases and promoter regions, role of alternate sigma factors; regulation of rRNA and tRNA synthesis; maturation and splicing of mRNA, cutting and modification of tRNA: catalytic RNA, group I and group II splicing.

UNIT – IV

Gene expression in prokaryotes: induction and repression operon concept, regulatory and structural genes, operator, promoter, repressor and co-repressor, catabolite repression, cyclic AMP, CRP/CAP protein, regulation of lactose, tryptophan, histidine and arabinose operons, attenuation regulation. Gene expression in eukaryotes, Britton and Davidson's model of regulation involvement of HCP, NHCP and hormones. Regulation by N protein and nut sites in DNA binding proteins, enhancer sequences and control of transcription. Global regulatory responses: heat shock response, stringent response and regulation by small molecules such as ppGpp.

UNIT – V

Basic principle of gene cloning, genomic libraries, vectors, strategies of gene cloning using DNA or cDNA inserts, gene expression in recombinants, screening method for recombinant clones, important molecular techniques like Southern Blotting, PCR, RAPD, RFLP, DNA sequencing, and probe hybridization.

Course No. VI: Biostatistics and Computer Application

UNIT-I

Importance and scope of statistics in biochemical experimentation; Elements of Probability-Mathematical and Statistical definitions; Addition and Multiplication theorems; Probability Distribution Functions – Binomial, Poisson and Normal; Area under normal distribution curve.

UNIT-II

Measures of central tendency: Arithmetic, geometric & harmonic means; Measures of dispersion: range, quartile deviation, variance, standard deviation, coefficient of variation, confidence limits of population mean. Tests of significance hypotheses and errors; student t statistics- population mean equals a specified value; equality of 2 independent means (equal & unequal variance), equality of 2 means (paired samples).

UNIT-III

Analysis of variance: one-way analysis (sample sizes equal and unequal), completely randomized design; two-way analysis (one observation per cell), randomized block design; multiple comparisons: least significant difference, Duncan's new multiple range test.

UNIT-IV

Linear regression: regression diagram and equation, regression coefficient, standard error, significant tests, prediction of dependent variable from the independent variable; linear correlation- scatter diagram, correlation coefficient, standard error, significance tests; relationship between regression and correlation coefficients; Non parametric tests: Chi-square statistics, test of goodness of fit, test of independence of attributes; standard line interpolation.

UNIT-V

Introduction to Computers**:** Basic architecture, generations of computer hardware and software; operating systems-WINDOWS and UNIX; system and application software; introduction to internet-LAN, MAN, WAN, Concept of bioinformatics; application of bioinformatics in microbiology.

Course No. VII: Microbial Genetics

UNIT-I

Gene as unit of mutation and recombination, molecular mechanism of mutation, mutagens, types of DNA damage (deamination, oxdative damage, alkylation, pyridine dimmers). spontaneous mutations-origin, suppression of mutation.

UNIT-II

Gene transfer and genetic mapping, transformations, transfection, conjugation and transduction, genetic mapping of *E,coli*; Molecular aspects of genetic recombination.

UNIT-III

Complementation analysis, cis-trans test, deletion mapping; Benzer's concept of cistron, overlapping genes. DNA repair- photo repair, excision or dark repair, recombinational repair, SOS repair, methyl- directed mismatch repair, very short patch repair.

UNIT-IV

Plasmids. F-factors description and their uses in genetic analysis; R factors, colocin and col factors; plasmids as vectors for gene cloning; replication of selected plasmids; compatibility. transposons and their uses in genetic analysis, plasmid vectors and bacteriophage vectors.

UNIT-V

Important application of advances in microbial genetics, production of proteins, hormones and design of vaccines: conventional as well as new generation recombinant DNA vaccine, their design and advantages.

Course No. VIII: Microbial Metabolism

UNIT-I

Microbial growth: mathematical expression of growth, growth measurement, efficient growth curve, synchronous growth and continuous culture, effect of environmental factors on microbial growth, nutrients diffusion, active transport, group translocation, solutes, temperature, oxygen relations.

UNIT-II

Chaemolithotrophy: Sulphur, iron, hydrogen, carbon monoxide, nitrogen oxidations. Methanogenesis, luminescence. Brief account of photosynthetic and accessory pigments-chlorophyll, bacteriochlorophyll, carotenoids, oxygenic, anoxygenic photosynthesis. Electron transport- photoautotrophic generation of ATP, fixation of CO_2- Calvin cycle, reverse TCA, carbohydrate anabolism.

UNIT-III

Respiratory metabolism: Embden Mayer Hoff pathway, Entner Doudroff pathway, glyoxalate pathway, Krebs cycle, oxidative and substrate level phosphorylation, Pasteur effect, fermentation of carbohydrates-homo and heterolactic fermentations. Synthesis of polysaccharides- gluconeogenesis and other pathways.

UNIT-IV

Assimilation of nitrogen: Dinitrogen - nitrate nitrogen-ammonia- denitrification, synthesis of major amino-acids, polyamines; peptidoglycan-biopolymers as cell components.

UNIT-V

Microbial development, sporulation and morphogenesis, hyphae vs. yeast forms and their significance. Multicellular organization of selected microbes. Dormancy. Endospore-structure, properties and germination.

THIRD SEMESTER

Course No. IX: Environmental Microbiology

Course No.-IX: Environmental Biotechnology

UNIT-I

Environment: Basic concepts and issues; environmental pollution: types and methods for the measurement; methodology of environmental management-problem solving approach, its limitations; air pollution and its control through biotechnology, air sampling techniques; biodiversity: conservation and management.

UNIT-II

Water pollution and its control: Water as a scarce natural resource, need for water management, sources and measurement of water pollution, waste water treatment-physical, chemical and biological treatment processes; algal blooms and human health.

UNIT-III

Microbiology of waste water treatment: Aerobic process-activated sludge, oxidation ditches, trickling filter, towers, rotating discs, rotating drums, oxidation ponds; anaerobic processes-anaerobic digestion, anaerobic filters, upflow anaerobic sludge blanket reactors; treatment schemes for waste waters of dairy, distillery, tannery industries; biotechnological application of microbes form extreme environment.

UNIT-IV

Microbial degradation of xenobiotics in the environment- ecological considerations, decay behaviour & degradative plasmids, hydrocarbons, substituted hydrocarbons, oil pollution, surfactants, pesticides; bioaccumulation of metals and radio-nucleids and detoxification; bioremediation.

UNIT-V

Biological N_2 fixation, H_2 production, biofertilizers and biopesticides; solid wastes; sources and management (composting, vermiculture and methane production). Single cell protein (*Spirulina*, yeast, mushroom); global environmental problems-ozone depletion, UV-B green house effect and acid rain, their impact and biotechnology approaches for management.

Course No. X: Medical Microbiology

UNIT-I

Early discovery of pathogenic microorganisms; development of bacteriology as scientific disciplines; contribution made by eminent scientists. Normal microbial flora and the human host; role of resident flora; classification of medically important microorganisms, dermatophytes, dimorphic fungi, opportunistic fungal pathogens, laboratory diagnosis of pathogenic fungi.

UNIT-II

Mechanism of pathogenicity, virulence and protection, organs and cells involved in immune system and immune response; antigens, antigenic specificity, antigenic determinants, cellular and humoral basis of immunity: immunoglobulins, antigen and antibody reactions, immunological (serological as well as cellular) methods.

UNIT-III

Classification of pathogenic bacteria- *Staphylococcus, Streptococcus, Pneumococcus, Corynebacteria, Bacillus, Clostridium,* non-sporing anaerobes, organisms belonging to *Enterobacteriaceae. Vibrios*, non- fermenting bacilli*, Yersinia, Haemophilus, Bordetella, Brucella, Mycobacteria, Spirochaetes,* Actinomycetes, *Ricketisae, Chlamydiae.*

UNIT-IV

Important RNA and DNA viral pathogens; virus host interactions; pox viruses, adenoviruses, picornaviruses, orthomyxoviruses, paramyxoviruses, arboviruses, rhabdoviruses; general properties of pathogenic protozoans and diseases caused by them, slow virus disease.

UNIT-V

Laboratory control of antimicrobial therapy; strategies/ approaches (conventional and modern) in the diagnosis of important disease/ syndrome; meningitis, urinary tract infection, sexually transmitted diseases, pyrexia of unknown origin, wound infection etc.

Course No. XI Industrial and Food Microbiology

UNIT-I

Biofermentation: designing and application, principles of biofermentation, monitoring and control of parameters (pH, oxygen, agitation, temperature, foam etc.), batch & continuous; production medium, raw materials, isolations, maintenance, preservation & improvement of industrial strains, computer control of fermentation processes.

UNIT-II

Downstream processing: filtration of fermentation broths, ultracentrifugation, recovery of biological products by distillation, superficial fluid extraction.

UNIT-III

Industrial production of solvents: ethyl alcohol, citric and acetic acids; enzymes: amylases, proteases, cellulases; vitamins: vitamin B_{12}, vitamin C; antibiotics (penicillin, streptomycin, tetracycline and griseofulvin). Microbes in petroleum industry (oil recovery). Immobilized cells & enzymes.

UNIT-IV

Microbiology of food: sources and types of microorganisms in food, foodborne pathogens, microbiological examination of food, spoilage of food, food preservation, fermented foods, microbial proteins.

UNIT-V

Dairy microbiology: sources and types of microorganisms in milk, microbial examination of milk, pasteurization and phosphatase test, sterilization of milk, grades of milk, dairy products, fermented milk, butter & cheese.

Course No. XII: Agricultural Microbiology

UNIT – I

History, scope and development of agricultural microbiology, rhizosphere and phyllosphere: concept, importance, factors affecting microbial diversity.

UNIT – II

Soil health: crop residues, humus, mineralization, immobilization, soil-sickness, composting, vermicomposting, green manure. Effect of crop residues on plant growth; biodegradation of pesticides and pollutants; biodegradation fate, bioavailability, acceleration, bioremediation. Biofertilizers: types, production, formulation and constraints.

UNIT – III

General idea about major agricultural pests: Plant diseases- late blight potato. downy mildew of pea, stem gall of coriander, powdery mildew / rust / smut, rust of linseed, Ergot of bajara, Anthracnose of soybean, Tikka disease of groundnut, wilt of arhar, bacterial blight of paddy, citrus canker, leaf curl of papaya, little left of brinjal. Insects: gram, soybean. Weeds: parthenium, xanthium, waterhyacinth, cyperus, phalaris

UNIT – IV

Post harvest losses of agricultural products: causes, problems and management recent trends in pest management: strategies, mass production, formulation and application technology, achievements, constraints

UNIT – V

Biotechnology in agriculture: the new green revolution, transgenic crops, gene protection technology, frost control technology, resistant varieties. Bioconversion futurology: exploitation of agricultural wastes for food / feed and fuel.

FOURTH SEMESTER

DISSERTATION
A. Valuation
(i) Language & Presentation
(ii) Review of Literature
(iii) Methodology
(iv) Analysis & interpretation of Result
B. Viva-Voce