Re-Accredited 'B++' 2.86 CGPA by NAAC
VEER NARMAD SOUTH GUJARAT UNIVERSITY
University Campus, Udhna-Magdalla Road, SURAT - 395 007, Gujarat, India.
વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી
યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.
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-: પરિપત્ર :-

યુનિવર્સિટી સંલગ્ન વિજ્ઞાન વિદ્યાશાખા હેઠળની તમામ કોલેજોનાં આચાર્યશ્રીઓને જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૨૫–૨૬ થી અમલમાં આવનાર B.Sc. Bioscience (Microbiology) Sem.-5 & 6 ના અભ્યાસક્રમ અંગે જૈવ વિજ્ઞાન વિષયની અભ્યાસ સમિતિની તા.૧૯/૦૪/૨૦૨૫ ની સભાના ઠરાવ ક્રમાંકઃ૦૨ થી કરેલ ભલામણ સ્વીકારી વિજ્ઞાન વિદ્યાશાખાની તા.૩૦/૦૪/૨૦૨૫ની સભાનાં ઠરાવ ક્રમાંકઃ૪૬ થી કરેલ ભલામણ સ્વીકારી એકેડેમિક કાઉન્સિલની તા.૦૫/૦૫/૨૦૨૫ ની સભાનાં ઠરાવ ક્રમાંકઃ૧૧૦ થી મંજુર કરેલ છે. જેનો અમલ કરવા આથી જાણ કરવામાં આવે છે.

બિડાણઃ ઉપર મુજબ

ક્રમાંકઃઓથો./પરિપત્ર/સિલેબસ/૧૨૧૮૯/૨૦૨૫
તા.૨૬–૦૫–૨૦૨૫

કુલસચિવશ્રી

પ્રતિ,
૧) યુનિવર્સિટી સંલગ્ન વિજ્ઞાન વિદ્યાશાખા હેઠળની તમામ કોલેજોનાં આચાર્યશ્રીઓ.
.....આપશ્રીની કોલેજના સંબંધિત શિક્ષકોને જાણ કરી અમલ કરવા સારૂ.
૨) ડીનશ્રી, વિજ્ઞાન વિદ્યાશાખા.
૩) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.
.....તરફ જાણ તેમજ અમલ સારૂ.

Veer Narmad South Gujarat University, Surat

B. Sc. Bioscience (Microbiology) Syllabus

NEP 2020

(Effective from June, 2025)

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

NEP 2020, CBCS Semester system

B. Sc. Bioscience (Microbiology)

[Major] Level: 300 - 399

T. Y. B. Sc. Semester V&VI (NEP)

(Effective from June 2025)

Paper No., Paper title, Teaching & Evaluation Scheme
Semester V

Paper No./ Course Code	Paper Title / Course Title	Course Credit	Teaching Hrs/Week	Internal marks	External marks	Total marks	Duration of Exam
BM-MJ-501	Vedic Microbiology	2	2	25	25	50	1 Hrs
BM-MJ-502	Fundamentals of Immunology	2	2	25	25	50	1 Hrs
BM-MJ-503	Epidemiology & Medical Microbiology	2	2	25	25	50	1 Hrs
BMP-MJ-501	Vedic Microbiology Practical	2	4	25	25	50	4 Hrs
BMP-MJ-502	Fundamentals of Immunology Practical	2	4	25	25	50	4 Hrs
BMP-MJ-503	Epidemiology & Medical Microbiology Practical	2	4	25	25	50	4 Hrs

B. Sc. Bioscience (Microbiology)

(Major)

T. Y. B. Sc. Semester V&VI (NEP)

(Effective from June 2025)

Semester VI

Paper No./ Course Code	Paper Title/ Course Title	Course Credit	Teaching Hrs/Week	External marks	Internal marks	Total marks	Duration of Exam
BM-MJ-601	Food & Dairy Microbiology	2	2	25	25	50	1 Hrs
BM-MJ-602	Environmental Microbiology	2	2	25	25	50	1 Hrs
BM-MJ-603	Industrial Microbiology	2	2	25	25	50	1 Hrs
BMP-MJ-601	Food & Dairy Microbiology Practical	2	4	25	25	50	4 Hrs
BMP-MJ-602	Environmental Microbiology Practical	2	4	25	25	50	4 Hrs
BMP-MJ-603	Industrial Microbiology Practical	2	4	25	25	50	4 Hrs

POs for All UG Science Programs

PO-01: Scientific Knowledge & Conceptual Understanding: Develop a strong foundation in scientific principles, theories and concepts across disciplines, fostering interdisciplinary learning, advance knowledge and problem-solving abilities.

PO-02: Analytical & Critical Thinking: Apply critical thinking and analytical reasoning to evaluate scientific data, hypotheses and real-world problems, leading to evidence-based conclusions.

PO-03: Research & Inquiry-based Learning: Develop investigative skills through experimentation, data analysis and scientific inquiry to contribute to research and innovation.

PO-04: Laboratory & Technical Skills: Gain hands-on experience with laboratory techniques, instrumentation and computational tools relevant to scientific research and industry applications.

PO-05: Digital & Computational Literacy: Utilize digital tools, computational techniques and emerging technologies such as AI, bioinformatics and statistical modelling to enhance scientific learning and problem-solving.

PO-06: Environmental & Societal Responsibility: Understand the role of science in addressing environmental, health and societal challenges, promoting sustainability and ethical responsibility.

PO-07: Effective Communication & Collaboration: Develop proficiency in scientific communication, both written and oral, for effective dissemination of knowledge while collaborating in multidisciplinary teams.

PO-08: Innovation & Entrepreneurship: Foster an entrepreneurial mind-set by applying scientific knowledge for innovation, technology development, and industry-oriented applications. Develop sustainable solutions to address real-world challenges in research and environmental management.

PO-09: Lifelong Learning & Professional Growth: Cultivate curiosity and adaptability for continuous learning, equipping students for higher education, research, and professional careers.

PO-10: Ethical Leadership & Value-based Education: Develop leadership qualities, ethical values, and a sense of responsibility in applying science for societal progress, aligning with Indian knowledge systems and global perspectives.

Program-Specific Outcomes (PSOs)

for

B.Sc. Bioscience (Microbiology)

After completing the Bioscience (Microbiology) Program students should achieve complete theoretical knowledge as well as practical skills and preparing them for careers in health care, pharmaceuticals industries, food and dairy, agriculture & research. The program helps the students to pursuit higher education and provides a strong foundation to make a career in allied fields of life sciences.

The Program Specific Outcomes includes;

1. To enrich students' core knowledge and train them in the fundamental concepts of microbiology as well as its applied area.
2. To acquire the laboratory skills, handling sophisticated laboratory instruments and biosafety measures in Microbiology
3. To introduce the critical thinking, problem-solving ability, analyse and interpret experimental results, fostering innovative solution and research.
4. To inculcate sense of scientific, professional and ethical responsibilities towards social, healthcare, industrial and environment problem.
5. To help the students to build up a progressive and successful career

[Subject Code-2503000505018001]

T. Y. B. Sc. Semester - V
Bioscience (Microbiology)
BM-MJ-501: Vedic Microbiology

Course Description:

Course Code	BM-MJ- 501
Course Title	Vedic Microbiology
Course Type	Major Theory - 1
Course Credit	02 (30 Hrs)

Course Content:

Unit: I Introduction to Vedic Microbiology. [15 Hrs.]

- Introduction & origin of Vedas, Concept of Vedic period, Gurus of Vedic Microbiology-Kanva, Sushruta and Charak.
- Major characteristics of Microbes as per Vedas, Various names and terms used for Krimis, Shapes and colors of Krimis (Germs).
- Microbial diversity, Major groups and classification of Krimis (Charak).
- Origin and prevalence of Krimis, Occurrence of Krimis in the environment, Prevalence Krimis in water, milk, whey and food.
- Prevalence Krimis in /on human body, Pathogenic Krimis, Methods of counting the numbers of Krimis.

Unit: II Vedic Technology. (Prevention & control of Krimis.) [15 Hrs.]

- Microbial disease during Vedic period, Kshudrarog in human. Pandemic & epidemic disease during Vedic period and their prevalence.
- Precautions for spread of Infectious Microorganisms, Germicidal properties in the Sun rays, Elimination of Krimis by Sun rays.
- Eradication of Krimis by medicinal herbs/plants, Eradication of germs by Vaca
- Significance of Hawan/Yagya, materials used in daily Yagya/Hawan.

- Agnihotra - Scientific Validation, Effect of Agnihotra on human health and environment

Course outcomes:

After successfully completing this course, student will able to;

CO1 Understand the foundational concepts of microbiology in the context of Vedic literature

CO2 Analyse ancient texts for microbial relevance in disease, medicine and fermentation

CO3 Explore microbial applications in Ayurveda, traditional health practices, and Vedic sustainability.

CO4 Integrate Vedic knowledge with modern microbiological practices.

Course Mapping:

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	■				
CO2	■		■		
CO3	■	■		■	
CO4			■		■

References:

1. Vedic Microbiology by R. C. Dubey. (2021), 1st Ed., Motilal Banarsidass International.
2. Dilip and Dipika Doctor International Vedic Vision, New York, In association with Indian Foundation for Vedic Science - Chakradhar F. and Shriji Kurup (2007), 1st Ed
3. Scientific Basis for Ayurvedic Therapies by Lakshmi Chandra Mishra, (2004), CRC Press LLC
4. The book on Alternative Antimicrobial Therapy, (2021) Edited by Singh, Sinha, Agrawal & Vidya Singh

T. Y. B. Sc. Semester - V
Bioscience (Microbiology)
BM-MJ-502: Fundamentals of Immunology

Course Description:

Course Code	BM-MJ- 502
Course Title	Fundamentals of Immunology
Course Type	Major Theory - 2
Course Credit	02 (30 Hrs)

Course Content:

Unit: I Immune system & Host defence. [15 Hrs.]

- Cells, tissues & organs of immune system. Immunity: Innate immunity.
- Host defense mechanism. Nonspecific – Physical barrier, chemical mediators, Cytokines.
- Adaptive immunity - Immune response: Primary & Secondary, Humoral & cellular.
- Antigen – properties, classification, Types of Antigen, Antigenic specificity. Antibody, Basic structure of immunoglobulin, Types of Immunoglobulin.
- Types of acquired immunity, T & B - cell biology.

Unit: II Antigen antibody reaction. [15 Hrs.]

- Opsonization, Neutralization, Immune complex formation - Compliment fixation & CFT. Agglutination (Direct & indirect), Precipitation, Gel precipitation.
- Immunity to bacterial & viral infection.
- Immune Disorders: Allergic reaction: Antibody& Cell mediated allergic reaction. Introduction to autoimmune diseases. Transplantation rejection.
- Polyclonal & Monoclonal antibody, Hybridoma technique.

- Advances in clinical immunology – ELISA, RIA, Immunoblot, Immunofluorescence Immunochromatographic technique.

Course outcomes:

After successfully completing this course, student will able to;

CO1 Learn about, the components of the immune system & understand mechanisms of immune responses

CO2 Differentiate between innate and adaptive immunity, know the role of Cytokines.

CO3 Acquire knowledge regarding various antigen antibody reactions, Allergic reaction & some autoimmune diseases.

CO4 They also learn some advanced technique like ELISA, RIA, Hybridoma, Immunoblot, Immunofluorescence, Immunochromatographic technique

Course Mapping:

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					
CO4					

References:

1. Foundation in Microbiology by Talaro & Chess 8th ed 2012 (McGraw-Hill)
2. Microbiology, 9th edition by Prescott, Harley & Klein (McGraw-Hill)
3. Text book of Medical Microbiology by Anantnarayan
4. An Introduction to Immunology by Rao
5. Immunology by Nandini Shetty 2nd ed. (New Age Pub)
6. Clinical aspect of Immunology by Gell & Coombs (Blackwell oxford)

[Subject Code-2503000505038001]

T. Y. B. Sc. Semester - V
Bioscience (Microbiology)
BM-MJ-503: Epidemiology & Medical Microbiology

Course Description:

Course Code	BM-MJ- 503
Course Title	Epidemiology & Medical Microbiology
Course Type	Major Theory - 3
Course Credit	02 (30 Hrs)

Course Content:

Unit – I Epidemiology & Clinical Microbiology. [15 Hrs.]

- Introduction to Epidemiology & Epidemiological tools. Patterns of infectious diseases, Infectious disease cycle, Source, Reservoir & Pathogens. Pathogenesis, entry of pathogen. Infection & virulence, virulence factors, attenuation & exaltation.
- Types of infection, types of pathological condition and types of diseases. Transmission of communicable diseases – Direct, Indirect. Emerging and re-emerging infectious diseases and pathways.
- Control of epidemics: Vaccine, Immunization. Public health system: CDC-WHO
- Introduction to clinical microbiology. Collection, aseptic handling, transport and microbiological examination of clinical sample. Rapid method for identification.
- Chemotherapeutic agent, Characteristics, Types & mode of action. Microbial susceptibility testing - MIC, MBC. Automation in Clinical Microbiology.

Unit – II Medical Microbiology [15 Hrs.]

- Air borne disease – Tuberculosis, Pneumonia, Meningitis, Chicken pox Mumps.
- Food & water borne disease – Cholera, Enteric fever, Dysentery, Polio, Hepatitis A, Amoebiasis, Giardiasis

- STD - Syphilis, Gonorrhea & Direct contact disease – AIDS, Superficial dermatomycosis
- Soil born disease – Tetanus & Zoonosis – Leptospirosis & Rabies & Vector borne disease – Malaria, Dengue & Nosocomial infection, UTI, sepsis
- Introduction to Helminthology, Tape worm infection – Taeniasis, Ascariasis & Hookworm infection, Filariasis.

Course outcomes:

After successfully completing this course, student will able to;

CO1 Learn about the principles and methods of epidemiology.

CO2 Analyse patterns of disease occurrence in populations.

CO3 Evaluate the laboratory diagnosis of infections & effectiveness of disease prevention and control programs

CO4 Understand about of various infectious diseases

Course Mapping:

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					
CO4					

References:

1. Text book of Medical Microbiology by Anantnarayan.
2. Microbiology, 9th edition by Prescott, Harley & Klein (McGraw-Hill)
3. District Laboratory Practice in Tropical Countries Part – I & II by Monika Cheesbraugh (Cambridge)
4. Medical Microbiology by Satish Gupte 10th ed.(2010) (Jaypee Brothers)
5. Review of Medical Microbiology by Jawetz& Melnick (Lange)
6. Foundation in Microbiology by Talaro & Chess 8th ed 2012 (McGraw-Hill)

[Subject Code-2503000505018002]

T. Y. B. Sc. Semester - V
Bioscience (Microbiology)
BMP-MJ-501: Vedic Microbiology Practical
(4 Hrs/Week)

Course Description:

Course Code	BMP-MJ- 501
Course Title	Vedic Microbiology Practical
Course Type	Major Practical - 1
Course Credit	02 (60 Hrs)

Course Content:

1. Introduction to Agnihotra/Homa/Yagya material.
2. Preparation of Agnihotra Ash extract. (Aqueous & Solvent).
3. Antimicrobial activity of Agnihotra Ash/Other Ash.
4. Antimicrobial activity of herbal fumes.
5. Evaluation of traditional herbal extracts/oil against pathogens
6. Evaluation of traditional Spices extracts/oil against pathogens
7. Effect of Agnihotra Ash on water.
8. Effect of Agnihotra on Airborne Microbial Load
9. Effect of Sunrays on the microorganisms
10. LAB count in fermented rice water.
11. LAB count in buttermilk.
12. Study of permanent slides & specimens as per theory.

References:

1. Practical Microbiology 2nd ed. by Dubey & Maheshwari (S. Chand & Company)

2. Experimental Microbiology, Vol. 1, 10th Edition by Patel, R. J., (2022). Aditya.

3. Experiments in microbiology, Plant Pathology, Tissue Culture and Mushroom Production Technology, 4thed., by Aneja, K. R., (2003). New Age International Publishers

4. The book on Alternative Antimicrobial Therapy, (2021) Edited by Singh, Sinha, Agrawal & Vidya Singh

5. Fermented Foods and Beverages of the World – Jyoti Prakash Tamang

[Subject Code-2503000505028002]

T. Y. B. Sc. Semester - V
Bioscience (Microbiology)
BMP-MJ- 502: Fundamentals of Immunology Practical
(4 Hrs/Week)

Course Description:

Course Code	BMP-MJ- 502
Course Title	Fundamentals of Immunology Practical
Course Type	Major Practical - 2
Course Credit	02 (60 Hrs)

Course Content:

1. Widal slide agglutination test, Screening test for enteric fever
2. Identification of unknown culture by slide agglutination test.
3. Rapid plasma reagin test
4. Rheumatoid arthritis test
5. Demonstration of precipitation reaction by ring test.
6. Demonstration of gel precipitate (immunodiffusion test).
7. Introduction to some advanced serological technique.
8. Coomb test. (Antiglobulin test)
9. Demonstration of ELISA.
10. Introduction & demonstration of Immunochromatographic test.
11. Introduction & demonstration of immunodot test.
12. Study of permanent slide/specimens as per theory.

References:

1. Practical Microbiology 2nd ed. by Dubey & Maheshwari (S. Chand & Company)

2. Manual of Microbiology 2nd ed. by Kanika Sharma, (Ane Books Pvt. Ltd)

3. Experimental Microbiology Vol. 1 9th ed. by Rakesh Patel&KiranPatel (Aditya Publication)

4. Microbiology: A Laboratory Manual 11th ed. by J. G. Cappuccino (Pearson Education Pvt. Ltd, Singapore)

5. Experiments in Microbiology, Plant Pathology and Biotechnology 4th ed. by K. R. Aneja (New Age International Publishers)

[Subject Code-2503000505038002]

T. Y. B. Sc. Semester - V
Bioscience (Microbiology)
BMP-MJ-503: Epidemiology & Medical Microbiology Practical
(4 Hrs/Week)

Course Description:

Course Code	BMP-MJ- 503
Course Title	Epidemiology & Medical Microbiology Practical
Course Type	Major Practical - 3
Course Credit	02 (60 Hrs)

Course Content:

1. Study of biochemical, transport media and anaerobic culture system.
2. Collection of clinical sample - Blood/Urine/Stool/Pus/Wound Abscess/Exudates.
3. Study of some biochemical test for pathogen identification. Study of Blood culture.
4. Microbiological examination of pus sample
5. Routine microbiological examination of sputum.
6. Study of frequency measurement by epidemiological tools
7. Antibiotic sensitivity testing. Paper disc method & Combi disc
8. Determination of MIC of antibiotics by tube dilution & Demonstration of E – test.
9. Diagnostic medical problem - Study of Salmonella pathogen.
10. Diagnostic medical problem - Study of UTI pathogen.
11. Diagnostic medical problem - Study of Nosocomial infection pathogen.
12. Study of permanent slide & specimens as per theory.

References:

1. Practical Microbiology 2nd ed. by Dubey & Maheshwari (S. Chand & Company)

2. Experimental Microbiology Vol. 1 9th ed. by Rakesh Patel & KiranPatel (Aditya Publication)

3. Microbiology: A Laboratory Manual 11th ed. by J. G. Cappuccino (Pearson Education Pvt. Ltd, Singapore)

4. Experiments in Microbiology, Plant Pathology, and Biotechnology 4th ed. by K. R. Aneja (New Age International Publishers)

5. Practical Microbiology 2nd ed. by Dubey & Maheshwari (S. Chand & Company)

[Subject Code-2603000506018001]

T. Y. B. Sc. Semester - VI
Bioscience (Microbiology)
BM-MJ-601: Food & Dairy Microbiology

Course Description:

Course Code	BM-MJ- 601
Course Title	Food & Dairy Microbiology
Course Type	Major Theory - 1
Course Credit	02 (30 Hrs)

Course Content:

Unit – I Food microbiology [15 Hrs.]

- Principles of food preservation, Asepsis, Removal of microorganisms, Heat treatments, drying. Chemical preservatives. Preservation by radiation
- Spoilage of food. Spoilage of Bread, Vegetables and fruits, Heated canned foods
- Food borne diseases, Detection of food-borne pathogens, Food intoxication
- Microbiology of fermented food, Chocolate fermentation. Other fermented foods
- Production of alcoholic beverages: Wine, beer, Production of breads, Introduction to Mushroom Culture

Unit – II Dairy Microbiology. [15 Hrs.]

- Introduction to milk, raw milk, microflora, sources of contamination, Pasteurization - principle & types. Milk processing – Products from milk.
- Normal fermentation (curdling), Spoilage of milk.
- Microbiology of Starter culture, Microbiology of Fermented milk; Lactic fermentation, Yeast- Lactic fermentation, Mold- Lactic fermentation
- Microbiology of therapeutic milk; Probiotic micro-organism, their properties, health benefits and Probiotic dairy products

- Microbiology of Milk products – Cheese, types of cheese, condense milk, dried milk, ice-cream & fermented milk products

Course outcomes:

After successfully completing this course, the student will able to;

CO1 Understand the basic knowledge of food microbes & their role in food and dairy systems

CO2 Describe emerging trends and technologies in food microbiology

CO3 Understand the principles of microbial spoilage and food borne illnesses & probiotics

CO4 Explore the food preservation technique, production of fermented milk products, food, alcoholic beverages, breads.

Course Mapping:

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	■				
CO2	■	■	■		
CO3	■			■	■
CO4	■	■	■		■

References:

1. Applied Microbiology by Vinita Kale (Himalaya)
2. Food Microbiology by Frazier (Tata McGraw-Hill)
3. Food Microbiology by Adams
4. Dairy Microbiology by Mahanta
5. Fundamental of Dairy Microbiology by Prajapati (Ekta prakasan)
6. Microbiology, sixth edition by Prescott, Harley & Klein (McGraw-Hill)

[Subject Code-2603000506028001]

T. Y. B. Sc. Semester - VI
Bioscience (Microbiology)
BM-MJ-602: Environmental Microbiology

Course Description:

Course Code	BM-MJ- 602
Course Title	Environmental Microbiology
Course Type	Major Theory - 2
Course Credit	02 (30 Hrs)

Course Content:

Unit – I Microbiology of water & waste water. [15 Hrs.]

- Sources of water, Purification of water, water quality & standard.
- Collection of water sample, faecal indicator, Coliforms & Detection of coliforms – Multiple tube fermentation tests, PA – test, defined substrate test. Membrane filtration technique,
- Introduction to sewage, characteristics of sewage. Sewage water quality – TOC, COD & BOD.
- Municipal waste water treatment: Primary, secondary & tertiary. Anaerobic sludge digestion,
- Solid waste management, Disposal of solid waste. Wetland treatment, Septic tank home treatment system.

Unit – II Agricultural Microbiology [15 Hrs.]

- Microorganisms in soil environment. Microbes-Plant interaction, Phyllosphere & rhizosphere and their significance, Mycorrhizae, types & N_2 exchange
- Soil fertility and phenomenon of mineralization & immobilization ofelements. Role of nitrogen fixers, nitrifying, ammonifying, denitrifying, phosphate solubilizing and plant growth promoting bacteria

- Biofertilizers: Innoculants of Rhizobium, Azobacter. Phosphate Solubilizer Biopesticide and Bioinsecticides (Production and Formulation)
- Bioenergy: Liquid Fuel &Gaseous Fuels – Alcohols, Biogas and Hydrogen
- Biodegradation process & types. Biodegradation of Hydrocarbons. Bioremediation: General Aspects. Phytoremediation & types.

Course outcomes:

After successfully completing this course, the student will be able to;

CO1 Understand the basic knowledge & detail about microbiology of water, water quality

CO2 Learn wastewater microbiology and treatment processes

CO3 Analyse the microbial biogeochemical cycles & soil fertility, nitrogen fixation,

CO4 Evaluate the role of microbes in sustainable practices

Course Mapping:

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					
CO4					

References:

1. Applied Microbiology by Vinita Kale (Himalaya)
2. Microbiology, by Prescott, Harley & Klein, 9th ed. (McGraw-Hill)
3. Fundamental Microbiology by Frobisher (W. B. Saunder)
4. Microbiology, fifth edition by Pelzar, Chan & Kreig (Tata McGraw-Hill)
5. Microbial Ecology by Atlas,R.M. and Bartha,R. 4thEd.

[Subject Code-2603000506038001]

T. Y. B. Sc. Semester - VI
Bioscience (Microbiology)
BM-MJ-603: Industrial Microbiology

Course Description:

Course Code	BM-MJ- 603
Course Title	Industrial Microbiology
Course Type	Major Theory - 3
Course Credit	02 (30 Hrs)

Course Content:

Unit – I Concept of fermentation process. [15 Hrs.]

- Characteristics of an industrially ideal organism, Screening & strain improvement of industrially important organisms.
- Screening techniques: Primary & secondary screening for metabolites.
- Principles of media formulation, Crude raw media
- Media ingredients: Water, carbon sources, nitrogen sources, minerals, growth factors, buffers, precursors, inducers, inhibitors, antifoam agents.
- Media Sterilization - Batch and continuous sterilization, Use of filtration: Principle, types of filters.

Unit – II Fermentor and Downstream Processing [15 Hrs.]

- Essential features of a bioreactor. Body construction & basic functions. Types of fermenter - batch fermenter and continuous fermenter
- Devices for aeration and agitation, pH, temperature, foam & dissolved oxygen
- Bioreactor for specialized purposes: (Alternate methods of mass culture)
- Product recovery, finishing step. Cell harvesting, Cell disruption
- Major industrial products – Antibiotics, Organic acids, Enzymes, vitamins & biopolymers.

Course outcomes:

After successfully completing this course, the student will be able to;

CO1 Acquire the basic knowledge of fermentation process, screening technique. &

CO2 Learn the detail of fermentation media, crude media, media formulation, Media sterilization.

CO3 Understand the essential features of bioreactor & types the bioreactor, types of fermentation (batch, fed-batch, continuous), & downstream processes, Cell harvesting, product recovery.

CO4 Explore the role of micro-organisms in the production of industrially important products like enzymes, alcohols, acids, antibiotics, and vitamins.

Course Mapping:

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	■				
CO2	■		■		
CO3	■	■	■		■
CO4	■	■		■	■

References:

1. Industrial Microbiology: An Introduction by Waites & Morgam. (Blackwell Science)
2. Biotechnology: The Biological Principles by Trevan (Tata McGraw-Hill, New Delhi)
3. Industrial Microbiology by Patel, A.H., 2nd Ed. (Macmillan, India)
4. Principles of Fermentation Technology by Stanbury, 2nd Ed., (Elsevier Science Ltd.)
5. Biotechnology: A textbook of industrial microbiology Creuger, W., 2nd Ed.,(Panima)
6. Fermentation technology, by, Srivastva M. L., 1st ed. (Narosa pub. House)

[Subject Code-2603000506018002]

T. Y. B. Sc. Semester - VI
Bioscience (Microbiology)
BMP-MJ-601: Food & Dairy Microbiology Practical
(4 Hrs/Week)

Course Description:

Course Code	BMP-MJ- 601
Course Title	Food & Dairy Microbiology Practical
Course Type	Major Practical - 1
Course Credit	02 (60 Hrs)

Course Content:

1. Standard plate counts of milk sample.
2. Gradation of milk. (MBRT)
3. To study the various biochemical changes in the milk.
4. Isolation & identification of yeast from grapes.
5. Study of yeast as a leavening agent in bread making.
6. Isolation & identification of lactic acid bacteria from milk.
7. Screening of probiotics characteristics in LAB.
8. Screening of antimicrobial activity as a probiotics characteristics in LAB.
9. Microbiological analysis of food – Aerobic mesophilic plate count
10. Demonstration of Wine production by using grape juice.
11. Demonstration of mushroom cultivation.
12. Study of permanent slide/specimens/images as per theory.

References:

1. Practical Microbiology 2nd ed. by Dubey & Maheshwari (S. Chand & Company)

2. Experimental Microbiology Vol. 1 9th ed. by Rakesh Patel&KiranPatel (Aditya Publication)

3. Microbiology: A Laboratory Manual 11th ed. by J. G. Cappuccino (Pearson Education Pvt. Ltd, Singapore)

4. A Laboratory Manual for UG in Agricultural Microbiology, Microbiology & Biotechnology, 1st ed. By Prita Borkar (2022)

5. A Laboratory Manual in Microbiology, Plant Pathology, and Biotechnology 4th ed. by K. R. Aneja (New Age International Publishers)

[Subject Code-2603000506028002]

T. Y. B. Sc. Semester - VI
Bioscience (Microbiology)
BMP-MJ-602: Environmental Microbiology Practical
(4 Hrs/Week)

Course Description:

Course Code	BMP-MJ- 602
Course Title	Environmental Microbiology Practical
Course Type	Major Practical - 2
Course Credit	02 (60 Hrs)

Course Content:

1. Standard plate counts of water sample.
2. Detection of coliform (DCT)
3. Enumeration of coliform (MPN)
4. Study of fecal indicator bacteria by membrane tech.
5. Enumeration of soli microorganisms.
6. Isolation of phosphate solubilizing microorganism.
7. Isolation of symbiotic nitrogen fixing microorganism
8. Isolation of non symbiotic nitrogen fixing microorganism
9. Isolation of cellulose decomposing bacteria.
10. Isolation and identification of Trichoderma.
11. Production of liquid Biofertilizer.
12. Study of permanent slides & specimens as per theory.

References:

1. Practical Microbiology 2nd ed. by Dubey & Maheshwari (S. Chand & Company)
2. A Laboratory Manual for UG in Agricultural Microbiology, Microbiology & Biotechnology, 1st ed. By Prita Borkar (2022)
3. Experimental Microbiology Vol. 1 9th ed. by Rakesh Patel (Aditya Publication)
4. Microbiology: A Laboratory Manual 11th ed. by J. G. Cappuccino (Pearson Education Pvt. Ltd, Singapore)
5. Experiments in Microbiology, Plant Pathology and Biotechnology 4th ed. by K. R. Aneja (New Age International Publishers)

[Subject Code-2603000506038002]

T. Y. B. Sc. Semester - VI
Bioscience (Microbiology)
BMP-MJ-603: Industrial Microbiology Practical
(4 Hrs/Week)

Course Description:

Course Code	BMP-MJ- 603
Course Title	Industrial Microbiology Practical
Course Type	Major Practical - 3
Course Credit	02 (60 Hrs)

Course Content:

1. Primary screening of amylase producers
2. Primary screening of organic acid producers
3. Primary screening of antibiotic producers by crowded plate method
4. Production of amylase by submerge fermentation
5. Activity check of amylase.
6. Demonstration of recovery of crude protein / amylase from fermentation broth.
7. Bioassay of penicillin using *Bacillus subtilis*
8. Production of amylase by solid state fermentation.
9. Production of citric acid by *Aspergillus niger*
10. Production of alcohol from molasses.
11. Estimation of Alcohol by colorimetric method.
12. Study of permanent slides & specimens as per theory.

References:

1. Practical Microbiology 2nd ed. by Dubey & Maheshwari (S. Chand & Company)

2. A Laboratory Manual for UG in Agricultural Microbiology, Microbiology & Biotechnology, 1st ed. By Prita Borkar (2022)

3. Experimental Microbiology Vol. 1 9th ed. by Rakesh Patel (Aditya Publication)

4. Microbiology: A Laboratory Manual 11th ed. by J. G. Cappuccino (Pearson Education Pvt. Ltd, Singapore)

5. Experiments in Microbiology, Plant Pathology and Biotechnology 4th ed. by K. R. Aneja (New Age International Publishers)

Veer Narmad South Gujarat University, Surat

B. Sc. Bioscience (Microbiology) Syllabus

NEP 2020

(Effective from June, 2025)

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

NEP 2020, CBCS Semester system

B. Sc. Bioscience (Microbiology)

[Minor Elective] Level: 200 - 299

T. Y. B. Sc. Semester V (NEP)

(Effective from June 2025)

Paper No., Paper title, Teaching & Evaluation Scheme

Semester V

Paper No./ Course Code	Paper Title/ Course Title	Course Credit	Hrs/ Week	External marks	Internal marks	Total marks	Duration of Exam
BM-ME- 4	Fundamental of Cell Biology & Genetics	2	2	25	25	50	1 Hrs
BM-ME- 5	Molecular Biology	2	2	25	25	50	1 Hrs
BMP-ME-4	Fundamental of Cell Biology & Genetics Practical	2	4	25	25	50	4 Hrs
BMP-ME-5	Molecular Biology Practical	2	4	25	25	50	4 Hrs

Semester VI

Paper No./ Course Code	Paper Title/ Course Title	Course Credit	Hrs/week	External marks	Internal marks	Total marks	Duration of Exam
BM-ME- 6	Haematology & Blood Banking	2	2	25	25	50	1 Hrs
BMP-ME- 6	Haematology & Blood Banking Practical	2	2	25	25	50	4 Hrs

[Subject Code-2503000505048001]

T. Y. B. Sc. Semester - V
Bioscience (Microbiology) – Minor Elective
BM-ME-4: Fundamental of Cell Biology & Genetics

Course Description:

Course Code	BM-ME- 4
Course Title	Fundamental of Cell Biology & Genetics
Course Type	Minor Elective Theory - 4
Course Credit	02 (30 Hrs.)

Course Content:

Unit: I Cell biology [15 Hrs.]

- Ultra-structure, composition and functions of Cell membrane & Ribosome
- Ultra-structure and functions of Nucleus, Mitochondria & Chloroplast.
- Ultra-structure and functions of ER, Golgi body, Lysosome, Centriole, Cilia & Flagella.
- Chromosome: Morphology, types, structure. Special chromosome: Polytene, Lamp brush chromosome.
- Cell cycle: Interphase, Mitotic phase & Meiosis. Apoptosis.

Unit: II Mendelian genetics & Gene concept. [15 Hrs.]

- Mendel's experiments: Mono hybrid and di-hybrid cross, Mendel's law. Incomplete dominance, Co-dominance, Multiple allele & Blood group inheritance.
- Gene concept: Morgan classical concept. Modern concept of gene, Gene-enzyme, Gene-polypeptide relationship.
- Properties of genes, Fine structure of gene, Linkage, crossing over & recombination.

- Human Karyotype, Banding technique and Chromosomal abnormality, Pedigree analysis of genetic disorders.
- Sex linked inheritance: X & Y linked inheritance, Hemophilia & color blindness.

Course Outcomes:

After successfully completing this course, the student will be able to;

CO1 Understand the detail structure & functions of cell organelles.

CO2 Learn about chromosome - morphology, types, structure & cell cycle – cell division.

CO3 Know the Mendelian genetics, Incomplete dominance, multiple allele Gene concept & fine structure of gene.

CO4 Understand human karyotype, Banding technique, Chromosomal abnormality & sex-linked inheritance,

Course Mapping:

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					
CO4					

References:

1. **Cell Biology** by Satyesh Chandra and K. Kumar De(Central)
2. **Cytology** by Agrawal (S Chand pub)
3. **Cytology, Genetics & Evolution** by P. K Gupta (Rastogi Pub)
4. **Genetics** by Varma P. & Agrawal V. (S Chand Pub)
5. **Genetics** by Arora &Shandhu (Himalaya)
6. **Human Genetics**4th ed. by S. D. Gangane (Elsevier)

[Subject Code-2503000505058001]

T. Y. B. Sc. Semester - V
Bioscience (Microbiology) – Minor Elective
BM-ME-5: Molecular Biology

Course Description:

Course Code	BM-ME- 5
Course Title	Molecular Biology
Course Type	Minor Elective Theory - 5
Course Credit	02 (30 Hrs.)

Course Content:

Unit: I Central dogma of the Life. **[15 Hrs.]**

- DNA is hereditary material – Griffith's experiment, Avery's experiment, Chase experiment. Central dogma of life - the flow of genetic information.
- Protein coding genes, reading frame, tRNA & rRNA. Bacterial structural gene
- Patterns of DNA synthesis. The replication machinery.DNA polymerase.
- DNA replication, Semi-conservative, Replication fork, Termination of replication.
- Replication of linear chromosomes,

Unit: II Gene Expression & Gene Mutation. **[15 Hrs.]**

- Polycistronic mRNA, Ribozymes. The transcription machinery, RNA polymerase. Transcription events,
- Transcription in eukaryotes, Post transcription modification. Introduction to Genetic Code - Characteristics & Organization of genetic code.
- Mutations – types, Gene mutation, Types of gene mutation. Spontaneous and induced mutations, Effects of mutation.
- Detection & Isolation of mutants, Mutant selection, Carcinogenicity testing
- DNA Repair: Excision, Direct, Mismatch & Recombination.

Course Outcomes:

After successfully completing this course, the student will be able to;

CO1 Learn the detail aspects of DNA – as genetic material, Central dogma of the life.

CO2 Understand the coding gene, gene structure.

CO3 Acquire the knowledge regarding DNA replication, Transcription & Genetic code.

CO4 Know the basic of Gene mutation & DNA repair mechanism.

Course Mapping:

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					
CO4					

Reference books:

1. **Prescott, Harley, and Klein's Microbiology**7th ed. by Wiley, J., & Sherwood, L. (2007), McGraw-Hill Science/Engineering/Math.
2. **Genetics: A Molecular Approach** 2nd ed. by Russell, P. J. (2005)., Benjamin Cummings.
3. **Cell Biology, Genetics & Molecular Biology** by Verma, (2005) S. Chand & Co. Ltd.
4. **Cell & Molecular Biology**, by Sheeler & Bianchi. Biley publication.

[Subject Code-2503000505048002]

T. Y. B. Sc. Semester - V
Bioscience (Microbiology) – Minor Elective
BMP-ME-4: Fundamental of Cell Biology & Genetics Practical
(4 Hrs/Week)

Course Description:

Course Code	BMP-ME- 4
Course Title	Fundamental of Cell Biology & Genetics Practical
Course Type	Minor Elective Practical - 4
Course Credit	02 (60 Hrs.)

Course Content:

1. Study of animal & plant cell by temporary mount.
2. Study of nucleus and nucleolus by staining of onion peel.
3. Demonstration of chloroplast and study of various types of chloroplast.
4. Demonstration of mitochondria.
5. Study of mitotic cell division of onion root tip.
6. Demonstrate the Plasmolysis using Rhoeo Leaf.
7. Study of Mendelian Inheritance & Gene Interaction.
8. Study & Preparation of human karyotype.
9. Study of banding technique by chart/images.
10. Study of chromosomal abnormalities by chart/images.
11. Study of sex chromatin. (Barr body)
12. Study of Pedigree chart.

References:

1. **Experiments in Microbiology, Plant Pathology and Biotechnology** 4th ed. by K. R. Aneja (New Age International Publishers)
2. **Practical Cytology, Applied Genetics & Biostatistics** 2nd ed. by Goswami (Himalaya)
3. **Basic Human genetics** by Kapur & Suri Jaypee Brothers Publication
4. **Cell & Molecular Biology: Laboratory by IGNOU**
5. **Genetics & Evolutionary Biology: Laboratory by IGNOU**

[Subject Code-2503000505058002]

T. Y. B. Sc. Semester - V
Bioscience (Microbiology) – Minor Elective
BMP-ME-5: Molecular Biology Practical
(4 Hrs/Week)

Course Description:

Course Code	BMP-MN- 5
Course Title	Molecular Biology Practical
Course Type	Minor Elective Practical - 5
Course Credit	02 (60 Hrs.)

Course Content:

1. Extraction of DNA from Onion
2. Colorimetric estimation of DNA by Diphenylamine reagent.
3. Estimation of RNA by Orcinol method.
4. Preparation of replica plate, gradient plate.
5. Replica plating for transfer of bacterial colonies
6. Study of the lethal effect of ultraviolet radiation.
7. To study the effect of physical (UV) mutagen on bacteria.
8. To study the effect of chemical (HNO2) mutagen on bacteria.
9. Isolation of inducible mutant by UV rays.
10. Determination of antibiotic-resistant mutant by gradient plate method.
11. Demonstration of direct repair in bacteria. (Photo reactivation)
12. Study of permanent slide/specimens/images.

Reference books:

1. **Manual of Microbiology** 2nd ed. by Kanika Sharma, (Ane Books Pvt. Ltd)
2. **Experimental Microbiology Vol. 1** 9th ed. by Rakesh Patel (Aditya Publication)
3. **Microbiology: A Laboratory Manual** 11th ed.by J. G. Cappuccino (Pearson Education Pvt. Ltd, Singapore)
4. **Experiments in Microbiology, Plant Pathology and Biotechnology** 4th ed. by K. R. Aneja (New Age International Publishers)
5. **Practical Cytology, Applied Genetics & Biostatistics** 2nd ed. by Goswami (Himalaya)

[Subject Code-2603000506048001]

T. Y. B. Sc. Semester - VI
Bioscience (Microbiology) – Minor Elective
BM-ME-6: Haematology& Blood Banking

Course Description:

Course Code	BM-ME- 6
Course Title	Haematology & Blood Banking
Course Type	Minor Elective Theory - 6
Course Credit	02 (30 Hrs.)

Course Content:

Unit - I Haematology. [15 Hrs.]

- Blood constituent-Blood plasma, serum, Types & functions of blood cells – RBC, WBC, Platelets. Structure, functions & types of hemoglobin, Abnormal Hb.
- Hematopoietic system of the body. Erythropoiesis, Leucopoiesis, Thrombopoiesis.
- Introduction to Homeostasis, Blood coagulation mechanism. Blood pressure - Systolic, diastolic.
- Disorders of RBC: Anemia, Inherited hemoglobinopathies (SCA, thalassemia).
- Disorders of WBC: Leukemia, lymphomas & multiple myelomas.

Unit – II Blood Banking [15 Hrs.]

- Blood transfusion practice, Blood/blood component for transfusion.
- Blood donors, Types of donor, blood donor records, General history & screening of the donor.
- Blood collection, Preservation & storage of blood/blood component.
- Testing of blood, Blood grouping - ABO (cell, serum, tile method) & Rh typing. Compatibility testing (slide, tube & AHG) & serological investigation.
- Introduction to transfusion complication, Types, Investigation & Prevention of transfusion reaction.

Course Outcomes:

After successfully completing this course, the student will be able to;

CO1 Learn the basic knowledge & detail aspects of blood and hematopoietic system.

CO2 Understand the hemostasis and Blood disorder.

CO3 Acquired the knowledge regarding transfusion practice, Blood donor – types, requirement, screening of donor, testing of blood for transfusion.

CO4 Know about the transfusion complications – types, investigation, prevention.

Course Mapping:

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					
CO2					
CO3					
CO4					

References:

1. Clinical Hematology by Wintrobe (K.M.Varghese)
2. Practical Hematology by Davis
3. District Laboratory Practice in Tropical Countries Part – I & II by Monika Cheesbraugh (Cambridge)
4. Medical laboratory science by Kolhatkar (Tata McGraw-Hill)
5. Handbook ofBlood Banking andTransfusion Medicine by Rao (Jaypee)
6. Hematology – Blood Transfusion Practice (WHO)

[Subject Code-2603000506048002]

T. Y. B. Sc. Semester – VI
Bioscience (Microbiology) – Minor Elective
BMP-ME-6: Haematology & Blood Banking Practical
(4 Hrs/Week)

Course Description:

Course Code	BMP-ME- 6
Course Title	Haematology & Blood Banking practical
Course Type	Minor Elective Practical - 6
Course Credit	02 (60 Hrs.)

Course Content:

1. Blood collection & preservation.
2. Blood cell count: RBC and WBC counting.
3. Blood smear staining & Differential counts (DC).
4. Estimation of hemoglobin by Sahli's & Cyanmethemoglobin method.
5. Measurement of blood pressure.
6. Determination of ESR, PCV.
7. Determination of clotting time by capillary method.
8. Blood collection for transfusion, blood packs, preservatives.
9. Determination of blood groups.
10. Separation of serum, plasma, preparation of washed RBC suspension.
11. Compatibility testing
12. Study of permanent slide/specimens/images.

References:

1. Clinical Hematology by Wintrobe (K.M.Varghese)
2. Practical Hematology by Davis
3. District Laboratory Practice in Tropical Countries Part – I & II by Monika Cheesbraugh (Cambridge)
4. Medical laboratory science by Kolhatkar (Tata McGraw-Hill)
5. Handbook of Blood Banking and Transfusion Medicine by Rao (Jaypee)