1.3.1 Institution integrates cross- cutting issues relevant to Gender, Environment and Sustainability, Human Values and Professional Ethics into the Curriculum

Gender Issues

Class	Subject & Text	Topic
B A I/ BSc I	**ENGLISH (Compulsory) Text: - Golden Petals.**	1) The First Woman Jawan: A News Paper Article. 2) Thomas Wyatt: I Find No Peace
	History	1) Role of Rajmata Jijabai in Rise of Maratha Power
	Zoology	Paper II: Human Genetics, Sex determination, Blood Group
	PHYSICAL EDUCATION	1) Difference between two sexes with reference to physical performance
	COMPUTER SCIENCE	Introduction to Networking
		Introduction , Network topology, LAN,MAN, WAN, Introduction to Internet, Requirement for Internet.
BAII	**ENGLISH (Compulsory) Text: - Gems of Wisdom**	1) Virginia Woolf : Professions For Women
		2) Mahashweta Devi: Draupadi
	British Literature(papers-III&V)	1) Elizabethan Age 2) Shakespeare's Sister: Virginia Woolf 3) Edmund Spenser: One day I wrote Her Name 4) William Blake: Garden of Love 5) William Wordsworth: Lucy Gray 6) Michael Drayton: Since There is No Help 7) Vijay Tendulkar: Silence! The Court is in Session
	HISTORY	1) Participation of Annie Bezent in Homrule Movement 2) Participation of Women in Indian Freedom Movement 3) Status of Women in 19th Century 4) Work of Mahatama Phule for Empowerment of Women 5) Work of Maharshi Dhondo Keshav Karve
	ECONOMICS	1) Women Empowerment, Sex Ratio
	PSYCHOLOGY Gander and Behaviour.	1) Gender Stereotype 2) Gender Similarities and Differences. 3) Biological Origins of Gender Differences. 4) Environmental Origins of Gender Differences. 5) Gender Role

		6) Application – Bridging Gender Gap in Discrimination.
	GEOGRAPHY **Population Geography**	**Concept of under, over and optimum population, age and sex composition** 1) Theories of population growth and population
	Zoology	Paper VI: Human Genetic: Chromosomal Disorders, Paper VIII: Reproductive Physiology, Sex Hormones, Menstrual Cycles, Hormonal Control of Pregnancy, Study Of Contraceptives: use of contraceptives by Male and Female
B A III/ B.Sc. III	**ENGLISH** **P.5. British Literature**	1) Pride and Prejudice by Jane Austen
	P.8. Literatures in English	1) Sula By toni Morrison 2) Three Sisters by Anton Checkov
	P 9. Indian Writings in English	1) Roots and Shadows BY Shashi Deshpande 3) The God of Small Things by Arundhati Roy
	PHYSICAL EDUCATION (Paper – XI)	1) Environmental Hygiene –Lighting, Ventilation, Water supply, Disposal of Waste.
	MARATHI	स्त्रीवादी साहित्य स्त्रीवादी नेमलेली कलाकृती : उत्खनन - गौरी देशपांडे
	Botany	**Sex determination**
	Zoology	Paper X: Human Embryology- Use of ultrasound for fetus study, Causes of Miscarriages
	COMPUTER SCIENCE	Unguided Media:- Wireless- Radio Waves, Microwaves, Infrared, Satellite Communication.
		TCP/IP protocol suite :- UDP,TCP,SCTP, IP, RTP, FTP, DNS, TELNET, SMTP, POP, HTTP, WWW, SNMP,ARP, RARP.
M A I/ MSc I	**ENGLISH** **British Literature**	1) Hotel Du Lac,by Anita Brookner
	Indian English Literature	1) Thirty Days in September by Mahesh Dattani 2) Brides are not for burning by Dina Mehata
	Comparative Literature	1) Kamala by Vijay Tendulkar 2) Candida by GB Shaw
	ECONOMICS	1) Human Resource Development
	MARATHI	स्त्रीपुरूष तुलना

MAII/ MSc II	**ENGLISH** **Postcolonial Literature**	1) Family Matters by Rohinton Mistry 2) Tara by Mahesh Dattani 3) At the Bottom of the River by Jamaica Kincaid 4) Search for my Tongue by Sujata Bhatt 5) A Different History by Sujata Bhatt (Poem) 6) Dead Woman Walking by Meena Kandasamy (Poem)
	Contemporary Critical Theory	1) Ecofeminism 2) Feminist Criticism 3) The Point of View of Historical materialism
	HISTORY	1) Reform Movement: Emanicipation of Women, 2) Women: Status, property rights, reforms, legislation and Political participation 3) Women in India history 4) Women and social history of India
	MARATHI	**Lokra«;ksRRkj dkGkrhy L=hoknh lkfgR;** ;equki;ZVu & ckck in~euth czkã.kdU;k & Jh-O;a-dsrdj

Environment & Sustainability

Class	Subject & Text	Topic
B A I/ B Sc I	**HISTORY**	1) Village Community and Agrarian System
	PHYSICAL GEOGRAPHY	1) **Diastrophic Movement** Earthquake and Volcanoes Their origin , causes, effect 2) **Weather and climate** Effect of climate on Human life 3) **Insulation and temperature** Terrestrial heat balance
	Botany	Role of Algae, Fungi, Bryophyte, Pteridophyte, Gymnosperm in environment
	Zoology	Paper VI: Ecology- Scope of Ecology, Biotic and abiotic factors, Social Behavior in honey bees
	CHEMISTRY	**Physical properties of liquids,** Thermodynamics, **Environmental Chemistry: Air pollution and water pollution, Petroleum and petrochemicals**
	Microbiology	**Microbiology in everyday life** **A) Definition & types of associations with examples – Beneficial and harmful associations.** **Beneficial – Neutralism, Mutalism, Ammensalism, Symbiosis, Proto.co-operation, Commensalism.** **Harmful – Competition, Parasitism, Predation.**

		B) Association of microorganisms with plant – root nodulation. **Association of microorganisms with animal – ruminant symbiosis.** **Association of microorganisms with human – normal flora of human body & their significance.Microbial interactions with human being.** Microbiology of air, water, sewage, milk food etc Gnotobiology space microbiology
	Hindi	**Aavaj (poem), bahata pani Nirmala (Yatra varnan)**
	ECONOMICS	1) Demography, Health, Environment
	HISTORY	1) Work of Sant Gadage Maharaj
	Introduction to tourism Geography	**1)** Impact of Tourism Impact on Physical Environment Air and water pollution, solid waste and its littering, loss of bio-diversity
	MARATHI	jkukrY;k dfork
B A II/ B Sc II	Botany	Sources, causes and control measures of pollution
	Zoology	Paper V: Study of Animal Biodiversity. Paper VII; Migration in Birds, Leg and Beak Modification according to their natural habitat, Poisonous Snakes and Non –poisonous Snakes.
	CHEMISTRY	**Alcohols and Phenols, Acids and Bases,** Thermodynamics, Distribution law, **Industrial heavy Chemicals, Metallurgy Iron and Steel**
	MICRIBIOOGY	Industrial Microbiology Industrial use of microorganisms, Role of microbiology and microorganisms in treatment of Industrial waste , Study of bacterial and fungal Diseases-
	Hindi	**Ikkisvi sadi ka ped (Story)**
B A III/ BSc III	**HISTORY**	1) Indus Valley Civilization 2) Work of Jahangir and Shajahan
	RESOURCE GEOGRAPHY	**Resources** Classification of resources, Utilization or resources for the sustainable economic growth, Need and nature of conservation resources. **Non conventional energy and Bio-resources** Forest , Live stock **Issues related to physical environment: Environmental degradation** Environmental degradation, soil erosion, deforestation, pollution, air, water and noise, Global warming, ozone layers depletion and acid rain

		Issues related to physical environmental disaster Natural disaster- floods, drought, earthquakes, landslides with special reference to India, Enviromental management **Geopolitical issues of India** Inter-state issue of water disputes
B.Sc. III	**Botany**	Biotechnology, Plant breeding
	Zoology	Paper XII-Biodiversity and Conservation of Animals, Climate change and Biodiversity, Biodiversity of hot-spots. Paper XVI- Environmental Biology-Fresh water, Marine water and Terrestrial ecosystems, Biological indicators of pollution, Solid waste management, Rain water harvesting.
	CHEMISTRY	**Catalysis, Green Chemistry, Chemical Safety and Ethical Handling of Chemicals, Solutions, Thermodynamics, Electromotive force** **Photochemistry, Nuclear Chemistry**
	Microbiology	Environmental microbiology :Role of microbiology and microorganisms in Environment Role of microbiology and microorganisms in pollution Medical Microbiology Agricultural microbiology
	Hindi	**Badalo ke ghere (Story),** **Tin Phahad(Novel)**
	Physical education	Environmental Hygiene –Lighting, Ventilation, Water supply, Disposal of Waste.
M A I/ MSc I	**ECONOMICS**	1) Sustainable Development
	GEOMORPHOLOGY	**Applied Geomorphology** Geomorphic Hazards
	CHEMISTRY	Nuclear Chemistry, Green Chemistry, Hazard assessment and mitigation in chemical industry, Basic principles of green chemistry and their illustration with examples, Examples of green synthesis, Future trends in green chemistry
	Microbiology	**Viruses and Emerging Viral infections** **Biofertilizers** 1.Historical development, concept, scope, merits and limitations of Biofertilize Systematic study of major groups of microorganisms as biofertilizers, Nitrogen fixing bacteria, Phosphate solubilizing microbes, blue green algae and mycorrhizae. 2.Production of biofertilizers, screening, selection of

		potential strains Laboratory and large scale production of bacterial, algal and fungal biofertilizers 3. Methods of application and evaluation of biofertilizers. Green manure, organic matter, compost and composting, vermi-composting Production, economics and commercial viability of biofertilizers. Latest developments and future prospects of biofertilizer technology. **BIOPESTICIDES** 1. Biological control, its importance in crop pests and disease management, merits and demerits of biological control, history, distribution of biopesticides, role and status of biopesticides in pest control. 2.Pest control for crop protection by using biocontrol agents like bacteria (spore formers and non-spore formers) with special reference to *B.thuringiensis* and *B. sphericus*, mosquito control by fungi (culicinomyces, langenidium and coelomomyces), NPV of *Heliothis sp.* 3Toxin produced by bacteria anfd fungi, their chemistry, mode of action, pest control and safety. 4. Commercial production of *B.thuringiensis,* NPV, fungal pathogens, their formulations and applications. 5. Development of genetically modified crop plants for control of insect pests, *B.thuringiensis* gene transformation, transgenic crop plants. 6. Economic and future prospects of biopesticides. 7. Biopesticides, their use and significance in the developing era of ecological approaches of insect control and plant protection. Microbial diversity and Ecology Scope of Ecology, Biotic and abiotic factors etc Geomicrobiology
	Hindi	**Lok Run (Novel)**
MAII/ MSc II	**ECONOMICS**	1) Population , Poverty and Environment
	CHEMISTRY	**Environmental Chemical Analysis, Environment, Air**

		pollution **Waste water treatment, Soil Pollution, Industrial pollution, Hazardous substance analysis, Soil Analysis, Analysis of Fertilizers, Analysis of petroleum and petroleum products, Analysis of coal and coke, Analysis of gaseous fuels, Analysis of Explosives** Industrial Waste management technology Agricultural microbiology, fertilizer chemicals and biological Food and dairy microbiology: Genetically modified food **Types and Characterization of Industrial wastes**: Types of industrial wastes, General Characteristics of different wastes- pH, Suspended solids, volatile solids, BOD, COD, Organic Carbon etc. **UNIT –II 10L** **Microbiology and biochemistry of waste water treatment**: **a**. Introduction, types of biological treatments, impact of pollutants on biotreatment, bio-augmentation, basic concepts of waste water treatment **b**. Microorganisms in waste water treatment: source of organisms, enrichment and acclimatization, isolation, treatability tests, mass scale production, mixed cultures. **c**. genetically engineered microorganisms, preservation, applications and future prospects **Working of treatment systems and their analysis**: **a**. Reaction and kinetics, mass balance analysis, reactor types, hydraulic characters of reactor, selection of reactor type **B.Critical** operation parameters like DO, HRT, Mean Cell Residence Time (MCRT), F/M ratio, tank volume, flow rate, BOD, COD, temperature.Malfunctioning of treatment systems due to shock loading, hydraulic loading and remedial measures adapted. **C.**Hazardous waste management, low cost waste treatment systems, treatment of distillery, textile, paper and Pulp and cyanide wastes 1.Waste disposal control and regulations: a. Water pollution control, regulation and limits for disposal in to Lakes, rivers, oceans, and land. b.Environmental Impact Assessment (EIA), Environmental Audit (EA) c.Water Tracing: need, tracing problems, criteria for

		selection of tracer, tracing method, significance. 1 Novel Methods of Pollution Control : Vermicomposting, treatment using aquatic plants, root zone process 2. Eutrophication, El Nino, global warming, acid rains and significance 3. Enzymes and Pollution – Monooxingenases, aminotransferases, bioenergetic enzymes, other metabolic enzymes, enzymatic Rectifications.

Human Values

Class	Subject & Text	Topic
B A I/ BSc I	**HISTORY**	1) Role of Shahaji, Jijabai and early activities of Shivaji
	ZOOLOGY	Study tour- observation of different animals in their natural habitat
	PHYSICAL EDUCATION	1) a) Meaning of principles b)Principle of education c)Principle of Physical Education d) Meaning of Education and Physical Education 2) Physical Training ,Sport and Game
	MARATHI	नटसम्राट-वि.वा.शिरवाडकर नरायण सुर्वे यांची कविता - (संपादक - कुसुमाग्रज)
	Microbiology	2. Distribution of microorganisms in nature and their beneficial and Harmful activities. 3. Introduction to Applied branches in Microbiology. - Environmental, (Air, Sewage, Water, Soil) - Food, Dairy, Medical, Industrial, Biotechnology, Geomicrobiology, Gnotobiology Health aspect and microbiology Microbial solution s for everyday life (**Medical Microbiology)**
	Hindi	**Rahim ke dohe, kabir ke dohe, Pita ka chehra, vannya(Poem)** **Usane kaha tha, Thithurta huva ganatrantra(Story)**
B A II/	**POLITICAL SCIENCE**	1) Liberty, Equality, Justice, Democracy, Social Reform and

B Sc II		Justice
	ENGLISH (COMPL.)	1) Three Visions for India by APJ Abdul Kalam
	ENGLISH OPT. P.4	2) My Visions foe India by APJ Abdul Kalam
	HISTORY	1) French Revolution, 2) Work of Brahmo Samaj, Ary samaj 3) Work of Satyshodhak Samaj, Gandhian Principles 4) Thoughts of Mahatma Phule on social reforms, 5) Work of Chhatrapti Shahu Maharaj
	HUMAN GEOGRAPHY	**1) Racial conflicts** Human Race **2) Human life and adoption to environment** Human life and adoption to environment **3) Human resources planning** population and its adverse effect on resources **4) Causes and consequences of migration** Migration
	Botany	Medicinal, legume, ornamental plants and their importance in human welfare
	Zoology	Visit to dairy industry, fishing centre Paper XII: Medical Zoology- Study of Diseases-HIV, T B, Swine Flu, Dengue, Elephantiasis
	Microbiology	**Clinical Microbiology** 1. Basic concept 2.Collection, handling & transportation of specimen 3. Methods of diagnosis of diseases: Microscopic, Cultural, Biochemical & Serological **Unit IV Pathogenecity** **1.** Definition & Concept 2. Basic principles of Microbial adhesion 3. Mechanism Bacterial invasion 4. Bacterial toxins – Types & mechanism of action **A) Definitions –** Infections, etiology, etiological agents, disease, pathogen, incubation period, fomite, pathogenecity, virulence, morbidity rate, mortality rate, opportunistic pathogen, epidemiology, prophylaxis, carriers, host. **B) Types of disease** – epidemic, endemic, pandemic & sporatic. **C) Types of infections** – Primary, Secondary, acute, chronic, reinfection, cross infection, Mixed infection, congenital, local, and generalized. **D) Methods of transmission of disease –** 1. Inoculation 2. Ingestion

		3. Contact 4. Inhalation **E) Prophylactic measures for microbial diseases** a) Chemoprophylaxis b) Immunoprophylaxis (Active & Passive)
	PHYSICAL EDUCATION Paper - IX	Sport Compaction, Origination
	Hindi	Aage Rasta Band Hai, sangharsh, Fulva, Bali, bajar Me ramdhan, Saso ka tar, faisala(Story) Daud (Novel)
	MARATHI	आपण माणसात जमा नाही - राजन गवस
B A III/ B Sc III	**POLITICAL SCIENCE**	1) Politics and Morality
	HISTORY	1) Jainism: life and work of Bhagwan Mahavir . 2) Buddhism: life and work of Gautam Buddha 3) Work of Akbar: Din- e-Ilahi Religion 4) Internal policy of Bismark
	ENGLISH **P.8. British Literature**	1) Pride and Prejudice by Jane Austen
	P 9. **Indian Literature in English**	1) Final solutions By Mahesh Dattani 2) Roots and Shadows BY Shashi Deshpande 3) The God of Small Things by Arundhati Roy
	ECONOMICS	1) Economic Equality
	URBAN GEOGRAPHY	**Urban problems and urban planning** Urban morphology, urban problem and urban planning
	MARATHI	महानुभावीय वाङ्मय, वारकरी संप्रदायातील संतकवी. साहित्यमूल्ये शाहिरी वाङ्मय, पंडिती वाङ्मय,बखर वाङ्मय...इ.
	BOTANY	Role of biotechnology, transgenic plants, tissue culture
	ZOOLOGY	Survey of socioeconomic importance of animals
	Microbiology	Microbes in toxic environments like acid mine drainage, coal desulphurisation ,wastes containing cyanides, xenobiotics, pesticides and chemicals, heavy metals, hydrocarbons and radio isotopic materials Concept of autotrophy – an example of extreme synthesis Biodeterioration-concept, biodeterioration of wood, stonework, pharmaceutical products, rubber, plastic, paints, lubricants, cosmetics, & control of

		biodefenoration Microbial fossils
	PHYSICAL EDUCATION	Balanced diet, Malnutrition and disease due to deficiency Yoga Physical Health Nature Of primitives, preventive and curative aspects of Physical Health tackled through Yogic practices. Yoga and Mantel health :-nature of problems in mental health Primitive, Preventives and Curative aspects of mental health health through Yogic practices. Social Recreation Clubs, parties, Social Evenings.
	Hindi	**Juthan(biography)**
M A I/ MSc I	**POLITICAL SCIENCE**	1) Nature and Significance of Political Theory, 2) Feminism, Multiculturalism, Right to equality, 3) Raja Ram Mohan Roy, Mahatma Gandhi, Political Theory of Dr. Babasaheb Ambedkar
	ENGLISH **Indian English Literature**	1) Thirty Days in September by Mahesh Dattani 2) Brides are not for Burning by Dina Mehata 3) Sanskara By U R Anantmurty
	HISTORY	1) Meaning and definitions of History 2) Socialism, Nationalism, civil Rights Movement, Jainism and Budhism , Ashok and his Dhamma
	MARATHI	युगांतर-यशवंतराव चव्हाण, मधुकर -विनोबा भावे
	Hindi	**Lokrun (Novel)**
	CHEMISTRY	**Bio-chemical and food analysis** **Standardization and quality control of different dosage form** **Role of FDA in pharmaceutical industry.**
	Microbiology	Immunology and Immunotec Bioinformatics and Biometry Nanobiotecnology Health care and Diagnostic Microbiology Waste Management Technology Genetically engineered organisms in everyday life Pharmaceutical microbiology Biomedicines, Nanomedicines, antibiotics and its resistance Bioprocess Technology and Fermentation Technology
MAII/ MSc II	**POLITICAL SCIENCE**	1) Human Rights, Feminist Movement
	ENGLISH	1) Tara by Mahesh Dattani 2) The Old Man and the Sea by Earnest Hemingway

	HISTORY	**1) Bhakti Movement:** Bhakti culture in Mhaharahtra, work Marathi saints, **2) Maharashtra Dharma:** concept, Rise and its spread **3) Social and religious thoughts of Mahatma Phule**
	CULTURAL GEOGRAPHY	Concept of culture, base of cultural diversity, race religion, language, concept of cultural hearts and cultural diffusion, Socio-cultural development and well ing indicators, cultural pattern of rural and urban socity, Ethinic traits,world cultural relems
	MARATHI	महाराष्ट्रातील संप्रदाय आणि साहित्यनिर्मिती आधुनिक मराठी वाङ्मयाचा इतिहास कौंचवध - वि.स.खांडेकर
	CHEMISTRY	**Bio-chemical and food analysis** **Standardization and quality control of different dosage form** **Role of FDA in pharmaceutical industry.**
	Hindi	**Saket, Kurukshetra (mahakavya)**

Professional Ethics

Class	Subject & Text	Topic
B A I/ BSc I	**HISTORY**	Shivaji's Administrative system and Policies a) Civil b) Military c) Judicial d) Religious
	PHYSICAL EDUCATION	1)Na) Meaning of principles b)Principle of education c)Principle of Physical Education d) Meaning of Education and Physical Education 2) Physical Training ,Sport and Game
	CHEMISTRY	**Qualitative and Quantitative analysis, Preparations and Estimations**
B A II/ B Sc II	**PHILOSOPHY**	**Unit 1 Definition and subject matter of ethics :** Characteristics of ethics Religion and morality Descriptive and Normative ethics. Customary and Reflective morality.

		Unit 2 Basic moral concepts : Good and moral right, Instincts, Desire, will and Reason. **Unit 3 Major concepts concerns in Indian normative ethics:** Dharma, Rta, Rna, Preyas, Shreyas, Krupa(Grace), Theory of Karma ,Niskama Karma, Nature and types of Purusarthas. **Unit 4 a) Buddhist ethics:** The four noble truths The Eight fold path. **b) Carvak's hedonism and ethical views.** **Unit 1 Major trends in Western normative ethics :** **a)Teleology: (Mill and Bentham)** Hedonism, Egoism and Utilitarianism **b)Deontology: (Kant)** Good will and Duty, Categorical Imperative, Intuitive ethics. **Unit 2 Virtue ethics :** Major four virtues (Plato) Eudemonism (Plato) Eudemonism (Aristotle) **Unit 3 Theories of Punishment :** 1) Preventive theory 2) Retributive theory. 3) Reformative theory. **Unit 4 Ethical issues concerning right to Life :** Female feticide, Euthanasia, Ecology, Homosexuality and it's types
	Botany	Ornamental, medicinal plants, food, fodder plant
	CHEMISTRY	**Spectroscopic Methods, Volumetric Analysis, Gravimetric Analysis,** **Preparations and Estimations, Qualitative and quantitative analysis**
B A III/B Sc III	**ECONOMICS**	1) Trusteeship Concept by Mahatma Gandhi

	PHYSICAL EDUCATION	Paper – XI - Balanced diet, Malnutrition and disease due to deficiency Paper – IX - Yoga Physical Health Nature Of primitives, preventive and curative aspects of Physical Health tackled through Yogic practices. Yoga and Mantel health :-nature of problems in mental health Primitive, Preventives and Curative aspects of mental health health through Yogic practices.
	Botany	Plant biotechnology, plant tissue culture, Nursery, Horticulture and gardening
	Zoology	Paper IV: Applied zoology- Sericulture, Apiculture, Poultry science, Dairy Science, Vermiculture, Fishery, pearl culture Piggary
		Paper VI: Economic zoology
		Paper XII: Biostatistics, Bioinformatics and medical zoology
	CHEMISTRY	**Bioinorganic Chemistry, Fertilizers, Spectroscopic Methods,** **Organic synthesis, Analytical techniques, Data Analysis Chemical Safety and Ethical Handling of Chemicals, Nanomaterials** **Composite materials, Metals and Semiconductors, Corrosion and Passivity, Heterocyclic compounds, Carbohydrates,Vitamins and Synthetic dyes, Agrochemicals, Soaps and Detergents, Synthetic Polymers, Sugar and Alcohol Industry, Synthetic Reagents, Chromatography, Chemistry of cosmetics, Chemistry of perfumes , Fermentation, Textile Chemistry, Preparations and Estimations, Qualitative and quantitative analysis**
	Hindi	**Prayojanmulak hindi, Translation, letter Writing, Advertisement**
M A I/MSc I	CHEMISTRY	Inorganic materials, **Colloids and macromolecules, Statistical data analysis, Chromatographic Methods Analytical Techniques, Computer for Chemists, Bioinorganic Chemistry, Methodologies in organic synthesis, Bio-Physical Chemistry, Medicinal Chemistry, Ore and alloy analysis,** **Catalyzed reactions, Preparations and Estimations, Qualitative and quantitative analysis, Advanced Separation Techniques**
	Microbiology	Biosafety, Bioethics and IPR a) Guidelines for safety in microbiological processes, Good manufacturing practices, biosafety levels of infectious

		agents. b) Regulatory practices, process validation, Quality assurance. c) Bioethics – concept, case study, stem cells, GM foods and Nanobiotechnology. Food adulterations and contaminations of foods with harmful microorganisms. Food laws and standards, Indian and international food safety laws and standards.BIS Laboratory Services, BIS product certification and licensing, BIS Quality Systems certification. Quality and safety assurance in food and dairy industry, Sanitation and regulation in food and dairy industry, food and dairy arithmetic standardization of products & costing. **Types and Characterization of Industrial wastes**: Types of industrial wastes, General Characteristics of different wastes- pH, Suspended solids, volatile solids, BOD, COD, Organic Carbon etc. **Microbiology and biochemistry of waste water treatment**: **a**. Introduction, types of biological treatments, impact of pollutants on biotreatment, bio-augmentation, basic concepts of waste water treatment **b**. Microorganisms in waste water treatment: source of organisms, enrichment and acclimatization, isolation, treatability tests, mass scale production, mixed cultures. **c**. genetically engineered microorganisms, preservation, applications and future prospects **Working of treatment systems and their analysis**: **a**. Reaction and kinetics, mass balance analysis, reactor types, hydraulic characters of reactor, selection of reactor type **B.Critical** operation parameters like DO, HRT, Mean Cell Residence Time (MCRT), F/M ratio, tank volume, flow rate, BOD, COD, temperature. Malfunctioning of treatment systems due to shock loading, hydraulic loading and remedial measures adapted. **C.**Hazardous waste management, low cost waste treatment systems,treatment of distillery, textile, paper and Pulp and cyanide wastes

		1.Waste disposal control and regulations: a. Water pollution control, regulation and limits for disposal into Lakes, rivers, oceans, and land. b.Environmental Impact Assessment (EIA), Environmental Audit (EA) c.Water Tracing: need, tracing problems, criteria for selection of tracer, tracing method, significance. 1 Novel Methods of Pollution Control : Vermicomposting, treatment using aquatic plants, root zone process 2. Eutrophication, El Nino, global warming, acid rains and significance 3. Enzymes and Pollution – Monooxingenases, aminotransferases, bioenergetic enzymes, other metabolic enzymes, enzymatic Rectifications.
	Hindi	**Prayojanmulak hindi, Advertisement**
MAII/MSc II	CHEMISTRY	**Analytical Techniques, Stock feeds analysis , Plant analysis** **Pesticides and insecticides analysis, Cosmetics Analysis, Analysis of face powder, Analysis of Deodorants and antiperspirants, Cement ,Glass and Glass-Ceramics , Analysis of Paints and Pigments, Analysis of Soaps, Analysis of Detergents, Body Fluid Analysis, Drug Analysis, Clinical Analysis, Forensic Analysis, Pharmaceutical Analysis, Test and assay of raw materials and finished products , Preparations and Estimations, Qualitative and quantitative analysis, Project or Industrial in plant training**
	Microbiology	Applications of Genetic engineering & legal aspects in genetic engineering **Quality control in Microbiology** Role of microbiology laboratory, Specimen handling, laboratory records, safety regulation, basic procedure of diagnostic microbiology laboratory, Rapid methods for identification of microorganisms, Principles, working and applications of instruments in medical microbiology. **Biofertilizers** 1.Historical development, concept, scope, merits and limitations of

		Biofertilize Systematic study of major groups of microorganisms as biofertilizers, Nitrogen fixing bacteria, Phosphate solubilizing microbes, blue green algae and mycorrhizae. 2.Production of biofertilizers, screening, selection of potential strains Laboratory and large scale production of bacterial, algal and fungal biofertilizers 3. Methods of application and evaluation of biofertilizers. Green manure, organic matter, compost and composting, vermi-composting Production, economics and commercial viability of biofertilizers. Latest developments and future prospects of biofertilizer technology. **BIOPESTICIDES** 1. Biological control, its importance in crop pests and disease management, merits and demerits of biological control, history, distribution of biopesticides, role and status of biopesticides in pest control. 2.Pest control for crop protection by using biocontrol agents like bacteria spore formers and non-spore formers) with special reference to *B.thuringiensis* and *B. sphericus*, mosquito control by fungi (culicinomyces, langenidium and coelomomyces), NPV of *Heliothis sp.*,Toxin produced by bacteria and fungi, their chemistry, mode of action,pest control and safety. 4. Commercial production of *B.thuringiensis,* NPV, fungal pathogens, their formulations and applications. 5. Development of genetically modified crop plants for control of insect pests, *B.thuringiensis* gene transformation, transgenic crop plants. 6. Economic and future prospects of biopesticides. 7. Biopesticides, their use and significance in the developing era of ecological approaches of insect control and plant protection.
	Hindi	**Translation**