Syllabus Book

1st to 6th Semester

B. Sc.

Microbiology

P P Savani University

School of Sciences

Effective From: July 2022
Authored

by: P P Savani University

P P Savani University
School of Sciences

Syllabus, Teaching and Examination Scheme

Sem-1

Syllabus, Teaching and Examination Scheme

Course Name: Introduction to Biotechnology I

Course Code: SSBT1010

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				**Examination Scheme (Marks)**		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To introduce the students with the field of Biotechnology.
To impart knowledge of classification of Plant and Animal kingdom, viruses and their life cycle, and the basics of Biotechnology.
To prepare the student for general biotechnology laboratory practices.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage(%)**
1	Plant-Introduction and outline classification of angiosperms, Gymnosperms, Pteridophytes, Bryophytes.	08	25
2	Animal- Introduction and outline classification non-chordates (Prolifera to Echinodermates) and chordates.	06	25
Section-II			
3	Viruses-Structure and Classification of Viruses Virions,Prions.	08	25
4	Biotechnology: definitions an interdisciplinary pursuit. Traditional and Modern Biotechnology, Introduction to Nanotechnology, Three central core components of Biotechnology Product safety, Public perception of Biotechnology, Scope of Biotechnology, Definition of genetic engineering & cloning.	08	25

Course Outcome :

CO-1: Acquire knowledge about the characters and life cycle of angiosperms, gymnosperms, pteridophytes, etc.
CO-2: Acquire Knowledge about important characters of the animal kingdom phylum along with examples.
CO-3: Acquire Information about virus structures, the classification of viruses, and the mechanism of propagation in the host cells.
CO-4: Acquire knowledge of about basic understanding of the multidisciplinary nature of Biotechnology and public perception of this emerging field.

Reference Books:

Title	Authors	Publisher
Elements of Biotechnology	P.K Gupta	Rastogi Publications
Basic Biotechnology	Ratledge C & Kristiansen B	Cambridge University Press
Biotechnology: Expanding Horizon	B.D Singh	Kalyani publishers
Microbiology	Prescott	McGraw-Hill
Zoology for Degree Students	V K Agarwal	S Chand Publishing

Course Name: Introduction to Biotechnology II

Course Code: SSBT1020

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To introduce the students with the field of microbiology.
To make student aware about various types of microorganism and their general characteristics.
To prepare the student for general microbiology lab practices and handling of microbes in laboratory.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage(%)**
1	Transgenics, Fundamentals of Plant Biotechnology: Transgenic plants (GM Papaya, GM Tomato), Biotic and abiotic Resistant Plants developed, BT Cotton, golden rice and BT Brinjal Pros and Cons	08	25
2	Fundamentals of Animal Biotechnology: Transgenic animals and Livestock Improvements, Dolly sheep, Stem cell research	06	25
Section-II			
3	Fundamentals of Microbial Biotechnology: Industrial important microbes and derived products.	08	25
4	Biotechnology Research in India. Biotechnology Institutions in India (Public and Private Sector), Biotech Success Stories Biotech Policy Initiatives Biotechnology in context of Developing World, Introduction to DBT, Autonomous institutions of DBT, Public sector undertaking of DBT, BITS-NET, Introduction to ABLE	08	25

Course Outcome :

CO-1: Students will acquire knowledge about Plant Biotechnology and certain species developed using biotechnological methods.
CO-2: Acquire knowledge various techniques and approaches applied for developing transgenic plants and animals.
CO-3: Learn to identify industrially important microbial strains, their maintenance, preservation techniques, and processing to get the product.
CO-4: Learn about need for biotechnology subjects in our everyday life, their regulation, and controlling bodies in India. Their various schemes are implemented from time to time for the upliftment of society.

Reference Books:

Title	Authors	Publisher
Elements of Biotechnology	P.K Gupta	Rastogi Publications
Basic Biotechnology	Ratledge C & Kristiansen B	Cambridge University
Biotechnology: Expanding Horizon	B.D Singh	Kalyani publishers
Microbiology	Prescott	McGraw-Hill
Zoology for Degree Students	V K Agarwal	S Chand Publishing

Course Name: Biotechnology Practical

Course Code: SSBT1030

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	4	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To introduce the students with the field of biotechnology.
To make student aware about various types of microorganism, various instruments used in microbiology laboratory, microscopy, laboratory practices, culture media and general characteristics.
To prepare the student for general microbiology lab practices and handling of microbes in laboratory.

Course Contents:

Section-I		
Module	**Content**	**Hours**
1	Principle working & uses of following laboratory instruments: Microscope, Incubator, pH meter.	3
2	Principle working & uses of following laboratory instruments: Colony counter, Autoclave, Weighing balance, Laminar Air Flow (LAF)chamber.	3
3	Principle working & uses of following laboratory instruments: Hot air oven, Inspissator and UV-VIS Spectrophotometer.	3
4	Centrifugation including ultra-centrifugation.	3
5	Preparation & sterilization of Glassware using Autoclave.	3
6	Preparation & sterilization culture media.	3
7	Methods of disposing the culture media, culture sand laboratory waste materials.	3
8	A visit to nearby Industry.	3
9	A visit to nearby Scientific laboratory.	3

Course Outcome :

CO-1: Learn about the principle, working, and applications of commonly used instruments in Biotechnology
CO-2: Knowledge about handling, calibration, and use of various instruments
CO-3: Students will acquire knowledge about Plant Biotechnology and certain species developed using biotechnological methods.
CO-4: Learn to dispose culture media, laboratory waste material.

Reference Books:

Title	Authors	Publisher
Elements of Biotechnology	P.K Gupta	Rastogi Publications
Basic Biotechnology	Ratledge C & Kristiansen B	Cambridge University Press
Biotechnology: Expanding Horizon	B.D Singh	Kalyani publishers
Microbiology	Prescott	McGraw-Hill
Zoology for Degree Students	V K Agarwal	S Chand Publishing

Course Name: Introduction to Microbiology I

Course Code: SSMB1010

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:
To learn about basic concepts of Biotechnology, scope and applications.
To make students well conversant with current scenario of Biotechnology in India and across world, students will learn basic structures of Algae, Fungi.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	History and scope of Microbiology, Introduction to microorganisms, Discovery, Types of microbes, Golden period of microbiology, Scope and future of microbiology	08	25
2	Bacteria: General characteristics of Bacteria, Achaea, Cyanobacteria. Classification and economic importance	08	25
Section II			
3	Fungal Diversity: General characteristics of fungi including habitat, distribution, nutritional requirements, fungal cell ultra-structure, Thallus organization and aggregation, Classification and Economic importance of fungi	06	25
4	Algal Diversity: General characteristics of algae including occurrence, Thallus organization, algae cell ultra-structure, Classification and Economic importance of algae	08	25

Course Outcome :

CO-1: Students will learn about the various field in microbiology and the future scope of microbiology
CO-2: Students will gain knowledge about the morphology structure, characteristics of algae, and their significance
CO-3: Students will gain knowledge about the morphology structure, characteristics of algae, and their significance.
CO-4: Students will gain knowledge about the morphology structure, characteristics of fungi, and their significance.

Reference Books:

Title	Authors	Publisher
Microbiology	Prescott	McGraw-Hill
Microbiology	Peleczar	Tata McGraw-Hill
General Microbiology	Stanier RY, Ingraham JL, Wheelis ML, and Painter PR	5th edition. McMillan (2005)
Introduction to Microbiology	Tortora Gerad	Benjamin Publishers
Experiments in Microbiology, Plant	Aneja	New Age Publisher

Course Name: Introduction to Microbiology II

Course Code: SSMB1020

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To learn about basic concepts of Microbiology, scope and applications.
To make student aware about various types of microorganism, various instruments used in microbiology, microscopy, various types of Microscopes and handling techniques.
To make students learn about general characters of Prokaryotes and its identification, general characteristics.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage(%)**
1	Microbial Classification Systems of classification: Binomial Nomenclature, Whittaker's five kingdom and Carl Woese's, Three kingdom classification systems and their utility, Bacterial systematics, Bacterial Nomenclature	08	25
2	Major cell Morphologies, Biology, Cell size and significance of smallness, Significance of surface to volume ratio, Size, Shape and arrangement of Bacterial cells, Lower limits of cell size.	06	25
Section-II			
3	Bacterial cell surface appendages, Pili, Fimbrae, Cell inclusions, Gas Vesicles, Endospores, Nucleoid, Chemotaxis, Structure responsible for motility in bacteria, Types of motility	08	25
4	Concept of Microscopy-resolution, simple and compound microscopy, various types of microscopy, Electron Microscopy-TEM, SEM	08	25

Course Outcome :

CO-1: Knowledge of the basics of the classification of various microorganisms in the earlier and current eras. Students will be able to name or classify bacteria by taxonomic study, etc.
CO-2: Acquire information about the differentiated microbes based on their morphology and categorize them as prokaryotes or eukaryotes.

CO-3: Knowledge of the major differences between prokaryotic and eukaryotic microbes based on their internal structure. Moreover, students will also be able to differentiate/recognize microbes based on their internal structures.

CO-4: Knowledge of the acquired specialization in microscopic techniques for the identification of microbes. Moreover, students could classify and differentiate microbes on the basis of electron and phase-contrast microscopy. Students will be able to handle electron microscopes and could become technical specialists significance.

Reference Books:

Title	Authors	Publisher
Microbiology	Prescott	McGraw-Hill
Microbiology	Pelczar	Tata McGraw-Hill
Experiments in Microbiology, PlantPathology and Biotechnology	Aneja	New Age Publisher
Introduction to Microbiology	Tortora Gerad	Benjamin Publishers
General Microbiology	Stanier RY, Ingraham JL, Wheelis	5thedition. McMillan (2005)

Course Name: Microbiology Practical

Course Code: SSMB1030

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	4	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To learn about basic concepts of Microbiology, scope and applications.
To make student aware about various types of microorganism, various instruments used in microbiology laboratory, microscopy, laboratory practices, culture media and general characteristics.
To prepare the student for general microbiology lab practices and handling of microbes in laboratory.

Course Contents:

Section-I		
Module	**Content**	**Hours**
1.	Introduction to Microbiology Good Laboratory Practice and Biosafety	3
2.	To study the principle and applications of important instruments: Biological safety cabinets, autoclave, incubator, BOD incubator	3
3.	To study the principle and applications of important instruments: Hot air oven, light microscope, pH meter) used in the Microbiology laboratory	3
4.	Sterilization of glassware, medium using autoclave and assessment for sterility.	3
5.	Sterilization of heat sensitive material by membrane filtration and assessment for Sterility	3
6.	Preparation of Nutrient broth and Nutrient agar medium	3
7.	Demonstration of the presence of microflora in the environment by exposing nutrient agar plates to air	3
8.	Microscopic observation of morphological characteristics of Protozoa/Yeast using compound microscope	5
9.	Study of bacterial motility by hanging drop techniques	5
10.	Preparation of culture media for microbes (bacteria, fungal, algal cultivation)	5

Course Outcome :

CO-1: Introduction to Microbiology Good Laboratory Practices and Biosafety
CO-2: Acquire basic skills to operate various microbiological laboratory instruments and also could train them for future as a technical professional.
CO-3: Acquire the skills for isolation of microbes independently from environmental, clinical and food, and

industrial samples.

CO-4: Basic microbiological skills about streaking, spreading, and serial dilution which is considered the backbone of microbiology practicals with perfection which could they apply in hospitals, industries, and water samples.

Reference Books:

Title	Authors	Publisher
Microbiology	Prescott	McGraw-Hill
Microbiology	Peleczar	Tata McGraw-Hill
General Microbiology	Stanier RY, Ingraham JL,Wheelis ML, and Painter PR	5th edition. McMillan (2005)
Introduction to Microbiology	Tortora Gerad	Benjamin Publishers

P P Savani University
School of Sciences

Syllabus, Teaching and Examination Scheme

Course Name: Introduction to Environment Science I

Course Code: SSES1010

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To study about environment and ecosystems.
To study about different types of natural resource.
To develop Knowledge and concept of biodiversity and its conservation, basic knowledge and concept of causes, effect and control of different type of environmental pollution.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	Multidisciplinary nature of environmental studies a) Definition, scope and importance b) Need for public awareness.	06	20
2	Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems. Forest resources; Water resources; Mineral resources; Food resources; Energy resources; Land resources	08	25
Section-II			
3	Ecosystems Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids	08	30

4	Biodiversity and its conservation Introduction – Definition: genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. Indian Biodiversity & its importance (HotSpots) Threats to biodiversity: habitat loss, poaching of wildlife, man-wild life conflicts. Endangered and endemic species of India Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity	08	25

Course Outcome :

CO-1: Acquired fundamental knowledge of different aspects of the environment and local, regional, and global environmental problems.
CO-2: Understanding the factor affecting the need to find out the sustainable usage and maintenance of natural resources.
CO-3: having information about different ecosystems, food web, food chain, and ecological pyramids
CO-4: : Knowledge about basic concepts of biodiversity and its conservation

Reference Books:

Title	Authors	Publisher
The Biodiversity of India,	Bharucha Erach,	Map in Publishing Pvt. Ltd., Ahmedabad–380013, India
Environmental Biology,	Agarwal, K.C.	Nidi Publ. Ltd. Bikaner.
Fundamentals of Ecology.	Odum, E.P.	W.B. Saunders Co. USA, 574p
Essentials of Physical Chemistry	A.Bahl, B.S.Bahl and G.D.Tuli	S. Chand Publishing
Microbiology Introduction	Tortora Gerad	Benjamin Cumming
Textbook of Engineering Chemistry (4th Edition)	R.Gopalan, D.Venkappaya,S. Nagarajan	Vikas Publishing house Ltd.
Concise Inorganic Chemistry	J.D. Lee	Wiley India
Engineering Chemistry (16thEdition)	P.C. Jain and Monika Jain	Dhanpat Rai publishing Company.

P P Savani University
School of Sciences

Syllabus, Teaching and Examination Scheme

Course Name: Chemistry I

Course Code: SSES1020

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:
To present sound knowledge of chemistry fundamentals, enriching student to understand the role of Chemistry in the field of science.
To inculcate habit of scientific reasoning to do the task rationally.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Structure of Atom:** Atom, sub-atomic particles, Rutherford's atomic model, Mosley's determination of atomic number, Electromagnetic spectrum, Continuous spectrum, Atomic spectra, Atomic spectrum of hydrogen, Quantum theory of radiation, Explanation to Photoelectric effect, Compton effect, Bohr's model of atom, Zeemeffect	6	25

2	**Chemical Bonding and Structure of Molecules:** General terms: Chemical bond, valence, valence electrons, Bonding and Non bonding electrons, Lewis symbols, Octet rule. Ionic bond: Definition, Condition for formation of ionic bond, Factors governing formation of ionic bond, Characteristics of ionic compounds. Covalent bond: Definition, conditions for covalent bond formation, examples, General characteristics of covalent compounds, valence bond approach, Concept of hybridization, Hybridization and shape of molecules, Limitations of Valence bond theory, VSEPR theory. Hydrogen bonding: Definition, conditions for H-bond formation, examples, Types of H-bonds, Characteristics of H-bonded compounds. Metallic bond: Definition, The Electron sea model	8	25
	Section-II		
3	**Acid and Bases:** Basic properties of acids and bases, Arrhenius concept, Lowry Bronsted Concept, Lewis concept of acids and bases, Derive equation For relative strength of strong acids and bases, Calculate the relative strength of weak acids and bases, pH of solutions, measurement of pH, pH scale, common ion effect, Buffer solutions, Discuss how the addition of a small amount of acids or bases not affects the pH of buffer solutions, derivation of Henderson equation and its applications; buffer capacity, buffer range, buffer action and applications of buffers in analytical chemistry and biochemical processes in the human body. Numerical Problems.	8	25
4	**Colloids** Lyophilic and lyophobic sols, Characteristics of lyophilic and lyophobic sols, preparation of sols, Purification of sols, Dialysis, Properties of sols, stability of sols, coagulation or flocculation of colloids, gold number, zeta potential, application of colloids.	8	25

Course Outcome :

CO-1: Acquired fundamental knowledge of solution preparation which is the basic and essential criteria that students must understand during their graduation
CO-2: Basic understanding of liquid state with various forces, and characterization of physical properties should be known
CO-3: having information about colloid and colloidal solutions with coagulation and flocculation with their

stability and applications is provided

CO-4: Knowledge about the properties of acid and bases along with their pH parameters will be applicable

Reference Books:

Title	Authors	Publisher
The Biodiversity of India,	Bharucha Erach,	Map in Publishing Pvt. Ltd., Ahmedabad 380013, India
Environmental Biology,	Agarwal, K.C.	Nidi Publ. Ltd. Bikaner.
Fundamentals of Ecology.	Odum, E.P.	W.B. Saunders Co. USA, 574 p
Essentials of Physical Chemistry	A.Bahl, B.S.Bahl and G.D.Tuli	S. Chand Publishing
Microbiology Introduction	Tortora Gerad	Benjamin Cumming
Textbook of Engineering Chemistry (4th Edition)	R.Gopalan,D.Venkappa, S. Nagarajan	Vikas Publishing house Ltd.
Concise Inorganic Chemistry	J.D. Lee	Wiley India

P P Savani University
School of Sciences

Syllabus, Teaching and Examination Scheme

Course Name: Environment & Chemistry Practical I

Course Code: SSES1030

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	4	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:
To present sound knowledge of chemistry fundamentals, enriching students to understand the role of Environment & Chemistry in the field of science.
To inculcate habit of scientific reasoning to do the task rationally.

Course Contents:

Section-I		
Module	**Content**	**Hours**
1	Water & waste water quality assessment experiment.	6
2	Analysis of salts/ions present in hard & soft water.	6
3	Visit to Local Polluted Site -Observations and Remedial Measures.	6
4	Visit to In situ or Ex situ Conservation Centre/ Social Service Organization/ Environmental Education Centre.	12
Chemistry Practicals		
1.	Introduction to chemistry laboratory – Equipment, common laboratory Glasswares and their uses. General awareness on handling of chemicals and waste disposal in laboratory, fire hazards, eye protection, contact and ingestion hazard.	6
2.	Prepare 0.1N NaOH solution and standardize it by given oxalic acid solution.	6
3.	Determination of dissociation constant of strong acid by pH metric method.	6
4.	Surface tension measurements of different solvents by stalagnometer.	6
5.	Determine the precipitation values for arsenious sulphide sol.	6

Course Outcome :

CO-1: Acquired fundamental knowledge of solution preparation which is the basic and essential criteria that students must understand during their graduation.
CO-2: Basic understanding of liquid state with various forces, and characterization of physical properties should be known.
CO-3: Learn to operate certain chemistry equipment like, pH meter, stalagmometer.
CO-4: Learn analysis of water solution and testing of hard and soft water sample.

Reference Books:

Title	Authors	Publisher
The Biodiversity of India,	Bharucha Erach,	Mapin Publishing Pvt. Ltd., Ahmedabad–380013, India
Environmental Biology,	Agarwal, K.C.	Nidi Publ. Ltd. Bikaner.
Fundamentals of Ecology.	Odum, E.P.	W.B. Saunders Co. USA, 574p
Essentials of Physical Chemistry	A.Bahl,B.S.Bahl and G.D.Tuli	S. Chand Publishing
Microbiology Introduction	Tortora Gerad	Benjamin Cumming
Textbook of Engineering Chemistry (4th Edition)	R.Gopalan,D.Venkappaya, S.Nagarajan	Vikas Publishing house Ltd.
Concise Inorganic Chemistry	J.D. Lee	Wiley India

Sem-2

Course Name: Cell Biology I

Course Code: SSBT1040

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:
To learn about cell ,Cell Theory, chemical composition of cells and its various organelles.
To develop basic understanding for cellular structures and their functions to make students understand process about reproduction, cell division and genetics.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	a) Discovery of cells, Basic properties of cells, Fundamental classes of b) Cells: Prokaryotic (Bacterial cell, Archaeal cell),Eukaryotic cells (Plant and Animal), Viruses	8	25
2	c) Structure and various models of biological membranes, d) Organization and Fluid Mosaic Model, membrane as a dynamic entity, cell recognition and membrane transport.	6	25
Section-II			
3	Structure, composition and functions of: a) Membrane Vacuolar system, and cytoskeleton, Endoplasmic reticulum b) Golgi complex	8	25
4	Structure, composition and functions of: e) Lysosomes f) Ribosomes g) Mitochondria h) Chloroplasts i) Nucleus	8	25

Course Outcome :

CO-1: Students will learn about the various field in microbiology and the future scope of microbiology
CO-2: Students will gain knowledge about the morphology structure, characteristics of Prokaryotic and Eukaryotic cells and their significance.
CO-3: Students will gain knowledge about the morphology structure, characteristics of microbes like viruses and bacteria, and their significance
CO-4: Students will gain knowledge about the morphology structure, characteristics of fungi, and their significance

Reference Books:

Title	Authors	Publisher
Cell and Molecular Biology: Concepts and Experiments.	Karp, G. 2010.	6thEdition. John Wiley & Sons. Inc.
Cell and Molecular Biology.	De Robertis, E.D.P. and De Robertis, E.M.F.2006.	8th Edition. Lippincott Williams and Wilkins, Philadelphia
Cell Biology	Bhatia KN	True man
The Cell: A Molecular Approach	Geoffrey M. Cooper, Robert E. Hausman	Sinauer

Course Name: Cell Biology II

Course Code: SSBT1050

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To learn about cell, Cell Theory, chemical composition of cells and its various organelles.
To develop basic understanding for cellular structures and their functions to make students understand process about reproduction, cell division and genetics.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage(%)**
1	The Cell cycle and its Regulation via various Checkpoints	8	25
2	Mitosis: cell division of somatic cell, Various Phases (Prophase, Prometaphase, Metaphase, Anaphase, Telophase), Forces required for Mitotic Movements, Cytokinesis.	8	25
Section-II			
3	Meiosis: cell division of gametic cell, Various Phases in Meiosis I and Meiosis II, Genetic recombination during Meiosis	8	25
4	Oncology: study of Cancer, types and molecular basis of cancer, Programmed cell death(PCD)	6	25

Course Outcome :

CO-1: Knowledge of the basics of the classification of various microorganisms in the earlier and current eras. Students will be able to name or classify bacteria by taxonomic study, etc

CO-2: Acquire information about the differentiated microbes based on their morphology and categorize them as prokaryotes or eukaryotes

CO-3: Knowledge of the major differences between prokaryotic and eukaryotic microbes based on their internal structure. Moreover, students will also be able to differentiate/recognize microbes based on their internal structures.

CO-4: Knowledge of the acquired specialization in microscopic techniques for the identification of microbes. Moreover, students could classify and differentiate microbes on the basis of electron and phase-contrast microscopy. Students will be able to handle electron microscopes and could become technical.

Reference Books:

Title	Authors	Publisher
Cell and Molecular Biology: Concepts and Experiments.	Karp, G. 2010.	6thEdition. John Wiley & Sons. Inc.
Cell and Molecular Biology.	De Robertis,E.D.P .and De Robertis,E.M.F.2 006.	8thedition.Lippincott Williams and Wilkins, Philadelphia
Cell Biology	Bhatia KN	Trueman
The Cell: A Molecular Approach	Geoffrey M.Cooper, Robert E. Hausman	Sinauer

Course Name: Cell Biology Practical

Course Code: SSBT1060

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	4	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:
To learn about cell and its organelles by appling a basic core of scientific and quantitative knowledge to enhance understanding of cell structure and function at the molecular level.
Utilize laboratory skills to enhance understanding of cell structure and function..
To develop basic understanding for cellular structures and their functions.

Course Contents:

Section-I		
Module	**Content**	**Hours**
1	Study of structure of Prokaryotic and Eukaryotic cells	3
2	To study osmosis	3
3	Demonstration of dialysis	3
4	To study of plasmolysis and de-plasmolysis	6
5	To study various Cell division stages in onion root tip	3
6	Estimation of reducing sugar by Cole's method	3
7	Estimation of reducing sugar by Folin-lowry's method	3
8	Quantitative estimation of amino-acids by Ninhydrin method	3
9	Microscopic observation of Drosophila compound eyes	3

Course Outcome :

CO-1: To Understand the different types of cell organelles present in plant and animal cells. They will also be able to differentiate prokaryotic and eukaryotic cells.
CO-2: To understand basic processes like diffusion, osmosis, dialysis, and plasmolysis
CO-3 : To Acquire and compare different cellular events that happen during cell division
CO-4: To learn the estimation of reducing sugar, protein, and amino acids.

Reference Books:

Title	Authors	Publisher
Cell and Molecular Biology: Concepts and Experiments.	Karp, G. 2010.	6th Edition. John Wiley & Sons. Inc.
Cell and Molecular Biology.	De Robertis, E. D. P. and De Robertis, E.M.F.2006.	8thedition. Lippincott Williams and Wilkins, Philadelphia
Cell Biology	Bhatia KN	Trueman
The Cell: A Molecular Approach	Geoffrey M. Cooper, Robert E. Hausman	Sinauer

Course Name: Fundamentals of Bacteriology I

Course Code: SSMB1040

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:
To introduce student to bacterial cell structure and taxonomy
To learn the bacterial growth kinetics, the most important aspects
To introduce student with various biological macromolecules
To develop the skill of isolating and culturing bacteria using various traditional bacteriology methods

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	Nutritional Requirement of Bacteria, Needs of Carbon, Hydrogen, oxygen, Electrons, Nitrogen, Phosphorus, Sulfur	6	25
2	Types of microbes based on nutritional requirement, Growth factors	8	25
Section-II			
3	Bacteriological techniques, Pure culture isolation: Streaking plate, serial dilution and plating methods; cultivation, maintenance and preservation/stocking of pure cultures	8	25
4	Concept and Types of Culture media: Chemical, Physical & Biological, Cultivation of anaerobic and aerobic bacteria	8	25

Course Outcome :

CO-1: To Acquire knowledge about what, why, and how much nutrients are required for microbial growth.
CO-2: To learn to differentiate among different microbes based on the source they are fed on
CO-3 : To Acquire knowledge regarding plating techniques, culture isolation, and how to store and preserve isolated pure culture
CO-4: To Acquire knowledge about using various media to grow various microbes

Reference Books:

Title	Authors	Publisher
Microbiology	Prescott	McGraw-Hill
Microbiology	Pelczar	Tata McGraw-Hill
Experimental Microbiology	Rakesh Patel	Aditya Prakashan
Experiments in Microbiology, Plant Pathology and Biotechnology	Aneja	New Age Publisher

Course Name: Fundamental of Bacteriology II

Course Code: SSMB1050

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To introduce student to bacterial cell structure and taxonomy.
To learn the bacterial growth kinetics, the most important aspects.To introduce student with various biological macromolecules.
To develop the skill of isolating and culturing bacteria using various traditional bacteriology methods.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage(%)**
1	Bacterial Cell cycle, Growth curve, Techniques for Bacterial Growth measurement.	8	25
2	Batch and continuous culture of micro-organisms (Chemostat, Turbidostat) Microbial Growth in natural environments, Bio-films.	8	25
Section-II			
3	Influence of Environment on Microbial growth (Solutes and water activity, pH, Temperature, Oxygen concentration, Pressure, Radiation)	8	25
4	Introduction to various biological, macromolecules: carbohydrates, lipids, proteins and nucleic acids. Staining Techniques of Bio molecules – Gram's Staining, Capsule Staining, Cell wall Staining, Granule Staining	6	25

Course Outcome :

CO-1: Students will learn about the bacterial cell cycle and growth curve..
CO-2: Acquire knowledge about measuring the growth by batch, continuous culture.
CO-3 : Learn about the effect of the external environment on the growth and modification of bacteria. Types of bacteria based on the external environment.
CO-4: Learn about the nature and structure of biomolecules that make the structure and other components of the bacterial cell.

Reference Books:

Title	Authors	Publisher
Microbiology	Prescott	McGraw-Hill
Microbiology	Pelczar	Tata McGraw-Hill
Experimental Microbiology	Rakesh Patel	Aditya Prakashan
Experiments in Microbiology, Plant Pathology and Biotechnology	Aneja	New Age Publisher

Course Name: Bacteriology Practical

Course Code: SSMB1060

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	4	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To introduce student to bacterial cell structure and taxonomy.
To learn the bacterial growth kinetics, the most important aspects. To introduce student with various biological macromolecules.
To develop the skill of isolating and culturing bacteria using various traditional bacteriology methods.

Course Contents:

Section-I		
Module	**Content**	**Hours**
1	Preparation of different media: Synthetic media & Complex media	3
2	Cultivation of bacteria using Broth culture	3
3	Cultivation of bacteria using Slant-culture	3
4	Cultivation of bacteria using Stab-culture	3
5	Enumeration of CFU by spread plate method	3
6	Enumeration of CFU by pour plate method	3
7	Isolation of pure cultures of bacteria	3
8	Gram Staining: principle & procedure	3
9	Preservation of bacterial cultures by various techniques	3
10	Motility by hanging drop method	3

Course Outcome :

CO-1: Students will learn to prepare various culture media.
CO-2: Acquire knowledge about cultivation of bacteria using different culture techniques.
CO-3 : Learn about the enumeration of CFU by various plating methods and how to prepare pure culture of bacteria.
CO-4: Learn about the various microbial techniques like, Gram staining, hanging drop method for mobility testing.

Reference Books:

Title	Authors	Publisher
Microbiology	Prescott	McGraw-Hill
Microbiology	Pelczar	Tata McGraw-Hill
Experimental Microbiology	Rakesh Patel	Aditya Prakashan
Experiments in Microbiology, Plant Pathology and Biotechnology	Aneja	New Age Publisher

P P Savani University
School of Sciences

Syllabus, Teaching and Examination Scheme

Course Name: Introduction to Environment Science II

Course Code: SSES1040

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:
To gain knowledge of different types of pollution, its cause and effects, using resource to develop a sustainable environment, and to know about what protective actions are made to prevent our environment and about population control and its ultimate benefits to the environment.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Environmental Pollution**: Definition • Cause, effects and control measures of:- a) Air pollution b) Water pollution c) Soil pollution d) Marine pollution e) Noise pollution f) Thermal pollution g) Nuclear hazards In situ, ex situ, bio remediation, Phyto remediation	08	25
2	**Social Issues and the Environment** a) From Unsustainable to Sustainable development b) Urban problems related to energy c) Water conservation, rain water harvesting, watershed management d) Climate change, global warming, acid rain, ozone layer Depletion, nuclear accidents and holocaust.	08	25
Section-II			
3	**Environment Protection Act.** a) Air (Prevention and Control of Pollution) Act. b) Water (Prevention and control of Pollution) Act c) Wild life Protect on Act d) Forest Conservation Act	06	30
4	**Human Population** a) Population growth, variation among nations.	08	20

	b) Population explosion – Family Welfare Program Impact of Climate change on Environment and human health		

Course Outcome :

CO-1: Acquire information regarding different pollution, its effect and control mechanism.
CO-2: Students will learn about sustainability, water conservation methods and environmental changes like climate change, global warming, acid rain, etc.
CO-3 : Learn to implement the various protection laws and would also contribute in developing new preventive measures for the environment.
CO-4: Learn about the synthesis and chemical properties of hydrocarbons

Reference Books:

Title	Authors	Publisher
The Biodiversity of India,	Bharucha Erach,	Mapin Publishing Pvt. Ltd., Ahmedabad 380013, India
Environmental Biology,	Agarwal, K.C.	Nidi Publ. Ltd. Bikaner.
Fundamentals of Ecology.	Odum, E.P.	W.B. Saunders Co. USA, 574p
Chemistry Reference/textbooks Book:		
Title	**Author/s**	**Publication**
Molecular biology of cells	David Baltimore, Harvey Lodish	S. Chand Publishing
A textbook of Organic Chemistry	Arun Bahl and B S Bahl	S. Chand
March's Advanced Organic Chemistry; Reactions, Mechanisms and structure	Michael Smith and Jerry March	Wiley Publications
Essentials of Physical Chemistry	A. Bahl, B.S. Bahl and G.D. Tuli	S. Chand Publishing
Atkins' Physical Chemistry 10thEdition	Peter Atkins and Julio de Paula	Oxford University Press

Course Name: Chemistry II

Course Code: SSES1050

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To study comprehensively about Alkane, Alkene, Alkyne, fundamental reaction mechanisms, about chemical Kinetics and Thermodynamics

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Hydrocarbons** Definitions (Bond distances, Bond angles, Torsion angle, Isomers) (i) Alkanes: Nomenclature, sources, methods of formation, Physical properties and chemical reactions. (ii) Alkenes: Nomenclature, method of preparation, Physical properties, Reactions of alkenes (iii) Dienes: nomenclature, classification of dienes methods of formation of Butadiene chemical reactions 1,2 and 1,4additions. (iv) Alkynes: nomenclature methods of formation, chemical reactions, electrophilic and nucleophilic addition reactions of acetylene.	8	27
2	**Fundamentals of reaction mechanism** Introduction, Homolytic fission, Heterolytic fission, Classification of reactions, Inductive effect, Electromeric effect, Resonance and mesomeric effect, Hyperconjugation and their applications, Effect of hybridization, Dipole moment, types of arrow, Electrophiles and Nucleophiles, Dipole moment, types of arrow, Electrophiles and Nucleophiles, Leaving groups, Basic idea about Carbocations, Carbanions, Free radicals and Carbenes and their stability, Types of addition reaction, Types of substitution reaction, Types of elimination reaction,	8	26

	mechanism of nucleophilic substitution reaction, mechanism of elimination reaction, steric hindrance, Hydride and alkyl shift, aldol condensation, Beckmann Rearrangement.		
	Section-II		
3	**Chemical Kinetics** Introduction, reaction rate, units of rate, rate laws, order of a reaction, molecularity of a reaction, Molecularity of a complex reaction, Differences between order and molecularity, Psuedo order reactions, zero order reaction, Derivation rate constant equation for zero order reaction, First order reaction, Derivation rate constant equation for first order reaction, Units of rate constant, Half -life of a reaction, Calculation of half-life of a first order reaction.	8	27
4	**Thermodynamics** Introduction, scope and limitation of thermodynamics, System, boundary, surroundings, homogeneous and heterogeneous systems, Types of thermodynamic systems, Intensive and extensive properties, state of system, Equilibrium and non–equilibrium states, Process, Types of processes: Isobaric, Isochoric, Isothermal, adiabatic, reversible and irreversible process, Heat and work, pressure-volume work, Internal energy, Sign conversations and units, First law of thermodynamics, enthalpy of system, Relation between ΔH and ΔE, Heat capacity, Specific and molar heat capacities, Concept of entropy, Entropy and its unit	6	20

Course Outcome :

CO-1: Learn about the synthesis and chemical properties of hydrocarbons.
CO-2: Learn the basics of reaction mechanisms such as electrophile, nucleophile, resonance, Inductive effects, etc.
CO-3 : Acquire knowledge of the Introduction, reaction rate, units of rate, rate laws, order of a reaction, molecularity of a reaction and Molecularity of a complex reaction.
CO-4: Obtain knowledge about the relation between enthalpy, types of thermodynamics, etc.

Reference Books:

Title	Authors	Publisher
The Biodiversity of India,	Bharucha Erach,	Mapin Publishing Pvt. Ltd., Ahmedabad 380013, India
Environmental Biology,	Agarwal, K.C.	Nidi Publ. Ltd. Bikaner.
Fundamentals of Ecology.	Odum, E.P.	W.B. Saunders Co. USA, 574p
Chemistry Reference/textbooks Book:		
Title	**Author/s**	**Publication**
Molecular biology of cells	David Baltimore, Harvey Lodish	S. Chand Publishing
A textbook of Organic Chemistry	Arun Bahl and B S Bahl	S. Chand
March's Advanced Organic Chemistry; Reactions, Mechanisms and structure	Michael Smith and Jerry March	Wiley Publications
Essentials of Physical Chemistry	A.Bahl, B.S. Bahl and G.D. Tuli	S. Chand Publishing
Atkins' Physical Chemistry 10th Edition	Peter Atkins and Julio de Paula	Oxford University Press

Course Name: Environment & Chemistry Practical II

Course Code: SSES1060

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	4	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To learn documentation related to the local area, polluted sites, about environment life and basic ecosystem, and determine different properties of solids & liquids, spectrophotometer, and application of chemical kinetics.

Course Contents:

Section-I		
Module	**Content**	**Hours**
1	Field work, Visit to a local area to document environmental assets i.e. river/forest/grassland/hill/mountain	5
2.	Visit to a local polluted site-Urban/Rural/Industrial/Agricultural	5
3.	Study of common plants, insects, birds.	5
4.	Study of simple ecosystems-pond, river, hill slopes, etc.	5
5.	Estimation of Dissolved Oxygen in Water sample	10
Chemistry Practicals		
1.	To determine the viscosity of a given solvents	6
2.	Identify and determine melting point, boiling point, and solubility of various organic compounds.	6
3.	Determination of concentration of unknown solution spectrophotometrically	12
4.	To study the monomolecular reaction in the hydrolysis of methyl acetate in 0.5 N HCl at different initial concentrations.	6

Course Outcome :

CO-1: Acquired fundamental knowledge of documentation on Local areas and compare them.
CO-2: Basic understanding to identify some basic plants, insects, etc. and explain basic ecosystem
CO-3 : Knowledge to measure melting point, boiling point, viscosity, solubility, etc. as well as to measure the level of water and can prepare solutions for that.
CO-4: Prior knowledge to measure different absorption levels with the use of a spectrophotometer. They also have ideas about chemical kinetics, rate of reaction, and equilibrium constant.

Reference Books:

Title	Authors	Publisher
The Biodiversity of India,	Bharucha Erach,	Mapin Publishing Pvt. Ltd., Ahmedabad–380013, India
Environmental Biology,	Agarwal, K.C.	Nidi Publ. Ltd. Bikaner.
Fundamentals of Ecology.	Odum, E.P.	W.B. Saunders Co. USA, 574p

Chemistry Reference/textbooks Book:		
Title	**Author/s**	**Publication**
Molecular biology of cells	David Baltimore, Harvey Lodish	S. Chand Publishing
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March's Advanced Organic Chemistry; Reactions, Mechanisms and structure	Michael Smith and Jerry March	Wiley Publications
Essentials of Physical Chemistry	A.Bahl, B.S.Bahl and G.D. Tuli	S. Chand Publishing
Atkins' Physical Chemistry 10thEdition	Peter Atkins and Julio de Paula	Oxford University Press

P P Savani University
School of Sciences

Syllabus, Teaching and Examination Scheme

Course Name: Linguistic Proficiency (A1 Elementary)

Course Code: CFLS1010

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To help learners ,

- To Raise, or ask questions about surrounded information and give answers about themselves and family.
- Understand very simple and daily routine information.
- Read and understand the very simple texts.
- Form simple sentences.
- Identify the usage of grammar and vocabulary

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Grammar & Vocabulary** **Grammar** • Present tense (Simple, Continue, Perfect) • Past tenses (Simple, tobe) • Future (Simple) • Modals (Can, could, may, might, must, should, would) • -ing and the infinitive (Verbs+ to +infinitive and verbs+-ing) • Identification of parts of speech • there and it • Questions and word Order **Vocabulary** Numbers (cardinal/ordinal) and money • Countries, nationalities and languages • Times• Days, dates, months, years and seasons •Shops and places •Interests, sports and activities •Jobs •Rooms and furniture• Colours •Size and weight• Body parts and Appearance •Food ,meals, cooking •Weather • Transport • Health •Feelings and emotions• Street directions • Clothes (any 4 of these)	09	20

2	• **Listening** • Listening to my last holiday • Listening to my family, • Listening to my flat, • Listening to daily routine • Listening to shopping habits	04	20
3	• **Speaking** • Giving and taking introductions, personal information and family, getting to know each other, greetings, asking for directions and giving directions • Raising or asking and answering simple questions	06	20
4	• **Reading** • Reading of the content of the simpler texts like labels, posters, catalogs, ads, menus, schedules, and guess the unknown words on a contextual basis. • Reading of information around us such as a noun cements, simple advertising, places and activities, job vacancies ,etc.	04	20
5	• **Writing** • Write about themselves • Form basic sentences • Write about hobbies • Writing short personal letters	07	20

Learning outcomes:

- At the end of the teaching, the students will be able to:
  understands familiar words and phrases that are directly related to everyday communication situations
- (Family, shopping, home, work), when people speak slowly and clearly
  understands short, simple texts and personal messages, can find information from simple daily texts
- (Labels, posters, directories, ads, job offers, menus, schedules)
  can ask questions about others and answer questions on themselves, can communicate in a simple
- language, if a partner helps her/him, can describe her/his family and other people, living conditions, education and work in a very simple way
- can write a very simple personal message or sentences

Assessment methods. Assessment criteria:

- **Listening** understands the simplest questions and the core of the information hears when the conversation partner speaks slowly and clearly and is ready to repeat.
- **Reading** – understands the content of the simpler texts (labels, posters, catalogs, ads, menus, job offers, schedules), guesses the unknown words on a contextual basis.
- **Speaking**- can answer questions about her/himself, speaks about her/himself, family, place of residence food using simple sentences.
- **Writing** – can write a short message or sentence
- **Grammar and Vocabulary** – can identify tenses and parts of speech

P P Savani University
School of Sciences

Syllabus, Teaching and Examination Scheme

Course Name: Linguistic Proficiency(A2)

Course Code: CFLS1010

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To help learners to

- Communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar topics and activities.
- Handle very short social exchanges.
- Read and understand the main ideas of simple texts.
- Structure ideas logically inwriting.
- Develop accuracy in the usage of grammar and vocabulary.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Grammar & Vocabulary Grammar** • Asking Questions—Question forms • Present simple vs present continuous • Past simple—Form and use • However, although, because, so, and time connectors • Will vs be going to—future • Present perfect or past simple? • Much, many, little, few, some, any—quantifiers • Subject and object pronouns, possessive pronouns and adjectives • Prepositions of movement **Vocabulary** Families, Restaurants and leisure venues, Personality, Biographical information, Buildings and monuments, Weather, Clothes and accessories, Large numbers, Hobbies, sports and interests, Education, Life changes and events, Animals, Descriptions of people, health, fitness, and illnesses (any 4 of these)	09	20
2	**Listening** • Listening to factual information,	04	20

	• Listening to the weather forecast, • Listening to the content of guidelines, • Listening to everyday communication situation of the family, shopping, home, work, • Listening to simple pair or group talks		
3	**Speaking** • **Giving and taking** introductions, personal information and family, getting to know each other, simpler personal information, greetings, asking for directions and giving directions, accommodation establishments, booking a room, describing weather, seasons, birds, animals, plants • **Descriptions of Food and drink** including Cafes, restaurants, and other catering establishments; booking a table, ordering, etc.	06	20
4	**Reading** • **Reading of the content of the simpler texts** like labels, posters, catalogs, ads, menus, job offers, schedules, and guess the unknown words on a contextual basis. • **Reading of information around us** such as noun cements, advertising, places and activities, job vacancies, etc.	04	20
5	**Writing** • Description of the day • Writing messages & experiences • Writing on familiar topics • Writing short personal letters	07	20

Learning outcomes:

At the end of the teaching, the students will be able to:

- At the end of the teaching, the students will be able to:
  understands familiar words and phrases that are directly related to everyday communication situations
- (Family, shopping, home, work), when people speak slowly and clearly
  understands short, simple texts and personal messages, can find information from simple daily texts
- (Labels, posters, directories, ads, job offers, menus, schedules)
  can ask questions about others and answer questions on themselves, can communicate in a simple
- language, if a partner helps her/him, can describe her/his family and other people, living conditions, education and work in a very simple way
- can write a very simple personal message or sentences

Assessment methods. Assessment criteria:

- **Listening** understands the simplest questions and the core of the information hears when the conversation partner speaks slowly and clearly and is ready to repeat.
- **Reading** – understands the content of the simpler texts (labels, posters, catalogs, ads, menus, job

offers, schedules), guesses the unknown words on a contextual basis.

- **Speaking**- can answer questions about her/himself, speaks about her/himself, family, place of residence food using simple sentences.
- **Writing** – can write a short message or sentence
- **Grammar and Vocabulary** – can identify tenses and parts of speech

P P Savani University
School of Sciences

Syllabus, Teaching and Examination Scheme

Course Name: Linguistic Proficiency(B1)

Course Code: CFLS1010

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To help learners to

- Demonstrate a greater knowledge of linguistic styles and dorm.
- Read and understand the main ideas of a variety of texts.
- Structure ideas logically inwriting.
- Write clearly and in detail about a wide range of subjects.
- Develop accuracy in the usage of grammar and vocabulary

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Grammar & Vocabulary** Grammar • Functional use of parts of speech • Questions—different types • Auxiliary verbs • Comparatives using the • Narrative tenses—all past tenses • Position of adverbs and adverb phrases • Gerund or infinitive—verb patterns **Vocabulary** Buildings, Appliances, Clothes, Education, Entertainment, Environment, Food and drink, Nature, Personal Feelings, Technology,Weather,Sport(any 3 of these)	09	20
2	**Listening Skills** • Note Taking & Making • Audio Comprehension • Movie Clips, News, documentaries	04	20
3	**Speaking Skills** • Speaking invarious contexts: • Expressing Result, Talking about People/Place/Thing in Relation to	06	20

	• Something, Expressing Manner of an Action, Making Supposition about an Action, Describing the process, Connecting Information, Offering Suggestion/Advice, Expressing Choice and Alternative Choice		
4	**Reading Skills** • Reading News-paper, Books • Summarizing • Paraphrasing	04	20
5	**Writing Skills** • Technical Writing: Application, Report Writing, Dialogue Writing, Movie Review, Book Review, Letter Writing	07	20

Learning outcomes:

At the end of the teaching, the students will be able to:

- Speak confidently and discuss the familiar topics with native speakers in brief.
- Understand lengthy speech and lectures and follow complex arguments of the familiar topic.
- Understand most TV news, the majority of films and current affairs program sin common accents.
- Read articles and reports about common topics, read literature in English

Write clearly and in detail about a wide range of subjects as well as essays, reports, and letters

Assessment methods. Assessment criteria:

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- **Listening** – understands the dialogues, instructions, and narration.
- **Reading** – understands the content of analytical writing, books, newspaper, and magazines
- **Speaking**–narrate the event, describe the cause and process, and give a short speech on a familiar topic.
- **Writing** – can write letters, event reports, narrative writing
- **Grammar and Vocabulary** –can use grammar and vocabulary in the tasks assigned.

Course Name: Linguistic Proficiency(B2)

Course Code: CFLS1010

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To help learners to

- Read and understand the main ideas of a variety of texts.
- Structure ideas logically inwriting.
- Write clearly and in detail about the given topic.
- Develop accuracy in the usage of grammar and vocabulary.
- Create, organize and defend effective oral presentations.
- Clearly arrange paragraphs with main ideas and topic sentences.
- Logically sequence the ideas.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage(%)**
1	**Grammar & Vocabulary** **Grammar** • Clauses of contrast, purpose, reason, and result • Reflexive and reciprocal pronouns • 'There and it'– preparatory subjects • Speculation and deduction–modal verbs and expressions • Conditionals • Gerunds and infinitives • Functions **Vocabulary** • Travel and Tourism, Health and Medicine, Crime and Law, Education, Personality Adjectives, Collocations and Phrases (any 3 of these)	09	20
2	**Listening Skills** • Understanding the difference between Hearing and Listening and Critical Listening. • Understanding the various texts in the context of the tone and emotion they portray.	04	20

	• Exploring domain-general audio clips and deriving an understanding of the embedded message. • Developing the ability to understand the context of a given situation • In a conversation/audio clip.		
3	**Speaking Skills** • Exploration of various forms of speech like extempore, elocution, short speech, etc. • Conversational Role Plays and Skits. • Elocution to express one's opinion on various subjects given by the Teacher. • Collaborative discussion to generate different opinions and responses. • Sustaining an interaction; exchanging ideas, expressing and justifying opinions, agreeing and/or disagreeing, suggesting, speculating, evaluating, reaching a decision through negotiation, etc.	06	20
4	**Reading Skills** • Introduction to Reading Vs Critical Reading. • Reading and discussion of Short Prose with different writing styles. • Understanding vivid descriptions of texts • Description of genres and writing styles that showcase the varying tones and features. • Develop an understanding to read between the lines	04	20
5	**Writing Skills** • Summarizing vs. Paraphrasing • Understanding the various texts in the context of the tone and emotion they portray. • Understanding the various forms of written documentation like reports and summary. • Writing activities that assist students in expressing their emotions and feelings. • Writing tasks to generate contrasting ideas, letters for suggestions, letters for • The recommendation, essays.	07	20

Learning outcomes:

At the end of the teaching, the students will be able to:

- Use writing and reading for inquiry, learning, thinking, and communicating.
- Develop knowledge and understanding of Grammar.
- Develop abilities to make use of the grammar in own writing and speaking English.
- Enhance competencies in writing essays and gist of the passage in own words/language.
- Develop an understanding of specific information, text organization features, tone, and text structure.

- Develop an ability to write regular/common/casual text types such as an article, an essay, a letter, an email, a report, are view, or a short story, with a focus on advising, apologizing, comparing, describing, explaining, expressing opinions, recommending, suggesting.
- Demonstrate an understanding of attitude, detail, function, genre, gist, main idea, opinion, place, purpose situation, specific information, relationship, topic, agreement, etc.

Assessment methods. Assessment criteria:

- **Listening** –Analyzing audio clips to understand the crux of the clip, A series of short unrelated extracts from monologues or exchanges between interacting speakers. The learners are expected to decode the information given like Details, specific information, stated opinion, etc.

- **Reading**–Comprehension Passage Testto help the students establish structure coherence of the given prose/passage, Evaluation of various reading strategies like Skimming and Scanning, Cloze Test, Understanding the structure of different write- ups to visualize descriptions, Critically analyze and draw reports, Matching the mismatched sentence order from the provided text, A text or several short texts preceded by 15 multiple-matching questions, Developing a short story based on a similar genre taught on one's own self.

- **Speaking** – Individual speaking assignments to develop general interactional and social language, Ability to organize a larger unit of conversation; comparing, describing, expressing opinions, Group Discussions on issues of importance, A two-way conversation between the students. The students are given spoken instructions with written and visual stimuli, which are used in a decision -making task, Expressing and justifying opinions, agreeing and/or disagreeing, Setting up interviews like mock testing system.

- **Writing** – Developing existing written texts into alternative texts via paraphrasing, Developing summaries of provided extracts, Essay and Article Writing based on the assigned genre, Exploring understanding of various genres of writing, Writingforspecificoccasionsandevents,Developingavocabularyforwriting different genres, Visualizing and then writing about certain incidents, memories, trips, visits, etc., Expressing emotions in various contexts and situations, Writing for special occasions and circumstance

Sem-3

P P Savani University

School of Sciences

Syllabus, Teaching and Examination Scheme

Course Name: Microbial Genetics I

Course Code: SSMB2070

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To make understand about the Principle of inheritance, concept of linkage, crossing over, genetic genetic mapping, and chromosomal mutation as well as to solve genetical problems by using Mendelian genetics Understand the significance of dominance and recessiveness.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**SCIENCE OF GENETICS** Overview of modern history of Genetics; General classification of Genetics (Classical, Molecular & Evolutionary), Mendelian Genetics	08	25
2	**Concept of allele and chromosomal inheritance** Alleles, types of alleles, Dominant allele, recessive allele, incomplete dominance, Co dominance, Multiple alleles, lethal alleles with example. Sutton and Boveri Theory, Genetic linkage and its types, crossing over and gene mapping	08	25
Section-II			
3	**Chromosomal Mutation: change in structure** Structural changes-deletion, duplication, inversion, translocation, variation in chromosome morphology	8	25
4	**Chromosomal Mutation: change in number** Euploidy: monoploidy; polyploidy-autoploidy, alloploidy; aneuploidy: monosomy, nullisomy, trisomy, double trisomy, Tetrasomy.	6	25

Course Outcome :

CO-1: Students will gain the basic knowledge about principles of inheritance at the molecular, cellular and organism levels.

CO-2: Students will test and deepen their mastery of genetics by understanding the concept of alleles and chromosomal basis of inheritance.

CO-3 : Students will understand the inheritance of character and identification of parents and recombinants by using linkage as well as crossing over. Also learn how to prepare genetic map

CO-4: Students will understand the molecular basis like mutations, diagnosis and treatment of genetic disease.

Reference Books:

Title	Authors	Publisher
Principles of Genetics	Gardner	Wiley; 8 edition
Genetics: Analysis and Principles	Robert Booker	McGraw-Hill Professional Publishing
Theory and Problems of Genetics	Stansfield	McGraw-Hill Professional Publication
Genetics: A conceptual Approach	Pierce	W. H. Freeman; 6 edition
Life science:fundamentals and practice part I & part II	USH &Minar	3rd edition, pathfinder academy

Course Name: Microbial Genetics II

Course Code: SSMB2090

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:
To acquire comprehensive knowledge on structure of nucleic acid, gene, genetic material and understand the genome organization of prokaryotic as well as eukaryotic cell.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Nucleic acid as genetic material** Characteristics of Genetic material, Protein & nucleic acid as Hereditary material, Experimental evidences: Griffith Experiment, Avery experiment, Hershey experiment, Stanley experiment	8	25
2	**Nucleic acid Structure** ➢ DNA structure ➢ DNA topology ➢ RNA structure	8	25
Section-II			
3	**Gene concept** ➢ Prokaryotic genome: Chromosomal and plasmid ➢ Eukaryotic genome: Chromosomal and organelle (Mitochondrial DNA and Chloroplast DNA) ➢ Fine structure of the Gene: Citrons, muton and recon	8	25
4	**Bacterial Genetics** ➢ Transformation ➢ Transduction-Generalized and specialized: ➢ Conjugation: F factor mediated, Hfr and Sexduction.	6	25

Course Outcome :

CO-1: The student will come to know about characteristics of nucleic acids and the early experimental approaches for establishing nucleic acid as hereditary material.
CO-2: The student will be able to understand structural features of nucleic acid.
CO-3: The student will be able to gain knowledge of fine structure of gene and will come to know about characteristic features of prokaryotic and eukaryotic genome.
CO-4: The student will understand transformation, transduction & conjugation.

Reference Books:

Title	Authors	Publisher
Principles of Genetics	Gardner	Wiley; 8 edition
Genetics: Analysis and Principles	Robert Booker	McGraw-HillProfessional Publishing
Theory and Problems of Genetics	Stansfield	McGraw-Hill Professional Publication
Genetics: A conceptual Approach	Pierce	W. H. Freeman; 6 edition
Life Science:Fundamentals and practice part I & part II	USH &Minar	3rd edition, pathfinder academy

Course Name: Microbial Genetics Practical

Course Code: SSMB2110

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	4	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:
To practically learn about the staining of chromosomes, phases of mitosis, various phases of meiosis, how mutation arise, What are mutants? How they can be identified and isolated.

Course Contents:

Section-I		
Module	**Content**	**Hours**
1	Monohybrid and dihybrid cross	**10**
2.	Karyo typing with the help of photographs	**10**
3.	Study of Barr Body	**10**
4.	Meiosis and mitosis stages from onion root tips	**10**
5.	Isolation of pigment mutant	**10**
6.	UV survival of E. coli	**10**

Course Outcome :

CO-1: The student will get basic knowledge of genetics and will be able to understand inheritance of characters from one generation to next
CO-2: The student will be able to stain barr body, and isolate the pigment mutant by employing different staining and isolation methods
CO-3: The student will be able to see stages of cell division in onion root tip cells
CO-4: The student will be able to perform mutagenesis experiment in *E. coli* and will be able to study effects of UV radiation on *E. coli* cultures.

Reference Books:

Title	Authors	Publisher
Principles of Genetics	Gardner	Wiley; 8 edition
Genetics: Analysis and Principles	Robert Booker	McGraw-Hill Professional Publishing
Theory and Problems of Genetics	Stans field	McGraw-Hill Professional Publication
Genetics: A conceptual Approach	Pierce	W. H. Freeman; 6 edition
Life science: fundamentals andpractice part I & part II	USH & Minar	3rd edition, pathfinder academy

Course Name: Immunology I

Course Code: SSBT2070

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will learn about basic things related to our immune system, immunology including cellular and molecular processes, including cells and organs of Immune system, antigen, antibody and its mechanism, understand the significance of vaccines and also learn various techniques as well.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Overview of Immune System** ➢ Historical perspective of Immunology ➢ Early theories of Immunology. ➢ Types of immunity- Innate, Adaptive (cell mediated and humoral)	6	25
2	**Innate Immunity** ➢ Physical barrier ➢ Chemical barrier ➢ Biological barrier **Adaptive immunity** ➢ B-lymphocytes ➢ T-lymphocytes ➢ Antigen presenting cell	8	25
Section-II			
3	**Antigens** Characteristics of antigen, types of antigens, Immunogenicity Versus Antigenicity, Factors that Influence Immunogenicity, Epitopes, Haptens and the Study of Antigenicity, Pattern-Recognition Receptors	8	25
4	**Antibodies** ➢ Immunoglobulins - Structure and Functions, classes and function. ➢ Monoclonal antibodies ➢ Hybridoma technology	8	25

Course Outcome :

CO-1: To understand the cells of the immune system, history and early theories of immunity
CO-2: To learn about the barriers of the body defense mechanism and to learn the major types of cells involved in defense responses
CO-3: The study the characteristics, structure and functions of the antigens and the determining sites with special attention to the pattern receptors.
CO-4: To differentiate between the different heavy chains and light chains of antibodies, study the structure and function of each one of them.

Reference Books:

Title	Authors	Publisher
Immunology XI Edition. Roitt's Essential Immunology, Blackwell Publishing	Kindt, T. J., Goldsby, R. A., Osborne, B. A., Kuby, J. (2006).	VI Edition. Immunology. W.H. Freeman and Company
Essential Immunology	Delves, P. J., Martin, S. J., Burton, D. R., Roitt, I.M. (2006).	XI Edition. Roitt's, Blackwell Publishing
Immunology	Kuby	MacMillan Publishers

Course Name: Immunology II

Course Code: SSBT2090

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:
The students will learn about basic things related to our immune system, Hematopoeisis, immunology including cellular and molecular processes, including cells and organs of Immune system, antigen antibody reactions and its mechanism, understand the significance of vaccines , autoimmune diseases and also learn various techniques as well.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Cells and Organs of The Immune System** ➢ Hematopoiesis and role of hematopoietic factors, Cells of the immune system. ➢ Organs of the Immune system: Primary and Secondary lymphoid organs, Lymphatic system. ➢ Systemic Function of the Immune System Lymphoid Cells and Organs—Evolutionary Comparisons	6	25
2	**Antigen-Antibody Interactions: Principles and Applications** ➢ Antigen-antibody affinity and avidity ➢ Cross reactivity ➢ Precipitation reaction ➢ Agglutination	8	25
Section-II			
3	**Vaccines & Vaccination** ➢ Adjuvants ➢ Types of vaccines ➢ Principles of vaccination ➢ Passive and Active immunization ➢ Immunization programs and role of WHO	8	25
4	**Auto-Immune Diseases** Immune Dysfunction and Its Consequences, Autoimmunity & auto-immune diseases, factors contributing development of auto-immune	8	25

	diseases, mechanism of development, breakdown of self-tolerance, rejection of transplants, molecular mimicry, diagnosis & treatment of auto-immune diseases, immunodeficiency, AIDS, hypersensitivity reactions: types and examples		

Course Outcome :

CO-1: The students will learn the basics of immune system, its importance in building the immune response and various aspects of its functioning.
CO-2: Students will acquire the knowledge of hematopoietic stem cell lineage. They will also know the various primary and secondary lymphoid organs of immune system.
CO-3: Students will learn about the prevention of an immune response against a particular antigen. They will learn about generation of antibodies and how at times the body's own immune system can go against itself.
CO-4: The students will learn how the body releases certain chemicals as a response to foreign invaders. They will learn about the main causes and treatment of inflammation.

Reference Books:

Title	Authors	Publisher
Immunology XI Edition. Roitt's Essential Immunology, Blackwell Publishing	Kindt, T. J., Goldsby, R. A., Osborne, B. A., Kuby, J. (2006).	VI Edition. Immunology. W.H. Freeman and Company
Essential Immunology	Delves, P. J., Martin, S. J., Burton, D. R., Roitt, I.M. (2006).	XI Edition. Roitt's, Blackwell Publishing
Immunology	Kuby	

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Syllabus, Teaching and Examination Scheme

Course Name: Immunology Practical

Course Code: SSBT2110

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	4	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will learn about basic things related to our immune system , develop the application and skill of antigen antibody reaction to detect the various diseases .Understand the significance of vaccines and also learn various techniques as well.

Course Contents:

Section-I		
Module	**Content**	**Hours**
1	Antigen-Antibody reactions – Agglutination (Blood grouping testing).	**10**
2.	Single diffusion in two dimensions (Mancini Assay)	**10**
3.	ELISA Method	**10**
4.	Syphilis slide agglutination test	**10**
5.	Widal test	**10**
6.	Total count of blood cells	**10**

Course Outcome :

CO-1: Students will learn about the basic things related to Antigen-Antibody reactions
CO-2: Enquire knowledge about various immunological techniques.
CO-3: Students will develop skills to perform various clinical immunological tests.
CO-4: Students will learn the techniques for handling and testing the blood samples

Reference Books:

Title	Authors	Publisher
Immunology XI Edition. Roitt's Essential Immunology, Blackwell Publishing	Kindt, T. J., Goldsby, R. A., Osborne, B. A., Kuby, J. (2006).	VI Edition. Immunology. W.H. Freeman and Company
Essential Immunology	Delves, P. J., Martin, S. J., Burton, D. R., Roitt, I.M. (2006).	XI Edition. Roitt's, Blackwell Publishing
Immunology	Kuby	MacMillan Publishers

Course Name: Biochemistry and Metabolism I

Course Code: SSBT2130

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will learn about various micro and macromolecules that are required for our diet, understand the catabolic reactions , metabolic cycles, various aerobic and anaerobic reactions,functions and also understanding its significance value.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Bioenergetics & Metabolism** Introduction of bioenergetics, law of thermodynamics, concept of free energy, Concepts of metabolism; Metabolic Pathways-Catabolic and anabolic; Structure and function of ATP (ATP-Bioenergetics)	8	25
2	**Cell respiration and Photosynthesis** Aerobic respiration, oxidative phosphorylation (Chemo osmotic theory and ATP synthesis), Anaerobic respiration, Fermentation Concept of PS-I & PS-II, Light reaction (cyclic and Non cyclic), C3 path, C4 path, CAM path	10	25
Section-II			
3	**Metabolism of Carbohydrates** ➢ Glycolysis ➢ Citric acid cycle ➢ , Electron transport chain, ➢ Pentose phosphate pathway, Gluconeogenesis, Glycogenesis, Glycogenolysis	6	25
4	**Overview of Metabolism:** ➢ Lipids ➢ Proteins ➢ Nucleic acid	6	25

Course Outcome :

CO-1: The student will get exposure of types of bio molecules.
CO-2: The student will have understanding of different structures of bio molecules.
CO-3: The student will study the basic properties of carbohydrates, proteins, amino acids and Nucleic acids
CO-4: The student will lean the role of different bio molecules.

Reference Books:

Title	Authors	Publisher
Principles of Biochemistry	Lehninger	,5th edition 2008 David Nelson & Michael Cox, W.H. Freeman and company, NY.
Biochemistry	Powar CB and chatwal GR (2002).	Himalaya Publishing house, India.
Biochemical Methods	S. Sadashivam, A. Manickam (1995)	New Age International Publishers, India
An Introduction to Practical Biochemistry.	David Plummer	3rd Edition, (2001), Tata McGraw Hill Edu. Pvt. Ltd. New Delhi, India

Course Name: Microbial Physiology I

Course Code: SSMB2010

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:
The students will acquire the fundamental knowledge about growth of microorganism, microbial diversity based on nutrition, prokaryotic and eukaryotic structure and composition as well as the means by which nutrients are transported into cells across membranes and its metabolism.To inculcate habit of scientific reasoning to do the task rationally.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Microbial nutrition** Nutritional groups of microorganisms – autotrophs, heterotrophs, mixotrophs, methylotrophs, Chemolithoautotroph, Chemolithoheterotroph, Chemoheterotroph, Chemolithotroph, photolithoautotroph, Photoorganoheterotroph.	6	25
2	**Microbial growth** – Growth kinetics, different phases of growth in batch cultures. Factors influencing microbial growth, Synchronous, continuous, biphasic growth, diauxic growth curve.	8	25
Section-II			
3	**Nutrient uptake and Transport** Passive and facilitated diffusion Primary and secondary active transport, concept of uniport, symport and antiport Group translocation Iron uptake	8	25
4	**Culture media**: Types of culture media: Routine and specialized media; selective media, differential media, enriched media, enrichment media, enumeration media, assay media and maintenance media	8	25

Course Outcome :

CO-1: The student will get knowledge about the functioning of diverse bacterial cultures.
CO-2: Knowledge will be applied to understand microbial physiology and identify microorganisms.
CO-3: The student will gain knowledge about the various pathways for regulating the generation of bacterial byproducts.
CO-4: Students will gain knowledge about the usage of media and how to prepare them for different microbial growth.

Reference Books:

Title	Authors	Publisher
Brock Biology of Microorganisms 14th edition.	Madigan MT, and Martinko JM (2014)	Prentice Hall International Inc.
Microbial Physiology. 4th edition.	Moat AG and Foster JW. (2002).	John Wiley & Sons
Microbial Physiology.	Reddy SR and Reddy SM. (2005).	Scientific Publishers India
Bacterial Metabolism. 2nd edition.	Gottschalk G. (1986	Springer Verlag
General Microbiology. 5th edition	Stanier RY, Ingrahm JI, Wheelis ML and Painter PR. (1987).	McMillan Press.
Prescott's Microbiology. 9th edition.	Willey JM, Sherwood LM, and Woolverton CJ. (2013).	McGraw Hill Higher Education.

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Syllabus, Teaching and Examination Scheme

Course Name: Microbial physiology and Biochemistry Practical

Course Code: SSMB2170

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	4	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will acquire the fundamental knowledge about growth of microorganism and its metabolismTo inculcate habit of scientific reasoning to do the task rationally

Course Contents:

Module	Name of Practical	Hours
1	Study and plot the growth curve of *E. coli* by turbidometric and standard plate count Methods,	**6**
2.	Biochemical test Biochemical test -Carbohydrate fermentation & Gas production, TSI agar slant test, casein hydrolysis, gelatin hydrolysis, H_2S production test, Nitrate reductase test, Urea hydrolysis, Starch hydrolysis, catalase test- Indole test, Methyl red test, Voges proskauer test, Citrate test	**6**
3.	Estimation of Acid Value of Fats	**6**
4.	Estimation of KOH	**6**
5	Identification of biomolecules.	**6**
6	Estimation of Starch and Cholestrol	**6**
7	Estimation of Protein by Folin Lowry's method	**6**
8	Sugar estimation by Cole's methods.	**6**
9	Estimation of amino acids by Ninhydrin reagent	**6**
10	Calculations of generation time and specific growth rate of bacteria from the graphplotted with the given data	**6**

Course Outcome :

CO-1: Knowledge will help in determining the protein concentration by calculating the reactivity of the peptide nitrogen with the Copper ions under alkaline conditions. This will be followed by a reduction reaction.

CO-2: Acquire information to estimate the biomolecules and study their properties.

CO-3: Students will gain knowledge about the biochemical analysis of the following biomolecules.

CO-4: Experiment will help in estimating the acid value of fats and cholesterol microbial growth.

Reference Books:

Title	Authors	Publisher
Brock Biology of Microorganisms 14th edition.	Madigan MT, and Martinko JM (2014)	Prentice Hall International Inc.
Microbial Physiology. 4th edition.	Moat AG and Foster JW. (2002).	John Wiley & Sons
Microbial Physiology.	Reddy SR and Reddy SM. (2005).	Scientific Publishers India
Bacterial Metabolism. 2nd edition.	Gottschalk G. (1986	Springer Verlag
General Microbiology. 5th edition	Stanier RY, Ingrahm JI, Wheelis ML and Painter PR. (1987).	McMillan Press.
Prescott's Microbiology. 9th edition.	Willey JM, Sherwood LM, and Woolverton CJ. (2013).	McGraw Hill Higher Education.

Course Name: Creativity, Problem Solving & Innovation

Course Code: SEPD4010

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
3	0	0	3	100	00	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To help learners to
- achieve expertise with the technicalities of creativity and problem solving.
- advance an assertiveness for innovation.
- advance creative thinking skills using shaft of learning components leading to understanding of plans of creativity, problem solving and innovation
- discuss uses of the concepts of creativity and problem-solving skills in personal, social, academic, and profession life

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Introduction to Creativity, Problem Solving and Innovation** • Definitions of problem solving, Creativity and Innovation • Need for Problem Solving and Innovation & Scope of creativity • Types and Styles of Thinking • Strategies to develop Creativity, Problem Solving and Innovation skills	8	17
2	**Questioning and Learning** • Introduction to questioning, learning and visualization and its strategies • Sources and methods of questioning and learning • Finding perspective, Visualizing thinking • Mind Mapping	7	16
3	**Creative Thinking and Problem Solving** • Need of creative thinking • Cracking Creativity - Reversals, Reversing Perspective, seeing all sides, Looking in other world • Finding what you are not looking for and following up • Fishbone diagram • SCAMPER Technique	8	17

Section-II			
4	**Logic and Reasoning** • Basic concept of Logic • Divergent Vs Convergent Thinking, Inductive Vs • Deductive thinking Fusion of ideas for problem solving • Moral Reasoning • Improvisation	8	17
5	**Practices of Playing** • Collaboration and Brainstorming • The Spirit of Koinonia • QFT Model • Connecting the unconnected • Making novel combinations	7	16
6	**Review Strategies for Creative problem-solving methods** • A Heuristic technique • Problem-Solving Strategies: Why Bother? • Five building blocks as per Fogler & LeBlanc. • Strategy for critical thinking for Choosing • Lateral Thinking • Six thinking hats by Edward de Bono • Design Thinking	7	17

Text Book(s):

Title	Authors	Publisher
Thinker Toys	Michael Michalko	Random House Publication 2006
Crackling Creativity, The Secrets of Creative Genus	Michael Michalko	Ten Speed Press 2001

Reference Book(s):

Title	Author/s	Publication
Zig Zag, The Surprising Path to Greater Creativity	R Keith Sawyer	Jossy-Bass Publication 2013
De Bono's Thinking Course	Edward De Bono	Penguin Publication 1994
Six Thinking Hats	Edward De Bono	Penguin Publication 1999
How to Mind Map	Tony Buzan	Thorsons Publication 2002
The Myths of Innovation	Scott Berkum	Berkun Publication 2010
Creative confidence: Unleashing the creative Potential within Us all	Tom Kelly and David Kelly	William Collins Publication 2013
The all Laughed	Ira Flatow	Harper Publication 1992
The Ultimate Lateral & Critical Thinking Puzzle book	Paul Sloane, Des MacHale & M.A. DiSpezio	Sterling Publication 2002

Course Evaluation:

Section	Module No.	Evaluation Criteria	Marks
1	1	Group Activity on Brainstorming	15
	2	Mind Mapping Activity	10
	3	Chart Preparation on 'Practicality of Fishbone Diagram'	15
		Group presentation on 'SCAMPER Technique & its applications'	10
2	1	Group Presentation on Critical Analysis of a Govt. scheme/ policy/ budget (merit/ demerit, pros/cons etc.)	15
	2	Group Discussion/ Debate/ Elocution	10
	3	Problem Solving Activity (Individual)	10
		Presentation (Learning Outcomes)	15
Grand Total			100

Course Outcome(s):
After completion of the course, the student will be able to -

- establish creativity in their day-to-day actions and educational output
- solve all types of problems with an optimistic and an impartial attitude
- reflect innovatively and work towards problem solving in a tactical way
- initiate different and advanced practices in their selected field of profession

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Syllabus, Teaching and Examination Scheme

Course Name: Foreign Language I (German)

Course Code: CFLS3010

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				**Examination Scheme (Marks)**		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To help learner to

- Develop and integrate the use of the four language skills i.e. listening, speaking, reading and writing.
- Use the language effectively and appropriately on topics of everyday life situations.
- Develop an interest in the appreciation of German.
- Develop an intercultural awareness.
- Enhance the ability of the candidates to express their ideas and feelings in their own words and for them to understand the use of correct language.
- Appreciate the language as an effective means of communication.
- Understand language when spoken at normal conversational speed in everyday life situations.
- Understand the basic structural patterns of the language, vocabulary and constructions.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Introduction to German** • Alphabets • German accents • German Numbers • What are the similarities and differences between English and German? • Greetings	2	15
2	**German Time** • Basic Introduction	2	15
3	**Vocabulary part-1** • The days of the week • The months of the year • Seasons • Directions & Weather	2	05
4	**Vocabulary part-2** • Family • Colors and Shapes • Day/time indicators • Body parts • Clothing	2	07
5	**Vocabulary Part-3**	2	05

	• Food and Meals • Fruits, Vegetables and Meats • Sports and Hobbies		
6	• Transportation • House and Furniture	2	05
7	• School Subject • Places • Common Expressions	2	05
Section-II			
1	**German grammar** • Verb Sein (to be) • Verb Haben (to have) • Introduction of Regular verbs and Irregular verb • Konjugation of Regular verb First group verbs('EN' group)	2	10
2	• Second group verbs('Ten/Den' group) • Konjugation of Irregular verbs • Third group verbs (Stem change verb) Fourth group verbs (Spell Change Verb)	2	10
3	• Nicht trennbare und trennbare Verben • Die Modalverben Personalpronomen-Nominativ	2	10
4	• W-Frage • Ja/Nein-Fragen • Nomen und Artikel-Nominativ Die Anrede	2	10
5	• Nomen-Genusregein • Adjektiv • Nomen und Artikel-Akkusativ Personal pronomen-Akkusativ	2	10
6	• Practice of Writing Practice of Speaking	2	-
7	Practice of Listening	2	-
8	Practice of Reading	2	-

Text Book(s):

Title	Authors	Publisher
Namaste German	Yoshita Dalal	Yoshita Dalal

Reference Book(s):

Title	Authors	Publisher
Fit In Deutsch	Hueber	Goyal Publication

Web Material Links:

- https://www.youtube.com/watch?v=iGovllrEsF8&list=PLRps6yTcWQbpoqIOCmqMeI1HLnLIRmO_t
- https://www.youtube.com/watch?v=GwBfUzPCiaw&list=PL5QyCnFPRx0GxaFjdAVkx7K9TfEklY4sg

Course Name: Integrated Personality Development Course (IPDC-I)

Course Code: SEPD3040

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	1	100	00	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To help learners to

- provide students with a holistic education – focused on increasing their intelligence quotient, physical quotient, emotional quotient and spiritual quotient
- provide students with hard and soft skills, making them more marketable when entering the workforce
- educate students on their social responsibilities as citizens of India
- provide students with a value-based education which will enable them to be successful in their family, professional, and social relationships.
- teach self-analysis and self-improvement exercises to enhance the potential of the participants.

Course Contents:

Section-I			
Lecture No	**Content**	**Hours**	**Weightage (%)**
1	Remaking Yourself - Restructuring Yourself	2	50
2	Remaking Yourself - Power of Habit	2	
3	Remaking Yourself - Developing Effective Habits	2	
4	Learning from Legends - Tendulkar and Ratan Tata	2	
5	From House To Home - Affectionate Relationship	2	
6	Facing Failures - Failures are not Always Bad	2	50
7	Facing Failures - Insignificance of Failures.	2	
8	Facing Failures - Insignificance of Failures	2	
9	Facing Failures - Failures can be Overcome	2	
10	Learning from Legends - Yogiji Maharaj and Nelson Mandela.	2	

Course Evaluation:
Theory:

- Continuous Evaluation consists of 40 marks. There will be a mid-term exam which will assess the current progress of students, it assessed out of 20 marks and will be equivalent to 20 marks of the Continuous Course Evaluation (CCE). There will be a submission consisting 10 marks as per the guidelines of course coordinator and average of the attendance consisting 10 marks (minimum 60 percentage attendance is required).
- End semester exam (ESE) part A 30 marks and part B 30 marks.

Course Outcome(s):
After completing the IPDC course (lecture and full participation in activities/challenges), we would like to see PPSU students:

- To have gained a greater sense of social responsibility
- To have gained marketable hard and soft skills that would directly apply to their future careers
- To have gained greater insight and ability to navigate their family, social, and professional relationships along with difficult situations which may arise in their life
- To have a broader sense of self-confidence and a defined identity
- To have greater value for living a moral and ethical life based on principles taught in the course.

Course Name: Global Communication Skills

Course Code: CFLS1020

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To help learners to

- hone basic communication skills by exposing them to the key communication techniques.
- improvise comprehension and expressional skills which are required for personal, social, academic and professional environment.
- sharpen communication skills with reference to organizational structure.
- show the importance of team work and give practice in group communication with reference to group dynamics.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Introduction to Communication Skills** • Concept and Process of Communication • Types of Communication • Principles of Effective Communication • Barriers to Communication	05	33
2	**Interpersonal Organizational Communication** • Styles and Flows of Communication • Essentials of Organizational Communication • Kinesics, Proxemics and Chronemics	03	20
3	**Team/ Group Dynamics and Leadership** • Types of Groups and Essentials of Group Work and Networking • Concept and Types of Leadership • Traits of an Effective Leader	03	20
4	**Presentation Skills** • Modes, Means and Purposes of Presentation • Audience Analysis and Content Organization • Visual aids and Nuances of Delivery	04	27

	• Non-Verbal Cues for Effective Presentation		
5	**Writing Skills** • Technical Writing: Application, Report Writing, Dialogue Writing, Movie Review, Book Review, Letter Writing	07	20

Text Book(s):

Title	Author/s	Publication
Practical Techniques to Develop Communication Skills	ParulPopat& Kaushal Kotadia	PothiPrakashan, 2015

Reference Book(s):

Title	Author/s	Publication
Communication Skills	ParulPopat& Kaushal Kotadia	Pearson, 2015
Communication Skills, Second Edition	Sanjay Kumar, PushpLata	Oxford University Press,2015
Communication Skills for Engineers	Sunita Mishra	Pearson, 2011
Effective Interpersonal and Team Communication Skills for Engineers	Clifford Whitcomb, Leslie E. Whitcomb	John Wiley & Sons, 2012

Web Material Link (s):

- http://www.mindtools.com/page8.html
- http://techpreparation.com/soft-skills.htm?gclid=CJf34fyQv5wCFdMtpAodjjX_tA
- http://lorien.ncl.ac.uk/ming/Dept/Tips/present/comms.htm

Course Evaluation:
Theory:

- Continuous Evaluation consists of 40 marks. This carries two tests/ presentations/group discussions each of 20 marks.
- End Semester Examination comprising of 60 marks will carry application based and skill testing questions.

Course Outcome(s):
Students will be able to

- Follow the process of communication and its components in organizational context.
- Express themselves and to participate in the classroom discussions and other such academic activities.
- Comprehend whatever they receive from Informal Interactions with the family, teachers and friends; and from Formal Communications taking Place in Lectures, Laboratories and the like.
- Enhance the teamwork and collaborative attitude.

- Communicate effectively using suitable styles and techniques.
- Able to participate in the group discussions and other such academic or academic support activities.
- Use language effectively with reference to communication in groups and group behavior.

Sem-4

P P Savani University
School of Sciences
Syllabus, Teaching and Examination Scheme

Course Name: Instrumentation &Techniques

Course Code: SSBT2020

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:
The students will acquire the fundamental knowledge about Chromatographic, Spectroscopy, Electrophoresis, PCR techniques and its application in the field of biotechnology via this course.
To inculcate habit of scientific reasoning to do the task rationally.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Planar Chromatography** (Principles, Instrumentation and application) Classification of chromatography a) Paper Chromatography (PC) b) Thin Layer Chromatography (TLC) c) HPTLC	6	25
2	**Gas Chromatography** Principle of GC, Components of GC, Carrier gas and its selection, System for sample introduction, Column and its specifications, Characteristics and classification of Detectors (FID and TCD), Applications of GC, Limitations of GC.	8	25
Section-II			
3	**Liquid Chromatography** Limitations of conventional liquid Chromatography, Principle and diagram of instrument, Components of instrument, Column of HPLC, Detectors (UV absorption, RI detector), Applications of HPLC.	8	25
4	**Spectroscopy** (Principles, Instrumentation and applications) a) Circular Dichroism (CD) b) Fluorescence c) Infrared (IR) d) ^{1}H NMR (Proton NMR)	8	25

Course Outcome :

CO-1: Students could perform the separation of organic molecules by paper chromatography
CO-2: Students will learn which samples are suitable for LCMS and GCMS. Also, students could handle GCMS instruments on their own after knowing the principles and working
CO-3: Students will have distinctive features in their minds about conventional liquid chromatography and HPLC, their principle, working, instrumentation and applications
CO-4: Instrumentational knowledge and skills of IR spectroscopy, NMR, CD, & fluorescence spectroscopy for their samples in addition to the operation, handling, working, principle, and application of such instruments. Students will be technically sound in the handling, & maintenance of these instruments.

Reference Books:

Title	Authors	Publisher
Principles and Practice ofModern Chromatographic Methods	Robards K., Jackson P. E., Haddad P. A.	Elsevier Academic Press
Fundamentals of Analytical Chemistry	Douglas A. S., Donald M. W., Holler H. J., Crouch H. R.	Brooks Cole; 9 edition
Introduction to Spectroscopy	Donald L. P., Gary M. L., George S. K., James A. V.	Brooks Cole

Course Name: Bioanalytical techniques

Course Code: SSBT2040

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will acquire the fundamental knowledge about Chromatographic, Spectroscopy, Electrophoresis, PCR techniques and its application in the field of Microbiology via this course.

To inculcate habit of scientific reasoning to do the task rationally.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Electrophoresis** Electrophoresis Theory & Principle, Various factors affecting electrophoresis, Horizontal and vertical Electrophoresis. Electrophoresis of DNA and RNA.	6	25
2	**Electrophoresis Techniques** Native PAGE, Sodium dodecyl sulphate (SDS)- polyacrylamide gel electrophoresis (PAGE), 2-D Gel Electrophoresis, CapillaryElectrophoresis, Application of capillary electrophoresis.	8	25
Section-II			
3	**Nucleic Acids Hybridization** Labeling of Nucleic acids (isotopic and non-isotopic labeling methods),Blotting and types: Southern, Northern and Western.	8	25
4	**Polymerase Chain Reaction** Polymerase Chain Reaction: Principle and Steps, Modification to PCR Techniques (Types of PCR), Application of PCR in Biologicalfields.	8	25

Course Outcome :

CO-1: The student will have an introduction and comparison of various separation techniques
CO-2: The student will study agarose gel electrophoresis, SDS-PAGE, 2-D Gel, and capillary electrophoresis
CO-3: The student will get knowledge of various types of labeling techniques and also detection of labeled fragments
CO-4: The student gets acquainted with PCR, optimization of PCR, uses, and types of PCR

Reference Books:

Title	Authors	Publisher
Principles of Gene Manipulation and Genomics	Sandy B. Primrose ,Richard Twyman	Blackwell Publisher
Gene Cloning and DNA Analysis: An Introduction	T. A. Brown	Wiley Publisher
Biotechnology	U Satyanarayana	Books and Allied P LTD.

P P Savani University

School of Sciences

Syllabus, Teaching and Examination Scheme

Course Name: Bioanalytical Practical

Course Code: SSBT2060

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	4	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will acquire the fundamental knowledge about Chromatographic, Spectroscopy, Electrophoresis, PCR techniques and its application in the field of biotechnology via this course.
To inculcate habit of scientific reasoning to do the task rationally.

Course Contents:

Section-I		
Module	**Content**	**Hours**
1	Identification of Amino Acids in Food by Paper Chromatography.	**06**
2.	Separation of amino acid mixture by Paper Chromatography.	**06**
3.	TLC Separation of Drug.	**06**
4.	Agarose gel electrophoresis of genomic DNA.	**06**
5.	SDS PAGE of Protein.	**12**
6.	Southern blotting of DNA.	**12**
7.	DNA amplification by PCR method.	**12**

Course Outcome :

CO-1: The student will acquire fundamental knowledge of Chromatography and Electrophoresis in their job

CO-2: The student will Learn that DNA and protein are macromolecules that require expertise in handling and proper storage conditions.

CO-3: The student will exposed to study chromatography, its types, and electrophoresis fragments

CO-4: The student would be able to prepare appropriate reagents for the isolation and characterization of the macromolecule, know how to run equipment, and prepare the individual samples.

Reference Books:

Title	Authors	Publisher
Principles and Practice of Modern Chromatographic Methods	Robards K., Jackson P. E., Haddad P. A.	ElsevierAcademic Press
Fundamentals of Analytical Chemistry	Douglas A. S., Donald M. W., Holler H. J., Crouch H. R.	Brooks Cole; 9 edition
Introduction to Spectroscopy	Donald L. P., Gary M. L., George S. K., James A. V.	Brooks Cole
Principles of Gene Manipulation and Genomics	Sandy B. Primrose, Richard Twyman	Blackwell Publisher
Gene Cloning and DNA Analysis: An Introduction	T. A. Brown	Wiley Publisher
Biotechnology	U Satyanarayana	Books and Allied P LTD.

P P Savani University
School of Sciences
Syllabus, Teaching and Examination Scheme

Course Name: Molecular Biology I

Course Code: SSBT2080

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:
The students will acquire the fundamental knowledge about genome, genome structure and central dogma processes via this course
To inculcate habit of scientific reasoning to do the task rationally

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**INTRODUCTION** Origin of term molecular biology, Development of Molecular Biology, Classical and New Molecular Biology, Experimental Organismsin Molecular Biology	6	25
2	**Organization of Genome** Definition of a gene and types of genes, Genome, Organization of chromatin: Nucleosome concept and packaging of DNA into higher order structures, Chromosome: structure and types, Lamp brush and polytene chromosomes.	8	25
Section-II			
3	**Replication of DNA** Structure of DNA, Types/forms of DNA, Semi-conservative nature ofDNA replication, Origin of replications, Enzymology of DNA replication, Mechanism of replication in prokaryotes and eukaryotes, Proteins associated with DNA replication, Replication Models, Inhibitors of DNA replication.	8	25
4	**Mutation and DNA repair** Mutation and its types, Necessity of DNA repair, Types of mistakes inDNA, Agents causing damage/mistakes in DNA, Biochemical mechanism of DNA repair	8	25

Course Outcome :

CO-1: Students will understand the advances in molecular biology and knowledge about the model (experimental) organisms
CO-2: Students will understand the advances in molecular biology and knowledge about the model (experimental) organisms.
CO-3: Students will understand what proteins and enzymes are used to replicate DNA and the steps involved for replication in both types respectively.
CO-4: Students will obtain knowledge about what damages DNA and how can it be repaired and if not repaired what mutations can occur resulting in various diseases.

Reference Books:

Title	Authors	Publisher
Fundamentals of Molecular Biology	Veer Bala Rastogi	Anne Book Publisher. 2010
Cell and Molecular Biology: Concepts and Experiments. VIEdition.	Karp, G. (2010).	John Wiley & Sons. Inc.
Molecular Biology of the Gene (VI Edition.).	Watson, J. D., Baker T.A., Bell, S. P., Gann, A., Levine, M., and Losick, R., (2008)	Cold Spring Harbour Lab. Press, Pearson Pub.

Course Name: Molecular Biology II

Course Code: SSBT2100

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will acquire the fundamental knowledge about genome, genome structure , various modifications, transcription, genetic code , central dogma processes and gene expression via this course.
To inculcate habit of scientific reasoning to do the task rationally.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**DNA-dependent synthesis of RNA** RNA structure and types, DNA-dependent RNA polymerase, sigma factor, bacterial promoters, The three stages of RNA synthesis, initiation, elongation and termination, rho-dependent and rho-independent termination, Transcription in eukaryotes, inhibitors of transcription.	6	25
2	**RNA processing/post transcriptional modification** Modification of eukaryotic mRNA at the 5' and the 3' end, splicing introns, differential RNA processing, processing of r RNAs and t RNAs, special function RNAs, RNA as enzyme.	8	25
Section-II			
3	**Genetic code and Translation** The genetic code, nature and characteristics of genetic code, cracking the genetic code, degeneracy, wobble hypothesis, Raw materials for protein synthesis, structure of t RNAs, the five stages of protein biosynthesis, amino acyl-t RNA synthetases, initiation in prokaryotes and in eukaryotes, elongation, termination, Protein folding and processing, inhibitors of protein synthesis.	8	25
4	**Regulation of Gene Expression** Regulation of gene activity, negative and positive regulation, mechanism of gene regulation at transcriptional level, concept of	8	25

	operons, regulatory proteins, activators, repressors, DNA binding domains. Regulation of gene expression in bacteria, lac operon and trp operon.		

Course Outcome :

CO-1: Study the Structure and Function of RNA polymerase, Initiation, elongation, termination in prokaryotes and eukaryotes

CO-2: Students will know the mechanism involved in Capping, Tailing, and splicing exons.

CO-3: Students will be able to solve the cracking of the GC, Wobble hypothesis, Protein synthesis, and stages of translation in prokaryotes and eukaryotes.

CO-4: Study the gene regulation in prokaryotes and eukaryotes, operon models, and other accessory proteins involved in it.

Reference Books:

Title	Authors	Publisher
Fundamentals of Molecular Biology	Veer Bala Rastogi	Anne Book Publisher. 2010
Cell and Molecular Biology: Concepts and Experiments. VI Edition.	Karp, G. (2010).	John Wiley & Sons. Inc.
Molecular Biology of the Gene (VI Edition.).	Watson, J. D., Baker T.A., Bell, S. P., Gann, A., Levine, M., and Losick, R., (2008)	Cold Spring Harbour Lab. Press, Pearson Pub.

Course Name: Molecular Biology Practical

Course Code: SSBT2120

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	4	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will acquire the fundamental knowledge about genome, genome structure and central dogma processes via this course
To inculcate habit of scientific reasoning to do the task rationally

Course Contents:

Section-I		
Module	**Content**	**Hours**
1	Preparation of solutions for Molecular Biology experiments.	**06**
2.	Isolation of chromosomal DNA from bacterial cells.	**06**
3.	Isolation of Plasmid DNA by alkaline lysis method.	**06**
4.	Agarose gel electrophoresis of genomic DNA.	**06**
5.	Isolation of Yeast genomic DNA.	**12**
6.	Isolation of Plant genomic DNA.	**12**
7.	DNA estimation by Diphenylamine method.	**06**
8.	RNA Estimation by Orcinol method.	**06**

Course Outcome :

CO-1: Students will learn the preparation and importance of molecular biological buffers
CO-2: Learners will gain knowledge about the requirement of careful and expert handling of nucleic acid as well as practice the steps for isolation of Genomic and plasmid DNA from prokaryotic as well as eukaryotic cell.
CO-3: Students will learn how DNA samples are analyzed by agarose gel electrophoresis
CO-4: Students will learn about quantitative measurement of DNA and RNA

Reference Books:

Title	Authors	Publisher
Fundamentals of Molecular Biology	Veer Bala Rastogi	Anne Book Publisher. 2010
Cell and Molecular Biology: Concepts and Experiments. VI Edition.	Karp, G. (2010).	John Wiley & Sons. Inc.
Molecular Biology of the Gene (VI Edition.).	Watson, J. D., Baker T.A., Bell, S. P., Gann, A., Levine, M., and Losick, R., (2008)	Cold Spring Harbour Lab. Press, Pearson Pub.

Course Name: Virology I

Course Code: SSMB2040

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:
The students will acquire the fundamental knowledge about viruses, nature , properties, structure, mechanism of infection and its control.To inculcate habit of scientific reasoning to do the task rationally.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Nature and Properties of Viruses** Introduction: Discovery of viruses, nature and definition of viruses, general properties, concept of viroids, virusoids, satellite viruses and Prions, Emerging Viruses.	6	25
2	S**tructure of virus** Structure of Viruses: Capsid symmetry, enveloped and non-enveloped viruses, Isolation, purification and cultivation of viruses	8	25
Section-II			
3	**Classification and Nomenclature of Viruses** Classification on the basis of nucleic acid, Symmetry/structure, replication, host and mode of transmission. Rules of Nomenclature	8	25
4	**Viruses and Cancer** Introduction to oncogenic viruses Types of oncogenic DNA and RNA viruses: Concepts of oncogenes and proto-oncogenes	8	25

Course Outcome :

CO-1: Students will be able to describe and review the history, scope, and elements of the viral life cycle
CO-2: Students will get the knowledge of the structure of viruses and different isolation and purification methods for viruses.
CO-3: Students will be able to explain the rationale behind the Baltimore classification system of viruses and present example viruses for each Baltimore group
CO-4: Students will learn about the concept of oncogenic viruses and proto viruses

Reference Books:

Title	Authors	Publisher
Introduction to Modern Virology. 6th edition	Dimmock, NJ, Easton, AL, Leppard, KN (2007)	Blackwell Publishing Ltd.
Virology: Principles and Applications	Carter J and Saunders V (2007).	John Wiley and Sons.
Principles of Virology, Molecular biology, Pathogenesis and	Flint SJ, Enquist, LW, Krug, RM, Racaniello, VR, Skalka, AM	ASM press Washington DC.
Control. 2nd edition	(2004).	
Virology. 3rd edition.	Levy JA, Conrat HF, Owens RA. (2000).	Prentice Hall publication, New Jersey.
Lehninger Principles of Biochemistry, 5th Edition.,	Nelson DL and Cox MM (2008)	W.H. Freeman and Company
Microbiology 9th Ed.,	Prescott, Harley and Klein's Willey MJ, Sherwood, LM &Woolverton C J (2013)	McGrawHill
Basic Virology. 2nd edition	Wagner EK, Hewlett MJ. (2004).	Blackwell Publishing.

P P Savani University
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Syllabus, Teaching and Examination Scheme

Course Name: Virology II

Course Code: SSMB2060

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will acquire the fundamental knowledge about viruses, mechanism of infection and its control
To inculcate habit of scientific reasoning to do the taskrationally

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Modes of Viral Entry** Attachment to host (Plant, Animal and Bacteria) Adsorption of virion by different host Penetration into Host Uncoating of virus	6	25
2	**Genome replication strategies** Replication and Transcription in DNA virus Replication and Transcription in RNA Virus Synthesis and assembly of virus capsid Virion release	8	25
Section-II			
3	**Life Cycle of viruses** Lambda M13 HIV Pox virus Influenza Virus Corona virus	8	25
4	**Applications of Virology** Use of viral vectors in cloning and expression, Gene therapy and Phage display	8	25

Course Outcome :

CO-1: Students will be get knowledge about the basic structure, morphology, and classification of different types of viruses.
CO-2: Acquire information to differentiate between the infection mechanism difference of viruses and other bacteria.
CO-3: Students will learn abo viral replication strategies, and compare and contrast replication mechanisms used by viruses' relevant infections.
CO-4: Students will acquire knowledge about various techniques used in gene therapy, vaccination, and the mechanism of their action.

Reference Books:

Title	Authors	Publisher
Introduction to Modern Virology. 6th edition	Dimmock, NJ, Easton, AL, Leppard, KN (2007)	Blackwell Publishing Ltd.
Virology: Principles and Applications	Carter J and Saunders V (2007).	John Wiley and Sons.
Principles of Virology, Molecular biology, Pathogenesis and Control. 2nd edition	Flint SJ, Enquist, LW, Krug, RM, Racaniello, VR, Skalka, AM (2004).	ASM press Washington DC.
Virology. 3rd edition.	Levy JA, Conrat HF, Owens RA. (2000).	Prentice Hall publication, New Jersey.
Lehninger Principles of Biochemistry, 5th Edition.,	Nelson DL and Cox MM (2008)	W.H. Freeman and Company
Microbiology 9th Ed.,	Prescott, Harley and Klein's Willey MJ, Sherwood, LM &Woolverton C J (2013)	McGrawHill
Basic Virology. 2nd edition	Wagner EK, Hewlett MJ. (2004).	Blackwell Publishing.

Course Name: Virology Practical

Course Code: SSMB2080

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	4	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will acquire the fundamental knowledge about viruses, mechanism of infection and its control
To inculcate habit of scientific reasoning to do the task rationally

Course Contents:

Section-I		
Module	**Content**	**Hours**
1	Study of the structure of important animal viruses (rhabdo, influenza, paramyxo hepatitis B and retroviruses).	10
2.	Detection of HIV.	10
3.	Isolation of Bacteriophage.	10
4.	Studying isolation and propagation of animal viruses by chick embryo technique.	10
5.	Perform local lesion technique for assaying plant viruses.	10
6.	Study the Structure, mechanism and importance of Corona Virus	10

Course Outcome :

CO-1: Students will learn the structure and functioning of important animal viruses that are responsible for causing diseases in humans.

CO-2: The students will learn HIV diagnostic testing through a readymade kit. This will include Antibody screening tests, Antigen/ Antibody combination tests, and RNA tests.

CO-3: The students will get the knowledge to isolate bacteriophage from sewage samples

CO-4: Students will obtain knowledge about what damages DNA and how can it be repaired and if not repaired what mutations can occur resulting in various diseases.

Reference Books:

Title	Authors	Publisher
Introduction to Modern Virology. 6th edition	Dimmock, NJ, Easton, AL, Leppard, KN (2007)	Blackwell Publishing Ltd.
Virology: Principles and Applications	Carter J and Saunders V (2007).	John Wiley and Sons.
Principles of Virology, Molecular biology, Pathogenesis and Control. 2nd edition	Flint SJ, Enquist, LW, Krug, RM, Racaniello, VR, Skalka, AM (2004).	ASM press Washington DC.
Virology. 3rd edition.	Levy JA, Conrat HF, Owens RA. (2000).	Prentice Hall publication, New Jersey.
Lehninger Principles of Biochemistry, 5th Edition.,	Nelson DL and Cox MM (2008)	W.H. Freeman and Company
Microbiology 9th Ed.,	Prescott, Harley and Klein's Willey MJ, Sherwood, LM &Woolverton C J (2013)	McGrawHill
Basic Virology. 2nd edition	Wagner EK, Hewlett MJ. (2004).	Blackwell Publishing.

P P Savani University
School of Sciences
Syllabus, Teaching and Examination Scheme

Course Name: Introduction to Bioindustries

Course Code: SSBT2240

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:
The students will acquire the fundamental knowledge of various Bio-Industries like food, chemical, pharmaceutical, agriculture-based industries etc. and its application in the field of biotechnology

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Food Based Industries** A visit to Food based industry and acquaintance with instruments/ equipment's/ processes/ technology employed.	6	25
2	**Pharmaceutical Industries** A visit to Pharmaceutical industry and acquaintance with instruments/ equipment's/ processes/ technology employed.	8	25
Section-II			
3	**Agriculture/Dairy based Industries** A visit to Agriculture based industry and acquaintance with instruments/ equipment's/ processes/ technology employed.	8	25
4	**Chemical Industries** A visit to Chemical industry and acquaintance with instruments/ equipment's/ processes/ technology employed	8	25

Course Outcome :

CO-1: Students will understand the various operations involved in venture creation.
CO-2: Students will acquire the knowledge of the different types production and quality, manufacturing ideas, new processes and bioengineering with innovation.
CO-3: Students will be able to determine the market value of the different bio product and identify scope for entrepreneurship in biosciences
CO-4: Students will understand complex processes on different scales, used to multidisciplinary approaches

Reference Books:

Title	Authors	Publisher
Seven Crisis of Business Strategies for Survival & Growth	V.G.Patel	EDI Ahemdabad
"Small Business Management	Ramchandran	Himalaya Publication

Course Name: German II (Foreign Language)

Course Code: CFLS3021

Prerequisite Course/s: CFLS3010 Communication Skills (Foreign Language) French

Teaching & Examination Scheme:

Teaching Scheme (Hours/week)					Examination Scheme (Marks)			
Lecture/ Seminar	Studio	Practical/ Workshop	Others	Credit	CE	Mid Sem Jury/Exam	ESE/ Final Fury	Total
01	--	01	--	02	40	00	60	100

CE: Continuous Evaluation, ESE: End Semester Exam

Introduction & Objective of the Course:

1. To develop and integrate the use of the four Language skills i.e. listening, speaking,reading and Writing.
2. To use the language effectively and appropriately on topics of everyday life situations.
3. To develop an interest in the appreciation of French.
4. To develop an intercultural awareness.
5. To enhance the ability of the candidates to express their ideas and feelings in their own words and for them to understand the use of correct language.
6. To appreciate the language as an effective means of communication.
7. To understand language when spoken at normal conversational speed in everyday lifesituations.
8. To understand the basic structural patterns of the language, vocabulary and constructions.

Section I – Theory			
Unit	Content	Hours	Weightage
1.	• Introduction to German • ● Alphabets • ● German accents • ● German Numbers • ● What are the similarities and differences between English and German? • ● Greetings	10	20%
2.	• German Time • ● Basic Introduction	5	25%
3.	• Vocabulary part-1 • ● The days of the week • ● The months of the year • ● Seasons 2 05 • ● Directions & Weather	5	25%

4.	• Vocabulary part-2 • ● Family • ● Colors and Shapes • ● Day/time indicators • ● Body parts • ● Clothing	10	30%

Outcome(s):

After completion of the course, the student will be able to

- Demonstrate the level of proficiency necessary to enable them to function in anenvironment where French is used exclusively.
- Demonstrate speaking, listening, reading, and writing in French.
- Delf exam certification will be valid throughout the world.

Textbook(s):

Title	Author/s	Publication
Nameste German G.MAUGER MON LIVRE FRANCAIS	Yoshita dalal	9 seeries publications
DELF A1	Bruno Giraedeau Nelly Mous	Goyal publishers

Web Material/Links:

- **Ciep.com**
- **www.youlearnfrench**

Course Evaluation:

Based on the exam.

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Syllabus, Teaching and Examination Scheme

Course Name: Integrated Personality Development Course 2 (IPDC-2)

Course Code: SEPD3050

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	1	100	00	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To help learners to

- provide students with a holistic education – focused on increasing their intelligence quotient, physical quotient, emotional quotient and spiritual quotient
- provide students with hard and soft skills, making them more marketable when entering the workforce
- educate students on their social responsibilities as citizens of India
- provide students with a value-based education which will enable them to be successful in their family, professional, and social relationships.
- teach self-analysis and self-improvement exercises to enhance the potential of the participant.

Course Contents:

Theory:

- Continuous Evaluation consists of 40 marks. There will be a mid-term exam which will assess the current progress of students, it assessed out of 20 marks and will be equivalent to 20 marks of the Continuous Course Evaluation (CCE). There will be a submission consisting 10 marks as per the guidelines of course coordinator and average of the attendance consisting 10 marks (minimum 60 percentage attendance is required).
- End semester exam (ESE) part A 30 marks and part B 30 marks.

Course Outcome(s):

After completing the IPDC course (lecture and full participation in activities/challenges), we would like to see PPSU students:

- To have gained a greater sense of social responsibility
- To have gained marketable hard and soft skills that would directly apply to their future careers
- To have gained greater insight and ability to navigate their family, social, and professional relationships along with difficult situations which may arise in their life
- To have a broader sense of self-confidence and a defined identity
- To have greater value for living a moral and ethical life based on principles taught in the course.

Course Contents:

Lecture No.	Content	Hours
1.	Remaking Yourself - Restructuring Yourself	02
2.	Essentials of Profession -Writing A Resume	02
3.	Financial Wisdom -Basics of Financial Planning.	02
4.	Financial Wisdom -Financial Planning Process.	02
5.	From House to Home -Listening & Understanding.	02

6.	From House to Home -Forgive & Forget.	02
7.	From House to Home –Bonding the Family.	02
8	Soft Skills -Networking, Decision making & Leadership	02
9	Soft Skills -Teamwork, Harmony & Adaptability	02
10	Mass Management – Project Management	02
11	My India My Pride -Glorious Past (Part -1)	02
12	My India My Pride -Glorious Past (Part -2)	02
13	My India My Pride –Present Scenario.	02
14	My India My Pride -An Ideal Citizen-1	02
15	My India My Pride -An Ideal Citizen-2	02

Course Evaluation:
Theory:

- Continuous Evaluation consists of 40 marks. There will be a mid-term exam which will assess the current progress of students, it assessed out of 20 marks and will be equivalent to 20 marks of the Continuous Course Evaluation (CCE). There will be a submission consisting 10 marks as per the guidelines of course coordinator and average of the attendance consisting 10 marks (minimum 60 percentage attendance is required).
- End semester exam (ESE) part A 30 marks and part B 30 marks.

Course Outcome(s):
After completing the IPDC course (lecture and full participation in activities/challenges), we would like to see PPSU students:

- To have gained a greater sense of social responsibility
- To have gained marketable hard and soft skills that would directly apply to their future careers
- To have gained greater insight and ability to navigate their family, social, and professional relationships along with difficult situations which may arise in their life
- To have a broader sense of self-confidence and a defined identity
- To have greater value for living a moral and ethical life based on principles taught in the course.

Sem-5

Course Name: Food and Dairy Microbiology I

Course Code: SSMB3070

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:
The students will acquire the fundamental knowledge about Food and Dairy Microbiology, intrinsic and extrinsic factors, microbial spoilage, food preservation.
To inculcate habit of scientific reasoning to do the task rationally.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Foods as a substrate for microorganisms** Intrinsic and extrinsic factors that affect growth and survival of microbes in foods, natural flora and source of contamination of foods in general.	6	25
2	**Microbial spoilage of various foods** Principles, Spoilage of vegetables, fruits, meat, eggs, milk and butter,bread, canned Foods.	8	25
Section-II			
3	**Principles and methods of food preservation** Principles, physical methods of food preservation: temperature (low,high, canning, drying), irradiation, hydrostatic pressure, high voltage pulse, microwaveprocessing and aseptic packaging, chemical methods of food preservation: salt, sugar, organic acids, SO2, nitrite and nitrates, ethylene oxide, antibiotics and bacteriocins.	8	25
4	**Fermented foods** Dairy starter cultures, fermented dairy products: yogurt, acidophilusmilk, kumiss, kefir, dahi and cheese, other fermented foods: dosa, sauerkraut, soy sauce and tampeh, Probiotics: Health benefits, types of microorganisms used, probiotic foods available in market.	8	25

Course Outcome :

CO-1: Students will learn about the different types of fermentation processes, equipment used, and microbiological processes involved. Students will also gain knowledge about the microbiology of milk and fermented products.
CO-2: Students will gain knowledge of the significance and activities of microorganisms in food.
CO-3: Students will learn about the diseases caused due to microbial infection and ways to prevent it.
CO-4: Students will know the role of microorganisms in determining the quality of food and its spoilage process

Reference Books:

Title	Authors	Publisher
Food Microbiology. 4th edition	Adams MR and Moss MO.(1995).	New Age International (P) Limited Publishers, New Delhi, India
Basic Food Microbiology. 1st edition.	Banwart JM. (1987).	CBS Publishers and Distributors Delhi, India.
Antimicrobials in Foods	Davidson PM and Brannen AL.(1993).	Marcel Dekker, New York.
Natural Antimicrobial Systems and Food Preservation	Dillion VM and Board RG.(1996).	CAB International, Wallingford, Oxon
Food Microbiology. 3rd edition	Frazier WC and Westhoff DC.(1992).	Tata McGraw-Hill Publishing Company Ltd, New Delhi, India

Course Name: Food and Dairy Microbiology II

Course Code: SSMB3090

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will acquire the fundamental knowledge about Food and Dairy Microbiology
To inculcate habit of scientific reasoning to do the task rationally

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	Food borne diseases (causative agents, foods involved, symptoms and preventive measures) Food intoxications: *Staphylococcus aureus*, *Clostridium botulinum* and mycotoxins.	6	25
2	Food borne diseases Food infections: *Bacillus cereus*, *Vibrio parahaemolyticus*, *Escherichia coli*, Salmonellosis, Shigellosis, *Yersinia enterocolitica*, *Listeria monocytogenes*and *Campylobacter jejuni.*	8	25
Section-II			
3	Food sanitation and control HACCP, Indices of food sanitary quality and sanitizers	8	25
4	Cultural and rapid detection methods of food borne pathogens in foods and introduction to predictive microbiology.	8	25

Course Outcome :

CO-1: Students will learn about causative agents, foods involved, symptoms and Preventive measures for the Foodborne diseases.
CO-2: Students will acquire the fundamental knowledge about Food intoxications and Food infections caused by the effect of different microbes
CO-3: Students will understand basic principles of HACCP, Indices of food sanitary quality, and sanitizers
CO-4: Students will study different Cultural and rapid detection methods and predictive microbiology.

Reference Books:

Title	Authors	Publisher
Food Microbiology. 4th edition	Adams MR and Moss MO. (1995).	New Age International (P) Limited Publishers, New Delhi, India
Basic Food Microbiology. 1st edition.	Banwart JM. (1987).	CBS Publishers and Distributors Delhi, India.
Antimicrobials in Foods	Davidson PM and Brannen AL. (1993).	Marcel Dekker, New York.
Natural Antimicrobial Systems and Food Preservation	Dillion VM and Board RG. (1996).	CAB International, Wallingford, Oxon
Food Microbiology. 3rd edition	Frazier WC and Westhoff DC. (1992).	Tata McGraw-Hill Publishing Company Ltd, New Delhi, India

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Syllabus, Teaching and Examination Scheme

Course Name: Food and Dairy Microbiology Practical

Course Code: SSMB3110

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	4	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will acquire the fundamental knowledge about Food and Dairy Microbiology
To inculcate habit of scientific reasoning to do the task rationally

Course Contents:

Section-I		
Module	**Content**	**Hours**
1	MBRT of milk samples and their standard plate count.	10
2.	Alkaline phosphatase test to check the efficiency of pasteurization of milk.	10
3.	Isolation of any food borne bacteria from food products.	10
4.	Isolation of spoilage microorganisms from spoiled vegetables/fruits.	10
5.	Isolation of spoilage microorganisms from bread.	10
6.	Preparation of Yogurt/Dahi.	10

Course Outcome :

CO-1: The students will learn to check the quality of milk and perform the standard plate count method

CO-2: Students will learn to check the quality of pasteurized milk.

CO-3: Students will know how to isolate foodborne bacteria and other microorganisms

CO-4: Students will learn about the preparation of dahi and also its importance as a probiotics.

Reference Books:

Title	Authors	Publisher
Food Microbiology. 4th edition	Adams MR and Moss MO. (1995).	New Age International (P) Limited Publishers, New Delhi, India
Basic Food Microbiology. 1st edition.	Banwart JM. (1987).	CBS Publishers and Distributors Delhi, India.
Antimicrobials in Foods	Davidson PM and Brannen AL. (1993).	Marcel Dekker, New York.
Natural Antimicrobial Systems and Food Preservation	Dillion VM and Board RG. (1996).	CAB International, Wallingford, Oxon
Food Microbiology. 3rd edition	Frazier WC and Westhoff DC. (1992).	Tata McGraw-Hill Publishing Company Ltd, New Delhi, India

Course Name: Industrial Microbiology I

Course Code: SSMB3130

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
3	0	0	3	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:
The students will acquire the fundamental knowledge about strain improvement, industrially important microbes and production process of various metabolites.
To inculcate habit of scientific reasoning to do the task rationally

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Introduction** Introduction to fermentation process. Range of fermentation process and its chronological development.	6	25
2	**Basic Principle** Basic principle components of fermentation technology. Types of microbial culture and its growth kinetics– Batch, Fed batch and Continuous culture.	8	25
Section-II			
3	**Design of Bioprocess Vessels** Design of bioprocess vessels- Significance of Impeller, Baffles, Sparger; Types of culture/production vessels- Airlift; Cyclone Column; Packed Tower and their application in production processes.	8	25
4	**Principles of Upstream Processing** Principles of upstream processing – Media preparation Media formulation. Carbon sources, Nitrogen sources, Minerals, Buffers, precursors, antifoam.	8	25

Course Outcome :

CO-1: Students will learn about different commercial importance microorganisms and their bioprocesses.
CO-2: Students will be able to discuss the methods for the production of certain products (metabolites) using different microorganisms
CO-3: Students will be able to describe the environmental and nutritional factors affecting the production of various metabolites
CO-4: Students will be able to explain the various fermentation strategies and the growth kinetics of industrial microorganisms

Reference Books:

Title	Authors	Publisher
Industrial Microbiology. 1st edition	Casida LE. (1991)	Wiley Eastern Limited
A textbook of Industrial Microbiology. 2nd edition	Crueger W and Crueger A. (2000).	Panima Publishing Co. New Delhi.
Industrial Microbiology. 1st edition	Patel AH. (1996).	Macmillan India Limited.
Principles of Fermentation Technology. 2nd edition,	Stanbury PF, Whitaker A and Hall SJ. (2006).	Elsevier Science Ltd.

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Syllabus, Teaching and Examination Scheme

Course Name: Industrial Microbiology II

Course Code: SSMB3150

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will acquire the fundamental knowledge about strain improvement, industrially important microbes and production process of various metabolites

To inculcate habit of scientific reasoning to do the task rationally

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Sterilization** Introduction, batch sterilization, continues sterilization, filter sterilization	6	25
2	**Inoculum development** Introduction, development of inoculum for yeast process, bacterial process, mycelial process, Aspectic inoculation	8	25
Section-II			
3	**Introduction to Downstream Processing** Introduction to downstream processing, product recovery and purification. Effluent treatment.	8	25
4	**Microbial Production** Microbial production of ethanol, amylase, lactic acid and Single Cell Proteins, Antibiotic producing microorganisms.	8	25

Course Outcome :

CO-1: Students will gain knowledge about various processes, batch and continuous processes.
CO-2: Students will get knowledge of various types of fermenters, mechanisms, and fermentation strategies.
CO-3: Students will get knowledge of various environmental and nutritional factors affecting the production of various metabolites and various microbes.
CO-4: Students will be able to select the best optimum conditions and various substrates for various microbial products at affordable rates, strategies and the growth kinetics of industrial microorganisms.

Reference Books:

Title	Authors	Publisher
Industrial Microbiology. 1st edition	Casida LE. (1991)	Wiley Eastern Limited
A textbook of Industrial Microbiology. 2nd edition	Crueger W and Crueger A. (2000).	Panima Publishing Co. New Delhi.
Industrial Microbiology. 1st edition	Patel AH. (1996).	Macmillan India Limited.
Principles of Fermentation Technology. 2nd edition,	Stanbury PF, Whitaker A and Hall SJ. (2006).	Elsevier Science Ltd.

Course Name: Industrial Microbiology Practical

Course Code: SSMB3170

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	4	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will acquire the fundamental knowledge about strain improvement, industrially important microbes and production process of various metabolites.
To inculcate habit of scientific reasoning to do the task rationally.

Course Contents:

Section-I		
Module	**Content**	**Hours**
1	Antibiotic producing microbes by crowded plate techniques.	**10**
2.	Antibiotic producing microbes by Wilkin's techniques.	**10**
3.	Isolation of organic acid producing microbes.	**10**
4.	Ethanol estimation and production by yeast.	**10**
5.	Bioassay of penicillin by cup borer and paper disc method.	**10**
6.	Isolation of industrially important microorganism from natural resource.	**10**

Course Outcome :

CO-1: Students will Conduct experiments related to antibiotic-producing microbes
CO-2: Students will learn about the isolation of organic acid-producing microbes.
CO-3: Students will be able to learn about the production and estimation of alcohol and penicillin by different methods.
CO-4: Students will learn about the isolation of commercially and economically important microorganisms from natural recourses.

Reference Books:

Title	Authors	Publisher
Industrial Microbiology. 1st edition	Casida LE. (1991)	Wiley Eastern Limited
A textbook of Industrial Microbiology. 2nd edition	Crueger W and Crueger A. (2000).	Panima Publishing Co. New Delhi.
Industrial Microbiology. 1st edition	Patel AH. (1996).	Macmillan India Limited.
Principles of Fermentation Technology. 2nd edition,	Stanbury PF, Whitaker A and Hall SJ. (2006).	Elsevier Science Ltd.

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Syllabus, Teaching and Examination Scheme

Course Name: Recombinant DNA Technology I

Course Code: SSBT3130

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will acquire the fundamental knowledge about r-DNA technology, tools used in r-DNA technology and applications via this course

To inculcate habit of scientific reasoning to do the task rationally

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Basic Techniques of r-DNA technology** Introduction, History, Definitions, basic steps of gene cloning and r DNA technology, The tools used in gene cloning and r DNA Technology.	6	25
2	**Enzymes for Gene Cloning** Restriction Endonucleases and their types, Joining DNA molecules:Ligase, DNA modifiying enzymes: Kinase, Alkaline phosphatase, Terminal transferase, DNA polymerase, S1 nuclease, Exonuclease, Linkers and Adapters.	8	25
Section-II			
3	**Gene cloning: vector-I** Properties of vector, cloning and expression vector, Biology of *E. coli* K12 vector, Plasmid vector, pBR322, pUC18/19, pGEN3Z, Yeast Plasmid vector (yeast integrating plasmid, episomal plasmid, replicating plasmid, centromeric plasmid, linear plasmid), Ti plasmid, cosmids, Phagemid vector.	8	25
4	**Gene cloning: vector-II** Biology of Bacteriophage vector, ƛgt10, ƛgt11, EMBL3 & 4, M13 phage vector, YAC, BAC, P1 phage vector, PAC, Transposon, Shuttle vector, Vector for plant, Vector for animal.	8	25

Course Outcome :

CO-1: Students will learn the concepts and the tools used in gene cloning and rDNA Technology
CO-2: Students will learn the different types of enzymes and their catalyzed reactions
CO-3: Students will learn the basic vectors used in gene cloning and construct vector maps
CO-4 : Students will learn and study vectors that can take up inserts more than 1-2Kb.

Reference Books:

Title	Authors	Publisher
Gene Cloning and DNA Analysis. 5th edition.	Brown TA. (2006).	Blackwell Publishing, Oxford, U.K.
Biotechnology-Applying the Genetic Revolution.	Clark DP and Pazdernik NJ. (2009).	Elsevier Academic Press, USA.
Molecular Biotechnology- Principles and Applications of recombinant DNA.	Glick, B.R., Pasternak, J.J. (2003).	ASM Press, Washington
Principles of Gene Manipulation and Genomics, 7^{th}edition.	Primrose SB and Twyman RM. (2006).	Blackwell Publishing, Oxford, U.K.
Molecular Cloning-A Laboratory Manual. 3^{rd}edition	Sambrook J, Fritsch EF and Maniatis T. (2001).	Cold Spring Harbor Laboratory Press.

Course Name: Recombinant DNA Technology II

Course Code: SSBT3150

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will acquire the fundamental knowledge about r-DNA technology, tools used in r-DNA technology and applications via this course.
To inculcate habit of scientific reasoning to do the task rationally.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Construction of cDNA library** Isolation of mRNA, preparation of c DNA, cloning of c DNA, Problem on c DNA preparation, Properties of c DNA and c DNA libraries, application of c DNA libraries, introduction of host cells, clone selection.	6	25
2	**Construction of Genomic library** Isolation of DNA, Partial digestion, ligation of fragment to a vector, amplified genomic library, subgenomic libraries.	8	25
Section-II			
3	**Screening of clones-I** Probes, colony and plaque hybridization, immunological detection, southern blot analysis, chromosome walking, screening by PCR, Nick translation, Random primed.	8	25
4	**Screening of clones-II** Non-radioactive labelling, Horseradish peroxidase system, DIG, Biotin-streptavidin, Microarray technology, DNA sequencing-Sanger, Maxam-gilbert, NGS.	8	25

Course Outcome :

CO-1: The students will acquire the fundamental knowledge about r-DNA technology and application of cDNA libraries, the introduction of host cells, clone selection.
CO-2: The students will learn about Isolation of DNA, Partial digestion, ligation of the fragment to a vector, amplified genomic library, subgenomic libraries.
CO-3: The students will know about plaque hybridization, immunological detection, southern blot analysis, chromosome walking, screening by PCR, and Nick translation.
CO-4: The students will learn the topics non-radioactive labeling, Horseradish peroxidase system, DIG, Biotin-streptavidin, Microarray technology, DNA sequencing-Sanger, Maxam-gilbert, NGS

Reference Books:

Title	Authors	Publisher
Gene Cloning and DNA Analysis. 5th edition.	Brown TA. (2006).	Blackwell Publishing,Oxford, U.K.
Biotechnology-Applying the Genetic Revolution.	Clark DP and Pazdernik NJ. (2009).	Elsevier Academic Press, USA.
Molecular Biotechnology- Principles and Applications of recombinant DNA.	Glick, B.R., Pasternak, J.J. (2003).	ASM Press, Washington
Principles of Gene Manipulation and Genomics, 7thedition.	Primrose SB and Twyman RM. (2006).	Blackwell Publishing, Oxford, U.K.
Molecular Cloning-A Laboratory Manual. 3rdedition	Sambrook J, Fritsch EF and Maniatis T. (2001).	Cold Spring Harbor Laboratory Press.

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Syllabus, Teaching and Examination Scheme

Course Name: Recombinant DNA Technology Practical

Course Code: SSBT3170

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	4	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will acquire the fundamental knowledge about genome, genome structure and central dogma processes via this course.
To inculcate habit of scientific reasoning to do the task rationally.

Course Contents:

Section-I		
Module	**Content**	**Hours**
1	Isolation of chromosomal DNA from organisms.	**10**
2.	DNA molecular size determination.	**10**
3.	Restriction digestion of DNA.	**10**
4.	DNA ligation method.	**10**
5.	Transformation of competent cells by Blue-white screening methods.	**10**
6.	Optimization of PCR methods.	**10**

Course Outcome :

CO-1: To learn the basic techniques to isolate DNA and to learn the preparation of reagents required for the protocol.
CO-2: To learn the different types and basics of types of REs, patterns in gel, learn reaction mixture components required for restriction digestion and ligation reactions.
CO-3: Study and learn about the various screening techniques with special mention for blue-white screening. know about IPTG, X-GAL, and X-Gluc
CO-4: To set a PCR machine by preparing the individual reagents and mixing them in appropriate concentration, fix temperature profile, and about Taq polymerase

Reference Books:

Title	Authors	Publisher
Gene Cloning and DNA Analysis. 5th edition.	Brown TA. (2006).	Blackwell Publishing, Oxford, U.K.
Biotechnology-Applying the Genetic Revolution.	Clark DP and Pazdernik NJ. (2009).	Elsevier Academic Press, USA.
Molecular Biotechnology- Principles and Applications of recombinant DNA.	Glick, B.R., Pasternak, J.J. (2003).	ASM Press, Washington
Principles of Gene Manipulation and Genomics, 7thedition.	Primrose SB and Twyman RM. (2006).	Blackwell Publishing, Oxford, U.K.
Molecular cloning A laboratory Manual, 3rd edition.	Sambrook J, Fritsch EF and Maniatis T. (2001).	Cold Spring Harbor Laboratory Press.

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Syllabus, Teaching and Examination Scheme

Course Name: Mycology I

Course Code: SSMB3010

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
3	0	0	3	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:
The students will acquire the fundamental knowledge about nature, structure, occurrence, habitat, classification and application of Fungi.
To inculcate habit of scientific reasoning to do the task rationally.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	Definition, General characteristics; Affinities with plants and animals; Thallus organization; Cellwall composition; Nutrition; Classification.	6	25
2	Life cycle, structure and occurrence – (i) Cellular slime molds (ii) True slime mold (iii) Oomycetes (iv) Chytridiomycetes (v) Zygomycetes (vi) Ascomycetes (vii)Basidiomycetes (viii) Deuteromycetes	8	25
Section-II			
3	Life cycle and classification with reference to Saccharomyces, Aspergillus, Penicillium, Alternaria, Neurospora and Peziza.	8	25
4	Symbiotic associations: Lichens – Occurrence; General characteristics; Growth forms and range of thallus organization; Nature of associations of algal and fungal partners; Reproduction; Mycorrhiza-Ectomycorrhiza, Endomycorrhiza and their significance.	8	25

Course Outcome :

CO-1: Students will get familiar with the basic concepts of Mycology, taxonomy, and physiology.
CO-2: Students will get knowledge about various reproduction methods, spore formations, and identification determining the classes of fungi..
CO-3: Students will get to know about various lifecycles of fungi, their identification, and pathogenicity.
CO-4: Students will gain information about various fungal associations with plants, and algae, their helpfulness in various areas, and their economic importance.

Reference Books:

Title	Authors	Publisher
Volume 4: Medical Mycology	Leslie Collier	Topley & Wilson's
Medical Mycology and Human Mycoses	Everett Smith	
Introduction to Fungi. 3rd ed.	Webster, J. and Weber, R.	Cambridge: Cambridge University Press, 2007.
Plant Pathology.	Sharma, P.D.	Rastogi Publication,

Course Name: Mycology II

Course Code: SSMB3030

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will acquire the fundamental knowledge about nature, Structure, occurrence, habitat, classification and application of Fungi.
To inculcate habit of scientific reasoning to do the task rationally.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	Fungal Metabolism, Fungal Growth- Apical growth Fungi- Reproduction and Life cycles, Macro fungi- Ascomycota and Basidiomycota.	6	25
2	*Saccharomyces cerevisiae*-Model organism, Mushrooms and their medical relevance, Mycotoxins and Mushroom Poisoning Fungi- Ecological importance Mycorrhiza, Lichens.	8	25
Section-II			
3	Medical mycology- Culture methods fungi, Diagnosis, Dimorphism Mycoses (Superficial) (Opportunistic) Systemic) Host responses to fungal infection-Immunity Antifungal agents.	8	25
4	Applied Mycology: Role of fungi in biotechnology, food industry (Flavour & texture, Fermentation, Baking, Organic acids, Enzymes, Mycoproteins); Secondary metabolites (Pharmaceutical preparations); Agriculture (Biofertilizers); Mycotoxins; Biological control (Mycofungicides, Mycoherbicides, Mycoinsecticides, Myconematicides).	8	25

Course Outcome :

CO-1: Students will learn about the fungal world. The various concepts of their existences will be included in this..
CO-2: Students will acquire in-depth knowledge about Saccharomyces cerevisiae, its importance, structure, and usage
CO-3: Students will learn about the fungal growth and reproduction cycle.
CO-4: Students will know about useful as well as harmful fungi. They will also learn about the isolation of various fungal byproducts and their application in various industries.

Reference Books:

Title	Authors	Publisher
Volume 4: Medical Mycology	Leslie Collier	Topley& Wilson's
Medical Mycology and Human Mycoses	Everett Smith	Wiley Publishers
Introduction to Fungi. 3rd ed.	Webster, J. and Weber, R.	Cambridge: Cambridge University Press, 2007.
Plant Pathology.	Sharma, P.D.	Rastogi Publication,

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Syllabus, Teaching and Examination Scheme

Course Name: Mycology Practical

Course Code: SSMB3050

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	4	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will acquire the fundamental knowledge about nature, Structure , importance and application of Fungi.
To inculcate habit of scientific reasoning to do the task rationally.

Course Contents:

Module	Name of Practical	Hours
1	Introduction to the world of fungi (Unicellular, coenocytic/septate mycelium, structure of fungi, various spores of fungi, asocarps & basidiocarps).	**12**
2.	Study of Rhizopus and Mucor structure by isolating from nature. Rhizopus: study of asexual stage from temporary mounts and sexual structures throughpermanent slides.	**12**
3.	Study of Aspergillus spp and Penicillium spp by isolating from nature. Aspergillus and Penicillium: study of asexual stage from temporary mounts. Study of Sexual stage from permanent slides/photographs.	**12**
4.	Lichens: Study of growth forms of lichens (crustose, foliose and fruticose) on different substrates. Study of thallus and reproductive structures (soredia and apothecium) through permanent slides. Mycorrhizae: ectomycorrhiza and endomycorrhiza (Photographs), Mushroom study (various types, edible non edible, growth in lab study)	**12**
5.	Phytopathology: Herbarium specimens of bacterial diseases; Citrus Canker; Angular leaf spot of cotton, Viral diseases: TMV, Vein clearing, Fungal diseases: Early blight of potato, Black stem rust of wheat and White rust of crucifers.	**12**

Course Outcome :

CO-1: Students will gain knowledge of various different types of fungi and their importance as well as disadvantages to humans and nature.

CO-2: Students will develop skills to isolate, grow and aseptically handle the spore producing fungi.

CO-3: Students will gain information about growth patterns, growth requirements and become familiar with different life forms.

CO-4: Students will acquire the information about various plant disease, their symptoms, and the severity of threats.

Reference Books:

Title	Authors	Publisher
Volume 4: Medical Mycology	Leslie Collier	Topley& Wilson's
Medical Mycology and Human Mycoses	Everett Smith	Wiley Publishers
Introduction to Fungi. 3rd ed.	Webster, J. and Weber, R.	Cambridge: Cambridge University Press, 2007.
Plant Pathology.	Sharma, P.D.	Rastogi Publication,

Sem-6

Course Name: Environment Microbiology I

Course Code: SSMB3020

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:
The students will acquire the fundamental knowledge about bioenergy, bioremediation, renewable and non renewable sources and their application in fileds via this course.
To inculcate habit of scientific reasoning to do the task rationally.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Energy** Renewable and non-renewable energy sources. Conventional fuels and their environmental impact – Firewood, Plant, Animal, Water, Coal and Gas. Energy crops: Wood, sugar and starch crop, oilseed crops, hydrocarbon producing crops.	6	25
2	Biogas – Production and applications Bioethanol – Production and applications Hydrogen as a fuel Microbially Enhanced Oil Recovery	8	25
Section-II			
3	Biohydrometallurgy: Recovery of Copper and Uranium Biodegradation: Alkyl benzyl sulfonate, Herbicides and Pesticides	8	25
4	Bioremediation of oil spillage Biodeterioration: Paper, Paint, Metal, Leather and Textiles	8	25

Course Outcome :

CO-1: Students will learn about renewable and non-renewable energy sources, energy crops, and other conventional fuels.
CO-2: Students will learn about the production and application of biogas, bioethanol, hydrogen as fuel, and microbially enhanced oil recovery.
CO-3: Students will learn about the biohydrometallurgy and biodegradation of alkyl benzyl sulfonate, herbicides, and pesticides.
CO-4: Students will learn about the bioremediation of oil spillage and biodeterioration of paper, paint, metal, leather, and textiles.

Reference Books:

Title	Authors	Publisher
Biotechnology expanding horizons	B.D.Sign	5th edition, 2012, kalyani publication
Elements of Biotechnology	P.K.Gupta	Rastogi publication 2nd edition
Plant Virology.	Mathews (2004).	Hull R. Academic Press, New York.

Course Name: Environment Microbiology II

Course Code: SSMB3040

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	3	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will acquire the fundamental knowledge about Waste pollution, waste management, biodegradation, , bioremediation and their application in fields via this course.
To inculcate habit of scientific reasoning to do the task rationally.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Wastes and pollutants** Sources of wastes and pollutants, types of waste, hazards from wastes, scenario of waste, waste management.	6	25
2	**Waste treatment** Physical method, chemical method, biological methods, biofilters, treatment of liquid waste, treatment of solid wastes, conventional solid waste management treatment, municipal solid waste management, Application of Biotechnology in waste treatment.	8	25
Section-II			
3	**Waste water treatment** Characteristics of waste water, Aerobia waste water treatment: activated sludge and oxidation pond, anaerobia waste water treatment: UASB and anaerobic baffled reactor.	8	25
4	**Biodegradation of xenobiotics compounds** Types of xenobiotic compound, hazards from xenobiotics, hydrocarbon degradation, biodegradation of halogenated compound, origin of capacity to degrade xenobiotics, biotechnological approaches to degrade xenobiotics.	8	25

Course Outcome :

CO-1: Students will learn about the sources of wastes and pollutants, types of waste, hazards from waste, and waste management

CO-2: Students will learn about the physical, chemical, and biological methods of waste treatment. They will also learn about the application of biotechnology in waste treatment.

CO-3: Students will learn about the characteristics of wastewater and different types of bioreactors.

CO-4: Students will learn about the types of xenobiotic compounds, hazards from xenobiotics, hydrocarbon degradation and related biotechnological approaches.

Reference Books:

Title	Authors	Publisher
Biotechnology expanding horizons	B.D.Sign	5th edition, 2012, Kalyani Publication
Elements of Biotechnology	P.K.Gupta	Rastogi publication 2nd edition

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Syllabus, Teaching and Examination Scheme

Course Name: Environmental Microbiology Practical

Course Code: SSMB3060

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	4	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will acquire the fundamental knowledge about Waste pollution, waste management, biodegradation, , bioremediation and their application in fields via this course.
To inculcate habit of scientific reasoning to do the task rationally.

Course Contents:

Section-I		
Module	**Content**	**Hours**
1	Calculation of Total Dissolved Solids (TDS), TS Total Solids, TSS Total Suspended Solids of water sample.	**10**
2.	Calculation of DO, BOD of water sample.	**10**
3.	Calculation of COD of water sample.	**10**
4.	Bacterial Examination of Water by Most Probable Number Method.(Complete Test, Confirmed Test, IMVIC Test, EIJKman Test)	**10**
5.	To Study SPC Standard Plate Count and TVC Total Viable Count of Water Sample	**10**

Course Outcome :

CO-1: Students will know the basics of wastewater microbiology, environmental microbiology.
CO-2: Students will know the basics of wastewater analysis for different parameters, and treatments .
CO-3: Students will get the knowledge about biological treatments of various wastewaters.
CO-4: Students will gain knowledge related to hazardous waste, toxicity, and its effects.

Reference Books:

Title	Authors	Publisher
Biotechnology expanding horizons	B.D.Sign	5th edition, 2012, Kalyani Publication
Elements of Biotechnology	P.K.Gupta	Rastogi publication 2nd edition
Experimental Microbiology	Rakesh Patel	Aditya Publications

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Syllabus, Teaching and Examination Scheme

Course Name: Bioinformatics

Course Code: SSBT3140

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will acquire the fundamental knowledge about molecular database, various tools of data analysis,

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	History of Bioinformatics. The notion of Homology. Sequence Information Sources, EMBL, GENBANK, Entrez, Unigene, Understanding the structure of each source and using it on the web..	6	25
2	Protein Information Sources, PDB, SWISSPROT, TREMBL, Understanding the structure of each source and using it on the web. Introduction of Data Generating Techniques and Bioinformatics problem posed by them- Restriction Digestion, Chromatograms, Blots, PCR, Microarrays, Mass Spectrometry	8	25
Section-II			
3	Sequence and Phylogeny analysis, Detecting Open Reading Frames, Outline of sequence Assembly, Mutation/Substitution Matrices, Pairwise Alignments, Introduction to BLAST, using it on the web, Interpreting results, Multiple Sequence Alignment, Phylogenetic Analysis.	8	25
4	Searching Databases: SRS, Entrez, Sequence Similarity Searches-BLAST, FASTA, Data Submission. Genome Annotation: Pattern and repeat finding, Gene identification tools.	8	25

Course Outcome :

CO-1: Students will learn about Homology and its modelling.
CO-2: Students will learn about the sequence Information Sources, EMBL, GENBANK, Entrez, Unigene, Understanding the structure of each source and using it on the web.
CO-3: Students will understand the structure of each source and use it on the web. Introduction of Data Generating Techniques and Bioinformatics problem posed by them- Restriction Digestion, Chromatograms, Blots, PCR, Microarrays, Mass Spectrometry.
CO-4: Students will learn Pairwise Alignments, Introduction to BLAST, using it on the web, Interpreting results, Multiple Sequence Alignment, Phylogenetic Analysis.

Reference Books:

Title	Authors	Publisher
Bioinformatics: Principles and Applications.	Ghosh Z. and Bibekanand M.	Oxford University Press. (2008)
Bioinformatics and Functional Genomics. II Edition.	Pevsner J.	Wiley-Blackwell. (2009)

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Syllabus, Teaching and Examination Scheme

Course Name: Intellectual Property Right

Course Code: SSBT3160

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
2	0	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will acquire the fundamental knowledge about IPR, biotechnology entrepreneurship trademark, patents, plant breeding right, various plant patents and application in the field via this course.
To inculcate habit of scientific reasoning to do the task rationally.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	IPR Introduction, history, world organization, IPR in INDIA, Forms of protection: copy right, trademark, geographical indication, trade secret, designs, layout design of integrated circuits, patent	6	25
2	Patent Patent application, international patenting revocation of patent, patenting of biological material: microorganisms, plant patent, animal patent, genes & DNA patent, cloning patent, biological compounds, broad patent of Biotechnology	8	25
Section-II			
3	Plant Breeders right UPOV, function of UPOV, breeders exemption, farmers privilege, plant variety protection in India, farmer's right, advantages of PBR, Disadvantages of PBR	8	25
4	Case studies on plant patents Patenting of basmati rice in USA, revocation of turmeric patent, revocation of neem patent	8	25

Course Outcome :

CO-1: Students will be able to know the basic differences between copyrights, designs, patents, GI, etc. In addition to this, students will also be able to know the various procedures and forms available for a patent application in India.

CO-2: Students will be able to know which biological material and under what conditions are patentable? Biologists will be able to know the patentability criteria for their discovery of DNA, genes, newly modified microbes, and animals..

CO-3: Students shall be able to differentiate between plant protection and plant breeders right after reading this section. Acts and governing bodies for the PBR including India. Unique features of UPOV act 1978 and 1991, and some rights provided to a farmer or plant breeders.

CO-4: Students shall be able to know the process of revocation of patents after grant by taking case studies especially Basmati rice, turmeric, etc.

Reference Books:

Title	Authors	Publisher
Introduction to Plant biotechnology	H.S.Chawla	3rd edition, oxford & Hill
Biotechnology expanding horizons	B.D.Sign	5th edition, 2012, kalyani publication
Elements of Biotechnology	P.K.Gupta	Rastogi publication 2nd Edition

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Syllabus, Teaching and Examination Scheme

Course Name: Bioinformatics Practical

Course Code: SSBT3180

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	4	0	2	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The students will acquire the fundamental knowledge about IPR, trademark, patents, plant breeding right, various plant patents and application in the field via this course.
To inculcate habit of scientific reasoning to do the task rationally.

Course Contents:

Section-I		
Module	**Content**	**Hours**
1	Sequence information resource.	**10**
2.	Understanding and use of various web resources: EMBL, Genbank, Entrez, Unigene.	**10**
3.	Understanding and using: PDB, Swissprot, TREMBL.	**10**
4.	Retrieval of information from nucleotide databases.	**10**
5.	Sequence alignment using BLAST.	**10**
6.	Multiple sequence alignment using Clustal W.	**10**

Course Outcome :

CO-1: Students will be able to learn about the Sequence information resource such as NCBI, PDB, etc..

CO-2: Students will be able to perform the analysis sequences from various web resources: EMBL, Genbank, Entrez, and Unigene

CO-3: Students will learn the retrieval of information from nucleotide databases

CO-4: Students will be able to do Sequence alignment using BLAST and Multiple sequence alignment using Clustal W.

Reference Books:

Title	Authors	Publisher
Bioinformatics: Principles and Applications.	Ghosh Z. and Bibekanand M.	Oxford University Press. (2008)
Bioinformatics and Functional Genomics. II Edition.	Pevsner J.	Wiley-Blackwell. (2009)
Biostatistics For Dummies	John Pezzullo	Wiley Publications (2013) ISBN: 978-1-118-55398-5

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Syllabus, Teaching and Examination Scheme

Course Name: **Project/Training/Report**

Course Code: **SSMB3200**

Prerequisite: **Nil**

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				**Examination Scheme (Marks)**		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	30	0	15	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To help students learn about the research in state-of-the-art research institutions. This will also provide the students an opportunity to practically use their Microbiological y-based skills in a typical research environment.

Course Outline:

Content	**Hours**
The students shall carry out 2 -months dissertation in an academic or research institution of national/international repute. They must prepare a dissertation/ thesis/Project report on a specific template provided by the School of Sciences. Upon completion of the dissertation, students are required to present their work before the expert committee. Students must submit four copies of their thesis to the department .	**2 months**

Course Outcome :

CO-1: Develop basic understanding about large scale processes in industry/laboratories, also learn about safe handling of instruments and machines.

CO-2: Recognize formatting, drafting reports and results obtained during the period of training .

CO-3: Demonstrate practical knowledge about instrument working, principle as well as applications

CO-4: Learners will equip themselves with skills which can increase their employability.

Course Name: **Seminar**
Course Code: **SSMB3220**
Prerequisite: **Nil**

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	6	0	3	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To help students learn about recent topics, trends in the field of subject, research oriented knowledge and presentation skills.. This will also provide the students an opportunity to develop good on stage skills .
.

Course Outline:

Content	Hours
The students will have to present a topic on recent trends or research going on in the filed of Microbiology or interdisciplinary fields. . They must prepare presentation on topic in a specific template provided by the School of Sciences. .	**45**

Course Outcome :

CO-1: Learn to give convincing speeches, present material in a compelling, well-structured and logical order
CO-2: Gain deep knowledge of complicated subjects.
CO-3: Improve their ability to synthesize, evaluate, and reflect on information
CO-4: Learn to respond respectfully to opposing viewpoints

Course Evaluation:

Theory:

- Continuous Evaluation Consist of Two Test Each of 15 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each moduleand it carried of 10 Marks of Evaluation.
- End Semester Examination will consist of 60 Marks Exam.

Practical/Tutorial:

- Continuous Evaluation Consist of Performance of Practical/Tutorial which should be evaluatedout of 20 for each practical/Tutorial
- Internal Viva component of 5 Marks.
- Attendance/discipline/regularity for 5 marks
- Journal submission of 5 Marks.
- Assignment/Seminar of 5 Marks.