Syllabus Book

1st to 4th Semester

M.Sc. Biotechnology

P P Savani University

School of Sciences

Academic Session: 2022-23

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Sem-1

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

Course Code: SSBT7010

Course Name: Advances in Molecular biology

Prerequisite: Nil

Teaching and Examination Scheme:

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

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:
To study the structure of DNA, organization of genome and their replication, expression and regulation in prokaryotes and eukaryotes with operon models

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**DNA structure** DNA structure: Chemistry of DNA, DNA structure, Importance of hydrogen bonding, DNA usually right-handed double helix, Major & minor grooves, Different conformations of DNA (B, A and Z), Denaturation and Renaturation of DNA. DNA topology: linking number, twist, writhe, Supercoiling, Biology of Supercoiled DNA, DNA topoisomerases and their mechanism of action.	10	15
2	**Organization of genome & replication** Organization of DNA into chromosomes: Packaging of DNA and organization of chromosome in bacterial cells; Packaging of DNA in eukaryotic nucleosome and chromatin condensation, Nucleosome are building blocks, Histones, organization of histone octamer, atomic structure of nucleosome, histone wrapping around octamer, Histone binds to linker DNA, importance of Histone N-terminal tail for formation of 30nm fiber, chromatin remodelling, Histone modification, Acetylation-deacetylation-methylation-demethylation-phosphorylation of histone, enzymology of histone modification **DNA replication:** Chemistry of DNA synthesis, synthesized by 3' end of the primer, driving force of DNA synthesis, Replicon, extrachromosomal replicon, Function of DNA helicase, Single stranded binding protein,Topoisomerase, DNA polymerase enzymes: structure, holozymes has three subcomplex, sliding clamp functions, replication fork, clamp control association of core enzymes with DNA, coordinating synthesis of leading and lagging strand, RNA priming required to start replication, okazaki fragments, DNA polymerase in bacteria and eukaryotes, Proof reading activity, Termination of DNA replication: Type II topoisomerase, telomerase	25	45
Section-II			
3	**Expression of Genome**	13	20

	Promoters, Transcription binding protein, Transcription factors, Enhancers, **Transcription:** Different forms of RNA polymerases and its features, Activation of transcription by series of steps, Protein-protein interaction, DNA binding domains: zinc finger motif & helix loop helix, transcription in prokaryotes and eukaryotes, chemistry of RNA splicing, spliceosome machinery, splicing pathways, Exon shuffling, RNA editing, mRNA transport. **Genetic code:** makeup of code, characteristics of triplet codon, wobble hypothesis, three codon lead to chain termination, cracked code, universal nature of code **Translation:** Characteristics of mRNA, structure and role of t-RNA in protein synthesis, attachment of amino acids to tRNA, ribosome structure, Larger and smaller submit association and dissociation, translation -initiation, elongation and termination in in prokaryotes & eukaryotes.		
4	**Regulation of gene expression** Regulation of gene expression in prokaryotes: Operon concept, positive and negative regulation. Examples of lac, ara, and trp operon regulation. Regulation of gene expression in eukaryotes: Transcriptional: Modification of histone and DNA, Antisense RNA, si RNA, mi RNA, RNAi, translational: Post translation modification, chaperones, hsp 70, protein folding.	12	20

Course outcome:

CO-1: Understand the structure of DNA, different types of DNA, Characteristic features of DNA and their mechanism of action.

CO-2: Acquire the fundamental knowledge about organization of genome, genome structure and the detailed process of DNA replication in prokaryotes and eukaryotes

CO-3: Understand the central dogma process, synthesis of RNA, genetic code and proteins

CO-4: Develop basic understanding about the operon model for the regulation of genes in different environmental conditions

Reference Books:

Title	Authors	Publisher
Molecular biology of gene	Watson, baker, bell	5th edition, pearson
Genes IX	Lewin	Jones and bartlet
Principles of genetics	Gardner, Simmons, snustad	8th edition, wiley

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

Course Code: SSBT7030

Course Name: Advances in Molecular genetics

Prerequisite: Nil

Teaching and Examination Scheme:

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

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To impart knowledge about chemical, biological, and physical mutagens and their effect on DNA, and modes of gene transfer among microbes and transposons

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Mutation and DNA Repair:** Mutation, Spontaneous mutations DNA damages (Deamination of bases, alkylation, damage due to reactive oxygen, UV induced damage) and it repair pathways (Methyl-directed mismatch repair, Nucleotide excision repair, Base excision repair, recombinational repair, SOS inducible repair, specific repair for oxidative DNA damage, pyrimidine dimers and alkylation induced damage and adaptive response). **Recombination** (Types, Models of homologous recombination, Molecular mechanism of homologous, Homologous recombination in eukaryotes, mating type switching, Site specific recombination and its biological significance)	15	25
2	**Plasmid Biology** (Types of plasmids, compatibility, regulation of plasmid copy number and plasmid segregation) **Phage genetics** (T-series, complementation and Fine structure analysis, biology of lambda phages) **Fungal Genetics** (Tetrad analysis and Mitotic recombination) Model Organisms (*Bacteriophage*, *E.coli*, *Saccharomycescerevisiae*, *C.elegans*, *Drosophila*, *Arabidopsis thaliana*)	15	25
Section-II			
3	**Transformation** (Natural transformation in Bacillus subtilis, Streptococcus pneumonia and Haemophilus influenza). Transformation by inducing artificial competence, Gene linkage and mapping by transformation. **Transduction** (Generalized transduction in P22, P1, T4 and Mu bacteriophages, homologous recombination with recipient's chromosome, measuring transduction (co-transduction of markers, marker effects, abortive transduction, transduction of plasmids). Applications of generalized transduction, Specialized transduction and its applications. **Conjugation** (F-factor mediated Conjugation in E. coli, Hfr conjugation	15	25

	and chromosomal transfer, F-prime conjugation and merodiploids, Conjugation of fertility inhibited F-like plasmids, Non conjugative mobilizable plasmids, chromosomal mobilization of non-F plasmids, Plasmid based conjugation in other bacteria (Salmonella, Pseudomonas, Streptomyces and streptococcus, Interrupted mating and conjugational mapping)		
4	Agrobacterium genetics: Ti plasmid, Interkingdom gene transfer (Key early experiments, vir regulon, protein secretion apparatus, conjugation model of T-DNA transfer, Integration products) Transposable elements: Types of bacterial transposable elements; Structure, genetic organization and mechanism of transposition of Tn5, Tn3, phage Mu, Tn7, IS911, Integrons, Retrotransposons, conjugative and mobilizable transposons, Assays of transposition.	15	25

Course outcome:

CO-1: Knowledge about the effect of mutagens on the DNA, and repair mechanisms and types of recombination systems with its significance

CO-2: Understand about the vectors such as plasmids and phages; fungal genetics and knowledge of model organisms

CO-3: Knowledge of about the detailed mode of gene transfer in microbes i.e. by conjugation, transduction and transformation

CO-4: Knowledge of Agrobacterium genetics and importance of transposons, and insertion sequences during gene transfer

Reference Books:

Title	Authors	Publisher
Molecular Biology of the Gene	Watson et al	Vth edition.
Modern Microbial Genetics	Uldis Streips and Ronald Yasbin	Wiley publication
Microbial genetics	Stanley Molay, John Cronan and David Freifelder	Narosa Publishing House (1990)
Molecular Genetics of Bacteria	Snyder and Champness	American Society for Microbiology; 2nd Revised edition (1 December 2002)
Molecular Genetics	Stent and Calendar	W.H. Freeman& Co Ltd; 2nd Revised edition (4 December 1978)
Principles of Genetics	Gardener, Snustad and Simmons	Wiley India Pvt. Limited, 2006
Genes IX	Lewin	Jones and Bartlett Publishers, Inc; 9th Revised edition (6 March 2007)

Course Code:SSBT7050
Course Name: Molecular Biology and Genetics Practical
Prerequisite Course: Nil

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
				Theory		Practical		Tutorial		Total
Theory	Practical	Tutorial	Credit	CE	ESE	CE	ESE	CE	ESE	
0	8	-	4	-	-	40	60	-	-	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
This course is designed to understand basic and routine molecular biology and genetics practical, prepare competent cells for various applications, able to isolate DNA & RNA from bacteria, fungi and plants and learn about mutagens and their effect on the microbes

Course Contents:

Sr. No	Name of Experiment	Hours
1	To isolate genomic DNA from Bacterial Cell	8
2	To isolate total plant genomic DNA by CTAB method	8
3	Isolation of genomic DNA from fungi sample	8
4	Isolation of RNA from plant tissues	8
5	To perform agarose gel electrophoresis of isolated DNA	8
6	To estimate quantity and purity of the DNA sample by UV-Vis Spectroscopy	8
7	To extract specific bands of DNA from agarose gel	8
8	To study the process of bacterial conjugation through transfer of genes coding for antibiotic resistance	8
9	To prepare the competent cells and carry out transformation	8
10	To amplify 16S rRNA gene from *E.coli by* polymerase chain reaction	8
11	Isolation of pigment mutant of *Serratia marcescens*	8
12	Isolation of antibiotic resistance mutant	8

Course outcome:
CO-1: Perform molecular biology techniques in academics and industries
CO-2: Acquire the skills for preparation of competent cells and their subsequent utilization for various routine applications in molecular biology work
CO-3: Acquire basic biotechnological skills for extracting the genetic material from prokaryotes and eukaryotes
CO-4: Basic understanding about auxotrophs, the effect of UV on the microbial growth and their pigments

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

Course Code: SSBT7070

Course Name: Advances in Biochemistry

Prerequisite: Nil

Teaching and Examination Scheme:

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

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To understand the enzymes, enzyme kinetics and enzyme mediated inhibition, learn the basic processes of aerobic and anaerobic respiration, and to understand the regulations of metabolic pathways.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Basic Biochemistry:** Introduction to biomolecules, structure and biological significance of the different biomolecules. Nomenclature and classification of enzymes; enzyme Kinetics: Uni substrate enzyme kinetics, factors affecting the rate of enzyme catalyzed reactions; forms and derivation of Michaelis-Menten's equation, significance of Vmax and Km; Enzyme inhibition- reversible and irreversible (competitive, non-competitive and uncompetitive). General regulations of various metabolic pathways (Feedback, Allosteric, Covalent Modification).	15	25
2	**Carbohydrate Metabolism:** Overall pathways and regulation of different carbohydrate metabolism (Glycolysis, Gluconeogenesis, Pentose phosphate Pathway, TCA, Glycogenesis and glycogenolysis). Interaction of carbohydrate molecule with membrane receptor proteins.	15	25
Section-II			
3	**Lipid Metabolism:** Fatty acid synthesis and oxidation, Metabolism of phospholipids, triglycerides and cholesterol molecules. Interaction of different lipid molecule with membrane receptor proteins and their regulation.	15	25
4	**Amino acids and Nucleic acid Metabolism:** **Amino acids:** Overall pathways and regulation of amino acid metabolism (Transamination, Deamination, Specific reactions – Oxidation / decarboxylation and Urea cycle). Biogenic amines formation and their involvement in metabolism. Interaction of different amino acid with membrane receptor proteins. **Nucleic acid:** Catabolism and anabolism of purines and pyrimidinesand their regulation. De novo synthesis of nitrogen bases.	15	25

Learning outcome:

CO-1: Knowledge of types of enzyme catalyzed reactions, enzyme kinetics and inhibitions

CO-2: Knowledge about carbohydrate metabolism, glycolysis, TCA cycle, glycogen metabolism and other metabolic cycles

CO-3: Knowledge about lipid metabolism, fatty acid oxidation synthesis and regulation

CO-4: Knowledge of amino-acid and nucleic acid metabolism, biosynthetic pathways and their regulation

Reference Books:

Title	Authors	Publisher
Lehninger Principles of Biochemistry	Nelson David L & Cox, Michael M. W. H. Freeman and Company	5th Edition. ISBN: 978-0-2302-2699-9
Harpers's Biochemistry	Harper	McGraw Hill Publishing Company. 27th Edition. ISBN 10: 0071461973
Fundamentals of Biochemistry	Voet, Donald & Pratt, Charlotte W.	John Wiley and Sons, Inc, New York, 2rd Edition. ISBN: 0-471-74268-6
Biochemistry	Lubert Stryer	W. H. Freeman and Company. 6th Edition. ISBN-0716720094
Textbook of Medical Biochemistry	Chatterjee M.N and RanaShinde	Jaypee Brothers Medical Publisher PVT Ltd. ISBN – 8184481349.
An Introduction of Practical Biochemistry	Plummer, David T	Tata McGraw-Hill Publishing Co. Ltd, New Delhi., ISBN: 0-07-099487-0.
Textbook of medical Laboratory Technology	Praful B. Godkar	Bhalani Publishing house, Mumbai. 2nd Edition. ISBN – 81-85578-10-9

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

Course Code: SSBT7090

Course Name: Microbial Diversity

Prerequisite: Nil

Teaching and Examination Scheme:

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

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To impart knowledge about the diversity among microbes basically archaea, bacteria and actinomycetes, their economic importance and identification

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Microbial diversity:** What is microbial diversity, types of diversity: morphological, structural, metabolic, ecological, fundamental similarity of organisms, cultivable and non-cultivable diversity, conservation of microbial diversity	15	25
2	**Bacterial diversity:** occurrence, diversity, characteristics, significance of various groups of bacteria **Archaeal Diversity:** occurrence, diversity, characteristics, survival, adaptation & significance and application of various groups of archaea Actinomycetes Diversity: occurrence, diversity, characteristics, survival, adaptation & significance and application of various groups of actinomycetes	15	25
Section-II			
3	**Eukaryotic diversity:** Physiological variation, identification, cultivation and classification of important groups of Fungal and algal diversity, Economical importance of fungi and algae	15	25
4	**Methods of studying microbial diversity** **Conventional methods:** staining, microscopy and culturing characteristics **Molecular Methods:** DNA polymorphism, SNP, r-RNA sequence, PCR based techniques, RFLP, RAPD, AFLP, Microsatellite, DNA barcoding	15	25

Course outcome:

CO-1: Learn about diversity among microbes based on their nutrition, function, metabolism, and morphology

CO-2: Knowledge of bacteria, archaea, and actinomycetes along with their importance in the industries, their adaptations to various environmental factors

CO-3: Learn the economic importance of algae as food and biofuels

CO-4: Learn about principles and working of instrumental techniques as a basic tool for the identification and confirmation of microbes at both species and molecular levels

Reference Books:

Title	Authors	Publisher
Brock Biology of Microorganisms	Madigan, Martinko, Stahl	
Prescott's, Microbiology		
Principles of Microbiology	R.M Atlas	8th edition, wiley
Molecular and Cellular Biology	Cavicchioli, R. Archaea	ASM Press, Washington, 2007
The Prokaryotes.Vol. I – VII	Dworkin, M., Falkow, S., Rosenberg, E., Schleifer, K.H., Stackebrandt, E. (Eds.).	Springer, 2006.
Bergey's Manual of Systematic Bacteriology, 2nd edition, Vol. I	Garrity, G.M. and Boone, D.R. (Eds.)	Springer, 2001
Bergey's Manual of Systematic Bacteriology, 2nd edition, Vol. II,	Garrity, G.M., Brenner, D.J., Kreig, M.R. and Staley, J.T. (Eds.),	Springer, 2005
Physiology and Biodiversity of Extremophiles	Gerday, C. and Glansdorff, N.	ASM Press, Washington, 2007

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

Course Code: SSBT7110
Course Name: Biochemistry and Microbial diversity Practical
Prerequisite: Nil

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
0	8	-	4	-	-	40	60	-	-	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To learn about the preparation of different reagents, estimation of various biomolecules, factors affecting enzyme reaction, isolation and identification of various microbes.

Course Contents:

Sr No	Name of Experiment	Hours
1	To study Km and Vmax value of enzyme amylase	8
2	To optimize reaction parameters(pH/Temperature/Time) for enzyme	8
3	Estimation of proteins using Folin-lowry method	8
4	Estimation of sugar using DNS method	8
5	To study titration curve of amino acid and its significance	8
6	Estimation of DNA by DPA method	8
7	Preparation of sterilized media	8
8	Isolation of bacteria from soil/water	8
9	Pure culture preparation and maintenance using glycerol stock	8
10	Enumeration of microorganisms	8
11	Growth of Rhizopus and observation of characteristics	8
12	Growth of *Aspergillus niger* and observation of characteristics	8

Learning outcome:
CO-1: Learn to optimize various parameters for enzymatic reaction
CO-2: Knowledge about identification of various biomolecules and their estimation
CO-3: Learn to prepare media, and technique for isolating and enumerating bacteria
CO-4: Knowledge about to differentiate various fungi, algae, bacteria and other microorganisms

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

Course Name: Seminar I

Course Code: SSBT7130

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 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 Contents:

Content	Hours
The students will have to present a topic on recent trends or research going on in the field of Biotechnology or interdisciplinary fields. They must prepare presentation on topic in a specific template provided by the School of Sciences.	**30**

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

Sem-2

P P Savani University

School of Sciences

Syllabus, Teaching and Examination Scheme

Course Code: SSBT7020

Course Name: Immunotechnology

Prerequisite: Nil

Teaching and Examination Scheme:

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

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To have fundamental knowledge of immunology, antigen processing and presentation, B and T cell, immune effectors and applied aspect of immunology

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Fundamentals of Immunology (Part 1):** Historical Perspective of Immunology, Cells and Organs of Immunology, Antigen, Antibody structure and function, Innate Immunity, AcquiredImmunity.	15	25
2	**Fundamentals of Immunology (Part 2):** Antigen Processing and Presentation; B-Cell Generation, Activation, and Differentiation; T-Cell Maturation, Activation, and Differentiation	15	25
Section-II			
3	**Immune Effector Mechanisms:** Cytokines, Complement System, Cell-Mediated Effector Responses, Hypersensitive Reactions, Inflammation	15	25
4	**Applied Immunology:** Monoclonal and Polyclonal antibodies, Hybridoma Technology, Monoclonal and Polyclonal antibodies, Immunodeficiency disorder, Autoimmune diseases, Transplantation Immunology, Tumor Immunology	15	25

Course outcome:

CO-1: Learn about cells and organs of immunology, antigen and antibody structure, components of innate & acquired immunity

CO-2: Acquire the fundamental knowledge about different ways of antigen processing, B and T cell generation, activation and maturation

CO-3: Knowledge about cytokines, complement system, effector responses

CO-4: Basic understanding about monoclonal and polyclonal antibodies, hybridoma technology, immunological diseases, transplantation immunology

Reference Books:

Title	Authors	Publisher
Kuby Immunology	Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne	W.H. Freeman & Company
Basic Immunology: Functions and Disorders of the Immune System	AbulK. Abbas, Andrew H. Lichtman	W.B. Saunders Company
Roitt's Essential Immunology	Peter J. Delves, Seamus J. Martin, Dennis R. Burton	Willey Blackwell

P P Savani University

School of Sciences

Syllabus, Teaching and Examination Scheme

Course Code: SSBT7040

Course Name: Bioinstrumentation techniques

Prerequisite: Nil

Teaching and Examination Scheme:

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

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To understand the basic and advances in Chromatography, Spectroscopic techniques, cytological and molecular techniques, and basics of advanced molecular techniques

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Chromatography**: Adsorption and partition chromatography, Size Exclusion, Ion Exchange, Affinity,HPLC, Gas Chromatography	15	25
2	**Spectroscopy:** Electromagnetic radiation, types: U.V visible absorption spectroscopy. IR Spectroscopy, NMR, Raman Spectroscopy	15	25
Section-II			
3	**Cytological & Molecular Biology methods (part-1):** Flow cytometry, Nuclear Acid Hybridization/Blotting and types, FISH, DNA microarray	15	25
4	**Cytological & Molecular Biology methods (part-2):** PCR and its modification, Site-directed mutagenesis, Gene and Genome editing tools(RNAi, CRISPER-Cas, ZFN, TALENS)	15	25

Course outcome:

CO-1: Acquire knowledge about principle, working and applications of chromatographic techniques like Ion exchange, Size exclusion, HPLC & GC-MS

CO-2: Acquire information about the principle and working of spectroscopic techniques like UV, IR, NMR and Raman

CO-3: Knowledge of about the flow cytometry principle, parts, working and applications and also learn DNA hybridization principles, types and applications

CO-4: Knowledge about latest advanced genome editing techniques like CRISPER-CAS, SDM, RNAi etc.

Reference Books:

Title	Authors	Publisher
Principles and Techniques of Biochemistry and Molecular Biology	Wilson and Walker	Cambridge Press
Biophysical Chemistry	Upadhyay, UpadhyayandNath	Himalaya Publishing House

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

Course Name: Instrumentation and Immunotechnology practical

Course Code: SSBT7060

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	8	0	4	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To understand biophysical techniques and principle involved in bio instruments, their usage in biology and medical field along with molecular biology techniques and double diffusion technique, purification of immunoglobulin (IgG), and counting of total white blood cell

Course Contents:

Section-I		
Module	**Content**	**Hours**
1	To study the absorption spectrum of different plant pigments.	8
2	Optimization of PCR conditions for amplification of bacterial 16S rRNA	8
3	Identification of bacterial isolates using universal primers	8
4	Sodium dodecyl sulfate -polyacrylamide gel electrophoresis	8
5	Double immunodiffusion technique	8
6	Total white blood cell count	8
7	Purification of immunoglobulin (IgG)	8
8	Visit to advanced instrumentation lab	4

Learning outcome:

CO-1: Gain practical knowledge in SDS PAGE, PCR, UV-Vis spectroscopy, and their applications

CO-2: Acquire the skills for setting up SDS-PAGE apparatus, preparing samples and running SDS-PAGE gels

CO-3: Acquire basic biotechnological skills for performing amplification of DNA using Polymerase chain reaction (PCR)

CO-4: Aquire the skills to perform double immune-diffusion technique by Ouchterlony Double diffusion kit, purification of IgG

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

Course Code: SSBT7080

Course Name: Bioprocess Technology I

Prerequisite: Nil

Teaching and Examination Scheme:

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

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:
To understand the basics of Bioprocess Technology, growth kinetics of various organisms, mechanisms of upstream and downstream processes and purification of final products, packaging, marketing, and their economic importance.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1.	**Introduction to Bioprocess Technology:** Isolation, and Screening of Microorganisms,Strain Improvement, Maintenance of Industrial Cultures, Primary and Secondary Metabolites, Growth Phases of Microorganisms, Effect of Environmental Factors on growth, Growth Kinetics, Measurement of Growth, Preservation of Industrially important organisms	15	25
2.	**Up Stream Process:** Fermentation substrates used in media formulation, Optimization of media, Inoculum development, Solids and liquid handling, Sterilization of media, air, reactors, Aeration, agitation and maintenance of optimum fermentation condition, Batch, fed batch and continuous cultivation	15	25
Section-II			
3.	**Down Stream Process:** Characterization of products and by-products, Methods of Cell Separation, disruption, Product Recovery, Purification, Antibiotics, Biopolymers	15	25
4.	**Role of industrial important enzymes:** Product enrichment techniques, Product purification techniques, Immobilized enzymes, Bioreactors, its types, Applications, Bioprocess economics	15	25

Course outcome:

CO-1: Knowledge of basics of various bioprocess technology, fermenters, their parts and specificities for various products

CO-2: Knowledge about various methodologies of biomass production for various microbial metabolites

CO-3: Knowledge of about use of various expensive and cheap substrates for various optimizing conditions and products

CO-4: Knowledge about products isolation, purification using various analytical techniques

Reference Books:

Title	Authors	Publisher
Principles of Fermentation Technology	Principles of Fermentation Technology	Principles of Fermentation Technology
A. Whitekar, P. F. Stanbury& S. J. Hall	A. Whitekar, P. F. Stanbury& S. J. Hall	A. Whitekar, P. F. Stanbury& S. J. Hall
Butterworth-Heinemann	Butterworth-Heinemann	Butterworth-Heinemann

P P Savani University
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Syllabus, Teaching and Examination Scheme

Course Code: SSBT7100

Course Name: Enzyme technology

Prerequisite: Nil

Teaching and Examination Scheme:

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

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To understand the biochemistry and kinetics of enzymes

Course Contents:

Module	Content	Hours	Weightage (%)
	Section-I		
1	**Basics of Enzymology:** Definitions, Brief nomenclature and classification of enzymes, Enzyme assays, Isoenzymes, monomeric and oligomeric enzymes, Enzyme localization, Multienzyme complex, Methods for purification of enzymes	15	25
2	**Enzyme Kinetics:** First order and second order reaction, Significance of activation energy, Km, Vmax, Turnover number, Kcat, Transformation of MM equation (Lineweaver-Burk plot, Eadie-Hofstee plots, Hanes plots), Kinetics of multi substrate reactions (Ping-pong bi-bi mechanism), Mechanism of catalysis of Enzymes- Serine proteases, Chymotrypsin, Triose phosphate isomerase	15	25
	Section-II		
3	**Enzyme regulation:** General mechanism of enzyme regulation, Allosteric enzymes, Sigmoidal Kinetics and significance, Symmetric and sequential modes for action of allosteric enzymes and their significance, Reversible and irreversible covalent modifications of enzyme, Proteolytic Activation, Feed Back Inhibition	15	25
4	**Immobilization and Applications enzymes:** Methods of enzyme immobilization, Effect of immobilization on enzyme activity, partitioning/ diffusion limitations, Importance of Immobilization, Study of Industrial important enzymes, Enzyme as a biosensor, Case study	15	25

Learning outcome:
CO-1: Understand the relevance of fundamental Enzymes and its biological functions
CO-2: Knowledge regarding enzyme kinetics and optimization
CO-3: Learn about metabolic activities through enzyme regulation
CO-4: Knowledge about the application of enzymes in various industries

Reference Books:

Title	Authors	Publisher
Fundamentals of Enzymology	Nicholas Price & Lewis Stevens	Oxford Univ. Press
Enzymes	Trevor Palmer	East-West Press
Biochemistry	Donald Voet, Judith G. Voet	John Wiley & Sons
Lehninger, Principles of Biochemistry	Nelson, D. L., Lehninger, A. L., & Cox, M. M.	W. H. Freeman and Company
An introduction to practical biochemistry	Plummer, D	McGraw-HILL

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

Course Name: Bioprocess and Enzyme Technology practical

Course Code: SSBT7120

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	8	0	4	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To learn about the screening methods of different enzyme producing microbes, factors affecting enzyme activity and enzyme kinetics, bioprocess techniques, and database search for ligand-enzyme interactions

Course Contents:

Section-I		
Module	**Content**	**Hours**
1	Screening of Amylase producing microorganisms from soil.	8
2	Screening of Protease producing microorganisms from soil.	8
3	Screening of antibiotic producing microorganisms from soil.	8
4	Screening of organic acid producing microorganisms from soil.	8
5	Effect of various factors on enzyme activity	8
6	Isolation and purification of enzymes from different sources	8
7	Estimation of glucose by enzymatic method	8
8	Determination of specific activity of enzyme	8
9	Database search and ligand interaction study of enzymes	8

Learning outcome:

CO-1: Learn the methods to grow, culture and screen various different enzyme producing microbes

CO-2: Learn to determine optimum temperature, pH, and substrate concentration etc. for the maximum activity of an enzyme

CO-3: Learn to isolate and purify enzymes from various sources

CO-4: Knowledge about the Databases of ligand-enzymes interactions

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

Course Name: Seminar II

Course Code: SSBT7140

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 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 Contents:

Content	Hours
The students will have to present a topic on recent trends or research going on in the field of Biotechnology or interdisciplinary fields. They must prepare presentation on topic in a specific template provided by the School of Sciences.	**30**

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

Sem-3

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

Course Code: SSBT8010

Course Name: Genomics and Computational Biology

Prerequisite: MolecularBiology

Teaching and Examination Scheme:

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

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To develop understanding among the students for genomics and computational biology, algorithms, python, biopython and its uses

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**Introduction to Computational Biology:**Computational Genomics, Next Generation Sequencing and Its Applications- Exome-seq, RNA-seq, ChIP-seq, Methyl-seq	10	25
2	**Bioinformatics Algorithms:** Pairwise Sequence Alignment. Alignment Algorithms- Dot matrix Method, Dynamic Programming Method. Scoring Matrices. Multiple Sequence Alignment: Heuristic Algorithm, Iterative Alignment, Block-Based Alignment, Profiles and Hidden Markov Models	15	25
Section-II			
3	Python and Genomics: Overview of python, Data structures, Ifs and Loops, Functions, Module and Packages,	15	25
4	Biopython: Parsing sequence file formats, Connecting with Biological Databases, Working with sequences (Slicing, Turning sequence objectsinto strings, Concatenating or adding sequences, Nucleotide sequences and reverse complements, Transcription, Translation)	20	25

Course Outcome

CO-1: Students will learn about Computational Genomics, Next Generation Sequencing and Its Applications- Exome-seq, RNA-seq, ChIP-seq, Methyl-seq

CO-2: Students will learn about Pairwise Sequence Alignment. Alignment Algorithms and Multiple sequence Alignment

CO-3: Students will learn and study about Overview of python, Data structures, Ifs and Loops, Functions, Module and Packages

CO-4: Students will get knowledge about Parsing sequence file formats, Connecting with Biological Databases and Working with sequences

Reference Books:

Title	Authors	Publisher
An Introduction to Bioinformatics Algorithms	Neil C. Jones and Pavel A. Pevzner	MIT Press
Python Programming for the Absolute Beginner	Michael Dawson	Course Technology PTR
Bioinformatics with Python Cookbook	Tiago Antao	Packt Publishing ISBN:9781782175117
Essential Bioinformatics	Jin Xiong	Cambridge University Press 2012

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

Course Code: SSBT8030

Course Name: Agricultural Biotechnology

Prerequisite: Nil

Teaching and Examination Scheme:

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

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To get knowledge of carbon assimilation, plant hormones and their uses. The student will also learn about gene transformation methods in plants and biocontrol of plant pathogens

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	Carbon Assimilation; Light absorption and energy conversion; Calvin Cycle; Hatch-Slack pathway, Carbon dioxide uptake and assimilation, Photo respiration; Nitrogen Fixation — Symbiotic and non-symbiotic nitrogen fixation; Role of lectins; nod genes; nif genes; Structure, function and regulation of nitrogenase; Leghaemoglobin; Nodulins; Regulation and enhancement of nitrogen fixation.	15	25
2	General Aspects; Novel features of plant growth and development; Concept of plasticity in plant development; Biosynthesis of Plant Hormones and Elicitors; Structure and metabolism of auxins, gibberellins, cytokinins, abscisic acid, ethylene, brassino steroids, salicylic acid, jasmonates and related compounds	15	25
Section-II			
3	Gene flow in plants – Development of mapping population - Marker Assisted Selection (MAS), screening and validation; Trait related markers and characterization of genes involved; Mapping genes on specific chromosomes; QTL mapping; Gene pyramiding; Transcript mapping techniques. Development of ESTs, Secondary Metabolism — Importance and uses of Secondary Metabolites; Biosynthesis of phenolic compounds, isoprenoids, alkaloids and flavonoids.	15	25
4	Bio-control of Plant pathogens -- Siderophores - Types, Classification, PGPR, Effects of Iron on plants, Applications on plants as biocontrol, growth promoter Microbial-insecticides: *Bacillus thuringiensis*, Baculoviruses, *Agrobacterium tumefaciens.* Transgenic Plants – Resistance & Applications Advantages of Genetically modified Plants Agricultural Plant Diseases- Blight of Potato, Canker of Leaves, Powdery Mildew, Downy Mildew, Rust, Mosa Phytoremediation	15	25

Course outcome:

CO-1: The student will get knowledge of carbon assimilation cycle and nitrogen cycle
CO-2: The student will get acquitted with plant hormones and their uses.
CO-3: The student will learn about methods of gene flow in plants
CO-4: The student will have idea about various biocontrol agents for the protection of plants against plant pathogens.

Reference Books:

Title	Authors	Publisher
Plant Physiology	Taiz and Zeiger	3rd Edition, Panima Publishing Corporation, New Delhi, 2003
Light and Plant Development	Garry C Whitelam and Karen J Halliday	Oxford Ames, Iowa: Blackwell Pub., 2007
DNA markers – protocols, applications and overviews	Anolles, G. C. and Gresshoff, P.M	Wiley – Liss, New York, 1997

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

Course Name: Agribiotech and Computational Biology Practical

Course Code: SSBT8050

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	8	0	4	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To develop the practical understanding of python and biopython, isolation identification of of soil microflora and detection of siderophores, nitrogen fixing microbes and pathogenic microbes from plants.

Course Contents:

Section-I		
Module	**Content**	**Hours**
1	Write a function in python to compute GC% of the given sequence	8
2	Parsing sequence file formats using Biopython	8
3	Performing blast search using Biopython	8
4	Sequence Manipulation using Biopython	8
5	Isolation and detection of Siderophore producing Microoganisms	8
6	Qualitative estimation of Soil Microflora by Various Methods	8
7	Study and Isolation of Nitrogen fixing symbiotic and non-symbiotic microorganisms	8
8	Studyand isolation of pathogenic microorganisms from plants	4

Course Outcome:
CO-1: The student will learn to retrieve sequence files from different biological databases by using biopython
CO-2: The student will get the importance of siderophores and learn the methodology of isolation and characterization of siderophores.
CO-3: The student will get the importance of nitrogen fixing microbes and learn to isolate them
CO-4: The student will learn the method involved in isolation of pathogens and its specific assays.

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

Course Code: SSBT8070

Course Name: Pharmaceutical Biotechnology

Prerequisite: Nil

Teaching and Examination Scheme:

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

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To enable students about various biopharmaceutical molecules, their delivery and toxicity, understanding of various expression systems for the production of biopharmaceutical products and to acquire knowledge of upstream and downstream processing for the production of biopharmaceutics

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**THE DRUG DEVELOPMENT PROCESS:** Introduction to pharmaceutical products; Discovery of biopharmaceuticals; The impact of genomics and related technologies upon drug discovery (Gene chips, Proteomics, Structural Genomics, Pharmacogenetics); Initial product characterization; Patenting; Delivery of biopharmaceuticals; Preclinical studies; Pharmacokinetics and pharmacodynamics; Toxicity studies	10	25
2	**SOURCES AND UPSTREAM PROCESSING:** Production systems of biopharmaceuticals (*Escherichia coli*, animal cell-culture system, yeast, fungal production systems, transgenic animals, transgenic plants, insect cell-based systems); Cell banking system; Microbial cell fermentation; Mammalian cell culture systems	10	25
Section-II			
3	**DOWNSTREAM PROCESSING:** Initial product recovery; Cell disruption; Removal of nucleic acid; Initial product concentration; Chromatographic purification; High-performance liquid chromatography of proteins; Purification of recombinant proteins; Final product formulation	20	25
4	**PRODUCT ANALYSIS:** Protein-based contaminants; Removal of altered forms of the protein of interest from the product stream; Detection of protein-based product impurities; Immunological approaches to detection of contaminants; Endotoxin and other pyrogeniccontaminants.	20	25

Course outcome:

CO-1: The student will get knowledge of recombinant products, their toxicity studies and mode of delivery

CO-2: The study will study advantages and disadvantages of various expression systems such as *E.coli*, yeast, fungi, plants and animals.

CO-3: The student will get acquitted with fermentation technology and upstream processing

CO-4: The student will get acquitted with fermentation technology and downstream processing

Reference Books:

Title	Authors	Publisher
Pharmaceutical Biotechnology Concepts and Application	Gary Walsh	Wiley-Blackwell
Pharmaceutical Biotechnology Fundamental and Applications	Daan J.A. Crommelin, Robert D. Sindelar, Bernd Meibohm	Springer

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

Course Code: SSBT8090

Course Name: Genetic Engineering: Theory and Application

Prerequisite: Nil

Teaching and Examination Scheme:

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

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To impart knowledge about the fundamentals of Genetic Engineering and basics of comparative genomics in prokaryotes as well in eukaryotes.

Course Contents:

Section-I			
Module	**Content**	**Hours**	**Weightage (%)**
1	**GENE MANIPULATION:** Cutting and joining of DNA; Vectors (Plasmids, Cosmids, Phasmids); DNA libraries; Site-directed mutagenesis and Protein engineering	10	25
2	**CLONING IN DIFFERENT ORGANIMS:** Cloning in Gram-negative bacteria; Cloning in Gram-positive bacteria; Cloning in Archaea; Cloning in Saccharomyces cerevisiae; Gene transfer to animal cells; Gene transfer to plant cells	10	25
Section-II			
3	**ADVANCED TRANSGENIC TECHNOLOGY:** Inducible expression systems; Targeting specific RNA and DNA sequences; Viral delivery system; Nonviral delivery system; Gene therapy	20	25
4	**COMPARATIVE GENOMICS:** The formation of orthologs and paralogs; Protein evolution exon shuffling; Comparative genomics of bacteria, organelles, eukaryotes	20	25

Learning outcome:

CO-1: Students will acquire knowledge about various cloning vectors, composition and cloning capacities. They will know how these vectors can be used in construction of DNA Libraries.

CO-2: Students will understand about cloning process and get knowledge about various gene transfer methods which are employed in plant and animal cells.

CO-3: Students will learn about viral and non-viral DNA/RNA delivery methods and also understand the gene expression under inducible systems.

CO-4: Students will develop basic understanding about orthologs and paralogs and their role in comparative genomics.

Reference Books:

Title	Authors	Publisher
Principles of Gene Manipulation and Genomics	S.B. Primrose	Wiley-Blackwell
Molecular Biotechnology	Glick and Patten	American Society for Microbiology (ASM) Press

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

Course Name: Pharmaceutical & Genetic Engineering practical

Course Code: SSBT8110

Prerequisite: Nil

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	8	0	4	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

The aim of the course is to impart the knowledge among the students for creation of computational model, drug designing and their toxicity study. The students will also learn about the restriction digestion and ligation of DNA along with preparation of competent bacterial cells and transformation.

Course Contents:

Section-I		
Module	**Content**	**Hours**
1	Understanding of Drug Designing Process and different sections of pharmaceutical industry	8
2	Construction of computation model and Toxicity prediction of a pharmaceutical molecule	8
3	Docking studies to understand the interaction between drug molecule and receptor	8
4	Visit and report preparation for pharmaceutical industry	8
5	To perform restriction digestion of a) Genomic DNA, b) Plasmid DNA	8
6	Ligation of DNA into Linearized Plasmid	8
7	Preparation of Competent Bacterial cells and perform transformation	8
8	To check the ability of virus to replicate inside as susceptible host cell and to determine the concentration	4

Course outcome:

CO-1: The student will understand the drug designing process, their computation model and Toxicity prediction of a pharmaceutical molecules

CO-2: The students will learn the about the molecular Docking to understand the interaction between drug molecule and receptor

CO-3: Students will understand the process of DNA digestion and ligation for the cloning of bacterial cells

CO-4: Students will able to perform the cloning of bacterial cell using the recombinant plasmid.

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

Course Name: Seminar III

Course Code: SSBT8130

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 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 Contents:

Content	Hours
The students will have to present a topic on recent trends or research going on in the field of Biotechnology or interdisciplinary fields. They must prepare presentation on topic in a specific template provided by the School of Sciences.	**30**

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

Sem-4

Considering that some students choose academics and research as their career while others prefer industrial jobs, the students shall get two options to meet their specific need – (i) **Plan A: Research-based curriculum**, and (ii) **Plan B: Industry-based curriculum**.

The program coordinator and placement officer shall conduct an orientation session in semester 3 so that the students can take decision to choose between the two options.

PLAN A: Research-based curriculum

Course Code: SSBT8020

Course Name: Dissertation

Prerequisite: None

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	32	0	16	80	120	200

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 Biotechnology-based skills in a typical research environment

Course Outline:

Content	Duration
The students shall carry out 4-months dissertation in an academic or research institution of national/international repute. They must prepare a thesis 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.	4 months

Course Outcome:

CO-1: Students will develop basic understanding about large scale processes in laboratories, also learn about safe handling of instruments and machines
CO-2: Students will learn about formatting, drafting reports and results obtained during the period of training
CO-3: Students will acquire practical knowledge about instrument working, principle as well as applications
CO-4: Learners will equip themselves with skills which can increase their employability

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

Course Code: SSBT8040

Course Name: Review Article Writing

Prerequisite: None

Teaching and Examination Scheme:

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

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To learn scientific writing and develop presentation skills. The students will also learn about searching of scientific literature, scientific journals, impact factors/ratings and also the process of scientific communications.

Course Outline:

Content	Duration
The students shall write a review article on any topic of their choice under the supervision of an allotted faculty mentor. The topic must be from the discipline of life sciences. Review article must be communicated in UGC care, Scopus indexed, or NAAS rated journals only. During the semester examination, the students must (1) provide the proof-of-submission of their review article, along with a copy of communicated/published full-length article and (2) give an oral presentation on their review article.	4 months

Course outcome:

CO-1: Students will develop a scientific writing skill by writing review paper from the literature collected and then presenting their paper.

CO-2: Learners will get to know about various tools/ databases available for searching research papers on the internet

CO-3: Students will be able to select the appropriate journal where they can communicate their review paper. They will get to know about Scopus, SCI indexed, UGC care and NAAS rated journals.

CO-4: Students will develop a basic understanding of the whole process of communicating their manuscript to the selected journal. They will know about author guidelines and even about use of softwares to detect plagiarism

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

Course Code: SSBT8060

Course Name: Research paper presentation

Prerequisite: None

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:

This course will expose the students with recent developments in the field of Biotechnology. Research article presentation will not only improve their scientific presentation skills but also improve their ability to infer from complex scientific research papers

Course Outline:

Content	Duration
The students shall be given a recent research paper from journal of national or international repute with impact factor 3 or more by the allotted faculty. The students shall prepare a PowerPoint presentation on the same. In the semester examination, the students must give an oral presentation on their allotted research article before the external examiner. The presentation of review article shall not be considered. The presentation must discuss the hypothesis, objective(s), methods, results, and conclusion(s).	4 months

Course outcome:
CO-1: Students will develop confidence and defeat stage fear for presentations
CO-2: Know how to prepare research slides describing mainly the results and discussion portion
CO-3: Know about the conclusion and models to describe the entire paper in summary
CO-4: Know and learn about the detailed methodology involved in the research paper and study the use of its individual techniques

PLAN B: Industry-based curriculum

Course Code: SSBT8020

Course Name: Dissertation

Prerequisite: None

Teaching and Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)		
Theory	Practical	Tutorial	Credit	CE	ESE	Total
0	32	0	16	40	60	100

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

To help students learn about the application of Biotechnology in modern Biotech industries. This will also provide the students an opportunity to practically use their Biotechnology-based skills in a life-science industry.

Course Outline:

Content	Duration
The students shall carry out 4-months internship in an industry of national/international repute. They must prepare an internship 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 internship report to the department.	4 months

Course Outcome:

CO-1: Students will develop basic understanding about large scale processes in industry, also learn about safe handling of instruments and machines
CO-2: Students will learn about formatting, drafting reports and results obtained during the period of training
CO-3: Students will acquire practical knowledge about instrument working, principle as well as applications
CO-4: Learners will equip themselves with skills which can increase their employability

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

Course Code: SSBT8040

Course Name: Review Article Writing

Prerequisite: None

Teaching and Examination Scheme:

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

CE: Continuous Evaluation, ESE: End Semester Examination

Objective(s) of the Course:

This course will help students learn about the scientific writing skills and also help them develop the ability to comprehend the complex scientific papers.

Course Outline:

Content	Duration
The students shall write a review article on any topic of their choice under the supervision of an allotted faculty mentor. The topic must be from the discipline of life sciences. Review article must be communicated in UGC care, Scopus indexed, or NAAS rated journals only. During the semester examination, the students must (1) provide the proof-of-submission of their review article, along with a copy of communicated/published full-length article and (2) give an oral presentation on their review article.	4 months

Course outcome:

CO-1: Students will develop a scientific writing skill by writing review paper from the literature collected and then presenting their paper.

CO-2: Learners will get to know about various tools/ databases available for searching research papers on the internet

CO-3: Students will be able to select the appropriate journal where they can communicate their review paper. They will get to know about Scopus, SCI indexed, UGC care and NAAS rated journals.

CO-4: Students will develop a basic understanding of the whole process of communicating their manuscript to the selected journal. They will know about author guidelines and even about use of softwares to detect plagiarism

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

Course Code: SSBT8060

Course Name: Research paper presentation

Prerequisite: None

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:

This course will expose the students with recent developments in the field of Biotechnology. Research article presentation will not only improve their scientific presentation skills but also improve their ability to infer from complex scientific research papers

Course Outline:

Content	Duration
The students shall find a recent industry-centric applied technology article from journal of national or international repute with impact factor 3 or more by the allotted faculty. The students shall prepare a PowerPoint presentation on the same. In the semester examination, the students must give an oral presentation on their allotted research article before the external examiner. The presentation of review article shall not be considered. The presentation must discuss the hypothesis, objective(s), methods, results, and conclusion(s).	4 months

Course outcome:
CO-1: Students will develop confidence and defeat stage fear for presentations
CO-2: Know how to prepare research slides describing mainly the results and discussion portion
CO-3: Know about the conclusion and models to describe the entire paper in summary
CO-4: Know and learn about the detailed methodology involved in the research paper and study the use of its individual techniques