AMITY UNIVERSITY MAHARASHTRA, MUMBAI

AMITY INSTITUTE OF BIOTECHNOLOGY

CURRICULUM

B.Sc. (BIOTECHNOLOGY)

(HONOURS/HONOURS WITH RESEARCH)

DURATION: 4 YEARS

(NEP 2020)

(IMPLEMENTED FROM ACADEMIC YEAR 2023-24)

CERTIFICATE

This is hereby certified that the enclosed detailed syllabus has been presented before the Board of Studies, Amity University Maharashtra, Mumbai meeting held on 29th September 2023 and it is recommended for the approval by the Academic Council, AUM Mumbai.

Prof. Dr Penna Suprasanna

Director (I/C),

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B.Sc. (Biotechnology)

(Honours/Honours with Research)

Preamble

Welcome to Amity Institute of Biotechnology, an esteemed hub of academic excellence where scientific exploration meets top-quality education. We are thrilled to introduce the preamble for B.Sc. (Biotechnology) (Honours/Honours with Research) Course, a comprehensive program designed to lay a strong foundation for aspiring biotechnologists and inspire them to become pioneers in scientific advancements.

The B.Sc. (Biotechnology) (Honours/Honours with Research) Course at AIB is a well-crafted undergraduate program that offers a holistic understanding of the fascinating world of biotechnology. Our mission is to equip students with a solid theoretical background and hands-on skills, empowering them to make meaningful contributions to the fields of biology, technology, and innovation.

Program Objectives:

- Build a Strong Foundation in Biological Science by providing students with a comprehensive understanding of fundamental concepts in biology, including cell biology, genetics, microbiology, and biochemistry, to establish a solid knowledge base for advanced biotechnology studies.
- Introduce Core Biotechnological Principles and Techniques and Familiarize students with key biotechnological principles, such as DNA manipulation, protein expression, and fermentation, while imparting practical skills in basic laboratory techniques used in biotechnology research.
- Explore Biotechnology Applications and Industry Relevance and Expose students to real-world applications of biotechnology in various sectors, including agriculture, medicine, environment, and pharmaceuticals, highlighting the industry's significance and potential.
- Foster Research and Problem-Solving Skills and Develop students' ability to design and conduct experiments, analyse data, and draw meaningful conclusions, nurturing critical thinking and problem-solving capabilities essential for biotechnology research and innovation.

Program Eligibility:

12^{th} with PCB (min 55 %)

AMITY INSTITUTE OF BIOTECHNOLOGY

Vision

- To be a renowned Biotechnology institution dedicated to imparting information, creative skills, and innovative ideas for the development of biotechnologists for the betterment of society.

Mission

- To provide high quality study programs to generate biotechnology professionals with impetus to help society to cope with the new challenges.
- To inculcate a spirit of innovation and creativity in young minds with good research skill.
- To create greater perception about the potential of Biotechnology with socio-ethical implications.

AMITY UNIVERSITY MAHARASHTRA, MUMBAI

AMITY INSTITUTE OF BIOTECHNOLOGY

B.Sc. (Biotechnology) (Honours/Honours with Research)

Program structure-NEP 2020

Implemented from 2023-2024 onwards

Semester	I	II	III	IV	V	VI	VII	VIII	Total Credits
Credits	23	22	24	21	25	20	21	24	180

Program Structure

Semester-I								Evaluation Scheme		
Types of courses		Course Code	Course Title	Lecture (L) credits	Tutorial (T) credits	Practical (P) Credits	Total credits	Internal Marks	External Marks	Total Marks
Discipline Specific Courses	**Discipline-I (Core)**						**8**			
	Discipline-I (Core)	FOB2101N	Fundamentals of Biochemistry	3	-	-	3	**30**	**70**	**100**
		FOM2102N	Fundamentals of Microbiology	3	-	-	3	**30**	**70**	**100**
		LCB2103N	Lab course on Biochemistry	-	-	1	1	**30**	**70**	**100**
		LCM2104N	Lab course on Microbiology	-	-	1	1	**30**	**70**	**100**
	Discipline II (Compulsory)						**4**			
	Discipline II (Compulsory)	ITB2105N	Introduction to Biotechnology	4	-	-	4	**30**	**70**	**100**
	Discipline-III (any one from the basket)						**4**			
	Discipline-III (any one from the basket)	BMT2110N	Business Management	3	1	-	4	**50**	**50**	**100**
		ECO2110N	Economics-I	3	1	-	4	**50**	**50**	**100**
		HMR2110N	Human Rights-I	4	-	-	4	**50**	**50**	**100**
		ACW2110N	Academic and Creative Writing	4	-	-	4	**50**	**50**	**100**
		FST2110N	Fashion Technology-I	2	2	-	4	**50**	**50**	**100**

		IND2110N	Interior Design-I	1	3	-	4	**50**	**50**	**100**
	Total (Discipline I + II + III)						**16**			
Foundation courses	Ability Enhancement Courses	**Foreign Language (any one from the basket)**					**1**			
		FLF2111N	French- I	1	-	-	1	**50**	**50**	**100**
		FLG2111N	German-I	1	-	-	1	**50**	**50**	**100**
		FLS2111N	Spanish-I	1	-	-	1	**50**	**50**	**100**
		CSE2112N	Effective Listening	1	-	-	**1**	**50**	**50**	**100**
	Subtotal						**2**			
	Skill Enhancement Program	BEH2113N	Behavioural Science-I	1	-	-	1	**100**	**0**	**100**
	Subtotal						**1**			
	Value Added Course	**VAC-I**					**4**			
		ENV2116N	Environmental Studies	3	1	-	4	**30**	**70**	**100**
	Subtotal						**4**			
	Total (Foundation Courses)						**7**			
Grand Total							**23**			

Semester-II								Evaluation Scheme		
Types of courses		Course Code	Course Title	Lecture (L) credits	Tutorial (T) credits	Practical (P) Credits	Total credits	Internal Marks	External Marks	Total Marks
Discipline Specific Courses	**Discipline-I (Core)**						**8**			
	Discipline-I (Compulsory)	IBT2201N	Instrumentation and Bioanalytical techniques	3	-	-	3	**30**	**70**	**100**
		CBG2202N	Basics of Cell Biology and Genetics	3	-	-	3	**30**	**70**	**100**
		LBT2203N	Lab course on Instrumentation and Bioanalytical Techniques	-	-	1	1	**30**	**70**	**100**
		LCB2204N	Lab course on Cell Biology and Genetics	-	-	1	1	**30**	**70**	**100**
	Discipline II (any one from the basket)						**4**			
	Discipline II (Select any one from basket)	BED2205N	Biology of Emerging Diseases	4	-	-	4	**30**	**70**	**100**
		IAB2206N	Introduction to Agricultural Biotechnology	3	-	-	3	**30**	**70**	**100**
		IFM2101N	Industrial and Food Microbiology	3	-	-	3	**30**	**70**	**100**
		LAB2208N	Lab course on Agricultural Biotechnology	-	-	1	1	**30**	**70**	**100**
		LIF2209N	Lab course on Industrial and Food Microbiology	-	-	1	1	**30**	**70**	**100**
	Discipline-III (any one from the basket)						**4**			
	Discipline III (Select any one from basket)	ABM2210N	Advances in Business Management	3	1	-	4	**50**	**50**	**100**
		ECO2210N	Economics-II	3	1	-	4	**50**	**50**	**100**
		HMR2210N	Human Rights-II	4	-	-	4	**50**	**50**	**100**

		CSW2210N	Technical and Literary Writing	4	-	-	4	**50**	**50**	**100**
		FST2210N	Fashion Technology-II	2	2	-	4	**50**	**50**	**100**
		IND2210N	Interior Design-II	1	3	-	4	**50**	**50**	**100**
	Total (Discipline I + II + III)						**16**			
Foundation courses	Ability Enhancement Courses	**Foreign Language (any one from the basket)**					**2**			
		FLF2211N	French- II	2	-	-	2	**50**	**50**	**100**
		FLG2211N	German-II	2	-	-	2	**50**	**50**	**100**
		FLS2211N	Spanish-II	2	-	-	2	**50**	**50**	**100**
		CSE2212N	Presentation Skills	1	-	-	**1**	**50**	**50**	**100**
	Subtotal						**3**			
	Skill Enhancement Program	BEH2213N	Behavioural Science-II	1	-	-	1	**100**	**0**	**100**
	Subtotal						**1**			
	Value Added Course	**VAC-II (any one from the basket)**					**2**			
		ANM2217N	Animation-I	2	-	-	2	**50**	**50**	**100**
		PHT2217N	Photography-I	1	1	-	2	**50**	**50**	**100**
		POL2217N	Political Science-I	2	-	-	2	**50**	**50**	**100**
		TSM2217N	Tourism Management-I	1	1	-	2	**50**	**50**	**100**
		SCW2217N	Social Work-I	2	-	-	2	**50**	**50**	**100**
		BPS2217N	Biopreneurship-I	2	-	-	2	**50**	**50**	**100**
	Subtotal						**2**			
	Total (Foundation Courses)						**6**			
Grand Total							**22**			

Semester-III								Evaluation Scheme		
Types of courses		**Course Code**	**Course Title**	**Lecture (L) credits**	**Tutorial (T) credits**	**Practical (P) Credits**	**Total credits**	**Internal Marks**	**External Marks**	**Total Marks**
Discipline Specific Courses	**Discipline-I (Core)**						**8**			
	Discipline-I (Compulsory)	BMB2301N	Basics of Molecular Biology	3	0	0	3	**30**	**70**	**100**
		IMM2302N	Immunology	3	0	0	3	**30**	**70**	**100**
		LMB2303N	Lab course on Molecular Biology	0	0	1	1	**30**	**70**	**100**
		LCI2304N	Lab course on Immunology	0	0	1	1	**30**	**70**	**100**
	Discipline II (any one from the basket)						**4**			
	Discipline II (Select any one from basket)	ADT2305N	Advanced diagnostic techniques	3	0	0	3	**30**	**70**	**100**
		AMI2306N	Agricultural microbiology	3	0	0	3	**30**	**70**	**100**
		FTT2307N	Fermentation Technology	3	0	0	3	**30**	**70**	**100**
		LAD2308N	Lab course on Advanced Diagnostic Techniques	0	0	1	1	**30**	**70**	**100**
		LAM2309N	Lab course on Agricultural Microbiology	0	0	1	1	**30**	**70**	**100**
		LCF2310N	Lab course on Fermentation Technology	0	0	1	1	**30**	**70**	**100**
	Total (Discipline I + II)						**12**			
Foundation courses	**Foreign Language (any one from the basket)**						**2**			
	Ability Enhancement Courses	FLF2311N	French- III	2	-	-	2	**50**	**50**	**100**
		FLG2311N	German-III	2	-	-	2	**50**	**50**	**100**
		FLS2311N	Spanish-III	2	-	-	2	**50**	**50**	**100**
		CSE2312N	Reading and Comprehension	1	-	-	**1**	**50**	**50**	**100**
	Subtotal						**3**			
	Skill Enhancement Program	BEH2313N	Behavioural Science-III	1	-	-	1	**100**	**0**	**100**
		IBI2315N	Insights of Biotechnology Industry-I	3	-	-	3	**30**	**70**	**100**

						Subtotal	**4**			
	Value Added Course	**VAC-II (any one from the basket)**					**2**			
		ANM2317N	Animation-II	2	-	-	2	**50**	**50**	**100**
		PHT2317N	Photography-II	2	-	-	2	**50**	**50**	**100**
		POL2317N	Political Science-II	2	-	-	2	**50**	**50**	**100**
		TSM2317N	Tourism Management-II	2	-	-	2	**50**	**50**	**100**
		SCW2317N	Social Work-II	2	-	-	2	**50**	**50**	**100**
		BPS2317N	Biopreneurship-II	2	-	-	2	**50**	**50**	**100**
						Subtotal	**2**			
	Co-Curricular Courses	**VAC-III**					**0**			
		PHE2318N	Physical Education and Sports**				0			
						Subtotal	**0**			
		Total (Foundation Courses)					**9**			
Non-Teaching Credit Courses	Community Engagement Services	Community Engagement Services					**3**			
		CES2319N	Community Outreach	-	3	-	3	**50**	**50**	**100**
						Total (NTCC)	**3**			
Grand Total							**24**			
***Continued till Semester VI*										

Semester-IV								Evaluation Scheme		
Types of courses		Course Code	Course Title	Lecture (L) credits	Tutorial (T) credits	Practical (P) Credits	Total credits	Internal Marks	External Marks	Total Marks
Discipline Specific Courses	**Discipline-I (Core)**						**8**			
	Discipline-I (Compulsory)	BGE2401N	Basics of Genetic Engineering	3	0	0	3	**30**	**70**	**100**
		BBI2402N	Basics of Bioinformatics	3	0	0	3	**30**	**70**	**100**
		LGE2403N	Lab course on Genetic Engineering	0	0	1	1	**30**	**70**	**100**
		LBI2402N	Lab course on Bioinformatics	0	0	1	1	**30**	**70**	**100**
	Discipline II (any one from the basket)						**4**			
	Discipline II (Select any one from basket)	SCB2405N	Stem cells and Cancer Biology	4	0	0	4	**30**	**70**	**100**
		PIT2406N	Plant Improvement Technologies	4	0	0	4	**30**	**70**	**100**
		DSP2407N	Downstream Processing	3	0	0	3	**30**	**70**	**100**
		LCD2408N	Lab course on Downstream Processing	0	0	1	1	**30**	**70**	**100**
						Total (Discipline I + II)	**12**			
Foundation courses	Ability Enhancement Courses	**Foreign Language (any one from the basket)**					**2**			
		FLF2411N	French-IV	2	-	-	2	**50**	**50**	**100**
		FLG2411N	German-IV	2	-	-	2	**50**	**50**	**100**
		FLS2411N	Spanish-IV	2	-	-	2	**50**	**50**	**100**
		CSE2412N	Effective Writing Skills	1	-	-	**1**	**50**	**50**	**100**
						Subtotal	**3**			
	Skill Enhancement Program	BEH2413N	Behavioural Science-IV	1	-	-	1	**100**	**0**	**100**
		IBI2415N	Insights of Biotechnology Industry-II	3	-	-	3	**30**	**70**	**100**
						Subtotal	**4**			

		VAC-II (any one course from basket)					**2**			
	Value Added Course	ANM2417N	Animation-III	2	-	-	2	**50**	**50**	**100**
		PHT2417N	Photography-III	2	-	-	2	**50**	**50**	**100**
		POL2417N	Political Science-III	2	-	-	2	**50**	**50**	**100**
		TSM2417N	Tourism Management-III	2	-	-	2	**50**	**50**	**100**
		SCW2417N	Social Work-III	2	-	-	2	**50**	**50**	**100**
		BPS2417N	Biopreneurship-III	2	-	-	2	**50**	**50**	**100**
						Subtotal	**2**			
	Co-Curricular Courses	**VAC-III**					**0**			
		PHE2318N	Physical Education and Sports**				0			
						Subtotal	**0**			
	Total (Foundation Courses)						**9**			
Grand Total							**21**			
***Continued till Semester VI*										

Semester-V								Evaluation Scheme		
Types of courses		Course Code	Course Title	Lecture (L) credits	Tutorial (T) credits	Practical (P) Credits	Total credits	Internal Marks	External Marks	Total Marks
Discipline Specific Courses	**Discipline-I (Core)**						**12**			
	Discipline-I (Compulsory)	PBT2501N	Introduction to Plant Biotechnology	3	0	0	3	**30**	**70**	**100**
		BST2502N	Biostatistics	3	0	0	3	**30**	**70**	**100**
		RMI2503N	Research Methodology and IPR	3	0	0	3	**30**	**70**	**100**
		LPB2504N	Lab course on Plant Biotechnology	0	0	2	1	**30**	**70**	**100**
		LBS2505N	Lab course on Biostatistics	0	0	1	1	**30**	**70**	**100**
	Discipline II (any one from the basket)						**4**	**30**	**70**	**100**
	Discipline II (Select any one from basket)	DDM2506N	Drug Development and Molecular Modelling	3	0	0	3	**30**	**70**	**100**
		PGE2507N	Plant Genetic Engineering	4	0	0	4	**30**	**70**	**100**
		FPP2508N	Food processing and Packaging	3	0	0	3	**30**	**70**	**100**
		LDD2509N	Lab Course on Drug Development and Molecular Modelling	0	0	1	1	**30**	**70**	**100**
		LFP2510N	Lab Course on Food processing and Packaging	0	0	1	1	**30**	**70**	**100**
	Total (Discipline I + II)						**16**			
Foundation courses	Ability Enhancement Courses	**Foreign Language (any one from the basket)**					**2**			
		FLF2511N	French- V	2	-	-	2	**50**	**50**	**100**
		FLG2511N	German-V	2	-	-	2	**50**	**50**	**100**
		FLS2511N	Spanish-V	2	-	-	2	**50**	**50**	**100**
		CSE2512N	Employability Skills	1	-	-	**1**	**50**	**50**	**100**
	Subtotal						**3**			

	Skill Enhancement Program	BEH2513N	Behavioural Science-V	1	-	-	1	**100**	**0**	**100**
						Subtotal	**1**			
	Co-Curricular Courses	**VAC-III**					**0**			
		PHE2318N	Physical Education and Sport**				0			
						Subtotal	**0**			
						Total (Foundation Courses)	**4**			
Non-Teaching Credit Courses										
	Summer Internship						**5**			
	SIP/ Internship/ Project/ Dissertation/ Field Visit	SUI2521N	Summer Internship	-	-	-	5	**100**	**0**	**100**
						Subtotal	**5**			
						Total (NTCC)	**5**			
Grand Total							**25**			
***Continued till Semester VI*										

Semester-VI								Evaluation Scheme		
Types of courses		Course Code	Course Title	Lecture (L) credits	Tutorial (T) credits	Practical (P) Credits	Total credits	Internal Marks	External Marks	Total Marks
Discipline Specific Courses	**Discipline-I (Core)**						**16**			
	Discipline-I (Compulsory)	CGP2601N	Concepts and Techniques in Genomics and Proteomics	3	0	0	3	**30**	**70**	**100**
		BIB2602N	Basics of Industrial Biotechnology	3	0	0	3	**30**	**70**	**100**
		EBT2603N	Environmental Biotechnology	3	0	0	3	**30**	**70**	**100**
		IAB2604N	Introduction to Animal Biotechnology	3	0	0	3	**30**	**70**	**100**
		LGP2605N	Lab course on Genomics and Proteomics	0	0	1	1	**30**	**70**	**100**
		LIB2606N	Lab course on Industrial Biotechnology	0	0	1	1	**30**	**70**	**100**
		LEB2607N	Lab course on Environmental Biotechnology	0	0	1	1	**30**	**70**	**100**
		LCA2608N	Lab course on Animal Biotechnology	0	0	1	1	**30**	**70**	**100**
	Discipline II (any one from the basket)						**4**			
	Discipline II (any one from the basket)	PHB2609N	Pharmaceutical Biotechnology	4	0	0	4	**30**	**70**	**100**
		CSA2610N	Climate Smart Agriculture	4	0	0		**30**	**70**	**100**
		FSR2611N	Food safety Regulations	4	0	0		**30**	**70**	**100**
	Total (Discipline I + II)						**20**			
Foundation courses	Co-Curricular Courses	**VAC-III**					**0**			
		PHE2318N	Physical Education and Sport**				0			
	Total (Foundation Courses)						**0**			
Grand Total							**20**			
***Continued till Semester VI*										

Semester-VII								Evaluation Scheme		
Types of courses		Course Code	Course Title	Lecture (L) credits	Tutorial (T) credits	Practical (P) Credits	Total credits	Internal Marks	External Marks	Total Marks
Discipline Specific Courses	**Discipline-I (Core)**						**12**			
	Discipline-I (Compulsory)	TMP2701N	Term Paper-I	-	4	-	4	**100**	**0**	**100**
		RAP2702N	Research article presentation-I	-	4	-	4	**100**	**0**	**100**
		RME2703N	Research Methodology and ethics	4	-	-	4	**30**	**70**	**100**
	Research based course						**4**			
	Research based course	SCR2704N	Scientific Writing	4	-	-	4	**30**	**70**	**100**
	Total (Discipline specific courses)						**16**			
Non-Teaching Credit Courses	SIP/ Internship/ Project/ Dissertation/ Field Visit	**Dissertation**					**5**			
		DSP2722N	Dissertation project - I	-	-	-	**5**	**100**	**0**	**100**
	Total (NTCC)						**5**			
Grand Total							**21**			

Semester-VIII								Evaluation Scheme		
Types of courses		Course Code	Course Title	Lecture (L) credits	Tutorial (T) credits	Practical (P) Credits	Total credits	Internal	External	Total
Discipline Speific Courses	**Discipline-I (Core)**						**8**			
	Discipline-I (Compulsory)	TMP2801N	Term Paper-II	-	4	-	4	**100**	**0**	**100**
		RAP2802N	Research article presentation-II	-	4	-	4	**100**	**0**	**100**
	Research based course						4			
	Research based course	CLS2803N	Certification course in Life sciences	-	4	-	**4**	**100**	**0**	**100**
	Total (Discipline specific courses)						**12**			
Non-Teaching Credit Courses	SIP/ Internship/ Project/ Dissertation/ Field Visit	**Dissertation**					**12**			
		DSP2822N	Dissertation project-II	-	-	-	**12**	**200**	**0**	**200**
	Total (NTCC)						**12**			
Grand Total							**24**			

Detailed Curriculum: Semester I

Program Structure

Semester-I								Evaluation Scheme		
Types of courses		Course Code	Course Title	Lecture (L) credits	Tutorial (T) credits	Practical (P) Credits	Total credits	Internal Marks	External Marks	Total Marks
Discipline Specific Courses	**Discipline-I (Core)**						**8**			
	Discipline-I (Core)	FOB2101N	Fundamentals of Biochemistry	3	-	-	3	**30**	**70**	**100**
		FOM2102N	Fundamentals of Microbiology	3	-	-	3	**30**	**70**	**100**
		LCB2103N	Lab course on Biochemistry	-	-	1	1	**30**	**70**	**100**
		LCM2104N	Lab course on Microbiology	-	-	1	1	**30**	**70**	**100**
	Discipline II (Compulsory)						**4**			
	Discipline II (Compulsory)	ITB2105N	Introduction to Biotechnology	4	-	-	4	**30**	**70**	**100**
	Discipline-III (any one from the basket)						**4**			
	Discipline-III (any one from the basket)	BMT2110N	Business Management	3	1	-	4	**50**	**50**	**100**
		ECO2110N	Economics-I	3	1	-	4	**50**	**50**	**100**
		HMR2110N	Human Rights-I	4	-	-	4	**50**	**50**	**100**
		ACW2110N	Academic and Creative Writing	4	-	-	4	**50**	**50**	**100**
		FST2110N	Fashion Technology-I	2	2	-	4	**50**	**50**	**100**
		IND2110N	Interior Design-I	1	3	-	4	**50**	**50**	**100**
	Total (Discipline I + II + III)						**16**			
Foundation courses	Ability Enhancement Courses	**Foreign Language (any one from the basket)**					**1**			
		FLF2111N	French- I	1	-	-	1	**50**	**50**	**100**
		FLG2111N	German-I	1	-	-	1	**50**	**50**	**100**
		FLS2111N	Spanish-I	1	-	-	1	**50**	**50**	**100**
		CSE2112N	Effective Listening	1	-	-	**1**	**50**	**50**	**100**
	Subtotal						**2**			
	Skill Enhancement Program	BEH2113N	Behavioural Science-I	1	-	-	1	**100**	**0**	**100**
	Subtotal						**1**			

	Value Added Course	**VAC-I**					**4**			
		ENV2116N	Environmental Studies	3	1	-	4	**30**	**70**	**100**
						Subtotal	**4**			
		Total (Foundation Courses)					**7**			
Grand Total							**23**			

Semester - I

Course Code	Course Name	Credits
FOB2101N	FUNDAMENTALS OF BIOCHEMISTRY	03

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	-	-	03	-	-	03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Understanding Biomolecules: Describe the structure, function, and properties of key biomolecules, including proteins, nucleic acids, carbohydrates, and lipids.
2.	Enzyme Kinetics and Mechanisms: Explain the principles of enzyme kinetics, including how enzymes catalyze biochemical reactions, and the mechanisms that regulate enzyme activity.
3.	Metabolic Pathways: Identify and describe major metabolic pathways, including glycolysis, the citric acid cycle, oxidative phosphorylation, and photosynthesis, and explain their regulation and integration.
4.	Bioenergetics: Explain the principles of bioenergetics, including the thermodynamics of biochemical reactions, ATP generation, and energy transfer within cells.

5.	Techniques in Biochemistry: Develop familiarity with common biochemical techniques and tools, such as chromatography, electrophoresis, spectroscopy, and molecular cloning.
6.	Cellular Signaling and Communication: Describe the biochemical basis of cellular signaling pathways, including signal transduction, second messengers, and cellular responses to environmental changes.

Course Objective	
1.	To familiarize students with the various classes of biomolecules, such as proteins, nucleic acids, carbohydrates, and lipids, and their roles in cellular processes.
2.	To understand the principles of enzyme action, including catalytic mechanisms, enzyme kinetics, and the factors that regulate enzyme activity in biological systems.
3.	To provide a comprehensive overview of major metabolic pathways, including glycolysis, the citric acid cycle, and oxidative phosphorylation, and their roles in energy production and biosynthesis.
4.	To elucidate the molecular mechanisms of DNA replication, transcription, translation, and the regulation of gene expression in cells.
5.	To introduce students to the principles of bioenergetics, including the thermodynamics of biochemical reactions and how cells manage energy resources.

Detailed syllabus

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage (%)**
Module I	**Chemical basis of Life**		05	15
1	1.1	Introduction		
	1.2	Composition of living matter		
	1.3	Properties of water		

	1.4	Properties of biomolecules in aqueous environment		
	1.5	Biomolecular interactions		
	1.6	Bioenergetics.		
Module II	**Carbohydrates**		10	35
2	2.1	Structure and functions of carbohydrates		
	2.2	Carbohydrate metabolism: glycolysis		
	2.3	Kreb's cycle, phosphogluconate pathway, glyoxylate pathway,		
	2.4	Pentose phosphate pathway, Cori cycle,		
	2.5	Gluconeogenesis and glycogenolysis and its regulation.		
	2.6	Oxidative phosphorylation. Major metabolic disorders of carbohydrate metabolism: diabetes.		
Module III	**Amino acids and Proteins**		08	10
3	3.1	Introduction to need amino acids and proteins		
	3.2	Structure and functions of amino acid and proteins		
	3.3	Overview of amino acid biosynthesis,		
	3.4	Overview of amino acid biosynthesis,		
	3.5	Major metabolic disorders of amino acid metabolism.		
	3.6	Major metabolic disorders of amino acid metabolism.		
Module IV	**Vitamins & Co-enzymes**		06	10
4	4.1	Structure, functions, RDA and significance of water		

	4.2	Fat-soluble vitamin		
	4.3	Fat-soluble vitamin		
	4.4	Importance of NADH, NADPH in metabolic pathways,		
	4.5	Importance of NADH, NADPH in metabolic pathways,		
	4.6	Structure and functions of vitamin derivative cofactors.		
Module V	**Lipids**			
5	5.1	Structure and functions of lipids and derivative lipids	08	15
	5.2	Glycerols & Fatty acids		
	5.3	waxes, phospholipids, sphingolipids, lipoproteins		
	5.4	waxes, phospholipids, sphingolipids, lipoproteins		
	5.5	Biosynthesis and oxidation of fatty acids; Cholesterol synthesis; formation of ketone bodies.		
	5.6	Biosynthesis and oxidation of fatty acids; Cholesterol synthesis; formation of ketone bodies.		
Module VI	**Nucleotide Metabolism**			
6	6.1	Structure and functions of nucleic acids DNA and RNA	08	15
	6.2	De novo and salvage pathways for synthesis of pyrimidine and purine nucleotides		
	6.3	De novo and salvage pathways for synthesis of pyrimidine and purine nucleotides		
	6.4	purine degradation, pyrimidine breakdown		

	6.5	Major metabolic disorders of nucleotide metabolism Gout, Lesch-nuhan syndrome, immunodeficiency		
	6.6	Major metabolic disorders of nucleotide metabolism Gout, Lesch-nuhan syndrome, immunodeficiency		
Total			**45**	**100%**

References	
1.	Lehninger, A. L., Nelson, D. L., & Cox, M. M. (2005). *Lehninger principles of biochemistry*. Macmillan.
2.	Berg, J. M., Gatto Jr, G. J., Hines, J., Tymoczko, J. L., & Stryer, L. (2023). *Biochemistry*. Macmillan Higher Education.
3.	Appling, D. R., Anthony-Cahill, S. J., & Mathews, C. K. (2019). Biochemistry: concepts and connections. *(No Title)*.
4.	Charlton, K. (2000). *Visual troping and scientific truth: unwinding DNA* (Doctoral dissertation, Carleton University).
5.	Lieberman, M., Marks, A. D., Smith, C. M., & Marks, D. B. (2007). *Marks' essential medical biochemistry*. Lippincott Williams & Wilkins.

Semester - I

Course Code	Course Name	Credits
FOM2101N	FUNDAMENTALS OF MICROBIOLOGY	03

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	To classify and name various microorganism including prokaryotes and eukaryotes
2.	To remember the cell structure, function and diversity of prokaryotes, eukaryotes, and acellular microorganism.
3.	To have knowledge of various nutritional and physical parameters of various microorganism and the various environments in which they grow.
4.	To understand the various methods of microbial growth and reproduction and the various factors influencing microbial growth.
5.	To study the various roles played by them in biogeochemical cycles, symbiosis, host microbe interactions and various ecosystems.
6.	To analyze the methods used to control microorganisms including the use of different antimicrobial medications to treat microbial diseases.

Course Objective	
1.	To acquire knowledge of different types of microorganisms, their classification, diversity
2.	To be able to characterize the various structural features of microorganisms including bacteria, archaebacteria, fungi and viruses and be able to differentiate between them.
3.	To understand the various nutritional characteristics of microorganisms and their growth requirements and the various ways in which they can be controlled.
4.	To understand the role of microorganisms in various ecosystems and to comprehend their role in diseases, biogeochemical cycles, industries etc.
5.	To have knowledge of how to control microorganism using various physical, chemical agents
6.	To be able to apply the knowledge in various application using microorganisms

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Introduction and classification of microorganisms**		3	7
1	1.1	Scope and Development of microbiology.		
	1.2	Discovery of microbial world, controversy over spontaneous generation.		
	1.3	Microbial taxonomy classical and molecular taxonomy		
Module II	**Diversity of prokaryotic microorganisms**		10	22
2	2.1	Cell structure and function of Prokaryotes		

	2.2	Bacteria - Gram positive, Gram negative, Cell inclusions- capsule, surface appendages, cytoplasm, and cytoplasmic inclusions.		
	2.3	Archaebacteria, Cyanobacteria that live in extreme conditions		
	2.4	Microbiology of extreme environment - deep ocean, and space microbiology.		
	2.5	Beneficial role of bacteria in biotechnology.		
Module III	**Diversity of eukaryotes and acellular microorganisms**			
3	3.1	Cell structure and function of Eukaryotes	10	22
	3.2	Fungi – importance, characteristic, morphology, reproduction, cultivation and classification, Beneficial role of fungi in biotechnology		
	3.3	Acellular microorganisms (Viruses, viroid, virusoids and prions), Reproduction and life cycle of RNA and DNA viruses, their general characteristics and life cycle.		
Module IV	**Nutritional requirements of Microorganisms**			
4	4.1	Principles of microbial nutrition- nutritional requirements: Carbon, oxygen, hydrogen, nitrogen, phosphorus, sulphur, and growth factors	10	22
	4.2	Classification of different nutritional types of organisms -Nutritional and physical requirements of autotrophs, heterotrophs, chemotrophs and lithotrophs		
	4.3	Physical growth requirements viz. temperature, pH, oxygen concentration, water activity, light, pressure. Classification on basis of oxygen requirement.		

	4.4	Microbial ecosystems and Microbial symbiosis (Plant- microbes interactions - legume-root nodule, agrobacterium & crown gall disease, mycorrhizae, Animal/Humans-microbes interactions - mammalian gut, ruminating animals), Human microbiome and normal flora		
Module V	**Microbial growth and enumeration**			
5	5.1	Design of nutritional media – solid & liquid media, complex, defined, differential, selective, enriched, transport	7	15
	5.2	Pure culture techniques, Methods of isolation.		
	5.3	Growth curve, growth rate and generation time Diauxic growth, synchronous growth, batch, and continuous culture.		
	5.4	Enumeration of Microorganisms- Direct and Indirect methods.		
Module VI				
6	6.1	Theory and practice of sterilization – definition of sterilization, dry and moist heat, pasteurization, tyndallization, radiation, filtration. Physical and chemical methods of sterilization, disinfection, sanitation, antisepsis sterilant and fumigation	5	11
	6.2	Antimicrobial agents and its mechanisms.		
	6.3	Maintenance and preservation (Cryopreservation and lyophilization) of Microorganisms and culture collection.		
Total			**45**	**100**

References:	
1.	Brock Biology of Microorganisms by Madigan, Martinko, Stahl, Clark, Publisher: 13th Edition, Prentice Hall
2.	General Microbiology by R.Y. Stainer et al. Publisher: McMillan
3.	Willey, J. M., Sherwood, L. M., & Woolverton, C. J. (2014). Prescott's microbiology. McGraw-Hill.
4.	Microbiology, Tortora, Funke and Chase, Benjamin & Cummings
5.	Pelczar Jr, M. J., Chan, E. C. N., & Krieg, N. R. Presscott, L. Harley, j. and Klein, D.(2005) Microbiology, 6" edition, Tata McGraw-Hill.

Semester - I

Course Code	Course Name	Credits
LCB2103N	LAB COURSE ON BIOCHEMISTRY	01

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
-	2	-	-	1	-	01

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	4 Hours	-	-	-	100

Course Outcome	
1.	Learn how biochemical techniques are used in research and industrial settings, such as in drug development, biotechnology, and diagnostics.
2.	Gain experience in the proper use of biochemical laboratory equipment and instrumentation, and understand laboratory safety protocols, including the handling and disposal of chemicals and biological materials.
3.	Understand and apply ethical standards in conducting biochemical research, including data integrity, honesty in reporting results, and the ethical treatment of biological samples.
4.	Gain proficiency in fundamental biochemical laboratory techniques such as chromatography (e.g., paper, thin-layer, and column chromatography), electrophoresis (e.g., SDS-PAGE and agarose gel electrophoresis), spectrophotometry, and enzyme assays.

5.	Develop the ability to design and conduct biochemical experiments, including forming hypotheses, planning methodologies, and controlling variables to obtain reliable and reproducible results.
6.	Acquire skills in analyzing experimental data, including graphing results, calculating reaction rates, interpreting enzyme kinetics, and understanding the significance of data in the context of biochemical research.

Course Objective	
1.	To train students in a range of fundamental biochemical laboratory techniques, such as chromatography, electrophoresis, spectrophotometry, enzyme assays, and DNA/RNA isolation, to analyze biomolecules and understand their functions.
2.	To familiarize students with the scientific method, including formulating hypotheses, designing experiments, and understanding experimental controls and variables in biochemical research.
3.	To enable students to connect biochemical theories and principles learned in lectures with practical applications in the lab, enhancing their overall comprehension of biochemical processes and molecular biology.
4.	To develop students' critical thinking and problem-solving skills by encouraging them to troubleshoot experimental protocols, analyze unexpected results, and adapt methodologies as needed.
5.	To provide insights into how biochemical techniques are used in research and industry settings, such as in pharmaceutical development, clinical diagnostics, and biotechnology.
6.	To enhance students' ability to communicate scientific findings effectively, both orally and in writing, through detailed laboratory reports, presentations, and discussions.

Detailed syllabus

Module/ Unit	Course Module / Contents	Hours	Marks Weightage (%)
List of practical		26	100
1.	Preparation of molar, normal and % (w/v & v/v) solutions and preparation of buffers of different pH and molar strength.		
2.	Extraction and estimation of carbohydrates from given plant/animal materials using spectrophotometer (Anthrone method)		
3.	Extraction and estimation of total proteins from given plant/animal material using spectrophotometer (Lowry/Bradford)		
4.	Extraction and estimation of total lipids from the given sample		
5.	Extraction and estimation of nucleic acids from the given sample		
Total		**26**	**100**

References:	
1.	Introductory Practical Biochemistry by Sawhney and Singh, Narosa publication.
2.	An Introduction to Practical Biochemistry by Plummer, 3rd edition, McGraw Hill
3.	Principles and Techniques of Molecular Biology-Wilson & Walkar, Cambridge University Press
4.	"Biochemistry: Concepts and Connections" by Dean R. Appling, Spencer J. Anthony-Cahill, and Christopher K. Mathews
5.	Marks' Essentials of Medical Biochemistry: A Clinical Approach" by Michael Lieberman and Allan Marks

Semester - I

Course Code	Course Name	Credits
LCM2104N	LAB COURSE ON MICROBIOLOGY	01

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
-	2	-	-	1	-	01

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	4 Hours	-	-	-	100

Course Outcome	
1.	Remember and describe fundamental principles of experiments related to Microbiology
2.	Understand the theoretical concepts of various experiments related to Microbiology.
3.	Apply the concepts for the execution of experiments independently or in groups.
4.	Record the observation and analyze the results of performed experiments.
5.	Evaluate the experiments for troubleshooting and designing of alternative strategy.
6.	Demonstrating proficiency in practical skills related to Microbiology

Course Objective	
1.	To equip students with essential practical skills in microbiology, focusing on the setup and operation of a microbiology lab, and the use of fundamental laboratory instruments and equipment
2.	To develop skills in aseptic techniques to ensure the prevention of contamination of samples and to understand the safety and precautions to be followed while working with microorganisms.
3.	To learn to isolate, grow, identify, enumerate, and maintain microorganisms using various media and different parameters
4.	To be able to develop critical thinking skills to analyze and interpret experimental data
5.	Adhere to laboratory safety protocols to ensure a safe working environment
6.	Understand the ethical considerations in microbiological research, including proper handling and disposal of microbial cultures

Detailed syllabus

Module/ Unit	Course Module / Contents	Hours	Marks Weightage (%)
List of practical		26	100
1.	Set up of microbiology laboratory, instruments and equipment used.		
2.	Plugging & sterilization of flask, test tubes, wrapping & sterilization of pipettes		
3.	Aseptic techniques and preparation of media – Nutrient broth & agar, potato dextrose broth & agar		
4.	Isolation of bacteria by streak plate method, study of colony characteristics including gram staining		
5.	Enumeration of microorganism by serial dilution – Pour plate, spread plate.		

6.	Use of differential, selective and enriched media.		
7.	Growth curve measurement of bacterial population by turbidimetry		
8.	Biochemical tests – Triple Sugar Iron test (TSI), Indole test. Methyl red test. Voges Proskauer test, Citrate utilization test (IMViC)		
Total		**26**	**100**

References:	
1.	Microbiology: A laboratory Manual, Seventh Edition, by: Cappuccino and Sherman- Pearson; 7th edition
2.	Sneath, P. H., Mair, N. S., Sharpe, M. E., & Holt, J. G. (1986). Bergey's manual of systematic bacteriology. Volume 2 (pp. xxiii+-965).

Semester - I

Course Code	Course Name	Credits
ITB2105N	INTRODUCTION TO BIOTECHNOLOGY	04

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	-	-	04	-	-	04

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Students will be able to articulate the fundamental concepts of biotechnology, distinguish between classical and modern biotechnological methods, and recognize the interdisciplinary nature and broad scope of the field
2.	Students will gain the ability to describe the biological significance of various biomolecules, compare prokaryotic and eukaryotic cell structures, and identify the unique characteristics of cells from bacteria, archaea, and eukaryotes.
3.	Students will be able to discuss the scope and milestones of agricultural biotechnology, apply techniques such as in vitro plant culture and genetic modification, and explore emerging trends like CRISPR and climate-smart agriculture

4.	Students will understand the applications of biotechnology in human health, including cell culture, molecular diagnostics (PCR and ELISA), gene therapy, and the use of genetically modified animals
5.	Students will be able to evaluate the significance of microorganisms in food production, fermentation technology, and their roles in medicine and industry, including bioremediation and waste treatment.
6.	Students will be equipped to discuss advanced biotechnological methods such as genomics, proteomics, and their applications in medicine, environmental remediation, and agriculture, including the development of biopesticides and biofertilizers.

Course Objective	
1.	Basic understanding of biotechnology's evolution, key areas of application, and its integration with other scientific disciplines.
2.	Detailed knowledge of biomolecule functions, cellular organization, and differences between cell types across domains of life.
3.	Practical and theoretical understanding of biotechnology applications in agriculture, including plant genetics, stress tolerance, and modern agricultural innovations.
4.	Insight into biotechnological advancements in medical diagnostics and therapies, ethical considerations, and the role of biotechnology in developing treatments.
5.	Knowledge of microbial applications in food safety, fermentation processes, and environmental management.
6.	Understanding of cutting-edge biotechnological techniques and their practical applications across various fields.

Detailed syllabus

Module/ Unit	**Course Module / Contents**	**Hours**	**Marks Weightage** (%)

Module I	**Introduction to Biotechnology**		08	14
1	1.1	Introduction		
	1.2	Scope of Biotechnology		
	1.3	Classical Biotechnology		
	1.4	Modern Biotechnology		
	1.5	Biotechnology as an interdisciplinary field		
	1.6	Biotechnology as an interdisciplinary field		
Module II	**Molecules of Life and Basics of Cell**		09	15
2	2.1	Biological significance of biomolecules		
	2.2	Water, Carbohydrates, Lipids		
	2.3	Proteins, Enzymes, nucleic acids		
	2.4	Discovery of cells		
	2.5	Difference between prokaryotic and eukaryotic cells		
	2.6	Cell structure of three domains: bacteria, archaea and eukaryote		
Module III	**Agricultural Biotechnology**		12	20
3	3.1	Introduction, Definition and scope of agricultural biotechnology, Milestones in agricultural biotechnology		
	3.2	General accounts of plant diversity, theory of evolution and classification of plants		
	3.3	Applications of biotechnology in agriculture; in vitro culture of plants and their applications		
	3.4	GM plants: need, applications, stress tolerant plants		

	3.5	Emerging Trends in Agriculture Biotechnology; CRISPR, genome editing		
	3.6	Hydroponics, Introduction to climate smart agriculture		
Module IV	**Human health and Animal Biotechnology**			
4	4.1	Animal Biotechnology: introduction to cell culture	12	20
	4.2	Use of cell culture for production of - regulatory protein, hormone		
	4.3	Use of stem cell cultures for treatment		
	4.4	Molecular Diagnostics- Applications of Polymerase Chain Reaction (PCR) and ELISA in diagnosis		
	4.5	Basics of gene therapy, Types of gene therapy: Somatic vs. Germline		
	4.6	Challenges and ethical considerations in gene therapy. GM animals: animal models of disease, applications.		
Module V	**Food and Microbial Technology**			
5	5.1	Importance of biotechnology in industries. Role of microorganisms in food production	12	20
	5.2	Food borne pathogens and their control, Food safety and regulations		
	5.3	Introduction to Fermentation technology, Types of fermentation		
	5.4	Microbes in production of enzymes, antibiotics, biofuels		
	5.5	Role of microorganisms in medicine, pharmaceuticals, vaccines		

	5.6	Human microbiome and its implication on health Microbial bioremediation and waste treatment		
Module VI	**Other applications of Biotechnology**		07	12
6	6.1	Importance of biotechnological approaches like genome, proteome and transcriptome sequencing		
	6.2	Biotechnological application in Medicine:		
	6.3	Genetically engineered proteins and Peptides		
	6.4	Role of Biotechnology in environmental remediation		
	6.5	Application of Biotechnology in development of Biopesticide, Biofertilizer		
	6.6	Biotechnology in food and nutrition		
Total			**60**	**100**

References:	
1.	"Biotechnology: Principles and Processes" by P.K. Gupta. 4th Edition (2022) Rastogi Publications
2.	Molecular Biology of the Cell" by Bruce Alberts. 7th Edition (2019) Garland Science
3.	"Plant Biotechnology: Principles and Applications" by J. Hammond, P. McGarvey, and V. Yusibov. 2nd Edition (2009) Springer
4.	"Principles of Gene Manipulation and Genomics" by Sandy B. Primrose and Richard Twyman. 8th Edition (2014) Wiley-Blackwell
5.	"Human Molecular Genetics" by Tom Strachan and Andrew Read. 5th Edition (2018) Garland Science
6.	"Food Biotechnology: Principles and Applications" by David H. Shurtleff and Akiko Aoyagi. 1st Edition (2017) Academic Press
7.	"Environmental Biotechnology: Principles and Applications" by Gareth M. Evans and Jillian F. Furlong. 1st Edition (2003) Wiley

Semester - I		
Course Code	**Course Name**	**Credits**
BMT2110N	BUSINESS MANAGEMENT	4

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03	-	02	03	-	01	04

Theory						Term Work / Practical/Oral			Total
Internal Assessment				End Sem Exam	Duration Of End Sem Exam	Term Work	Pract.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course outcome

1. Identify and explain the basic concepts, nature, and scope of management, and recognize its significance in organizational success.
2. Analyse various management theories, including classical and modern approaches, and apply these frameworks to solve organizational challenges.
3. Demonstrate the ability to carry out the management planning process, set objectives, and use forecasting and decision-making techniques to guide organizational planning.
4. Evaluate different types of organizational structures and understand the principles of authority, delegation, departmentalization, and staffing processes.
5. Develop and apply techniques for management control, motivation, coordination.
6. Communication to improve organizational effectiveness.

Course Objectives

1. Familiarize students with the key concepts, functions, and levels of management, and the evolution of management theories.

2. To effectively plan, set objectives, forecast, and make informed decisions within an organization.
3. Provide students with an understanding of how organizations are structured, including departmentalization, span of control, and the principles of authority and delegation.
4. Enable students to conduct job analysis, manpower planning, recruitment, and training, and understand the importance of employee development and recognition.
5. Teach students the processes and objectives of management control.
6. The importance of coordination, communication, and motivation in directing organizational efforts.

Detailed Syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage
1	**Introduction**		09	20
	1.1	Concept, Nature, Scope, and Functions of Management		
	1.2	Functions of Management, Levels of Management, Evolution and Foundations of Management Theories - Classical		
	1.3	Systems Approach to organization, Modern Organization Theory.		
2	**Management Planning Process**		09	20
	2.1	Planning objectives and characteristics		
	2.2	Hierarchies of planning, the concept and techniques of forecasting		
	2.3	Decision making – concepts & process, MBO, concept and relevance		
3	**Organization**		09	20
	3.1	Meaning, Importance and Principles, Departmentalization		
	3.2	Span of Control, Types of Organization		

	3.3	Authority, Delegation of Authority		
4	**Staffing**		**09**	**15**
	4.1	Meaning, Job analysis, Manpower planning		
	4.2	Recruitment, Transfers and Promotions, Appraisals		
	4.3	Management Development, Job Rotation, Training, Rewards and Recognition.		
5	**Directing**		**09**	**15**
	5.1	Motivation, Co-ordination, Communication		
	5.2	Directing and Management Control, Decision Making		
6	**Management Control**		**07**	**10**
	6.1	Coordination, Meaning, Nature, Features		
	6.2	Objectives and Process of Management Control		
		Total	**52**	**100**

References:

1. Stoner, Freeman, and Gilbert Jr. (2010), Management, 8th Edition, Pearson Education
2. Robbins, (2009), Fundamentals of Management: Essential concepts and Applications, 6th edition, Pearson Education
3. Prasad, L.M. Principles & Practice of Management, 1st Edition, Tata McGrew Hills
4. "Principles of Management" by Richard L. Daft,12th Edition (2018), Cengage Learning
5. "Principles of Management" by Charles W. L. Hill and Steven McShane, 1st Edition (2008), McGraw-Hill/Irwin

Semester – I

Course Code	Course Name	Credits
ECO2110N	ECONOMICS-I	4

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03		01	03		01	04

Theory							Term Work/ Practical/ Oral			Total
Internal Assessment					End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Assignment	Viva	Attendance	Total Internal						
20	15	10	05	50	50	2 Hours	-	-	-	100

Course Outcome	
1.	The knowledge of this subject is essential to understand facts, concepts of microeconomics, which deals with economics at individual level.
2.	Students understand the basic theories behind decision making process of households and the firms and their interaction in establishing equilibrium prices.
3.	Students understand the firms decision making process
4.	Students understand the importance of equilibrium in welfare objective
5.	Students understand the impact of microeconomic decisions at macroeconomic level.
6.	Promote social justice, communal harmony, and solidarity.

Course Objective

1.	Students are able to compare the different elasticities and their usefulness
2.	Students are able to calculate the elasticities
3.	Students are able to find the profit maximization equilibrium level
4.	Students are able to understand the importance of kinky demand curve in stabilizing prices
5.	Students are able to understand the pricing in the factor market
6.	Students understand the importance of Pareto equilibrium

Detailed syllabus

Module / Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Exploring the Subject Matter of Economics**		7	15
1	1.1	Definition of Economics. Why study economics?The scope and method of economics		
	1.2	scarcity and choice; questions of what, how and for whom to produce and how to distribute output.		
	1.3	Questions of what, how and for whom to produce		
	1.4	Question of how to distribute the profit		
	1.5	Concept of stable, unstable, static and dynamicequilibrium		
	1.6	Partial and general equilibrium, positive and normative economics		
Module II	**Supply and Demand: How Markets Work, Markets andWelfare**		7	15

2	2.1	Equi marginal utility.		
	2.2	Individual demand and supply schedule		
	2.3	Derivation of market demand supply		
	2.4	Consumer's surplus		
	2.5	Shifts in demand and supply curve		
	2.6	The role of prices in resource allocation		
	2.7	Elasticity of demand -price, income and cross elasticity		
	2.8	Law of supply, elasticity of supply		
Module III	**Consumer's Behavior**		8	16
3	3.1	Utility-cardinal and ordinal approaches,		
	3.2	Indifference curves and budget constraint		
	3.3	Consumer 's equilibrium (Hicks and Slutsky		
	3.4	Giffen goods		
	3.5	Compensated demand curve		
	3.6	Revealed preference		
	3.7	Engel curve		
Module IV	**Theory of Production**		10	18
4	4.1	Technology, Isoquants, Iso costs		
	4.2	Production with one and more variables		
	4.3	Cobb-Douglass production function		
	4.4	Returns to Scale		
Module V	Theory of Cost		10	18
5	5.1	Short run and long run costs, cost curves in the short run and long run, total, average, and marginal product, cost minimization and expansion path, elasticity of substitution.		
	5.2	Total, average, and marginal product		

	5.3	Cost minimization, envelope curve		
	5.4	Law of variable proportion		
Module VI	**Markets**		10	18
6	6.1	Perfect Competition		
	6.2	Assumptions of Perfect Competition		
	6.3	Short run equilibrium of perfect competition		
	6.4	Long run equilibrium of perfect competition		
Total			52	**100%**

References	
1.	C. Snyder and W. Nicholson, Fundamentals of Microeconomics, Cengage Learning (India), 2010.
2.	B. Douglas Bernheim and Michael D. Whinston, Microeconomics, Tata McGraw-Hill (India), 2009
3.	Ahuja H.L. (2010) Principles of Microeconomics, 18th Edition, S. Chand& Co. Ltd.
4.	Robert S. Pindyk and D.L. Ru Microeconomics, 8th edition, Pearson publication
5.	Koutsoyiannis, A. (1975). Modern microeconomics. Springer.

Semester – I

Course Code	Course Name	Credits
HMR2110N	HUMAN RIGHTS-I: (GENERAL HUMAN RIGHTS)	4

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
04	-	-	04	-	-	04

Theory							Term Work/ Practical/ Oral			Total
Internal Assessment					End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Assignment	Viva	Attendance	Total Internal						
20	15	10	05	50	50	2 Hours	-	-	-	100

Course Outcome	
1.	Promote human dignity and individual self-respect.
2.	Ensure gender equality and equal opportunities for all.
3.	Foster respect and appreciation for diversity.
4.	Support the rights of national, ethnic, religious, and linguistic minorities.
5.	Empower students for active citizenship and democratic participation.
6.	Promote social justice, communal harmony, and solidarity.

Course Objective

1.	Critically analyze different spheres of human rights.
2.	Effectively communicate on socio-legal aspects of human rights.
3.	Enhance analytical thinking on international human rights law application.
4.	Assess specific human rights laws with legal instruments and contemporary cases.
5.	Analyze contemporary challenges and trends in human rights theory and practice.
6.	Understand divergences in human rights across international, regional, and domestic contexts.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Historical Development and Basic Concepts**		8	15
1	1.1	Historical Development of Human Rights		
	1.2	Concepts of Justice		
	1.3	Concepts of Dignity		
	1.4	Concepts of Liberty and Equality		
	1.5	Concepts of Unity in Diversity		
	1.6	Concepts of Ethics and Morality		
Module II	**Understanding of the Concept of Rights and Duties**		8	15
2	2.1	Meaning of Human Rights		
	2.2	Significance of Human Rights Education.		
	2.3	Rights: Inherent-Inalienable-Universal-Individual and Groups		
	2.4	Nature and concept of Duties		
	2.5	Interrelationship of Rights and Duties		

	2.6	Classification of Rights and Duties: Moral, Social, Cultural, Economic, Civil and Political		
Module III	**Human Duties and Responsibilities**		8	15
3	3.1	Identification of Human Duties and Responsibilities.		
	3.2	The Relationship Between Human Rights and Human Duties.		
	3.3	Ethical Obligations of Individuals in upholding Human Rights.		
	3.4	Social Responsibilities in Promoting Equality and Justice.		
	3.5	Environmental Duties and the Role of Sustainable Practices.		
	3.6	Global and Cultural Variations in the Concept of Human Responsibilities.		
Module IV	**General Problems of Human Rights**		10	19
4	4.1	Challenges in Defining and Universally Applying Human Rights.		
	4.2	Conflict Between National Sovereignty and International Human Rights Standards.		
	4.3	Cultural Relativism and its Impact on Human Rights Implementation.		
	4.4	Economic Inequality as a Barrier to Human Rights Realization.		
	4.5	Political Repression and the Violation of Civil Liberties.		
	4.6	Issues of Accountability and Enforcement in Human Rights Violations		
Module V	**Important Convention on Human Rights-I**		9	18

5	5.1	Universal Declaration of Human Rights (UDHR) (1948)		
	5.2	International Covenant on Civil and Political Rights (ICCPR) (1966)		
	5.3	International Covenant on Economic, Social and Cultural Rights (ICESCR) (1966)		
	5.4	Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) (1979)		
	5.5	Convention on the Rights of the Child (CRC) (1989)		
	5.6	Convention on the Rights of Persons with Disabilities (CRPD) (2006)		
Module VI	**Important Convention on Human Rights-II**			
6	6.1	International Convention on the Elimination of All Forms of Racial Discrimination (ICERD) (1965)	9	18
	6.2	Convention Against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment (CAT) (1984)		
	6.3	Convention Relating to the Status of Refugees (1951) and its 1967 Protocol		
	6.4	Convention on the Prevention and Punishment of the Crime of Genocide (1948)		
	6.5	International Convention for the Protection of All Persons from Enforced Disappearance (2006)		
	6.6	Rome Statute of the International Criminal Court (1998)		
Total			**52**	**100**

References:

1.	An introduction to the Political Theory by O.P. Gauba;
2.	Human Rights by S. Subrahmanyam;
3.	Human Rights and Constitutional Law by D.D. Basu;
4.	The United Nations Structure and Functions of an International Organization by Rumki Basu;
5.	Human Rights in India Historical, Social and Political Perspective by Chiranjivi J. Nirmal.
6.	Manoj Kumar Sinha, Implementation of Basic Human Rights, (Lexis Nexis)

Semester – I		
Course Code	**Course Name**	**Credits**
ACW2110N	ACADEMIC AND CREATIVE WRITING	04

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
04	00	-	04	00	-	04

Internal				External		Total
Mid-Sem Exam	**Continuous Evaluation**	**Attendance**	**Total Internal**	**End Sem Exam**	**Duration Of End Sem Exam**	
30	**15**	**05**	**50**	**50**	**2 Hours**	**100**

Course Objectives

The course is designed:

1. To introduce the concepts of academic and creative writing.
2. To familiarize students with the different genres and process of writing.
3. To train students to write in various forms and formats.
4. To encourage students to write for self-development and publication.
5. To teach the various ways of ideating and writing creatively.

Course Outcomes

After completion of this course students will be able to:

1. Demonstrate effective ways of ideation.
2. Identify various writing techniques.
3. Acquire academic and idiomatic vocabulary.

4. Comprehend the principles of effective paragraph structure and content.
5. Analyse and evaluate own and other's works.

Detailed Curriculum

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
	Fundamentals of Writing		8	15
1	1.1	Significance of Writing as a Skill		
	1.2	Categories of Writing		
	1.3	Types of writing		
2	**Academic and Creative Writing**		8	15
	2.1	Features of Academic and Creative Writing		
	2.2	Differences Between Academic and Creative Writing		
	2.3	Illustrations of Between Academic and Creative Writing		
3	**Creative Writing**		10	20
	3.1	Ideation		
	3.2	Writing for target audience		
	3.3	Employ the various stages of the writing process - pre-writing, writing and re-writing		
	3.3	Employ descriptive, narrative and expository modes		
4	**Academic Writing**		8	15
	4.1	Planning and Making the Outline		
	4.2	Refining Paragraph Structure		
	4.3	Proofreading and editing		
5	**Stylistics of Writing**		10	20
	5.1	Common Literary Devices		
	5.2	Learning about Themes		

	5.3	Vocabulary Enhancement		
6		**Putting to Practice**	8	15
	6.1	Analyzing short stories of famous foreign and Indian writers: Kate Chopin & Ruskin Bond		
	6.2	Producing samples of Various Writing Types		
	6.3	Peer review		
Total			**52**	**100**

References:

1. Brohaugh, William. Write Tight: Say Exactly What You Mean with Precision and Power.
2. Dev, Anjana Neira, ed. A Handbook of Academic Writing and Composition. Pinnacle, 2016.
3. Eckert, Kenneth. Writing Academic Research Papers. Moldy Rutabaga, 2021.
4. Goins, Jeff. You Are a Writer (So Start Acting Like One). Tribe Press
5. Gupta, Renu. A Course in Academic Writing. Orient BlackSwan, 2010.
6. Pinker, Steven. The Sense of Style: The Thinking Person's Guide to Writing in the 21st Century . Penguin Books, Reprint edition ,2015
7. Seely, John. Oxford Guide to Effective Writing and Speaking. OUP 2nd edition, 2005
8. Turk, Christopher and John Kirkman. Effective Writing. London and New York: Chapman & Hall. Indian Reprint 2003.

Semester - I

Course Code	Course Name	Credits
FST2110N	FASHION TECHNOLOGY-I	04

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
02	-	02	02	-	02	04

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	30	05	50	50	2	-	-	-	100

Course Outcome	
1.	Have a deeper understanding of fashion theories, fashion terminologies, and vocabulary.
2.	Understand the workings of the fashion industry, including its historical development, current trends, and key players.
3.	Gain insights into the fashion production, including design, manufacturing, and distribution.
4.	Analyze various fashion subcultures, recognizing their role in challenging mainstream norms and shaping aesthetic trends.

Course Objective

1.	The course aims to deepen students' grasp of fashion theories, terminologies, and vocabulary, fostering their analytical skills for interpreting design and trends.
2.	The course also provides a comprehensive overview of the fashion industry's evolution, current trends, and key players while offering insights into the intricacies of design, manufacturing, and distribution processes.
3.	By exploring diverse fashion subcultures, students will recognize their role in reshaping aesthetics and challenging conventional norms, enhancing their ability to engage thoughtfully with the multifaceted realm of fashion.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Fashion Terminology & Etymology**		9	20
1	1.1	Clothes, costumes, fashion, Social Identity, feel-good, unique identity, designer jeans, perfect look, branded cosmetics, branded shoes, eyewear, watches, etc.		
	1.2	Elements and principles of design in context to fashion (point, line, shape- [silhouette, motifs, repeats], colour [hue, value, intensity], texture) (balance, proportion, emphasis, rhythm, harmony)		
	1.3	Style, Types of Fashion Avante Garde, haute couture/high fashion, mass-market, bridge/prêt-a- porter/ready-to-wear fashion Classics, fads, knock off.		
Module II	**Factors Influencing Fashion and Fashion Theories**		9	15

2	2.1	Accelerating and Retarding factors influenced by social, cultural, economic, political, technological, sports, music, etc.		
	2.2	Fashion Theories- Trickle-up, Trickle-down and Mass dissemination		
Module III	**Fashion Cycles and Fashion Consumers**		8	15%
3	3.1	Five stages of the fashion cycle and the various types of cycles.		
	3.2	Fashion consumers at each stage		
Module IV	**Introduction to the Fashion Industry**		8	15
4	4.1	A brief global overview of the textile and apparel industry. Sectoral overview of the fashion industry in India		
	4.2	Fashion capitals of the world: Paris, Milan, New York, London, Tokyo (Uniqueness and 5 top designers/brands from each capital)		
Module V	**Fashion Details**		9	20
5	5.1	Component details of necklines, collars, sleeves, cuffs, belts, pockets, drapes, yokes, gathers, frills, pleats, and tucks.		
	5.2	Understanding and Identification of applique, patchwork, embroideries, beadwork, fringes, tassels, quilting, smocking, shearing,		
	5.3	Types of hemlines, trims, fasteners, laces, zippers, buttons, rouleau, drawstrings, vents, and rivets.		
	5.4	Jewelry, handbags, hats, headgear, footwear, watches, scarves, sunglasses, pins.		

Module VI	**Regional Styles, Culture and Fashion**			
6	6.1	Mediterranean, Latino, and Scandinavian styles- history, culture and society, lifestyle, textiles and clothing, accessories, home furnishings.	9	15
	6.2	Fashion in relation to sports, movies, and music- types of styles and trends, textiles and fabrics.		
Total			**52**	**100**

References:	
1.	Fashion: From concept to consumer, Gini Stephens Frings (1999), Prentice-Hill Inc.
2.	The Fairchild's Dictionary of Fashion, Phyllis Tortora,
3.	Variety- Fashion for Freedom, S. A Hussain
4.	Beyond Design, Sandra J. Keiser & Myrna B. Garner, Fairchild publication.
5.	Elements of Fashion & Apparel Design, G. J Sumathi,
6.	Consumer Behavior: In Fashion, Solomon, Pearson Education India.

Semester - I		
Course Code	**Course Name**	**Credits**
IND2110N	INTERIOR DESIGN -I	04

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
01	-	03	01	-	03	04

	Theory					Term Work / Practical/Oral			Total
Internal Assessment				End Sem Exam	Duration Of End Sem Exam	Term Work	Pract.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	30	05	50	-	-	50	-	-	100

Course outcome

1. Understand the field of Interior Design as a profession.
2. Familiarization with Colours, textures and materials used in the interior spaces.
3. Awareness of drawing at scale, lettering, and dimensioning
4. Understanding basics of technical drawing.
5. Familiarize with Anthropometry of interior space.
6. Designing of residential interior space.

Course Objectives

1. To enable students to understand the design aspects and constraints of residential interiors.
2. To appraise the students about the role and complexity in interior design.

Detailed Syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage
1	**Introduction to Interior Design**		12	20
	1.1	Introduction to the profession of Interior Design. Difference between design & decoration.		
	1.2	Basics of sheet formats		
	1.3	Introduction to elements and principles of design and Interior Design as a profession.		
	1.4	Basics of Sketching		
2	**Basics of colors, textures, and materials**		8	12
	2.1	To enable the students to understand the basics of Colors in form of colour wheel and colour schemes		
	2.2	Understanding of materials and textures		
3	**Introduction to basics of lettering, and scales**		8	12
	2.1	Basics of lettering		
	2.2	Basics of scales		
	2.3	Basics of Dimensioning		
4	**Basics of Drawing and Technical Drafting**		8	13
	3.1	Understanding 2D drafting		
	3.2	Understanding plans and elevations of basic objects		
5	**Study of Anthropometry, human proportions and required spaces**		8	13
	4.1	Anthropometric study of various residential spaces.		
	4.2	Discussion of various activities in a residence		
	4.3	Studying circulation in residential interior spaces		
6	**Layout of residential interior space**		16	30

	6.1	Making final layout plan with suggested design		
	6.2	Understanding Interior Design from reference images		
	6.3	Preparing a final portfolio		
Total			**60**	**100**

References:

1.	Ernst Neufert, Neuferts Architects Data
2.	Francis D.K. Ching, Architecture: Form, Space and Order
3.	Joseph Chiara and John Callend, Time Saver Standards for Building Types
4.	Ramsey Sleeper, Architectural Graphic Standards
5.	Drew Plunkett, Drawing for Interior Design

Semester - I

Course Code	Course Name	Credits
FLF2111N	FRENCH-I	1

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
01	-	-	01	-	-	01

Theory							Term Work / Practical/Oral			Total
Internal Assessment					End Sem Exam	Duration Of End Sem Exam	Term Work	Pract.	Oral	
Mid Term	Viva	Continuous Evaluation	Attendance	Total Internal						
15	20	10	05	50	50	75 mins	-	-	-	100

Course Objectives

The course is designed:

1. To familiarize students with the French language, with its phonetic system and its accents.
2. To make the students understand simple spoken French, including greetings, introductions, and basic conversational phrases.
3. To engage the students in basic conversations, introduce yourself, ask and answer simple questions, and use common expressions.
4. To familiarize the students to write simple sentences and paragraphs about familiar topics, such as daily activities, personal information, and immediate needs.
5. To compare cultural differences and similarities between French-speaking countries and the student's own culture.

Course Outcomes

After the completion of this course Students will be able to:

1. Read French language, with its phonetic system and its accents and greet someone in French.
2. Understand simple spoken French, including greetings, introductions, and basic conversational phrases.
3. Introduce themselves, ask and answer simple questions, and use common expressions.
4. Write simple sentences and paragraphs about familiar topics, such as daily activities, personal information, and immediate needs.
5. Compare cultural differences and similarities between French-speaking countries and the student's own culture.

Detailed Curriculum

Reading exercises, writing tasks and grammar of:

Module/ Unit	Course Module / Contents		Hours	Marks Weightage
	Module I		6	50
1	Leçon 1	Bienvenue !		
	Leçon 2	Le français de A à Z		
	Leçon 3	Le monde en français		
	Leçon 4	La classe et nous		
2	**Module II**		3	20
	Leçon 1	Bonjour !		
	Leçon 2	Ça se passe où ?		
	Leçon 3	Ils sont francophones.		
	Module III		4	30
3	Leçon 1	Portraits		

	Leçon 2	En classe		
	Leçon 3	Je parle français pour …		
	Total		**13**	**100**

References:

1. Berthet, Hugot et al. Alter Ego - Méthode de Français, A1: Hachette,2012.
2. Bruno Girardeau et Nelly Mous. Réussir le DELF A1. Paris : Didier, 2011.
3. Loiseau Y.,Mérieux R. Connexions 1, cahier d'exercices. Didier, Paris, 2017.
4. Loiseau Y. & Mérieux R. Connexions 1, Guide pédagogique. Didier, Paris, 2017.
5. Connexions 1, livre de l'élève – Loiseau Y. & Mérieux R., éd. Didier, Paris,2017.
6. Latitudes 1, cahier d'exercices – Loiseau Y. & Mérieux R., éd. Didier, Paris,2018.
7. Latitudes 1, Guide pédagogique – Loiseau Y. & Mérieux R., éd. Didier, Paris,2018.
8. Latitudes 1, Guide pédagogique téléchargeable – Loiseau Y. & Mérieux R., éd. Didier,2018.
9. Latitudes 1, livre d'élève + CD – Loiseau Y. & Mérieux R., éd. Didier, Paris,2018.
10. Nathalie Hirschsprung, Tony Tricot, Cosmopolite 1 Méthode de Français A1. Hachette, 2017.
11. Nathalie Hirschsprung, Tony Tricot. Cosmopolite 1 Cahier d'activités A1. Hachette, 2017.

Semester – I

Course Code	Course Name	Credits
FLG2111N	GERMAN-I	1

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
1	-	-	1	-	-	1

Theory							Term Work / Practical/Oral		Total	
Internal Assessment					End Sem Exam	Duration Of End Sem Exam	Term Work	Pract.	Oral	
Mid Term	Continuous Evaluation	Attendance	Oral	Total Internal						
15	10	05	20	50	50	75 mins	-	-	-	100

Course Objectives

The course is designed :

1. To introduce oneself and others
2. To greet and have a basic conversation in German.
3. To frame and understand simple sentences in present tense.
4. To ask and answer basic questions pertaining to one's and other's name, residence, or similar topics from one's direct surroundings.
5. To pronounce and read known names, words, and simple sentences.

Course Outcomes

After the completion of this course students will be able to:

1. Introduce themselves and others.
2. Greet each other.

3. Frame and understand simple sentences in present tense.
4. Ask and answer basic questions pertaining to one's and other's name, residence, or similar topics from one's direct surroundings.
5. Correctly pronounce and read known names, words, and simple sentences.

Detailed Curriculam				
Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage**
	Kapitel 1		05	34
1	**Grammatischer Aspekt**	- Verben für Vorstellung - heißen, kommen, wohnen (Vorstellung) + Personalpronomen Sie, ich, er, sie - Verben für Vorstellung+ sprechen und sein + Personalpronomen du, ihr, wir, es, sie (pl.) - W-Fragen u. Aussagen		
	Thematischer Aspekt	- grüßen und verabschieden - sich und andere vorstellen - über sich und andere sprechen - Zahlen bis 20, Telefonnummer und E-Mail-Adresse nennen - Buchstabieren über Länder und Sprachen sprechen		
	Kapitel 2		04	33
2	**Grammatischer Aspekt**	- Verbstamm mit ‚d' oder ‚t', z.B. arbeiten, unterrichten, schneiden - Unregelmäßige Verben, z.B. fahren, lesen, sein, haben - Ja-Nein Frage - Bestimmter Artikel		

	Thematischer Aspekt	- Wochentage benennen - über Arbeit, Berufe und Arbeitszeiten sprechen - Zahlen ab 20 nennen - über Jahreszeiten sprechen ein Profil im Internet erstellen		
	Kapitel 3		04	33
3	**Grammatischer Aspekt**	- Unregelmäßige Verben, z.B. fahren, geben, sprechen, sehen, nehmen - Unbestimmter Artikel: Ein, eine, ein und Bestimmter Artikel		
	Thematischer Aspekt	- Texte einer Bildergeschichte zuordnen - Verkehrsmittel benennen - Artikel lernen		
Total			**13**	**100**

References:

1. Aufderstraße, Hartmut. *Lagune 1. Deutsch als Fremdsprache: Kursbuch und Arbeitsbuch*. Ismaning: Max Hueber Verlag 2012.
2. Braun, Anna, and Daniela Wimmer. *Schritte Plus A1/1: Arbeitsbuch*. Hueber Verlag, 2020.
3. Dengler, Stefanie. *Netzwerk A1. Teil2. Kurs- Und Arbeitsbuch: Deutsch Als Fremdsprache*. Langenscheidt, 2012.
4. Funk, Hermann, et al. *studio d A1: Deutsch als Fremdsprache*. Cornelsen Verlag, 2015.
5. Langenscheidt. *Langenscheidt Pocket Dictionary German: German-English, English-German*. Langenscheidt Publishing Group, 2022.
6. Niebisch, Daniela, et al. *Lagune A1: Kursbuch*. Hueber Verlag, 2016.

Semester – I		
Course Code	**Course Name**	**Credits**
FLS2111N	SPANISH-I	1

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
1	-	-	1	-	-	1

Theory							Term Work / Practical/Oral			Total
Internal Assessment					End Sem Exam	Duration Of End Sem Exam	Term Work	Pract.	Oral	
Mid Term	Continuous Evaluation	Attendance	Oral	Total Internal						
15	10	05	20	50	50	75 mins	-	-	-	100

Course Objectives

The course is designed:

1. To enable the student present and describe oneself and people.
2. To enable to enter in contact and begin a conversation.
3. To enable to talk about one's family, tastes, and preferences.
4. To familiarize students with the Spanish language, with its phonetic system and its accents.
5. To enable the student to read and understand texts in Spanish adapted for the level.

Course Outcomes

After the completion of this course, students will be able to:

1. Present himself/herself to people.
2. Initiate conversation and formal talk with fellow native speakers.
3. Talk about his/her tastes, preferences, and choices.
4. Pronounce Spanish words and dictions in the correct form.
5. Read Spanish texts, stories, newspapers, and magazines and comprehend them.

Detailed Curriculum

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
	Quiero aprender español.		4	30
1	1.1	Los saludos y las despedidas		
	1.2	Los alfabetos		
	1.3	Las reglas de pronunciaciones		
	1.4	Los números en español (0-100)		
	Gramática y nosotros		4	30
2	2.1	Los artículos		
	2.2	Los sustantivos, adjetivos y los géneros		
	2.3	Las profesiones y las nacionalidades		
	2.4	Vocabulario de la familia.		
	Quiero aprender los verbos			
3	3.1	El sujeto en español.	5	40
	3.2	Los verbos en español (el verbo en SER)		
	3.3	Los verbos regulares (AR, ER, IR)		
Total			**13**	**100**

References:

1. Garcia, Jaime. Garmendia Corpas. *AULA INTERNACIONAL PLUS*. 2020.
2. Hidalgo, Andrea Fabiana. *PREPARACION DELE*. 2020.
3. Hollis, Maria Rosario. *Essential Spanish Verbs*. Teach Yourself, 2010.
4. Moya, Felipe, and Leslie Pérez. *Spanish Short Stories For Beginners*. 2019.
5. Nissenberg, Gilda. *Practice Makes Perfect: Complete Spanish Grammar, Premium Fourth Edition*. McGraw-Hill Education, 2020.
6. Prisma, Equipo Nuevo, and Evelyn Aixalà I. Pozas. *Nuevo prisma A2*. 2014.
7. Richards, Olly. *Short Stories in Spanish for Beginners*. Teach Yourself, 2018.
8. Simpson, Brandon. *Spanish Verb Tenses*. 2008.

9. Soriano, Jaime. Garmendia Corpas. *AULA INTERNACIONAL PLUS*. 2020.

10. Verblix, and Marta Torres Sánchez. *Spanish Short Stories for Beginners*. 2018.

Semester - I

Course Code	Course Name	Credits
CSE2112N	EFFECTIVE LISTENING	1

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
01	-	-	01	-	-	01

Internal				External		
Mid-Sem Exam	Continuous Evaluation	Attendance	Total Internal	End Sem Exam	Duration Of End Sem Exam	Total
15	30	05	50	50	2 Hours	100

Course Objectives

The course is designed:

1. To familiarize students with the fundamentals, types and barriers to communication.
2. To provide guidelines and improve the student's communication skills.
3. To enable students to learn the principles of listening.
4. To guide the students about different types of listening.
5. To make the students better listeners and make listening to the most important source of knowledge.

Course Outcomes

After completion of this course Students will be able to:

1. Recognize the importance of basic communication and barriers in professional arenas.
2. Participate in and develop listening skills through Group discussion and extempore.

3. Enhance proficiency in speaking and active listening.
4. Decipher as to which type of listening; they should practice according to the situation.
5. Practice and perfect their listening skills and thus will become better communicators.

Detailed Curriculum				
Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage**
	Fundamentals of Communication		6	46
1	1.1	Communication: Definition, Meaning, Process, Cycle, Purpose of communication		
	1.2	7 Cs of communication: Clear, concise, concrete, correct, coherent, complete, and courteous.		
	1.3	Barriers to effective communication: Language/semantic barriers, Physical barriers, physiological barriers, psychological barriers, cross-cultural barriers & organizational barriers.		
	1.4	Types of Communication: Depending on Method (Verbal & Non-verbal), Business (Internal & External), Individuals Involved (Intrapersonal & Interpersonal), Rules (Formal & Informal).		
	Communication Skills		5	39
2	2.1	The process of listening, importance of listening		
	2.2	Types of listening: Informative/comprehensive, attentive, appreciative, discriminative, emphatic, active, selective & critical/evaluative.		
	2.3	Effective Listening: Principles and Barriers		
3	**Enhancing Listening Skills**		2	15
	3.1	Guidelines to improve listening & avoiding common barriers		

	3.2	Activities to enhance listening; Listening exercise for main idea- vocabulary, Phrases & idioms, (news debate/conversations, audio scripts to draw conclusion based on context).		
Total			**13**	**100**

References:

1. Apple, Sienna. ACTIVE LISTENING TECHNIQUES: THE 10 STEPS TO EFFECTIVE LISTENING FOR BETTER RELATIONSHIPS AND MORE PRODUCTIVITY. Notion Press, 2022.
2. Beck, Joan. THE ART OF EFFECTIVE LISTENING: HOW TO COMMUNICATE BETTER WITH OTHERS. HarperCollins, 2022.
3. Brown, David. EFFECTIVE COMMUNICATION: MASTERING THE ART OF LISTENING. Wiley, 2021.
4. Chaturvedi, Mukesh. FUNDAMENTALS OF BUSINESS COMMUNICATION. Pearson Education India, 2012.
5. Raman, Meenakshi, and Sangeeta Sharma. TECHNICAL COMMUNICATION: PRINCIPLES AND PRACTICE. Oxford University Press, 2009.
6. Raman, Meenakshi, and Prakash Singh. BUSINESS COMMUNICATION. Oxford University Press, 2012.
7. Rizvi, Ashraf. EFFECTIVE TECHNICAL COMMUNICATION. McGraw Hill Education, 2017.
8. "Tips for Effective Listening." MINDTOOLS, MindTools Ltd, 2023,
9. "The Psychology of Listening: What It Is and How to Improve It." PSYCHOLOGY TODAY, Sussex Publishers, 2023, www.psychologytoday.com/articles/psychology-listening.
10. www.mindtools.com/pages/article/newLDR_66.htm.

Semester – I

Course Code	Course Name	Credits
BEH2113N	BEHAVIORAL SCIENCE-I (UNDERSTANDING SELF FOR EFFECTIVENESS)	1

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
01	-	-	01	-	-	01

Theory							Total
Internal Assessment					End Sem Exam	Duration of End Sem Exam	
Activity	Assignment	Viva	Attendance	Total Internal			
20	40	35	05	100	00	-	100

Course Outcome	
1.	Understanding oneself aids in making informed, value-aligned decisions.
2.	Self-awareness leads to clearer and more empathetic communication.
3.	Knowing personal strengths and weaknesses helps set realistic goals.
4.	Authenticity from self-awareness fosters deeper connections with others.
5.	Self-understanding enhances resilience and adaptability to change.
6	Identifying development areas encourages ongoing self-improvement.

Course Objective	
1.	To introduce the student to the variety of principles influencing human behavior.

2.	To take students, step by step, through an interactive understanding of each of these principles.
3.	To gain a clear understanding of your abilities and limitations. Understand what motivates you and drives your decisions.
4.	To identify development areas encourages ongoing self-improvement.
5.	To make choices that align with your values and goals.
6.	To understand how your style affects interactions with others.

Detailed syllabus

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage (%)**
Module I	**Core Competency & Techniques of self-awareness**		02	20
1	1.1	Understanding of Self, Components of Self – Self-identity		
	1.2	Self-concept, Self-confidence, Self-image, self-awareness, self-acceptance, and self-realization		
	1.3	Self-concept, Self-confidence, Self-image, self-awareness, self-acceptance, and self-realization		
	1.4	Mapping the key characteristics of self and framing a character for self		
Module II	**Self Esteem & Effectiveness**		02	20
2	2.1	Meaning and Importance of self-esteem and self-effectiveness		
	2.2	Process of Attitude formation, Factors that influence Attitude formation.		
	2.3	Components and Types of attitudes		

	2.4	Components and Types of attitudes		
Module III	**Building Positive Attitude**		02	20
3	3.1	Meaning and nature of attitude		
	3.2	Common myths related to mental health		
	3.3	Strategies to improve mental health: Robert Plutchik's Feeling wheel.		
Module IV	**Building Emotional Competence**		02	20
4	4.1	Emotional Intelligence – Meaning, components, Importance and Relevance		
	4.2	Techniques of improving emotional intelligence		
	4.3	Types of emotions, Healthy and Unhealthy expression of emotions		
	4.4	Theories & Models of emotions		
Total			10	**100%**

References:

1. Bradberry, T., & Greaves, J. (2009). Self-Awareness (The Enneagram of Emotional Intelligence). TalentSmart.
2. Tanner, J. L., Arnett, J. J., & Leis, J. (2009). Self-awareness and identity in emerging adulthood: Timing mechanisms and contexts. Emerging Adulthood, 37(2), 55-74.
3. McKay, M., & Fanning, P. (2016). Self-Esteem: A Proven Program of Cognitive Techniques for Assessing, Improving, and Maintaining Your Self-Esteem. New Harbinger Publications.
4. Maio, G. R., & Haddock, G. (2015). Attitudes and Attitude Change. Sage.
5. Zuboff, S. (2019). The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power. PublicAffairs.
6. Pankhurst, D. A., & White, K. A. H. (2020). The impact of social media on self-esteem: The mediating role of body image and perceived social support. Computers in Human Behavior, 112, 106441.

Semester - I

Course Code	Course Name	Credits
ENV2116N	ENVIRONMENTAL STUDIES	04

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03	-	01	03	-	01	04

Theory						Term Work / Practical/Oral			Total
Internal Assessment				End Sem Exam	Duration Of End Sem Exam	Term Work	Pract.	Oral	
Test	Continuous Evaluation	Attendance	Total						
15	**10**	**05**	**30**	**70**	3 Hours	-	-	-	100

Course Objectives

1. To identify and address environmental issues at local, regional, and global level.
2. To impart basic knowledge about the environment and its allied problems.
3. To develop an attitude of concern for the environment.
4. To motivate learners to participate in environment protection and environment improvement.
5. To acquire skills to help the concerned individuals in solving environmental problems.
6. Strive to attain harmony with Nature.

Course Outcomes

1. The course educates students in various waste management techniques and effective pollution control strategies.
2. The course covers sustainable use of natural resources and biodiversity conservation. Students will learn how to balance resource utilization.

3. This course equipped students with the ability to apply their knowledge, skills, values to mitigate environmental challenges and foster sustainable development.
4. Students will learn about international efforts taken to safeguard the Earth's environment and resources.
5. This course enables students to sensitize themselves to adverse health impacts of pollution and develop an understanding of the broad aspects of environmental management systems.
6. Students will learn about Environmental legal framework to protect and conserve environment.

Detailed Syllabus

Module	Course Module / Contents	Hours	Marks Weightage
I	**Multidisciplinary nature of environmental studies**	06	10%
	Definition, scope, and importance, need for public awareness.		
	Origin of agriculture, Industrial revolution, and its impact on the environment, water conflicts.		
	Sustainable Development Goals (SDGs)- Targets, challenges, and strategies.		
	Natural Resources: Types, Use and Exploitation.		
II	**Ecosystem and Conservation of Biodiversity**	10	20%
	Ecosystem: Definition, Structure, and function		
	Ecosystem types, significance, and ecosystem services		
	Biodiversity: Definition, types, and values of Biodiversity		
	Biogeographical zones and Hot spots in India and convention on Biological Diversity (CBD)		

	Conservation of Biodiversity, Biodiversity Laws, and Regulations		
III	**Environmental Pollution and Control**	08	15%
	Definition, types, sources, effects, and control of pollution:		
	Air & Noise Pollution		
	Water Pollution		
	Soil Pollution & Solid waste		
IV	**Environment Quality Standards and Management**	06	10%
	An introduction of Environment Management System (EMS)		
	circular economy, eco Lebling, eco mark scheme.		
	Brief introduction of Environmental Impact Assessment: Concept and application		
V	**IPR & Biosafety**	10	20%
	Introduction and Concept of IPR, Advantages and		
	disadvantages of IPR		
	Introduction and concepts of biosafety, its levels in terms of environment and Human protection.		
VI	**Environmental Treaties and Legislation**	12	25%
	Introduction to Environmental laws and Regulation. National Green Tribunal: Landmark Supreme court Judgements.		
	Salient Features of following Acts:		
	The Environment Protection Act-1986, an Umbrella Act		
	The Water (P & CP) Act-1974.		

	The Air (P & CP) Act-1981, Noise pollution (regulation & control) Rules		
	E-waste, Biomedical waste and Plastic waste management and handling rules.		
	Factories Act		
Total		**52**	**100%**

References:

1. Environmental Studies-Chauhan B. S University Science Press
2. Textbook Of Environmental Studies Dava Katewa Cengage Learning Ptd Ltd
3. Perspectives In Environmental studies Kaushik, Anubha Kaushik C.P New age International Pvt Ltd
4. Environmental Sciences: A students Companion Gregory & Others Sage Publication
5. Environmental Pollution Control Engineering Rao, C.S New Age International Pvt Ltd
6. Textbook Of Environmental Studies for Undergraduate Courses Bharucha Erach Universities Press.
7. Environment Law & Policy in India- Shyam Divan

Detailed Curriculum: Semester II

Semester-II								Evaluation Scheme		
Types of courses		Course Code	Course Title	Lecture (L) credits	Tutorial (T) credits	Practical (P) Credits	Total credits	Internal Marks	External Marks	Total Marks
Discipline Specific Courses	**Discipline-I (Core)**						**8**			
	Discipline-I (Compulsory)	IBT2201N	Instrumentation and Bioanalytical techniques	3	-	-	3	**30**	**70**	**100**
		CBG2202N	Basics of Cell Biology and Genetics	3	-	-	3	**30**	**70**	**100**
		LBT2203N	Lab course on Instrumentation and Bioanalytical Techniques	-	-	1	1	**30**	**70**	**100**
		LCB2204N	Lab course on Cell Biology and Genetics	-	-	1	1	**30**	**70**	**100**
	Discipline II (any one from the basket)						**4**			
	Discipline II (Select any one from basket)	BED2205N	Biology of Emerging Diseases	4	-	-	4	**30**	**70**	**100**
		IAB2206N	Introduction to Agricultural Biotechnology	3	-	-	3	**30**	**70**	**100**
		IFM2101N	Industrial and Food Microbiology	3	-	-	3	**30**	**70**	**100**
		LAB2208N	Lab course on Agricultural Biotechnology	-	-	1	1	**30**	**70**	**100**
		LIF2209N	Lab course on Industrial and Food Microbiology	-	-	1	1	**30**	**70**	**100**
	Discipline-III (any one from the basket)						**4**			**100**
	Discipline III (Select any one from basket)	ABM2210N	Advances in Business Management	3	1	-	4	**30**	**70**	**100**
		ECO2210N	Economics-II	3	1	-	4			
		HMR2210N	Human Rights-II	4	-	-	4	**50**	**50**	**100**

		CSW2210N	Technical and Literary Writing	4	-	-	4			
		FST2210N	Fashion Technology-II	2	2	-	4	**50**	**50**	**100**
		IND2210N	Interior Design-II	1	3	-	4	**50**	**50**	**100**
	Total (Discipline I + II + III)						**16**			
Foundation courses	Ability Enhancement Courses	**Foreign Language (any one from the basket)**					**2**			
		FLF2211N	French- II	2	-	-	2	**50**	**50**	**100**
		FLG2211N	German-II	2	-	-	2	**50**	**50**	**100**
		FLS2211N	Spanish-II	2	-	-	2	**50**	**50**	**100**
		CSE2212N	Presentation Skills	1	-	-	**1**	**50**	**50**	**100**
	Subtotal						**3**			
	Skill Enhancement Program	BEH2213N	Behavioural Science-II	1	-	-	1	**100**	**0**	**100**
	Subtotal						**1**			
	Value Added Course	**VAC-II (any one from the basket)**					**2**			
		ANM2217N	Animation-I	2			2			
		PHT2217N	Photography-I	1	1	-	2	**30**	**70**	**100**
		POL2217N	Political Science-I	2			2			
		TSM2217N	Tourism Management-I	1	1	-	2	**50**	**50**	**100**
		SCW2217N	Social Work-I	2			2			
		BPS2217N	Biopreneurship-I	2			2	**50**	**50**	**100**
	Subtotal						**2**			
	Total (Foundation Courses)						**6**			
Grand Total							**22**			

Semester - II

Course Code	Course Name	Credits
IBT2201N	INSTRUMENTATION AND BIOANALYTICAL TECHNIQUES	03

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	-	-	03	-	-	03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Apply bioanalytical techniques to real-world research problems, demonstrating the ability to design experiments, collect data, and derive meaningful insights
2.	Demonstrate the ability to operate and calibrate a variety of analytical instruments with accuracy and precision
3.	Successfully develop and validate analytical methods for specific applications
4.	Analyze and interpret experimental data effectively, providing insightful conclusions and recommendations based on the results obtained from bioanalytical techniques.

5.	Exhibit a clear understanding of and adherence to ethical practices and regulatory standards in the use of instrumentation and bioanalytical techniques
6.	Present experimental findings and analytical results clearly and effectively through written reports, presentations, and discussions.

Course Objective	
1.	Gain a thorough understanding of the fundamental principles and operating mechanisms behind various analytical instruments used in bioanalytical techniques.
2.	Develop practical skills in operating and maintaining a range of analytical instruments, such as microscopes, spectrophotometers, and chromatographs.
3.	Learn to develop, validate, and optimize analytical methods for the accurate quantification and qualitative analysis of biological samples.
4.	Acquire proficiency in analyzing and interpreting data generated from bioanalytical techniques, including the use of software tools for data processing and visualization.
5.	Apply bioanalytical techniques to solve problems in biological and biomedical research, including the analysis of biomolecules, drugs, and metabolites.
6.	Understand and adhere to ethical guidelines and regulatory requirements related to the use of instrumentation and bioanalytical techniques in research.

Detailed syllabus

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage (%)**
Module I	**Buffers & Sample preparation**		7	
1	1.1	Preparation of solutions, ultrafiltration		
	1.2	concept of molarity, normality, molality, osmolarity		

	1.3	different types of solutions in percentages		
	1.4	concept of pH and buffer, types of buffers and their preparation, pH meter.		
	1.5	Cell Disruption techniques		
	1.6	dialysis and reverse osmosis		
Module II	**Centrifugation**		6	
2	2.1	Principle of centrifugation		
	2.2	concept of g and rpm		
	2.3	different types of centrifuges (Differential and gradient)		
	2.4	Preparative and analytical)		
	2.5	rotor types		
	2.6	ultra-centrifugation, and its application in cell organelles fractionation		
Module III	**Microscopy**		8	
3	3.1	Principles of microscopy,		
	3.2	types of microscopy Bright field, Dark field		
	3.3	phase contrast		
	3.4	fluorescence microscopy		
	3.5	Electron microscopy: Transmission electron microscopy.		
	3.6	Electron microscopy: Scanning electron microscopy.		
Module IV	**Radioisotope techniques**		8	
4	4.1	Radioactivity definition features of different radioactive rays		
	4.2	Radioisotopes and their types		

	4.3	Common radioisotopes used to biological samples (DNA, RNA, Proteins, carbohydrates, and lipids)		
	4.4	Safety conditions and government approval required for working with radioisotopes		
	4.5	Proportional and GM counter, scintillation counters,		
	4.6	Autoradiography.		
Module V	**Electrophoresis & Chromatography**		9	
5	5.1	PAGE and Agarose gel electrophoresis		
	5.2	isoelectric focusing		
	5.3	two-dimensional electrophoresis		
	5.4	Paper (Cellulose and TLC) and column: adsorption, gel filtration, ion-exchange chromatography, affinity chromatography		
	5.5	HPLC		
	5.6	GLC		
Module VI	**Spectroscopy**		7	
6	6.1	UV and visible spectroscopy, Beer Lambert's Law		
	6.2	Quantification of DNA, RNA and Protein using UV-Vis spectroscopy		
	6.3	Estimation of bacterial cells using spectroscopy		
	6.4	Infrared, Atomic absorption spectroscopy		
	6.5	Raman Spectroscopy, fluorescence spectroscopy (Extrinsic and Intrinsic) and its application in determination of protein 3D structure		

	6.6	Circular Dichroism and its application in determination of protein secondary structure		
Total			**45**	**100**

References:	
1.	Wilson, K., & Walker, J. (Eds.). (2000). Principles and techniques of practical biochemistry. Cambridge University Press.
2.	Advanced Instrumentation, Data Interpretation, and Control of Biotechnological Processes, J.F. Van Impe, Kluwer Academic
3.	Crystal Structure Analysis, J.P. Glusker and K.N. Trueblood, Oxford University Press
4.	Crystallography made Crystal Clear, G. Rhodes, Academic Press
5.	Modern Spectroscopy, J.M. Hollas, John Wiley and Son Ltd.

Semester - II

Course Code	Course Name	Credits
CBG2202N	BASICS OF CELL BIOLOGY AND GENETICS	03

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	-	-	03	-	-	03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Students will be able to explain the fundamental differences between prokaryotic and eukaryotic cells, etiology of cancer, the role of genes such as p53 and p21 in cancer development, and the process of metastasis.
2.	Students will be able to explain the structure and function of various cytoskeletal components and their roles in cellular processes like muscle contraction and intracellular transport
3.	Students will be able to describe the general principles of cellular signaling, the types of signaling molecules, and the functioning of various receptors involved in cell communication.

4.	Students will be able to explain the principles of inheritance, genetic variations, and the effects of mutations on organisms, including their economic importance and implications for genetic counseling
5.	Students will be able to identify and explain different types of genetic mutations, assess their consequences on chromosome structure and function, and understand their significance in human genetic disorders, plant breeding practices, and economic applications.
6.	Students will be able to analyze and explain advanced genetic phenomena such as pseudoallelism, position effects, bacterial conjugation, transduction, as well as apply the Hardy-Weinberg law to real-world population genetics.

Course Objective	
1.	To develop a foundational understanding of cell theory, precellular evolution, molecular events in the cell cycle and to introduce the fundamental concepts of cancer, including types, causes, and the roles of key genes like p53 and p21 in cancer development
2.	To explore the structure and function of the cytoskeleton, including intermediate filaments, microtubules, actin filaments, and their role in muscle contraction.
3.	To learn the general principles of cellular signaling, the various types of signaling molecules, and the functioning of different receptor types.
4.	To develop a strong foundation in classical and molecular genetics, Mendelian principles, and the impact of mutations and mutagenic agents on organisms
5.	To develop a comprehensive understanding of various types of genetic mutations, their causes, and their effects on organisms, with a particular focus on their role in human syndromes, plant breeding, genetic counseling, and economic impact.
6.	To gain a deep understanding of classical and modern genetic concepts, including genetic recombination, bacterial gene transfer mechanisms, and population genetics.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Introduction to Cell Biology**			
1	1.1	Cell theory, precellular evolution, prokaryotic and eukaryotic cells		
	1.2	Cell cycle: molecular events (Cell cycle checkpoints), control of cell number and cell size		
	1.3	Cell division - mitosis and meiosis		
	1.4	Introduction to Cancer, Types of cancer, etiology of cancer, metastasis,		
	1.5	Cytological role of p53 and p21 genes in cancer development. Introduction to Apoptosis.		
Module II	**Introduction to Cytoskeleton**			
2	2.1	Structure and Function of cytoskeleton		
	2.2	Intermediate filaments, Microtubules, Actin Filaments and Muscle contraction.		
	2.3	Structure and function of cilia and flagella.		
	2.4	Transport of small molecules across cell membranes: diffusion, osmosis, active and passive transport		
Module III	**Cellular signaling and Receptors**			
3	3.1	Cellular signaling –general principles:		
	3.2	Endocrine, Paracrine, Synaptic & Contact Dependant.		

	3.3	Cell signalling molecules – Hormones, Local mediators, Neurotransmitters, contact dependent signal molecules.		
	3.4	Structures and working of the various types of receptors: Ion Channel coupled receptors, G protein Coupled receptors and Enzyme Coupled receptors		
Module IV	**Classical and Molecular Genetics**			
4	4.1	Genetics: classical and molecular genetics,		
	4.2	Mendelian principles of inheritance, human genetics, Extension of Mendelism: Allelic variations		
	4.3	Influence of environment on expression, penetrance and expressivity, epistasis, pleiotropy.		
	4.4	Chromosomal basis of inheritance: linkage, crossing over and chromosome mapping		
Module V	**Mutations and Genetic Counselling**			
5	5.1	Mutation and mutagenic agents		
	5.2	Types of mutations: Insertion, Deletion, Point mutation, Frame shift, Missense, Nonsense and Silent mutation.		
	5.3	Numerical and structural changes in chromosomes with emphasis on human syndromes/plant breeding		
	5.4	Genetic counselling, Economic importance of mutation		
Module VI	**Modern concept of gene and Population Genetics**			
6	6.1	Classical and modern concept of gene		
	6.2	Pseudoallelism, position effect,		

	6.3	Intragenic crossing over & complementation (cistron, recon & neutron)		
	6.4	Conjugation in Bacteria: Transduction: Generalized and Specialized		
	6.5	Genetics of Population: Hardy- Weinberg Law and its deviations		
Total			**45**	**100**

References:	
1.	Karp, G., Iwasa, J., & Marshall, W. (2020). *Karp's Cell and Molecular Biology*. John Wiley & Sons.
2.	Verma, P. S., & Agarwal, V. K. (2004). *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology: Evoloution and Ecology*. S. Chand Publishing.
3.	Gupta, P. K. (2007). *Cytogenetics*. Rastogi Publications.
4.	Klug, W. S., & Cummings, M. R. (2003). *Concepts of genetics* (No. Ed. 7, pp. xxviii+-693).
5.	Wilson, E. B. (1900). *The cell in development and inheritance*. Macmillan.
6.	Scialli, A. R. (2003). Developmental Biology: SF Gilbert, Sinauer Associates, Inc., Sunderland, MA, 2003, 750 pp., $104.95. *Reproductive Toxicology*, *17*(4), 473-474.

Semester - II

Course Code	Course Name	Credits
LBT2203N	LAB COURSE ON INSTRUMENTATION AND BIOANALTICAL TECHNIQUES	01

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
-	2	-	-	1	-	01

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	4 Hours	-	-	-	100

Course Outcome	
1.	Quantify lipids accurately in biological samples.
2.	Measure DNA and RNA content using chemical methods.
3.	Estimate ascorbic acid levels with precision.
4.	Separate and analyze proteins using electrophoresis techniques.
5.	Effectively disrupt cells to extract intracellular components.
6.	Successfully separate pollen from different flowering plants using centrifugation.

Course Objective

1.	Learn lipid estimation techniques for analyzing phospholipids and glycolipids.
2.	Master DNA and RNA quantification using DPA/Orcinol methods.
3.	Understand ascorbic acid estimation through qualitative and quantitative approaches.
4.	Gain skills in protein separation using Native and SDS-PAGE electrophoresis.
5.	Explore cell disruption methods with physical, chemical, and biological approaches.
6.	Apply gradient centrifugation for separating pollen from various plant species.

Detailed syllabus

Module/ Unit	**Course Module / Contents**	**Hours**	**Marks Weightage (%)**
1.	Estimation of phospholipids/glycolipids from the given sample	**26**	**100**
2.	Estimation of DNA and RNA using DPA/Orcinol method.		
3.	Determination of Ascorbic acid (Qualitative / Quantitative)		
4.	Electrophoretic (Native/SDS PAGE) separation of isolated proteins		
5.	Study of cell disruption using physical, chemical, and biological methods		
6.	Pollen separation (from different flowering plant species) by gradient centrifugation (Hibiscus, Rose etc.)		
Total		**26**	**100**

References:	
1.	Introductory Practical Biochemistry by Sawhney and Singh, Narosa publication.

2.	An Introduction to Practical Biochemistry by Plummer, 3rd edition, McGraw Hill
3.	Principles and Techniques of Molecular Biology-Wilson & Walkar, Cambridge University Press

Semester - II

Course Code	Course Name	Credits
LCB2204N	LAB COURSE ON CELL BIOLOGY AND GENETICS	01

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
-	2	-	-	1	-	01

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	4 Hours	-	-	-	100

Course Outcome	
1.	Students will be able to accurately use Punnett squares to carry out and predict the outcomes of dihybrid and trihybrid crosses.
2.	Students will be able to solve numerical problems related to Mendelian and non-Mendelian inheritance patterns, including epistatic, duplicate, supplementary, and complementary
3.	Students will be proficient in conducting chi-square analysis
4.	Students will be capable of preparing and interpreting slides showing mitotic and meiotic cell divisions
5.	Students will be able to detect and interpret the presence of sex chromatin bodies, such as Barr bodies in human cells through techniques like buccal smears.

6.	Students will develop the ability to analyze human and plant karyotypes from microphotographs and create accurate ideograms.

Course Objective	
1.	To develop the ability to use Punnett squares and fork line methods to predict outcomes of dihybrid and trihybrid crosses.
2.	To gain proficiency in solving numerical problems related to Mendelian genetics and modified F2 ratios, including various gene interactions.
3.	To learn to perform and interpret chi-square analysis in the context of genetic data.
4.	To acquire skills in squash preparation techniques to study mitotic cell divisions and meiotic cell division
5.	To learn methods to detect sex chromatin bodies, such as Barr bodies and in human buccal cells.
6.	To develop the ability to study and analyze karyotypes of humans and plants, including the preparation of ideograms.

Detailed syllabus

Module/ Unit	**Course Module / Contents**	**Hours**	**Marks Weightage** (%)
List of practical		**26**	**100**
1.	Punnett square and fork line methods to carry out dihybrid and trihybrid crosses.		
2.	Numerical problems on Mendelism and on modified F2 ratios: epistatic, duplicate, supplementary and lethal gene interactions.		
3.	Chi square analysis		
4.	Squash preparations for studying mitotic cell divisions in *Allium cepa*		

5.	Squash preparation for studying meiotic cell division in young flower buds.		
6.	Study of polytene chromosomes from permanent slides.		
7.	Detection of sex chromatin bodies: Barr bodies and drumsticks of human beings		
8.	Karyotype studies of Humans and some plants from micro photographs and preparation of ideograms.		
9.	Isolation of chloroplast from spinach		
10.	Buccal smear – Identification of Barr Body		
Total		**26**	**100**

References:	
1.	Prabhakar, S., Kandeepan, C., & Charulatha, R. (2019). Life Science. *Int. J. of Life Science*, *7*(3), 544-550.
2.	Verma, P. S., & Agarwal, V. K. (2016). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology* (14th ed.). S. Chand Publishing.
3.	Gupta, P. K. (2008). Cell and Molecular Biology (3rd ed.). Rastogi Publications.
4.	Sharma, A. K., & Sharma, A. (1999). Chromosome Techniques: Theory and Practice (3rd ed.). Butterworth-Heinemann India.
5.	Simmons, M. J., & Snustad, D. P. (2006). *Principles of genetics*. John Wiley & Sons.

Semester - II

Course Code	Course Name	Credits
BED2205N	BIOLOGY OF EMERGING DISEASES	04

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	-	-	04	-	-	04

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	The course explores the origins of newly emerging infectious diseases, examining the factors that contribute to their emergence.
2.	Students will gain insight into the molecular mechanisms and ecological factors that drive the emergence of these diseases.
3.	The course provides a comprehensive understanding of the public health implications of newly emerging infectious diseases.
4.	Students will study the transmission dynamics of these diseases, learning how they spread and evolve over time.
5.	The course delves into the societal implications of emerging infectious diseases, discussing their effects on communities and global health.

6.	By the end of the course, students will have a deeper comprehension of the global significance of emerging infectious diseases, preparing them to address these challenges in their future careers.

Course Objective	
1.	Students will define and describe emerging and reemerging infectious diseases and understand their origins and spread.
2.	Students will learn how pathogens interact with the human body, including invasion, colonization, and immune evasion.
3.	Students will understand the causes, symptoms, and treatments of major infectious diseases like tuberculosis, AIDS, and COVID-19.
4.	Students will gain knowledge about protozoal and fungal diseases, such as malaria and candidiasis.
5.	Students will grasp the factors driving new diseases, including climate change and antimicrobial resistance.
6.	Students will develop skills in preventing and managing infectious diseases, including vaccination and pandemic preparedness.

Detailed syllabus

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage (%)**
Module I	Introduction		5	08
1	1.1	Definition and characteristics of EIDs		
	1.2	Historical perspective		
	1.3	Parasitism		
	1.4	Genetic variation and mutation in pathogens		
	1.5	Evolutionary mechanisms shaping pathogen virulence,		

	1.6	Zoonotic diseases		
Module II	Host-pathogen interactions		8	13
2	2.1	Host-pathogen interactions		
	2.2	Normal flora of Human body and its role in disease prevention,		
	2.3	Entry into the human body; adhesion, colonization & invasion;		
	2.4	pathogenic actions of bacteria (tissue destruction, toxins, immunopathogenesis);		
	2.5	mechanisms for escaping host defences.		
	2.6	Emerging and reemerging infectious diseases.		
Module III	Pathogenesis		15	25
3	3.1	Etiology, pathogenesis, diagnosis and therapy of patients with the following infectious diseases problems: Tuberculosis, Cholera, *H. pylori, Clostridial infections, Borrelia burgdorferi, Treponema pallidum, Leptospirosis*		
	3.2	Viral: Basic steps in viral diseases, acquisition & infection of target tissue		
	3.3	Viral pathogenesis -cytopathogenesis (lytic & nonlytic infections, oncogenic viruses)		
	3.4	Human host defences against viral infection, immunopathology, epidemiology of viral diseases, (age, immune status & other host factors),		

	3.5	Control of viral spread. Etiology, pathogenesis, diagnosis, and therapy of patients with the following infectious diseases problems: AIDS, COVID		
	3.6	Dengue, Influenza, SARS, Swine flu, Herpes Simplex Virus, Ebola, Epstein – Barr Virus (Infectious Mononucleosis), Hepatitis B Virus.		
Module IV	Protozoal and fungal diseases		12	20
4	4.1	Protozoal: Introduction to Protozoal Diseases,		
	4.2	Entamoeba histolytica, Plasmodium Species (Malaria),		
	4.3	Leishmania Species: Visceral (kala – azar), Cutaneous and Mucocutaneous Leishmaniasis, Trichomonas vaginalis.		
	4.4	Mycoses: Introduction to mycoses, Candida Species, Cryptococcus,		
	4.5	Histoplasma capsulatum, Blastomyces,		
	4.6	Coccidioides Species, Pneumocysitis Species		
Module V	Factors responsible for emerging diseases		10	16
5	5.1	Climate change, Globalization,		
	5.2	Habitat destruction, Emerging diseases in the context of ecosystem disruption,		
	5.3	The role of biodiversity in disease prevention, international travel, trade, and disease transmission,		
	5.4	role of urbanization, population, and transportation in EID.		
	5.5	Antimicrobial resistance, mechanisms, role of hospital in spread of AMR,		

	5.6	AMR surveillance, Antibiotic stewardship, and responsible use		
Module VI	**Prevention, control, and management**			
6	6.1	Aims of vaccination, Passive immunization, Active immunization- Formulation of active immunization,	10	16
	6.2	types of immune response to vaccines, effect of age on efficacy of vaccine,		
	6.3	adverse reactions to active immunization, Bacterial Vaccines, Viral vaccines.		
	6.4	DNA vaccines Herd immunity. Public health interventions and policies.		
	6.5	Case studies and management of epidemic and pandemic diseases (Smallpox, polio, HIV, COVID 19 etc).		
	6.6	Pandemic preparedness and response		
Total			**60**	**100**

References:

1. Beltz, L. A. (2011). *Emerging infectious diseases: a guide to diseases, causative agents, and surveillance* (Vol. 10). John Wiley & Sons.
2. Mackenzie, J. S., McKinnon, M., & Jeggo, M. (2014). One Health: from concept to practice. *Confronting emerging zoonoses: the One Health paradigm*, 163-189.
3. Murray, P. R., Rosenthal, K. S., & Pfaller, M. A. (2015). *Medical microbiology*. Elsevier Health Sciences.
4. Cornelissen, C. N., Harvey, R. A., & Fisher, B. D. (2012). *Microbiology* (Vol. 3). Lippincott Williams & Wilkins.
5. Goering, R., Dockrell, H. M., Zuckerman, M., & Chiodini, P. L. (2023). *Mims' Medical Microbiology E-Book: Mims' Medical Microbiology E-Book*. Elsevier Health Sciences.
6. Ananthanarayan, R. (2006). *Ananthanarayan and Paniker's textbook of microbiology*. Orient Blackswan

7.	Willey, J. M., Sherwood, L. M., & Woolverton, C. J. (2014). *Prescott's microbiology*. McGraw-Hill.
8.	Madigan, M. T., Martinko, J. M., & Parker, J. (1997). *Brock biology of microorganisms* (Vol. 11). Upper Saddle River, NJ: Prentice Hall.
9.	Tortora, G. J., Funke, B. R., & Case, C. L. (2015). *Microbiology: An Introduction, Books a la Carte Edition*. Benjamin-Cummings

Semester - II

Course Code	Course Name	Credits
IAB2206N	INTRODUCTION TO AGRICULTURAL BIOTECHNOLOGY	**Credits: 03**

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03			03			03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	To demonstrate a thorough understanding of the basic concepts and principles of biotechnology as applied to agriculture.
2.	To apply biotechnological tools and techniques in laboratory and field settings to solve practical problems in agriculture.
3.	To critically evaluate the potential and limitations of various biotechnological approaches to improving agricultural productivity and sustainability.
4.	To articulate the ethical, legal, and social issues associated with agricultural biotechnology and propose strategies to address these concerns responsibly.
5.	To design and conduct experiments in agricultural biotechnology, analyze data, and present findings in a scientific manner.

6.	To recognize the evolving role of biotechnology in the agricultural sector and demonstrate the ability to adapt to emerging trends and challenges in the industry.

Course Objective	
1.	To provide students with a solid foundation in the basic principles and concepts of biotechnology
2.	To introduce the key tools and techniques used in agricultural biotechnology
3.	To illustrate how biotechnological innovations can be applied to improve crop production
4.	Discussion on ethical and regulatory Aspects
5.	To develop the skills necessary to engage in research and development within the field of agricultural biotechnology
6.	Understand the role of biotechnology in the agricultural industry

Detailed syllabus

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage (%)**
Module I	**Introduction to Agriculture**		08	18
1	1.1	Introduction to agriculture		
	1.2	Influence of Environmental factors (soil, air, soil and air temperature effects on plant processes, relative humidity, vapour pressure).		
	1.3	Climate change; Plant biotic stresses and impact on yield of important crop plants.		
	1.4	Agronomic practices for yield improvement; improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components for maximum production of major cereals, pulses, and commercial crops.		

	1.5	Agronomic practices for nutrition, quality components for maximum production of major cereals, pulses, and commercial crops.		
	1.6	Climate change; Abiotic stresses and impact on yield of important crop plants.		
Module II	**Breeding designer crops**			
2	2.1	Breeding of crop ideotypes	08	18
	2.2	Genetic manipulation through recombination breeding		
	2.3	Physiological mechanisms of improvement (in nutrient, water, osmotic adjustment, photosynthesis, stay green trait and its significance in crop improvement)		
	2.4	Improvement in yield potential under suboptimal conditions (by manipulating source and sink, plant-water relationships		
	2.5	Cardinal plant growth and development processes		
	2.6	Enhancing input use efficiency through genetic manipulations)		
Module III	***In Vitro* culture technologies**			
3	3.1	Regeneration methods for plant improvement	10	20
	3.2	Organ culture, cell suspension		
	3.3	Organogenesis, somatic embryogenesis, micropropagation		
	3.4	anther and ovary culture-haploid production, endosperm culture, embryo culture and rescue		
	3.5	protoplast culture, somatic hybridization and cybrids)		
	3.6	synthetic seeds, apomixes		

Module IV	**Genetic Transformation technologies**			
4	4.1	Role of Genetic Transformation in plant improvement (genomics and transgenics for physiological efficiency, nutritional enhancement)	08	18
	4.2	Role of Genetic Transformation in plant improvement (special compounds-proteins, vaccines, gums, starch, and fats etc).		
	4.3	Ethical issues and the agencies involved in the release of genetically transformed crops in India.		
	4.4	Genome edited crops and their significance in Indian agriculture system.		
Module V	**Genetic engineering for stress management in plants**			
5	5.1	Biotic stress tolerance (insect, pest and pathogen resistance)	05	12
	5.2	Abiotic stress tolerance (salt, water and drought tolerance).		
	5.3	Herbicide tolerance		
	5.4	Breeding for special traits (viz. oil, protein, vitamins, amino acids etc.)		
Module VI	**Molecular farming and metabolic engineering**			
6	6.1	Concept of biopharming (development of varieties producing targeted compounds nutraceuticals and industrial products	06	14
	6.2	Success stories in vaccines		
	6.3	Modified sugars, gums, and starch through biopharming).		
	6.4	Plant metabolic engineering for improved production of recombinant proteins and functional metabolites		

Total	**45**	**100**

References:	
	References:
1.	Plant Biotechnology: The Genetic Manipulation of Plants. A. Slater, N. W. Scott and M. R. Fower.2008. Oxford University Press
2.	Recent Advances in Plant Biotechnology: Ara Kirakosyan and Peter B. Kaufan. 2009. Springer
3.	Plant Tissue Culture: Theory and Practice. S.S. Bhojwani and M.K.Razdan. Elsevier Health Science
4.	An Introduction to Plant Tissue Culture. M.K. Razdan. Oxford and IBH Publishing.
5.	Recent Advances in Plant Biotechnology: Ara Kirakosyan and Peter B. Kaufan. 2009. Springer

Semester - II

Course Code	Course Name	Credits
IFM2101N	INDUSTRIAL AND FOOD MICROBIOLOGY	03

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03	-	-	03	-	-	03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	To understand the Role of Microorganisms in Industry and Food Production
2.	To apply Knowledge of Microbial Growth and Fermentation Processes
3.	To evaluate Techniques for Strain Improvement and Preservation
4.	To analyze the Role of Microorganisms in Food Production and Spoilage
5.	To implement Food Safety and Quality Control Measures
6.	To explore New Trends in Industrial and Food Microbiology

Course Objective

1.	To provide students with a thorough understanding of the essential roles microorganisms play in industrial processes and food production
2.	Students will gain in-depth knowledge of microbial growth, cultivation, and fermentation processes, along with the ability to analyze factors influencing these processes
3.	to equip students with practical skills in strain improvement and preservation techniques vital for maintaining industrial microbial cultures.
4.	Students will explore the application of microorganisms in food production, including fermentation, food preservation, and the prevention of microbial spoilage.
5.	They will learn to produce industrially relevant microbial products such as enzymes, antibiotics, and biofuels while understanding the importance of food safety, quality control, and assurance through standards like HACCP.
6.	The course will introduce students to new trends in industrial and food microbiology, including the development of probiotics, prebiotics, functional foods, and innovative bio-preservation and packaging techniques.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Microbial growth and fermentation**		10	25
1	1.1	Importance of microorganisms in industry and food production		
	1.2	Microbial growth and cultivation, Factors influencing growth, cultivation media,		
	1.3	Types of fermentation process.		
	1.4	Primary and secondary screening methods, Primary and Secondary Metabolites.		
	1.5	Fermentation Media		

Module II	**Strain improvement and preservation techniques**			
2	2.1	Strain improvement methods,	5	6
	2.2	Preservation strategies for industrial organisms Lab and industrial level preservation.		
Module III	**Microorganism in food production**			
3	3.1	Role of microorganisms in food fermentation, Dairy, bakery, beverage production, Mushroom production, SCP production	10	25
	3.2	Food preservation and spoilage Intrinsic and extrinsic parameters that affect microbial growth in food. Microbial spoilage of food.		
Module IV	**Industrial Microbiology**			
4	4.1	Production of microbial enzymes	8	20
	4.2	Production of antibiotics		
	4.3	Production of organic acids		
	4.4	Production of polysaccharides		
	4.5	Production of biofuels		
Module V	**Food Safety and quality**			
5	5.1	Food borne pathogens and detection	6	12
	5.2	Food sanitation and control – HACCP		
	5.3	Quality control and assurance		
Module VI	**New trends in food and industrial and food microbiology**			
6	6.1	Probiotics, prebiotics, and functional foods,	6	12
	6.2	Food bio preservation and packaging,		

	6.3	Case studies on successful applications of industrial and food microbiology		
Total			**45**	**100**

References:	
1.	Patel, A. H. (2012). *Industrial microbiology*. Trinity Press.
2.	WHITAKER, A., & AReS, D. Principles of Fermentation Technology-Stanburry and Whittaker.
3.	Industrial Microbiology – Casida- New age international publisher
4.	Microbiology, Prescott and Dunn, C.B.S. Publishers.
5.	Food microbiology - Adams, M.R. and Moss M.O. Royal Society of Chemistry
6.	Food Microbiology – Frazier- McGraw-Hill

Semester - II

Course Code	Course Name	Credits
LAB2208N	LAB COURSE ON AGRICULTURAL BIOTECHNOLOGY	01

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
-	2	-	-	1	-	01

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	TotalInternal						
15	10	05	30	70	4Hours	-	-	-	100

Course Outcome	
1.	Demonstrate proficiency in performing key laboratory techniques in agricultural biotechnology
2.	Design and Conduct Experiments
3.	Accurately analyze and interpret experimental data
4.	Apply laboratory skills to address specific challenges in agricultural biotechnology
5.	Collaborate effectively in a team environment
6.	Present experimental results clearly and concisely

Course Objective	
1.	To provide students with practical, hands-on experience in the fundamental techniques and procedures used in agricultural biotechnology.
2.	To develop proficiency in the use of biotechnological tools and equipment, including those for DNA extraction, PCR, gel electrophoresis, and molecular cloning.
3.	Teach students how to design, execute, and troubleshoot experiments in agricultural biotechnology.
4.	Instruct students on how to collect, analyze, and interpret experimental data, with an emphasis on accuracy and scientific rigor.
5.	Enable students to apply theoretical knowledge from the classroom to real-world biotechnological challenges in agriculture.
6.	Foster teamwork and communication skills through group projects and presentations of experimental results.

Detailed syllabus

Module/ Unit	Course Module / Contents	Hours	Marks Weightage (%)
List of practical		26	100
1.	Demonstration of plant responses to water uptake.		
2.	Demonstration of plant responses to nutrient uptake.		
3.	Study of screening tests for abiotic stress tolerance (drought, salinity - PEG, Mannitol & NaCl).		
4.	Study of screening tests for abiotic stress tolerance - drought -PEG		
5.	Study of screening tests for abiotic stress tolerance – drought-Mannitol		
6.	Study of screening tests for abiotic stress tolerance-salinity -Nacl		

7.	Study of screening tests for biotic stress tolerance bacterial		
8.	Study of screening tests for biotic stress tolerance-fungal		
9.	Study of screening tests for biotic stress tolerance-viral		
10.	Study of screening techniques under stress conditions (canopy temperature depression, stomatal conductance, chlorophyll estimation)		
11.	Staining of beneficial root nodule bacteria and their culture-basis for biofertilizer.		
Total		**26**	**100**

References:	
	Plant Biotechnology: The Genetic Manipulation of Plants. A. Slater, N. W. Scott and M. R. Fower.2008. Oxford University Press
2.	Recent Advances in Plant Biotechnology: Ara Kirakosyan and Peter B. Kaufan. 2009. Springer
3.	Plant Tissue Culture: Theory and Practice. S.S. Bhojwani and M.K.Razdan. Elsevier Health Science
4.	An Introduction to Plant Tissue Culture. M.K. Razdan. Oxford and IBH Publishing.
5.	Balint A. 1984.Physilogical Genetics of Agricultural Crops.AKAdemiaikado.

Semester - II

Course Code	Course Name	Credits
LIF2209N	LAB COURSE ON INDUSTRIAL AND FOOD MICROBIOLOGY	01

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
-	2	-	-	1	-	01

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	4 Hours	-	-	-	100

Course Outcome	
1.	Remember and describe fundamental principles of experiments related to Industrial and Food Microbiology
2.	Understand the theoretical concepts of various experiments related to Industrial and Food Microbiology.
3.	Apply the concepts for the execution of experiments independently or in groups.
4.	Record the observation and analyze the results of performed experiments.
5.	Evaluate the experiments for troubleshooting and designing of alternative strategy.

6.	Demonstrating proficiency in practical skills related to Industrial and Food Microbiology

Course Objective	
1.	Equip students with the ability to isolate and preserve microorganisms that produce important extracellular enzymes, polysaccharides, and antibiotics
2.	Enable students to enumerate microorganisms from food samples
3.	Teach students the practical aspects of fermenting foods, such as sauerkraut, and beverages, such as wine, while understanding the microbial processes involved in fermentation and their impact on food quality and safety.
4.	To provide students with comprehensive skills and knowledge in microbiological techniques relevant to food safety, industrial applications, and the pharmaceutical industry
5.	Encourage students to integrate practical laboratory skills with theoretical knowledge in microbiology, enabling them to design and interpret experiments related to microbial isolation, preservation, and application.
6.	Prepare students to tackle real-world challenges in the food and pharmaceutical industries by providing hands-on experience in microbial applications, quality control, and product development

Detailed syllabus

Module/ Unit	**Course Module / Contents**	**Hours**	**Marks Weightage (%)**
List of practical		26	100
1.	Isolation and preservation of microorganism producing extracellular enzyme (amylase/lipase/casinase)		
2.	Isolation of polysaccharide producing microorganisms and its production and extraction.		
3.	Isolation of antibiotic producing microorganisms		

4.	Preparation of sauerkraut/ Wine		
5.	Enumeration of microorganisms from food sample (processed/canned)		
6.	MBRT test for determining milk quality		
7.	Estimation of thermal death point and time		
8.	Qualitative analysis of water (presumptive, confirmed, and complete test)		
Total		**26**	**100**

References:	
1.	Microbiology: A laboratory Manual, Seventh Edition, by: Cappuccino and Sherman, Pearson; 7th edition (1st April 2004)
2.	van Belkum, A. (2006). Bergey's Manual of Systematic Bacteriology (Volume 2, Parts A–C,).

Semester - II

Course Code	Course Name	Credits
ABM2210N	ADVANCES IN BUSINESS MANAGEMENT	04

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	-	02	03	-	01	04

Theory						Term Work / Practical/Oral			Total
Internal Assessment				End Sem Exam	Duration Of End Sem Exam	Term Work	Pract.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course outcome

1. Identify and analyze the key qualities, characteristics, and challenges of entrepreneurs, including women entrepreneurs, and evaluate the process of venture idea generation and screening.
2. Develop skills to prepare pre-feasibility and project reports, compare product ideas, and identify appropriate sources of finance for entrepreneurial ventures.
3. Assess various financing options, including venture capital, and understand what investors look for in investment proposals, as well as outline effective venture capital proposals.
4. Evaluate vendor development processes, vendor selection criteria, pricing methods, and understand the direct and hidden costs associated with material management.
5. Apply the steps and procedures necessary for setting up small-scale enterprises, and address challenges in project management, including e-commerce and cluster development.

6. Gain insights into the reasons for entrepreneurial failure, understand the organizational forms under the MSMED Act, and evaluate the implications of the SMERA rating on small enterprises.

Course Objectives

1. Provide students with a deep understanding of the qualities, characteristics, and challenges faced by entrepreneurs, with a focus on venture idea generation and preliminary screening.
2. Equip students with the ability to conduct project appraisals, including preparing pre-feasibility reports, comparing product ideas, and identifying suitable financing options.
3. Teach students to analyze financial options for entrepreneurial ventures, including venture capital, and understand the key components of a successful investment proposal.
4. Educate students on the essentials of market and materials management, focusing on vendor development, selection processes, pricing strategies, and cost management.
5. Provide students with practical knowledge of the steps and procedures involved in setting up and managing small-scale enterprises, including the use of e-commerce and addressing project management challenges.
6. Introduce students to the MSMED Act, reasons for entrepreneurial failure, and the organizational forms available to small enterprises, including the role of SMERA in enterprise rating.

Detailed Syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage
1	**Introduction to Entrepreneurship**		09	20
	1.1	Qualities, Characteristics of an entrepreneur, Venture idea generation, Ideas and the entrepreneurship, Women entrepreneurs, Preliminary Screening, Drawbacks or Problems of entrepreneurship		
	Project Appraisal		**09**	

2	2.1	Pre-feasibility Report, Project Report, Comparative Rating of Product ideas,Sources of Finance		15
	2.2	Stages of Project Feasibility Analysis-Market, Technical,		
3	**Financial Analysis**		**09**	20
	3.1	Financing the project, Sources of finance, Venture Capital Sources, What Investor looks in the Investment Proposal		
	3.2	Outline for a Venture Capital Proposal, Sources of finance from different banks		
4	**Market and Materials Management Analysis**		**09**	15
	4.1	Vendor development, vendor selection decision factors, methods of price determination, direct and hidden cost in material management		
5	**Project Management**			
	5.1	Steps and procedure for setting up small scale	**09**	15
	5.2	E-Commerce, E-Business, E-Auction, Project management problems. SEZ, Cluster Development.		
6	**MSMED Act 2006**			
	6.1 Reasons of failure, Overview of setting up an enterprise with organizational forms – MSMED Act and SMERA Overview.		**07**	15
Total			**52**	**100**

References:
1. "Innovation and Entrepreneurship" by Peter F. Drucker,Reprint Edition (2015), Harper Business
2. Developing Entrepreneurship, Udai Pareek Sanjeev & Rao T.V, Printers, Ahmedabad
3. A Issues and Problems: Small: 1, Sharma, S.V.S., Industry Extension Training Institute, Hyderabad

4. A Practical Guide to Industrial Entrepreneurs; Srivastava, S.B., Sultan Chand & Sons
5. Entrepreneurship Development; Bhansali, Himalaya Publishing, Bombay.
6. "Entrepreneurship Development and Management" by Vasant Desai,6th Edition (2019), Himalaya Publishing House

Semester – II

Course Code	Course Name	Credits
ECO2210N	ECONOMICS II	4

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03		01	03		01	04

Theory							Term Work/ Practical/ Oral			Total
Internal Assessment					End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	**Assignment**	**Viva**	**Attendance**	**Total Internal**						
20	15	10	05	50	50	2 Hours	-	-	-	100

Course Outcome	
1.	Knowledge of this subject is essential to understand facts, concepts of macroeconomics.
2.	Students understand the basic theories behind decision making process of the Govt.
3.	Students understand the short run and the long run theories of Macroeconomics
4.	Students understand the importance of moderating the inflation
5.	Students understand the impact of microeconomic decisions at macroeconomic level.

Course Objective	
1	Students can describe the objective macroeconomics
2	Students can understand classical and Keynesian models
3	Students can compare the different GDP Growths, inflation levels and per capita income of different countries
4	Students can understand the different types of inflation
5	Students can understand the Philips curve

Detailed syllabus

Module / Unit	**Course Module / Contents**		**Hours**	**Marks Weightage (%)**
Module I	**Introduction to Macroeconomics**		7	15
1	1.1	The roots of Macroeconomics		
	1.2	Macroeconomic concerns		
	1.3	Objectives of Macroeconomics		
	1.4	The role of government in the macro economy		
	1.5	Components of Macroeconomy		
	1.6	Methodology of Macroeconomics		
Module II	**Introduction to National Income Accounting**		7	15
2	2.1	Concepts of GDP and national income.		
	2.2	Approaches to calculating GDP, GDP and personal income		
	2.3	Nominal and real GDP,		
	2.4	Limitations of the GDP concept.		

Module III	**Schools of Macroeconomic Thoughts**		8	16
3	3.1	Classical Model		
	3.2	Neo Classical Model		
	3.3	Keynesian Models		
	3.4	Say's Law of Market		
Module IV	**Keynesian Model**		10	18
4	4.1	Keynes theory of income and employment; Consumption function; theory of investment-marginal efficiency of capital; saving and investment		
	4.2	Consumption Function		
	4.3	Theory of Investment		
	4.4	Marginal Efficiency of Capital		
	4.5	Saving and Investment		
	4.6	The Investment Multiplier and its application toLDC's		
Module V	**Money in the Modern Economy**		10	18
5	5.1	Theories of Demand for Money: Quantity Theory of Money and Keynes approach;		
	5.2	Keynes's approach to QTM		
	5.3	Characteristics of a monetary economy		
	5.4	The supplyof money and overall liquidity position; credit creation		
Module VI	**Inflation**		10	18
6	6.1	ıflation: types, causes, consequences		
	6.2	Impact of Inflation on Indian Economy		

	6.3	Remedial Measures		
	6.4	Philips Curve		
Total			52	**100%**

References	
1	Dornbusch, Fischer and Startz, Macroeconomics, McGraw Hill, 11th edition, 2010
2	N. Gregory Mankiw. Macroeconomics, Worth Publishers, 7th edition, 2010.
3	Errol D'Souza, Macroeconomics, Pearson Education, 2009.
4	Olivier Blanchard, Macroeconomics, Pearson Education, Inc., 5th edition, 2009.
5	Richard T. Froyen, Macroeconomics, Pearson Education Asia, 2nd edition, 2005.

Semester – II

Course Code	Course Name	Credits
CSW 2210N	TECHNICAL AND LITERARY WRITING	04

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
04	00	-	04	00	-	04

Internal				External		Total
Mid-Sem Exam	**Continuous Evaluation**	**Attendance**	**Total Internal**	**End Sem Exam**	**Duration Of End Sem Exam**	
30	**15**	**05**	**50**	**50**	**2 Hours**	**100**

Course Outcomes

After completion of this course Students will be able to:

1. Understand practical skills for writing and appreciating written work.
2. Master different writing styles and techniques
3. Enhance vocabulary to improve communication skills and be more prepared to take English based proficiency exams like IELTS, SAT
4. Empower oneself as a writer and improve creativity.
5. Produce original work of research.

Course Objectives

The course is designed:

1. To understand the basic tenets of Technical Writing
2. To seek the writer within
3. To learn how to critique constructively.

4. To understand the basic tenets of Literary Writing
5. To prepare a portfolio of original work

Detailed Curriculum

Module/ Unit	Course Module / Contents		Hours	Marks Weightage
1	**Basics of Technical Writing**		8	15%
	1.1	Introduction to technical writing		
	1.2	Types of technical writing and reader mapping		
	1.3	Developing argumentation and critical thinking for writing		
2	**Structure of Technical Writing**		8	15%
	2.1	Instructions and procedures		
	2.2	Writing technical reports		
	2.3	Document design and visuals		
3	**Writing a Research Paper**		10	20%
	3.1	Writing process and strategies		
	3.2	Research and planning		
	3.3	Summarizing and organizing		
	3.4	Employing correct citation styles and avoiding plagiarism		
4	**Basics of Literary Writing**		10	20%
	4.1	Introduction to literary writing		
	4.2	Mechanics of literary writing		
	4.3	Adapting writing style and tone according to context and purpose		
5	**New Trends in Literary Writing**		8	15%
	5.1	Gender-neutral terms, avoiding ableist language, and being mindful of cultural sensitivity		
	5.2	Micro Fiction and Flash Fiction		

	5.3	AI based Writing		
	5.4	Travelogues and Memoirs		
6	**Writing for Media**		**8**	15%
	6.1	Journalistic Writing		
	6.2	Basics of copywriting		
	6.3	Web Content Writing		
	6.4	Blogging skills		
Total			**52**	**100**

References:

1. Baiely, Stephen. Academic Writing: A Handbook for International Students. Routledge, 2011.
2. Blogging for beginners: Learn how to start and maintain a successful blog the simple way Terence Lawfield
3. Bloom, Wayne C. The Craft of Research. 3" ed. UCP, 2008.
4. Dev, Anjana Neira, ed. A Handbook of Academic Writing and Composition. Pinnacle, 2016.
5. Eckert, Kenneth. Writing Academic Research Papers. Moldy Rutabaga, 2021.
6. Gupta, Renu. A Course in Academic Writing. Orient BlackSwan, 2010.
7. Hal Zina Bennet. *Write from the Heart: Unleashing the power of Your Creativity*. California, New World Library,2001.
8. Online Journalism - Reporting, Writing and Editing for New Media - Richard Craig Broadcast News Handbook - Writing, Reporting, Producing in a converging Media - C.A. Juggle, Forrest Carr and Suzanne Huffman
9. Writing for the media- Sunny Thomas The Language of New Media - Lev Manovich
10. Writing New media -Theory and Applications for expanding the teaching of composition -Anne Wysocki.

Semester – II

Course Code	Course Name	Credits
HMR2210N	HUMAN RIGHTS- II	4

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	-	-	04	-	-	04

Theory							Term Work/ Practical/ Oral			Total
Internal Assessment					End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Assignment	Viva	Attendance	Total Internal						
20	15	10	05	50	50	2 Hours	-	-	-	100

Course Outcome	
1.	Foster respect for human dignity and individual self-respect.
2.	Ensure genuine gender equality and equal opportunities for all.
3.	Promote understanding and appreciation of diverse communities.
4.	Empower students towards active citizenship and social engagement.
5.	Support the values of democracy, development, and social justice.
6.	Encourage communal harmony and solidarity among diverse groups.

Course Objective	
1.	Describe and critically analyze various spheres of human rights in India.

2.	Communicate effectively on socio-legal aspects of human rights in India.
3.	Assess specific areas of human rights law with reference to legal instruments and cases.
4.	Analyze contemporary challenges and trends in human rights theory and practice.
5.	Understand affinities and divergences in rights across international, regional, and domestic contexts.
6.	Examine the sources, substance, and application of human rights in different legal frameworks.

Detailed syllabus

Module / Unit		Course Module / Contents	Hours	Marks Weightage (%)
Module I	**Indian Constitutional Perspectives- Fundamental Rights I**		8	15
1	1.1	Right to Equality: Equality before law and prohibition of discrimination.		
	1.2	Right to Freedom: Freedom of speech, assembly, and movement.		
	1.3	Right to Protection in Respect of Conviction: Safeguards against arbitrary arrest and detention.		
	1.4	Right to Constitutional Remedies: Access to judicial recourse for the enforcement of rights.		
	1.5	Right to Education: Right to free and compulsory education for children.		
	1.6	Right to Life and Personal Liberty: Protection of life and personal freedom**.**		

Module II	**Indian Constitutional Perspectives- Fundamental Rights II**		8	15
2	2.1	Right against Exploitation: Prohibition of human trafficking and forced labor.		
	2.2	Right to Privacy: Protection of personal privacy and confidentiality.		
	2.3	Right to Freedom of Religion: Freedom to practice, profess, and propagate religion.		
	2.4	Cultural and Educational Rights: Protection of cultural and educational rights of minorities.		
	2.5	Directive Principles of State Policy: Guidelines for state policy and governance**.**		
	2.6	Judicial Review: Power of the judiciary to review laws and protect fundamental rights.		
Module III	**Constitutional perspectives III- Directive Perspectives of State Policy**		8	15
3	3.1	Promotion of Social Welfare: Ensuring the welfare of individuals and communities.		
	3.2	Economic Justice: Achieving fair distribution of wealth and resources.		
	3.3	Education and Health: Ensuring access to quality education and healthcare for all.		
	3.4	Protection of Marginalized Groups: Safeguarding the rights of disadvantaged and marginalized communities.		
	3.5	Environmental Sustainability: Promoting environmental protection and sustainable development.		
	3.6	Labor Rights: Ensuring fair working conditions and the rights of workers.		
Module IV	**General Problems of Human Rights**		10	19

4	4.1	National Human Rights Commission (NHRC)		
	4.2	National Commission for Women (NCW)		
	4.3	National Commission for Scheduled Castes (NCSC)**.**		
	4.4	National Commission for Scheduled Tribes (NCST)		
	4.5	National Commission for Protection of Child Rights (NCPCR)		
	4.6	National Commission for Persons with Disabilities (NCPWD)		
Module V	**National Human Rights Commission and State Human Rights Commission**			
5	5.1	Establishment and Structure: NHRC and SHRC	9	18
	5.2	Jurisdiction and Functions		
	5.3	Powers of NHRC and SHRC		
	5.4	Composition of NHRC and SHRC		
	5.5	Investigation and Redressal Mechanism		
	5.6	Role in Policy and Advocacy		
Module VI	**Different Scheme of the Govt to Promote Equality to Human beings**			
6	6.1	Pradhan Mantri Jan Arogya Yojana (PMJAY)	9	18
	6.2	Integrated Child Development Services (ICDS)		
	6.3	National Rural Employment Guarantee Act (MGNREGA)		
	6.4	National Action Plan for Children (NAPC)		
	6.5	Swachh Bharat Mission (SBM)		
	6.6	Pradhan Mantri Awas Yojana (PMAY)te of the International Criminal Court (1998)		
Total			**52**	**100**

References:	
1.	Legal Aid as Human Rights (Dharwad : Jagrut Bharut, 1985)
2.	2. Diwan, Paras, Human Rights and the Law: Universal and Indian (New Delhi Deep and Publishers 1985)
3.	3. Mohanti M. , Peoples Rights (New Delhi: Sage Publications 1998)
4.	4. Pal R. M. ed. Human Rights Education (New Delhi , PUDR 1995)
5.	5. Pandey J. and R.K. Dubey, Civil Liberty under Indian Constitution (New Delhi – Deep and Deep 1995)
6.	Legal Aid as Human Rights (Dharwad : Jagrut Bharut, 1985)

Semester - II

Course Code	Course Name	Credits
FST2210N	FASHION TECHNOLOGY-II (TREND RESEARCH & FASHION FORECASTING)	04

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
02		02	02		02	04

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	30	05	50	50	2 Hours	-	-	-	100

Course Outcome	
1.	Understand the concept and importance of trend analysis and fashion forecasting, including its impact on product development, marketing strategies, and overall business success.
2.	Develop trend analysis and prediction skills by learning to interpret cultural, social, economic, and technological influences on fashion trends.
3.	Master research methods for fashion forecasting, including effective data gathering, market trend analysis, and forecasting techniques.
4.	Enhance creativity and innovation in trend interpretation to translate fashion trends into innovative design concepts and adapt them to various market segments.

Course Objective

1.	The course aims to provide students with a comprehensive understanding of trend forecasting and its significance in the fashion industry, to develop skills in trend analysis, prediction, and research methods to identify emerging fashion trends and predict future directions.
2.	The course emphasizes the utilization of forecasting tools and technologies, such as data analysis software and trend forecasting platforms.

Detailed syllabus

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage (%)**
Module I	**Fundamentals of Design Thinking.**		8	15
1	1.1	Stages of Thinking-Define, Research Ideate, Prototype, Implement, Learn.		
	1.2	Research- Identifying drivers, Information gathering, Target Groups, Samples and feedback;		
	1.3	Idea generation- Basic design directions, Themes for thinking, Inspiration and reference, Brainstorming, Value, Inclusion, Sketching, Presenting Ideas; **Creative Thinking Methods** - Innovation through Design Thinking - The Need for Creative and Design Thinking.		
Module II	**The Research Method and Design Process.**		9	20

2	2.1	**Research** -Nature and Definition; **Research** Process – Preparation, Information Gathering-Goal, Identification of Problems and Hypothesis, Exposition of facts and interpretation, Presentation of result and findings;		
	2.2	**Research Methods** – Literature review, Collection of preliminary field data, Define the problem, Analysis and Modification, Presentation of findings;		
	2.3	**Design Process** – Study historical and contemporary examples, Experimentation with materials and visual Ideas, Visual analysis and identification of design problems, Create the work series and explore in subsequent work, Board presentation.		
Module III	**Concept of Fashion Forecasting**		8	15
3	3.1	Awareness of fashion fairs and fashion centers, Knowledge of creative writing		
	3.2	Reading of fashion forecast magazine, Sources of information		
	3.3	Role of Exhibitions and Fashion Shows		
Module IV	**Fashion Forecasting Process**		9	15
4	4.1	Market Research- Consumer research, Shopping, Sales records.		
	4.2	Evaluating the collections- Similar Ideas indicate fashion trends, Trends for the target market;		

	4.3	Fashion services – Collection reports, Trend books, consulting, Color services, Television/Video services, Newsletter services, Websites, Directories and reference books, Fashion Magazines and newspapers, and Catalogs.		
	4.4	Design Sources- Historic inspirations, Folk influences, Vintage clothing shops, Museums, Libraries and bookstores, Arts, Fabrics/Textiles, Travel, Form follows function, The street scene, The turn of the century, innovations, and technologies.		
Module V	**Fashion Forecasting Report and Trend Analysis**			
5	5.1	Market Research - On-site visits to fashion retailers and cloth markets to study market trends and collect various cloth samples, catalogues, etc.	9	20
	5.2	Forecasting Exploration through sources like - Magazines, Newspapers, Internet sites to become familiar with apparel, textile, colour, style, and general culture and consumer forecasting resources.		
	5.3	Preparation of storyboards - Students will prepare storyboards for specific targets.		
	5.4	Presentation of designs - Students will prepare a fashion forecast for different seasons.		
Module VI	**Fashion Product Development.**		9	15

6	6.1	**Introduction to Product development process –** Target market, Merchandising, Season; **Design –** Concept boards, knockoffs**,** Fakes**,** Design elements – Color and Fabric selection, Design principles, Sketching Ideas – Style boards. Sample Development – Draping, Flat pattern, Prototype, Fit;		
	6.2	**Tech packs –** Designer worksheets**, Line selection-** Editing, Reassessment of merchandising plan, Line presentation**;** **Manufacturing-** Duplicates the samples.		
Total			**52**	**100**

References:	
1.	Fashion: From concept to consumer, Gini Stephens Frings (1999), Prentice-Hill Inc.
2.	Design Thinking, Gavin Ambrose & Paul Harris, AVA Publishing, Switzerland.
3.	New Product Planning, Harry B. Watton, Prentice Hall Inc..
4.	Design Research: Methods and Perspectives, edited by Brenda Laurel
5.	Lateral Thinking: Creativity Step by Step, Edward De Bono.
6.	How Customers Think: Essential Insights into the Mind of the Market – Gerald Zaltman

Semester - II

Course Code	Course Name	Credits
IND2210N	INTERIOR DESIGN -II	04

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
01	-	03	01	-	03	04

Theory						Term Work / Practical/Oral			Total
Internal Assessment				End Sem Exam	Duration Of End Sem Exam	Term Work	Pract.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	30	05	50	-	-	50	-	-	100

Course outcome

1. Introduction of Interior Design of Office spaces
2. Understanding requirements of office spaces.
3. Developed ability to identify colours, materials, and lighting fixtures for office spaces.
4. Develop understanding of ancillary services.
5. Design of an office interior

Course Objectives

1. To encourage the students to develop visual thinking of the designed space.
2. To familiarize the students with the design process and the aspects and constraints to be considered while designing interior spaces.
3. To evolve concept and designs for a complete project like an office space

Detailed Syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage
1	**Introduction to commercial interiors**		8	10
	1.1	Introduction to Interiors of other spaces such as hospitality spaces, shopping areas, salons, spa, gymnasiums, healthcare facilities, specialty stores, etc.		
	1.2	Understanding of common spaces in commercial building		
	1.3	Introduction to Interiors of Office spaces		
2	**Office Interiors**		12	20
	2.1	Identifying the requirements for the office spaces		
	2.2	Study of anthropometry of office furniture		
	2.3	Understanding the circulation		
	2.4	Introduction to furniture		
3	**Materials and color scheme**		12	20
	3.1	Identifying Materials for walls, flooring and ceiling		
	3.2	Identifying color schemes		
	3.3	Discussion on lighting fixtures		
4		**Ancillary services**	12	20
	4.1	Pantry		
	4.2	Toilets		
	4.3	False ceiling, Airconditioning, sprinkles, smoke detectors		
5		**Interior Design Project**	16	30
	5.1	Design drawings, plans, elevations, with furniture layout to given scale		
	5.2	Presentation in the given format		
	5.3	Preparing the final portfolio		

		Total	**60**	**100**

References:

1. Joseph Chiara and John Callend, Time Saver Standards for Building Types
2. Panero, Human Dimensions, and Interior Space: A Source Book of Design Reference Standards
3. Drew Plunkett, Drawing for Interior Design

Semester - II

Course Code	Course Name	Credits
FLF2211N	FRENCH-II	2

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
02	-	-	02	-	-	02

Theory						Term Work / Practical/Oral			Total
Internal Assessment					End Sem Exam	Duration Of End Sem Exam	Term Work	Pract.	Oral	
Mid Term	Viva	Continuous Evaluation	Attendance	Total Internal						
15	20	10	05	50	50	75 mins	-	-	-	100

Course Objectives

The course is designed:

1. To develop the ability to engage in detailed conversations, expressing opinions, narrating events, and describing experiences.
2. To master complex grammatical structures, including past and future tenses, relative pronouns, and compound sentences.
3. To explore cultural practices and social norms more deeply to understand their impact on communication and behavior.
4. To enquire about products and place orders in shops or restaurants.
5. To enhance speaking fluency and confidence, reducing hesitation and errors.

Course Outcomes

After the completion of this course Students will be able to:

1. Engage in meaningful conversations in the target language, demonstrating a solid

understanding of its nuances.

2. Exhibit advanced grammar skills that encompass a wide range of tenses.
3. Well-informed about the culture, societal norms and civilization related to the language, enriching the conversational experience.
4. Demonstrate conversational proficiency across various real-life scenarios, including but not limited to dining in restaurants and making hotel reservations, thus enhancing everyday communication.
5. Speak fluently, conveying thoughts and ideas with confidence, accuracy, and an enjoyable ease, making interactions both effective and pleasant.

Detailed Curriculum

Reading exercises, writing tasks and grammar of:

Module/ Unit	Course Module / Contents		Hours	Marks Weightage
	Module I		6	20
1	Leçon 1	Aller voir ailleurs		
	Leçon 2	Balade autoguidée		
	Leçon 3	Week-end à Aoste		
2	**Module II**		7	30
	Leçon 1	Parle avec moi		
	Leçon 2	Nous couchsurfons		
	Leçon 3	En route !		
3	**Module III**		6	20
	Leçon 1	En route !		
	Leçon 2	Concours de selfies		
	Leçon 3	La France et nous		
4	**Module IV**		7	30
	Leçon 1	Vive le speak dating !		
	Leçon 2	Quartier Libre		
	Leçon 3	Vous avez mal où ?		
	Total		**26**	**100**

References :

1. Berthet, Hugot et al. Alter Ego - Méthode de Français, A1: Hachette,2012.
2. Bruno Girardeau et Nelly Mous. Réussir le DELF A1. Paris : Didier, 2011.
3. Loiseau Y.,Mérieux R. Connexions 1, cahier d'exercices. Didier, Paris, 2017.
4. Loiseau Y. & Mérieux R. Connexions 1, Guide pédagogique. Didier, Paris, 2017.
5. Connexions 1, livre de l'élève – Loiseau Y. & Mérieux R., éd. Didier, Paris,2017.
6. Latitudes 1, cahier d'exercices – Loiseau Y. & Mérieux R., éd. Didier, Paris,2018.
7. Latitudes 1, Guide pédagogique – Loiseau Y. & Mérieux R., éd. Didier, Paris,2018.
8. Latitudes 1, Guide pédagogique téléchargeable – Loiseau Y. & Mérieux R., éd. Didier,2018.
9. Latitudes 1, livre d'élève + CD – Loiseau Y. & Mérieux R., éd. Didier, Paris,2018.
10. Nathalie Hirschsprung, Tony Tricot, Cosmopolite 1 Méthode de Français A1. Hachette, 2017.
11. Nathalie Hirschsprung, Tony Tricot. Cosmopolite 1 Cahier d'activités A1. Hachette, 2017.

Semester – II

Course Code	Course Name	Credits
FLG2211N	GERMAN-II	2

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
2	-	-	2	-	-	2

Theory							Term Work / Practical/Oral			Total
Internal Assessment					End Sem Exam	Duration Of End Sem Exam	Term Work	Pract.	Oral	
Mid Term	Continuous Evaluation	Attendance	Oral	Total Internal						
15	10	05	20	50	50	75 mins	-	-	-	100

Course Objectives

The course is designed to:

1. To understand basic language structures when applied in authentic situations.
2. To build and understand simple sentences pertaining to concrete necessities.
3. To read and enhance comprehension skills with special focus on vocabulary and syntax.
4. To have a global and fine understanding of written texts.
5. To have a basic understanding of vocabulary related to food and beverages.

Course Outcomes

After completion of this course students will be able to:

1. Understand basic language structures when applied in authentic situations.

2. Build and understand simple sentences pertaining to concrete necessities.
3. Read and enhance comprehension skills with special focus on vocabulary and syntax.
4. Have a global and fine understanding of written texts.
5. Have a basic conversation using the vocabulary related to food and beverages.

Detailed Curriculam

Module/ Unit	Course Module / Contents		Hours	Marks Weightage
	Kapitel 4		**05**	**20**
1	**Grammatischer Aspekt**	- Unregelmäßige Verbformen, z.B. essen, mögen, möchten - Unbestimmter Artikel und Bestimmter Artikel im Akkusativ - Verben mit Akkusativkel		
	Kapitel 4			
2	**Thematischer Aspekt**	- über Essen sprechen - einen Einkauf planen - Gespräche beim Einkauf und Essen führen - mit W-Fragen Texte verstehen - Wörter ordnen und lernen	**05**	**20**
	Kapitel 5		**10**	**35**
3	**Grammatischer Aspekt**	- Modalverben, z.B. müssen, wollen, können - Possessivartikel im Nominativ - Zeitangaben: am, um, von...bis, W-Fragen		
	Thematischer Aspekt	- die Uhrzeit verstehen und nennen - Zeitangaben machen - über die Familie sprechen - sich verabreden		

		- einen Termin telefonisch vereinbaren		
	Kapitel 6		**06**	**25**
4	**Grammatischer Aspekt**	- Datumsangaben: wann, am Ordinalzahlen - Trennbare Verben: Thema Tagesablauf - Personalpronomen im Akkusativ - Präposition für+Akku.		
	Thematischer Aspekt	- etwas gemeinsam planen - über Geburtstage sprechen - eine Einladung verstehen und schreiben - im Restaurant bestellen und bezahlen		
Total			**26**	**100**

References:

1. Aufderstraße, Hartmut. *Lagune 1. Deutsch als Fremdsprache: Kursbuch und Arbeitsbuch*. Ismaning: Max Hueber Verlag 2012.
2. Braun, Anna, and Daniela Wimmer. *Schritte Plus A1/1: Arbeitsbuch*. Hueber Verlag, 2020.
3. Dengler, Stefanie. *NetzwerkA1. Teil2. Kurs- Und Arbeitsbuch: Deutsch Als Fremdsprache*. Langenscheidt, 2012.
4. Funk, Hermann, et al. *studio d A1: Deutsch als Fremdsprache*. Cornelsen Verlag, 2015.
5. Langenscheidt. *Langenscheidt Pocket Dictionary German: German-English, English-German*. Langenscheidt Publishing Group, 2022.
6. Niebisch, Daniela, et al. *Lagune A1: Kursbuch*. Hueber Verlag, 2016.

Semester – II

Course Code	Course Name	Credits
FLS2211N	SPANISH-II	2

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
2	-	-	2	-	-	2

Theory						Term Work / Practical/Oral			Total
Internal Assessment					End Sem Exam	Duration Of End Sem Exam	Term Work	Pract.	Oral	
Mid Term	Continuous Evaluation	Attendance	Oral	Total Internal						
15	10	05	20	50	50	75 mins	-	-	-	100

Course Objectives

The course is designed:

1. To enable the student to use future tense to express his/her plans.
2. To enable the student to use prepositions and directions to locate people, things, and places.
3. To enhance the vocabulary of the students about house, body parts, city.
4. To enhance the listening ability of students.
5. To enable the students to express their likes, dislikes, tastes and preferences and of others.

Course Outcomes

After completion of this course, students will be able:

1. To use future tense with the correct conjugation and use of the verbs which will enable the students to express their future plans.

2. To use prepositions and will be able to locate people, places, and things.
3. To use the vocabulary in a proficient way and incorporate it with prepositions.
4. To understand and comprehend basic Spanish conversations and songs.
5. To express his/her likes, dislikes, tastes and preferences and of others.

Detailed Curriculum

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
	¿Cúal preferís? Ser O estar		**7**	**25**
1	1.1	El verbo SER e introducción del verbo ESTAR		
	1.2	Diferencias entre SER y ESTAR		
	1.3	Los números (hasta un millon)		
	¿Dónde está Santiago?		**6**	**25**
2	2.1	Las preposiciones de lugar		
	2.2	La forma impersonal del verbo HABER		
	2.3	El vocabulario basado en casa.		
	Quiero expresar mis gustos		**7**	**25**
3	3.1	El verbo GUSTAR		
	3.2	Los verbos como GUSTAR (Encantar y doler)		
	3.3	Vocabulario de cuerpo.		
	Entra el mundo del futuro		**6**	**25**
4	4.1	El futuro inmediato (Ir + a + infinitivo)		
	4.2	Un ensayo basado en el futuro inmediato		
Total			**26**	**100**

References:

1. Blanco, Begoña. *Nuevo avance. Con CD Audio*. 2011.
2. Bregstein, Barbara. *Easy Spanish Step-By-Step*. McGraw Hill Professional, 2005.
3. García, Concha Moreno, et al. *Nuevo avance. Con CD Audio*.2011.
4. Hutchinson, Sam. *Los Numeros - Numbers*. Find and Speak Spanish, 2022.

5. Meredith, Susan. *Spanish for Beginners Flashcards*. 2010.
6. Moreno, Concha, et al. *Nuevo Avance Básico alumno +CD*. 2010.
7. Richmond, Dorothy. *Practice Makes Perfect Spanish Verb Tenses, Second Edition*. McGraw Hill Professional, 2010.
8. Richmond, Dorothy. *Practice Makes Perfect: Spanish Pronouns and Prepositions, Premium Fourth Edition*. McGraw-Hill Education, 2020.
9. Rivano, Emilio. *El verbo gustar y otros así. 2022.*
10. Rivas, Celestino. *Daily Spanish For Beginners*. 2019.
11. Thomas, Scott. *The Big Red Book of Spanish Vocabulary*. NTC Foreign Language, 2006.
12. Velarde, J. Gutierrez. *Los Verbos Ser y Estar En Español*. 2018.
13. Weibel, Peter. *The Big Red Book of Spanish Idioms : 4,000 Idiomatic Expressions*. McGraw Hill Professional, 2004.

Semester – II

Course Code	Course Name	Credits
CSE2212N	PRESENTATION SKILLS	1

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
01	-	-	01	-	-	01

Internal				External		
Mid-Sem Exam	**Continuous Evaluation**	**Attendance**	**Total Internal**	**End Sem Exam**	**Duration Of End Sem Exam**	**Total**
15	**30**	**05**	**50**	**50**	**2 Hours**	**100**

Course Objectives

The course is designed:

1. To explain the utility of Presentation Skills and incorporate it with career advancement.
2. To discuss and explore important steps of business presentation.
3. To enhance the knowledge of linguistics aspect of oral presentation.
4. To teach the nuances of non-verbal communication
5. To guide the students to become better communicators in social gatherings.

Course Outcomes

After completion of this course Students will be able to:

1. Identify the importance of presentation skills in career advancement.
2. Comprehend the steps for planning and preparing professional presentations.

3. Use proficiency in delivering well prepared and articulated presentations effectively.
4. Understand and demonstrate the nuances of non-verbal communication. Practice the socially appropriate behavior and communication.

Detailed Curriculum

Module/ Unit	Course Module / Contents		Hours	Marks Weightage
	Introduction Non-Verbal Communication		**05**	39
1	1.1	Define Non-Verbal Communication, importance of Non-Verbal communication, characteristics of Non-Verbal communication, relevance, and significance.		
	1.2	Types of Non-Verbal communication: Kinesics (Body Language), proxemics, chronemics, haptics, paralinguistics, artifacts, audio-visual & olfactics.		
2	**Business Presentation**		**04**	31
	2.1	What is a business presentation? 3 Ps of Presentation Importance of business presentation Stages of presentation: Planning- (Purpose audience analysis, occasion, & select title), Preparation, Practice/rehearsal Performing/delivery.		
	2.2	Preparing effective Power Point presentation		
	2.3	Delivering of presentation Handling questions, Corrections		
3	**Social Communication Skills**		**02**	**15**
	3.1	Appropriateness: Define social communication, appropriateness in social communication & developing social communication skills.		

	3.2	Building rapport: what is building rapport? Principles of rapport building, rapport building in online & face to face to communication, rapport building with employees, customers, higher authorities & colleagues.		
4	**Context Based Speaking**		**02**	**15**
	4.1	In general situations: Conversation between people		
	4.2	In specific professional situations: Meetings, seminars, interviews, public speeches.		
	4.3	Simulations/Role Play		
Total			**13**	**100**

References:

1. Adair, John. *Effective Communication*. Pan Macmillan Ltd, 2003.
2. Ajmani, J. C. *Good English: Getting It Right*. Rupa Publications, 2012.
3. Anderson, Marilyn. *Critical Thinking, Academic Writing and Presentation Skills*. Pearson Education, 2010.
4. Carnegie, Dale. *The Quick and Easy Way to Effective Speaking*. New York: Pocket Books, 1977.
5. Collins, Patrick. *Speak with Power and Confidence*. New York: Sterling, 2009.
6. Hargie, Owen, editor. *The Handbook of Communication Skills*. Routledge, 2006.
7. Mackall, Joe, editor. *Career Skills Library: Communication Skills*. Ferguson Publishing, 2009.
8. Raman, Meenakshi, and Sangeeta Sharma. *Technical Communication: Principles and Practice.* Oxford University Press, 2009.
9. Raman, Meenakshi, and Prakash Singh. *Business Communication.* Oxford University Press, 2012.
10. Rizvi, Ashraf. *Effective Technical Communication*. McGraw Hill Education, 2017.
11. Smith, John. *Effective Presentation Skills*. Academic Press, 2020.

Semester – II

Course Code	Course Name	Credits
BEH2213N	BEHAVIORAL SCIENCE-II (PROBLEM SOLVING AND CREATIVE THINKING)	1

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
01	-	-	01	-		01

Theory							Total
Internal Assessment					End Sem Exam	Duration of End Sem Exam	
Activity	Assignment	Viva	Attendance	Total Internal			
20	40	35	05	100	00	-	100

Course Outcome	
1.	The knowledge of this subject is essential to understand problem solving behavior as a human is very important concept to understand self and other human behavior
2.	variety of principles related to problem solving behavior and creative thinking influencing human behavior,
3.	to give students to understand aspects related how to solve problem in their student and personal life so that they can have a batter point of view about themselves and society.
4.	Authenticity from self-awareness fosters deeper connections with others.
5.	Self-understanding enhances resilience and adaptability to change.
6	Foster an open-minded and flexible mindset.

Course Objective

1.	To introduce the student to the variety of principles influencing problem solving behavior
2.	To take students, step by step, through an interactive understanding of each of the principles related to problem solving behavior and creative thinking.
3.	To give the student a basic understanding of these principles that he/she has a better understanding of problem-solving behavior and creative thinking.
4.	To give the student a basic understanding which will act as a foundation problem solving behavior and creative thinking.
5.	To develop an understanding of problem-solving behavior and creative thinking so that they can boost their problem-solving behavior and creative thinking
6.	To Develop logical and practical solutions.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Thinking as a tool for Problem Solving**		02	20
1	1.1	What is thinking: The Mind/Brain/behavior		
	1.2	Critical Thinking and Learning		
	1.3	Making Predictions and Reasoning		
	1.4	Memory and Critical Thinking, Emotions and Critical Thinking and thinking skills.		
Module II	**Hindrances to Problem Solving Process**		02	20
2	2.1	Recognizing and defining a problem, Analyzing the problem (potential causes)		
	2.2	Developing possible alternatives		
	2.3	Evaluating solution and resolution of problem and implementation		

	2.4	Barriers of problem-solving perception, expression, Perception, emotion, intellect & work environment, Perception Expression, Emotion Intellect and Work environment		
Module III	**Plan of Action**		02	20
3	3.1	Construction of POA		
	3.2	Monitoring		
	3.3	Reviewing and analyzing the outcome		
	3.4	Implications of Plan of action in students' life		
Module IV	**Critical Thinking**		02	20
4	4.1	Definition, Nature and meaning of creativity.		
	4.2	Convergent and Divergent thinking		
	4.3	Idea generation and evaluation (Brainstorming) Image generation and evaluation Debating		
	4.4	The six-phase model of Creative Thinking: ICEDIP model		
Module V		**Problem Solving Process**	02	20
5	5.1	Recognizing and defining a problem		
	5.2	Analyzing the problem (potential causes)		
	5.3	Developing possible alternatives		
	5.4	Evaluating Solutions and Resolution of problem		
Total			**10**	**100%**

References:	
1.	De Bono, E. (2015). Serious Creativity: Using the Power of Lateral Thinking to Create New Ideas. HarperCollins.
2.	Kahneman, D. (2011). Thinking, Fast and Slow. Farrar, Straus, and Giroux.
3.	Mayer, R. E. (2013). Thinking, Problem Solving, Cognition. Cambridge University Press.

4.	Runco, M. A., & Acar, S. (2012). Divergent thinking as an indicator of creative potential. Creativity Research Journal, 24(1), 66-75.
5.	Schunk, D. H. (2012). Learning Theories: An Educational Perspective. Pearson.
6.	Jonassen, D. H. (2000). Toward a design theory of problem solving. Educational Technology Research and Development, 48(4), 63-85.

Semester - II

Course Code	Course Name	Credits
ANM2217N	ANIMATION-I	02

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
01	02	-	01	02	-	02

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam Practical/ Project Presentation	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
35	10	05	50	50	02 Hours	-	-	-	100

Course Outcome	
1.	Upon completion of the course, students will demonstrate a thorough understanding of the historical and theoretical foundations of animation, as evidenced by their ability to analyze and discuss the evolution of animation techniques and their applications.
2.	Students will acquire practical skills in 3D modeling, evidenced by their ability to create and manipulate 3D models using industry-standard software, effectively translating conceptual ideas into digital representations.
3.	By the end of the course, students will be proficient in rotoscoping techniques, capable of producing accurate roto work for integration into visual effects sequences, demonstrating an understanding of the collaborative nature of rotoscope work within the VFX pipeline.

4.	Upon successful completion of the program, students will demonstrate advanced proficiency in UV unwrapping and texturing techniques, as evidenced by their ability to unwrap complex geometry, optimize texture distribution, and apply procedural textures to enhance the visual quality of 3D models.

Course Objective	
1.	To introduce students to the foundational concepts and principles of animation, including its historical evolution, core principles, and various animation techniques.
2.	To equip students with practical skills in 3D modeling using industry-standard software, enabling them to create and manipulate digital models effectively.
3.	To provide students with a comprehensive understanding of rotoscoping techniques in visual effects (VFX), emphasizing the role of rotoscope artists and the importance of accurate roto work in compositing.
4.	To enable students to explore advanced UV unwrapping and texturing techniques, including complex geometry, texture channels, and procedural texturing, enhancing their proficiency in 3D modelling and animation production.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Foundations of Animation**		**6**	**20%**
1	1.1	Overview of Early Animation Techniques Introduction to pre-cinematic animation forms such as zoetrope's and flipbooks.		
	1.2	Milestones in Animation History Examination of key developments in animation, including the invention of the multiplane camera and the release of iconic animated films.		

	1.3	Impact of Animation on Contemporary Media Analysis of animation's influence on modern media, exploring its role in advertising, education, and visual storytelling		
	1.4	Cultural Impact of Animation Discussion on how animation has shaped cultural narratives and influenced global perspectives.		
Module II	**Principles of Animation**			
2	2.1	Understanding Squash and Stretch Explanation of how squash and stretch principles create fluid and lifelike motion in animated characters and objects.	**6**	**20%**
	2.2	Mastering Timing and Spacing Exploration of timing and spacing principles to convey weight, emotion, and realism in animation sequences.		
	2.3	Exploring Anticipation and Follow-through Examination of anticipation and follow-through principles to enhance the believability and impact of animated actions.		
	2.4	Secondary Animation Principles Analysis of secondary animation principles such as overlapping action and exaggeration in creating dynamic and expressive characters.		
Module III	**Types of Animation Techniques**		**6**	**30%**

3	3.1	Hand-Drawn Animation: Techniques and Examples Overview of traditional hand-drawn animation methods and analysis of classic hand-drawn animated films.		
	3.2	Computer-Generated Animation: Processes and Applications Introduction to computer-generated animation techniques, including 3D modeling, rigging, and rendering, and exploration of its applications in film, gaming, and virtual reality.		
	3.3	Stop-Motion Animation: Methods and Innovations Investigation of stop-motion animation techniques, including claymation and puppet animation, and examination of innovative stop-motion films and commercials.		
	3.4	Experimental Animation Forms Exploration of experimental animation techniques and avant-garde animation movements in the context of artistic expression and creative exploration.		
Module IV	**Fundamentals of Animation**			
4	4.1	Character Development: Character Design: Techniques for designing characters with unique features and personalities.	**8**	**30%**
	4.2	Storyboarding and Planning: Storyboarding Techniques: Fundamentals of creating storyboards to plan and visualize animation sequences.		

	4.3	Introduction to Animation Software: Software Training: Basics of using popular animation software such as Adobe Animate or Blender. Tool Utilization: Learning key tools and features necessary for creating and editing animations.		
	4.4	Project Creation and Review: Animation Projects: Development of short animation projects that incorporate learned techniques and principles. Feedback and Refinement: Presentation of projects for peer and instructor feedback, with focus on refining and improving the final output.		
Total			**26**	**100%**

References:	
1.	Williams, R. (2012). THE ANIMATOR'S SURVIVAL KIT. Faber & Faber.
2.	Hooks, E. (2017). ACTING FOR ANIMATORS: 4TH EDITION. Routledge.
3.	Vaughan, W. (2012). DIGITAL MODELING. New Riders.
4.	Kerlow, I. V. (2017). THE ART OF 3D COMPUTER ANIMATION AND EFFECTS (4th ed.). Wiley.
5.	Goldberg, E. (2008). CHARACTER ANIMATION CRASH COURSE! Silman-James Press.
6.	Osipa, J. (2013). STOP STARING: FACIAL MODELING AND ANIMATION DONE RIGHT (3rd ed.). Wiley.

Semester - II

Course Code	Course Name	Credits
PHT2217N	PHOTOGRAPHY-I (INTRODUCTION TO PHOTOGRAPHY)	2

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
1	2	-	1	1	-	02

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Develop a comprehensive understanding of digital photography techniques.
2.	Acquire foundational knowledge of the principles governing light and its application in photography.
3.	Demonstrate proficiency in operating cameras, including an understanding of their components and functionality.
4.	Explore the intricacies of camera lenses, encompassing their types, functions, and optimal usage in various photographic contexts.

Course Objective

1.	Develop proficiency in composition techniques, enabling students to capture compelling photographs across diverse subjects such as people and nature.
2.	Master the principles of lighting and colour in photography to effectively manipulate mood, atmosphere, and visual impact within images.
3.	Acquire skills in displaying and presenting photographs, encompassing various formats and platforms to communicate messages effectively.
4.	Gain a deep understanding of the mechanics of imaging, including technical aspects such as exposure, focus, and image processing, to achieve desired photographic outcomes.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Understanding Digital Photography**		6	20
1	1.1	Inside the Digital Camera: Exploring the internal mechanisms and components of digital cameras.		
	1.2	Principles of Photography: Introduction to the fundamental principles governing the art and science of photography.		
	1.3	General Principles of Photography: Understanding key concepts such as exposure, focus, and composition.		
	1.4	Types of Cameras: Overview of different camera types and their respective functionalities.		
Module II	**Camera Varieties and Comparative Analysis**		6	20

2	2.1	Camera Types: Exploring a range of cameras including medium format, large format, and digital cameras.		
	2.2	Comparative Study: Analyzing the differences between digital and analogue (SLR) cameras, along with their advantages and applications.		
	2.3	Lens Types: Overview of normal, wide, telephoto, zoom, PC (Perspective Control), and TS (Tilt-Shift) lenses.		
	2.4	SLR & DSLR		
Module III	**Camera Controls and Composition Techniques**			
3	3.1	Camera Controls: Exploring shutter speed, aperture, exposure control, depth of field, and selective focus.	6	30
	3.2	Exposure Metering and Filters: Understanding exposure meters, metering systems, and various filters such as UV, polarizing, and special effect filters. Introduction to tripods.		
	3.3	Composition Techniques: Learning creative composition techniques including the rule of thirds and the Golden section. Managing digital assets and image printouts.		
	3.4	Camera Accessories and Maintenance: Overview of camera mounts, accessories, and maintenance practices. Understanding the differences between multicamera and single camera setups.		
Module IV	**Assignment: Outdoor Photography**		8	30
4	4.1	Lens Selection		

	4.2	Use of Aperture		
	4.3	Use of shutterspeed		
	4.4	Use of white balance		
Total			26	**100**

References:	
1.	Langford, M. (2015). Langford's Basic Photography: The Guide for Serious Photographers (10th ed.). Focal Press.
2.	Freeman, M. (2017). The Photographer's Eye: Composition and Design for Better Digital Photos (The Photographer's Guide) (2nd ed.). Focal Press.
3.	London, B. (2016). Photography (12th ed.). Pearson.
4.	Hunter, F., Biver, S., & Fuqua, P. (2012). Light: Science and Magic: An Introduction to Photographic Lighting (5th ed.). Routledge.

Semester - II

Course Code	Course Name	Credits
TSM2217N	TOURISM MANAGEMENT-I (TOURISM GEOGRAPHY)	02

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
13	-	13	01	-	01	02

Internal Assessment				End Sem Exam- End Semester Evaluation/ Project/ Report/ Presentation	Duration of End Sem Exam	Total
Mid Term	**Continuous Evaluation**	**Attendance**	**Total Internal**			**Internal Assessment + End Semester Evaluation**
15	**30**	**5**	**50**	**50**	**2 Hours**	**100**

Course Outcome	
1.	Students will recall and describe the importance of geography in tourism, providing an overview of continents and oceans, and understanding the concepts of latitudes, longitudes, climatic zones, and vegetation.
2.	Students will demonstrate an understanding of the general geographical features of Asia, Oceania, Europe, Africa, North America, and South America. They will comprehend the physiographic units, climate, vegetation, main countries, capitals, and key tourist attractions of each region.
3.	Given specific countries from Asia, Oceania, Europe, Africa, North America, and South America, students will apply their knowledge to complete assignments. They will identify and analyze the geographical features, capitals, and tourist attractions of assigned countries.

4.	Students will analyze the relationships between physiography, climate, and vegetation in each region. They will critically evaluate how these geographical features influence tourism and identify patterns or trends that emerge across continents.
5.	Students will evaluate the tourism potential of specific countries in each region, considering factors such as geographical features, climate, and key attractions. They will critically assess the impact of these factors on tourism development and make informed judgments about the attractiveness of destinations.
6.	Students will synthesize information to create comprehensive summaries of the general geographical features, climate, vegetation, and tourist attractions of Asia, Oceania, Europe, Africa, North America, and South America. They will integrate knowledge from different modules to develop a holistic understanding of world geography in the context of tourism.

Course Objective	
1.	To gain knowledge about the characteristics of tourist attractions across the globe.
2.	To study the Earth's physical features, climate, natural resources, human populations, and their interactions according to tourism Industry.
3.	To understand major destinations & accessibility of the world.
4.	To gain knowledge on case studies & broad information about the continents.

Detailed syllabus

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage**
Module I	**Introduction to Tourism Geography**		7	25
1	1.1	Brief Introduction of Geography and Tourism Geography		
	1.2	Continents & Oceans		
	1.3	Elements of Weather & Climate. Climatic Zones of the World.		

	1.4	Natural Vegetation of the World.		
Module II	**Asia and Europe**		**7**	30
2	2.1	General Geographical Features: Physiographic Units, Climate, Vegetation Main Countries, Capitals &their Tourist Attractions.		
Module III	**America and Other Countries**		7	30
3	3.1	General Geographical Features; Physiography, Climate, Vegetation. Main Countries, Capitals &Their Tourist Attractions.		
Module IV	**Case Study**		5	15
4	4.1	Case Studies/Assignments/Presentations on the tourist attractions of one continent/country/climatic region		
Total			**26**	**100**

References:	
1.	Tourism Geography: Critical Understandings of Place, Space and Experience by Stephen Williams and Alan A. Lew (2017)
2.	World Regional Geography: Global Patterns, Local Lives by Lydia Mihelic Pulsipher and Alex Pulsipher (2019)
3.	Geography of Travel and Tourism by Lloyd Hudman and Richard Jackson (2018)
4.	Contemporary World Regional Geography by Michael Bradshaw, Joseph Dymond, and George F. Carney (2016)
5.	Global Tourism: Cultural Heritage and Economic Encounters edited by Sarah M. Lyon and Christian Wells (2017)

Semester - II

Course Code	Course Name	Credits
POL2217N	POLITICAL SCIENCE- I- (FUNDAMENTALS OF INDIAN CONSTITUTION)	02

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
13	-	13	01	-	01	02

Internal Assessment				End Semester Evaluation	Total
Mid Term	**Continuous Evaluation**	**Attendance**	**Total**	**End Semester Evaluation/ Project/ Report/ Presentation**	**Internal Assessment + End Semester Evaluation**
15	**30**	**5**	**50**	**50**	**100**

Course Outcome

1. Upon completion of this course, students will possess a comprehensive understanding of the Indian Constitution, including its historical background, structure, key provisions, fundamental rights, duties, directive principles of state policy, Schedules, and the process of amending the Constitution.
2. After completing this course, students will be able to actively engage in constitutional debates, drawing on their comprehensive understanding of the Indian Constitution. They will demonstrate the ability to analyse and articulate the core principles and concepts embedded in the Constitution.
3. Through participation in discussions and case studies, students will foster an understanding of the importance of secularism in the Indian context. They will be able to apply their knowledge to real-world scenarios, demonstrating how constitutional principles shape and influence issues related to secularism in India.

4. By the end of this course, students will contribute to the promotion of an inclusive and equitable democracy through their knowledge and analysis of the Indian Constitution. They will critically evaluate the impact of constitutional provisions on democratic principles and formulate informed perspectives on how to enhance inclusivity and equity within the democratic framework.
5. After completing the course, students will critically assess historical events' impact on the Indian Constitution's evolution. They will analyse framers' decisions, evaluate constitutional provisions' relevance, and construct well-reasoned judgments on the strengths and weaknesses of the constitutional framework.
6. Upon course completion, students will creatively apply their understanding of the Indian Constitution. They will propose innovative solutions to constitutional dilemmas and recommend policy changes, showcasing their ability to contribute constructively to constitutional discourse and development.

Course Objectives

- To develop a comprehensive understanding of the Indian Constitution's foundational principles, structure, and key provisions, including its historical context and evolution.
- To explore different perspectives and evaluate the implications of various interpretations of Indian Constitution.
- To examine the intersections between constitutional law, political philosophy, and social dynamics to gain a deeper appreciation of the constitution's role in shaping society.

Detailed Syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage
	Introduction to Indian Constitution		7	25%
1	1.1	Definition of Constitution & Need for Constitution		
	1.2	Historical background of the Indian constitution		
	1.3	Constitutionalism and Indian Constitution		

	Division of Constitution		**7**	30%
2	2.1	Concepts of Fundamental Rights, Fundamental Rights in India, Safeguards of Fundamental Rights		
	2.2	Fundamental Duties in India: Objectives and Purpose, Relation between Fundamental Rights and Directive Principles of State Policy		
	Secularism & Indian Constitution		5	15%
3	3.1	Secularism and Religious Pluralism in India, Constitutional Rights and Religious Minorities		
	Structure of Government - Legislature, Executive, Judiciary		7	30%
4	4.1	The Legislature: Power and Functions of Parliament		
	4.2	The Executive: Election, Power, Functions, and the changing role of President and Prime Minister.		
	4.3	The Judiciary: Appointment of Judges in High Courts and the Supreme Court, Power and Functions of High Courts and the Supreme Court.		
Total			26	**100%**

References

1. M. P. Jain, Indian Constitutional Law, 8th ed., LexisNexis, New Delhi (2018).
2. D.D. Basu, Shorter Constitution of India, 6th ed., Prentice – Hall of India, New Delhi (1981).
3. V.N. Shukla, Constitution of India, 11th ed., Eastern Book Company, Lucknow (2018).
4. H.M. Sreevai, Constitutional Law of India: a critical commentary, 4th ed., N.M. Tripathi, Bombay (1991).
5. U.Bhatia, (Ed.), The Indian Constituent Assembly: Deliberations on Democracy, Taylor & Francis, London (2017).
6. M. V. Pylee, An Introduction to the Constitution of India, S. Chand Publishing, New Delhi (2009).

Semester – II

Course Code	Course Name	Credits
SCW2217N	SOCIAL WORK-I (SOCIAL ENTREPRENEURSHIP)	02

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
13	**13**	**-**	**01**	**01**	**-**	**02**

Internal Assessment				End Semester Evaluation	Total
Mid Term	**Continuous Evaluation**	**Attendance**	**Total**	**End Semester Evaluation/ Project/ Report/ Presentation**	**Internal Assessment + End Semester Evaluation**
15	**30**	**5**	**50**	**50**	**100**

Course outcome

1. Students will understand conceptual and theoretical aspects of social entrepreneurship in India.
2. Student will be aware about the challenges of social entrepreneurship.
3. Students will be able to understand the process to start a social entrepreneurship project.

Course Objectives

1. To study the basic concepts of social entrepreneurship.
2. To understand various social entrepreneurship processes.
3. To understand role and responsibilities in the management of social entrepreneurship.

Detailed Syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage
	Social entrepreneurship		7	25%
1	1.1	Introduction and basics of Social Entrepreneurship		
	1.2	Approaches to social development		
2	2.1	Strategic venture design, resource management and social sector marketing.	7	30%
	2.2	Funding and legal framework for social ventures		
3	**Social entrepreneurship in India**		7	30%
	3.1	Social impact assessment		
	3.2	Sustainable development		
4	4.1	Case-studies	5	15%
		Total	26	**100%**

References:

1. Bornstein, D., & Davis, S. (2010). Social entrepreneurship: What Everyone Needs to Know? New York: Oxford University Press.
2. Bornstein, D. (2007). How to change the world: Social entrepreneurs and the power of new ideas. New York: Oxford University Press.
3. Kickull, Jill and Lyons, S. Thomas. (2012). Understanding Social Entrepreneurship. Routledge: New York
4. Kramer, M. R. (2005). Measuring innovation: Evaluation in the field of social entrepreneurship.

Semester – II

Course Code	Course Name	Credits
BPS2217N	BIOPRENEURSHIP-I	02

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
02			02			02

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	30	05	50	50	2 Hours	-	-	-	100

Course Outcome	
1.	Understand the foundational concepts and principles of biopreneurship
2.	Analyze various business models and strategies applicable to biotech startups
3.	Apply theoretical knowledge to practical scenarios through case studies
4.	Demonstrate the ability to apply strategic planning, market analysis, and management strategies specific to the biotech industry.
5.	Critically assess real-world case studies, identifying challenges, strategies, and outcomes in biopreneurial ventures
6.	Effectively present and discuss biopreneurship concepts, focusing on market impact, product development, and business strategies

Course Objective

1.	To give students an understanding of the historical evolution of the biotech industry and its key developments
2.	To explore how biology, technology, and entrepreneurship combine to form the foundation of biopreneurship.
3.	To analyze and understand the factors contributing to the success of various biopreneurial ventures.
4.	To familiarize students with various business models and strategic planning methods tailored to the biotech industry.
5.	To engage students in the critical examination of case studies to understand the complexities of biopreneurship.
6.	To enhance students' practical knowledge and presentation skills through assignments, group discussions, and activities focused on biopreneurship.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	Introduction to Biopreneurship		**7**	**25**
1	1.1	Historical overview of the biotech industry, tracing its evolution		
	1.2	Key milestones in biotech industry		
	1.3	Exploration of the interdisciplinary nature of bio entrepreneurship		
	1.4	Combining aspects of biology, technology, and entrepreneurship		
	1.5	Examination of successful Bio entrepreneurial ventures		
	1.6	Examination of factors contributing to their success		

Module II	**Fundamentals of Business Management in Biotech**			
2	2.1	In-depth analysis of various business models prevalent in the biotech sector	**7**	**25**
	2.2	Analysis of platform technologies, therapeutics, diagnostics, and agriculture		
	2.3	Introduction to strategic planning		
	2.4	Introduction to market analysis, competitive positioning, and product differentiation		
	2.5	Discussion on organizational structures and management strategies tailored to biotech startups		
	2.6	Agility and innovation in biotech startups		
Module III	**Case Studies in Biopreneurship**		**6**	**20**
3	3.1	Review of case studies showcasing successful biopreneurial endeavors		
	3.2	Review of case studies showcasing unsuccessful biopreneurial endeavors		
	3.3	Analysis of key decisions, challenges		
	3.4	Analysis of key strategies employed by biotech startups		
	3.5	Application of theoretical concepts to practical scenarios		
	3.6	Emphasizing critical thinking and problem-solving skills		
Module IV	**Presentation**		**6**	**15**
4	4.1	Concepts of biopreneurship		
	4.2	Biotech industries		
	4.3	Impact of biotech industries in market		
	4.4	Products offered by biotech industries		

	4.5	Market analysis		
	4.6	Biotech industries placed in marketing		
Module V	**Assignment/group discussion/activity**			
5	5.1	Concepts of biopreneurship	**4**	**15**
	5.2	Biotech business management		
	5.3	Biotech industries		
	5.4	Products offered by biotech industries		
	5.5	Impact of biotech industries in market		
	5.6	Market analysis		
Total			**30**	**100**

References:	
1.	Deshpande, P. (2023). *Bioentrepreneurship: From Concept to Commercialization*. Springer Nature.
2.	Shimasaki, C. D. (2020). *Biotechnology Entrepreneurship: Starting, Managing, and Leading Biotech Companies*. Elsevier.
3.	Murray, F., & Stern, S. (2018). *Innovation in Biotechnology: Comparative Perspectives and the Limits of the Market*. University of Chicago Press.
4.	Kaitin, K. I., & DiMasi, J. A. (2018). *The Biopharmaceutical Industry in the 21st Century: Perspectives on Innovation, Economics, and Policy*. Wiley.
5.	Huggett, B., & Cacciuttolo, M. (2021). *Commercializing Biotech Innovation: The Practical Guide to New Biotech Companies and Products*. Woodhead Publishing.
6.	Pisano, G. P. (2019). *Science Business: The Promise, the Reality, and the Future of Biotech*. Harvard Business Review Press.

Detailed Curriculum: Semester III

Semester-III								Evaluation Scheme		
Types of courses		Course Code	Course Title	Lecture (L) credits	Tutorial (T) credits	Practical (P) Credits	Total credits	Internal Marks	External Marks	Total Marks
Discipline Specific Courses	Discipline-I (Core)						8			
	Discipline-I (Compulsory)	BMB2301N	Basics of Molecular Biology	3	0	0	3	30	70	100
		IMM2302N	Immunology	3	0	0	3	30	70	100
		LMB2303N	Lab course on Molecular Biology	0	0	1	1	30	70	100
		LCI2304N	Lab course on Immunology	0	0	1	1	30	70	100
	Discipline II (any one from the basket)						4			
	Discipline II (Select any one from basket)	ADT2305N	Advanced diagnostic techniques	3	0	0	3	30	70	100
		AMI2306N	Agricultural microbiology	3	0	0	3	30	70	100
		FTT2307N	Fermentation Technology	3	0	0	3	30	70	100
		LAD2308N	Lab course on Advanced Diagnostic Techniques	0	0	1	1	30	70	100
		LAM2309N	Lab course on Agricultural Microbiology	0	0	1	1	30	70	100
		LCF2310N	Lab course on Fermentation Technology	0	0	1	1	30	70	100
	Total (Discipline I + II)						12			
Foundation courses	Ability Enhancement Courses	Foreign Language (any one from the basket)					2			
		FLF2311N	French- III	2	-	-	2	50	50	100
		FLG2311N	German-III	2	-	-	2	50	50	100
		FLS2311N	Spanish-III	2	-	-	2	50	50	100
		CSE2312N	Reading and Comprehension	1	-	-	1	50	50	100
	Subtotal						3			
		BEH2313N	Behavioural Science-III	1	-	-	1	100	0	100

	Skill Enhancement Program	IBI2315N	Insights of Biotechnology Industry-I	3	-	-	3	**30**	**70**	**100**
						Subtotal	**4**			
	Value Added Course	**VAC-II (any one from the basket)**					**2**			
		ANM2317N	Animation-II	2	-	-	2	**50**	**50**	**100**
		PHT2317N	Photography-II	2	-	-	2	**50**	**50**	**100**
		POL2317N	Political Science-II	2	-	-	2	**50**	**50**	**100**
		TSM2317N	Tourism Management-II	2	-	-	2	**50**	**50**	**100**
		SCW2317N	Social Work-II	2	-	-	2	**50**	**50**	**100**
		BPS2317N	Biopreneurship-II	2	-	-	2	**50**	**50**	**100**
						Subtotal	**2**			
	Co-Curricular Courses	**VAC-III**					**0**			
		PHE2318N	Physical Education and Sports**				0			
						Subtotal	**0**			
	Total (Foundation Courses)						**9**			
Non-Teaching Credit Courses	Community Engagement Services	Community Engagement Services					**3**			
		CES2319N	Community Outreach	-	3	-	3	**50**	**50**	**100**
						Total (NTCC)	**3**			
Grand Total							**24**			
***Continued till Semester VI*										

Semester - III

Course Code	Course Name	Credits
BMB2301N	BASICS OF MOLECULAR BIOLOGY	03

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Learning and remembering of basic molecular biology principles
2.	Understanding the mechanism of concepts for future applications in genetic engineering
3.	Apply the knowledge of genetic information transfer with regulatory systems to describe phenotypic and biochemical characteristics in an individual
4.	Applying gained theoretical knowledge of molecular biology to analyze, describe and solve real time cases of genetic disorders
5.	Determine the flow of genetic information with respect to change in genetic sequences and environmental conditions over time (Molecular evolution)
6.	Designing protocols for genetic improvement in an organism (Microbes, plants animals and human beings) for sustainable growth of ecosystem

Course Objective	
1.	To provide students an understanding of the basic molecules of life-DNA its synthesis through replication
2.	To provide students an understanding of the RNA types, structure its synthesis through transcription
3.	To provide knowledge about modifications in the RNA molecules after synthesis through post-transcriptional events
4.	To give theoretical knowledge about synthesis of protein through translation process
5.	To understand the control of protein synthesis mechanism by gene expression regulation mechanism in prokaryotes and eukaryotes
6.	To provide knowledge about application of antisense and gene silencing technology in the genetic engineering

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	DNA replication and repair		7	16
1	1.1	Watson and Crick Model of DNA duplex		
	1.2	DNA replication in Prokaryotes: replication origin, DNA polymerases, the mechanism of replication		
	1.3	DNA replication in Eukaryotes: replication origin, DNA polymerases, the mechanism of replication		
	1.4	Rolling circle method of DNA replication		

	1.5	DNA damage: types and their repair mechanisms		
Module II	Transcription of DNA		8	18
2	2.1	Structure of RNA in prokaryotes		
	2.2	Structure of RNA in prokaryotes		
	2.3	Transcription in prokaryotes and eukaryotes		
	2.4	RNA polymerase – Composition and function		
	2.5	transcription mechanism; transcription factor and their role		
	2.6	inhibition of RNA synthesis		
Module III	Processing of RNA		7	15
3	3.1	Procession of ribosomal RNA		
	3.2	Procession of transfer RNA's		
	3.3	Processing of mRNA-5'cap formation		
	3.4	Processing of mRNA -3' polyadenylation		
	3.5	Processing of mRNA -RNA splicing		
	3.6	RNA editing and RNA degradation		
Module IV	Translation		8	18
4	4.1	Translation mechanism in prokaryotes: Ribosomes, initiation of translation, elongation, termination		
	4.2	Translation mechanism in eukaryotes: Ribosomes, initiation of translation, elongation, termination		
	4.3	Amino acid activation		
	4.4	Translation inhibitors		
	4.5	Post translational modification of protein		
	4.6	Protein sorting		

Module V	Regulation of gene expression		8	18
5	5.1	Regulation in prokaryotes – repressors and negative control, positive control, role of c AMP, AMP receptor protein		
	5.2	Lactose and tryptophan operons		
	5.3	Regulation in Eukaryotes: Transcriptional factors (General and Specific Transcription factors),		
	5.4	Enhancers (Activators) and silencers (Repressors). Transcriptional (Epigenetic regulation)		
	5.5	Post-transcriptional (mRNA processing and stability), translational (Upstream ORF and upstream AUG) gene regulation		
	5.6	Post-translational gene regulation		
Module VI	Gene Silencing		7	15
6	6.1	Antisense molecules		
	6.2	Biochemistry of ribozyme		
	6.3	Hammer head, hairpin ribozymes		
	6.4	Application of antisense RNA in genetic engineering.		
	6.5	Application of ribozymes in genetic engineering.		
	6.6	RNAi Technology.		
Total			**45**	**100**

References:	
1.	Brown, T. A. (2002). Genome. John Wiley & Sons Inc.

2.	Alberts, B., Bray, D., & Watson, J. D. (1983). Molecular Biology of the Cell. Garland Science.
3.	Lewin, B. (2005). Genes VIII. Oxford University Press.
4.	Lodish, H., Berk, A., Zipursky, S. L., Matsudaira, P., Baltimore, D., & Darnell, J. (2000). Molecular Cell Biology (4th ed.). W.H. Freeman and Company.
5.	Sambrook, J., Fritsch, E. F., & Maniatis, T. (1989). Molecular Cloning: A Laboratory Manual (2nd ed., 3-Volume set). Cold Spring Harbor Laboratory Press.
6.	Watson, J. D., Weiner, A. M., & Hopkins, N. H. (1987). Molecular Biology of the Gene (4th ed.). Addison-Wesley Publishing.
7.	Dabre, P. D. (1998). Introduction to Practical Molecular Biology. John Wiley & Sons Inc.

Semester - III

Course Code	Course Name	Credits
IMM2302N	**Immunology**	03

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03			03			03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	TotalInternal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Students will gain a understanding of the immune system's components and functions.
2.	Students will critically analyze the mechanisms of immune responses, including antigen presentation and lymphocyte activation.
3.	Students will apply concepts of antibody diversity and antigen interactions in research settings.
4.	Students will evaluate the roles of cytokines and the complement system in disease and therapy.
5.	Students will gain understanding for autoimmune diseases and hypersensitivity reactions.
6.	Students will assess current immunological research for application in scientific and clinical contexts.

Course Objective	
1.	Understand the fundamental components and functions of the immune system.
2.	Investigate the mechanisms of cell-mediated and humoral immunity.
3.	Examine the structure, function, and genetic basis of antibody variation.
4.	Assess the functions and therapeutic applications of cytokines.
5.	Analyze the activation, regulation, and functions of the complement system.
6.	Study the mechanisms, manifestations, and treatments of autoimmunity and hypersensitivity.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Introduction**		8	18
1	1.1	Historical perspective of immune system and immunity		
	1.2	Innate and specific immunity		
	1.3	Humoral immunity		
	1.4	Cell-mediated immunity		
	1.5	The organs and cells of the immune system		
Module II	**Cell Mediated and Humoral Immunity**		8	18
2	2.1	Antigen processing and presentation,		
	2.2	MHC		
	2.3	Activation and maturation of B and		
	2.4	T cells		

Module III	**Antigen and Antibody**			
3	3.1	Antibody structure in relation to function and antigen-binding	8	18
	3.2	Types of antibodies and their structures		
	3.3	Isotypes, allotypes, idiotypes,		
	3.4	Genetic basis of antibody diversity		
Module IV	**Cytokines**			
4	4.1	Cytokines: Properties of Cytokines	6	13
	4.2	Cytokine Receptors		
	4.3	Therapeutic Uses of Cytokines and Their Receptors		
	4.4	Cytokines in Hematopoiesis		
Module V	**Complement System**			
5	5.1	Complement System	6	13
	5.2	The Functions of Complement		
	5.3	The Complement Components		
	5.4	Complement Activation,		
	5.5	Regulation of the Complement System		
Module VI	**Autoimmunity & Hypersensitivity**			
6	6.1	Autoimmunity; Organ-Specific Autoimmune Diseases, Systemic Autoimmune Diseases	9	20
	6.2	Proposed Mechanisms for Induction of Autoimmunity		
	6.3	Treatment of Autoimmune Diseases Hypersensitivity: Gell and Coombs Classification, IgE-Mediated (Type I)		
	6.4	Hypersensitivity, Antibody-Mediated Cytotoxic (Type II) Hypersensitivity		

	6.5	Immune Complex–Mediated (Type III) Hypersensitivity		
	6.6	Type IV or Delayed-Type Hypersensitivity (DTH)		
Total			**45**	**100%**

References:	
1.	Abbas, A. K., Lichtman, A. H., & Pillai, S. (2021). *Cellular and molecular immunology* (10th ed.). Elsevier.
2.	Murphy, K., & Weaver, C. (2016). *Janeway's immunobiology* (9th ed.). Garland Science.
3.	Owen, J. A., Punt, J., & Stranford, S. A. (2019). *Kuby immunology* (8th ed.). W.H. Freeman.
4.	Sompayrac, L. (2019). *How the immune system works* (6th ed.). Wiley-Blackwell.
5.	Parham, P. (2021). *The immune system* (5th ed.). Garland Science.
6.	Goldsby, R. A., Kindt, T. J., & Osborne, B. A. (2006). *Kuby immunology* (6th ed.). W.H. Freeman.

Semester - III

Course Code	Course Name	Credits
LMB2303N	LAB COURSE ON MOLECULAR BIOLOGY	01

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
	2			1		01

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	4 Hours	-	-	-	100

Course Outcome	
1.	Students will be able to explain the process of isolating genomic DNA from plants, animals, and plasmids.
2.	Students will be skilled in isolating plant, animal, and plasmid DNA using appropriate laboratory techniques.
3.	Students will be able to separate and analyze DNA fragments using agarose gel electrophoresis.
4.	Students will understand how UV light causes DNA damage and how repair mechanisms work in light and dark conditions.
5.	Students will be able to measure the concentration and purity of genomic DNA using a spectrophotometer.
6.	Students will be capable of interpreting results from DNA isolation, electrophoresis, and quantification experiments.

Course Objective	
1.	To introduce students to the basic techniques of isolating genomic DNA from various sources, including plants, animals, and plasmids.
2.	To provide hands-on experience in the isolation of DNA and its separation through agarose gel electrophoresis.
3.	To teach students the principles behind agarose gel electrophoresis and its application in separating DNA fragments.
4.	To study the effects of UV light on DNA and the mechanisms that cells use to repair this damage.
5.	To train students in the use of spectrophotometry for assessing the quantity and quality of genomic DNA.
6.	To develop students' ability to analyze experimental data and effectively communicate their findings in written and oral formats.

Detailed syllabus

Module/ Unit	Course Module / Contents	Hours	Marks Weightage (%)
List of practical		26	100
1.	Isolation of plant genomic DNA and separation using agarose gel electrophoresis		
2.	Isolation of Animal genomic DNA and separation using agarose gel electrophoresis		
3.	Isolation of plasmid DNA and separation using agarose gel electrophoresis		
4.	Study of DNA damage by UV light & repair mechanism. (Light & Dark Mechanism)		
5.	Quantification of genomic DNA using spectrophotometer		
Total		26	**100%**

References:	
1.	Sambrook, J., & Russell, D. W. (2001). Molecular Cloning: A Laboratory Manual (3rd ed.). Cold Spring Harbor Laboratory Press.
2.	Ausubel, F. M., Brent, R., Kingston, R. E., Moore, D. D., Seidman, J. G., Smith, J. A., & Struhl, K. (1994). Current Protocols in Molecular Biology. John Wiley & Sons, Inc.
3.	Brown, T. A. (2016). Gene Cloning and DNA Analysis: An Introduction (7th ed.). John Wiley & Sons, Inc.
4.	Sambrook, J., & Russell, D. W. (2006). The Condensed Protocols: From Molecular Cloning: A Laboratory Manual. Cold Spring Harbor Laboratory Press.
5.	Herrick, J., & Bensimon, A. (1999). Introduction of single-stranded breaks into genomic DNA using UV light: A study of damage and repair mechanisms. Journal of Molecular Biology, 285(1), 1-12.

Semester - III

Course Code	Course Name	Credits
LCI2304N	LAB COURSE ON IMMUNOLOGY	01

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
	2			1		01

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	TotalInternal						
15	10	05	30	70	4Hours	-	-	-	100

Course Outcome	
1.	Students will accurately identify and analyze lymphoid organs under a microscope.
2.	Students will effectively prepare blood films and identify different blood cells.
3.	Students will isolate serum and detect antibodies using agglutination reactions.
4.	Students will characterize precipitin reactions using Radial Immunodiffusion.
5.	Students will accurately identify proteins using the Dot-Blot assay.
6.	Students will perform ELISA techniques and interpret the results effectively.

Course Objective

1.	Develop skills to microscopically observe and identify lymphoid organs such as the thymus, bone marrow, spleen, and lymph nodes.
2.	Learn the techniques for blood film preparation and the identification of various blood cell types.
3.	Master the isolation of serum and identification of antibodies using the Widal test for agglutination reactions.
4.	Understand and perform the characterization of precipitin reactions using the Radial Immunodiffusion Test.
5.	Gain proficiency in identifying proteins using the Dot-Blot assay technique.
6.	Demonstrate competency in performing and interpreting results from the ELISA technique.

Detailed syllabus

Module/ Unit	Course Module / Contents	Hours	Marks Weightage (%)
List of practical		26	100
1.	Microscopic observation of Lymphoid organs (thymus, bone marrow, spleen and lymph node)		
2.	Blood film preparation and identification of blood cells		
3.	Isolation of serum and identification of antibodies with agglutination reaction with Widal Test		
4.	Characterization of precipitin reactions with Radial Immunodiffusion Test		
5.	Identification of proteins with Dot-Blot Assay		
6.	Demonstration of ELISA Technique		
Total		**26**	**100%**

References:

1.	Coligan, J. E., Kruisbeek, A. M., Margulies, D. H., Shevach, E. M., & Strober, W. (2007). *Current protocols in immunology*. John Wiley & Sons.
2.	Hudson, L., & Hay, F. C. (2012). *Practical immunology* (4th ed.). Wiley-Blackwell.
3.	Givan, A. L. (2011). *Flow cytometry: First principles* (2nd ed.). Wiley-Liss.
4.	Tizard, I. R. (2018). *Immunology: An introduction* (9th ed.). Saunders.
5.	Goldsby, R. A., Kindt, T. J., & Osborne, B. A. (2002). *Immunology laboratory manual* (2nd ed.). W.H. Freeman.
6.	Mahon, C. R., Lehman, D. C., & Manuselis, G. (2018). *Textbook of diagnostic microbiology* (6th ed.). Elsevier.

Semester - III

Course Code	Course Name	Credits
ADT2305N	ADVANCED DIAGNOSTIC TECHNIQUES	03

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Develop a comprehensive understanding of the importance of accurate diagnostics in healthcare, with an emphasis on early disease detection, prevention, and predicting treatment responses.
2.	Learn techniques for collecting and preserving various biological samples, recognizing the importance of proper storage conditions and durations.
3.	Explore the concept of biomarkers, including their different types and clinical applications in diagnosing and managing various diseases.
4.	Understand the processes involved in purifying, quantifying, and assessing the quality of isolated nucleic acids and proteins.
5.	Gain proficiency in molecular techniques used in diagnostics, including PCR, sequencing, and gene expression analysis.

6.	Master immuno techniques, such as ELISA and western blotting, for detecting and quantifying proteins and other molecules in clinical samples

Course Objective	
1.	Provide a clear understanding of advanced diagnostic techniques and their role in early disease detection, prevention, and treatment response prediction.
2.	Teach how to collect and store different biological samples, such as blood, tissue, and swabs, with a focus on proper methods and conditions.
3.	Introduce biomarkers, explaining their types and how they are used in diagnosing various diseases.
4.	Equip students with the knowledge of how to isolate and assess DNA, RNA, and proteins for diagnostic purposes.
5.	Explore the use of molecular diagnostics, including PCR and next-generation sequencing, in detecting and profiling diseases.
6.	Familiarize students with immunodiagnostic techniques like ELISA, western blot, and FACS, and how they are used to diagnose diseases

Detailed syllabus

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage (%)**
Module I	Introduction to Advanced Diagnostic Techniques		(8L)	18
1	1.1	Definition and Scope of Diagnostics,		
	1.2	Importance of accurate diagnostics in healthcare-		
	1.3	Early detection and prevention of diseases,		
	1.4	Treatment response prediction approaches,		

	1.5	Regulatory bodies and standards in diagnostics.		
Module II	Different Biological Samples and Storage Considerations		(8L)	18
2	2.1	Blood, Urine, Tissue sample, etc.		
	2.2	Blood- collection methods, Anticoagulants and preservation,		
	2.3	Storage conditions and duration.		
	2.4	Biopsy and surgical specimens - Fixation and embedding techniques,		
	2.5	Cryopreservation and tissue banking.		
	2.6	Swab samples - Nasopharyngeal swab, Vaginal swab, Stool samples, Sputum samples etc.		
Module III	Biomarkers in diagnostics		(8L)	18
3	3.1	Introduction to biomarkers and their role in disease diagnosis,		
	3.2	Types of biomarkers (proteomic, genomic, metabolomic),		
	3.3	Biomarker discovery and validation processes,		
	3.4	Clinical applications of biomarkers in various diseases		
Module IV	Isolation of Biomolecules for Diagnostic Methods		(8L)	18
4	4.1	Principle of DNA, RNA, and protein extraction.		

	4.2	DNA and RNA extraction- phenol-chloroform extraction, silica-based methods, and column-based methods.		
	4.3	Purification and quantification and quality assessment of isolated nucleic acid.		
	4.4	Protein extraction- cell lysis and electrophoresis		
Module V	Molecular diagnostics			
5	5.1	Principles and applications of PCR in diagnostics.	(6L)	13
	5.2	Clinical application of NGS in various diseases, gene profiling, and mutation detection in various diseases.		
	5.3	gene profiling, and mutation detection in various diseases.		
Module VI	Immunodiagnostics			
6	6.1	Principles of immunodiagnostics.	(7L)	16
	6.2	Blood cell counting,		
	6.3	Applications of ELISA, immunohistochemistry,		
	6.4	western blot in diagnosis of various diseases.		
	6.5	Principle and application of FACS in diagnosis.		
	6.6	Lateral flow immunoassay		
Total			**45**	**100%**

References:	
1.	Grody, W. W., Nakamura, R. M., Kiechle, F. L., & Strom, C. (Eds.). (2009). *Molecular diagnostics: techniques and applications for the clinical laboratory*. Academic Press.

2.	Peakall, D. B., & Shugart, L. R. (Eds.). (2013). *Biomarkers: research and application in the assessment of environmental health* (Vol. 68). Springer Science & Business Media
3.	Debnath, M., Prasad, G. B., & Bisen, P. S. (2010). *Molecular diagnostics: promises and possibilities*. Springer Science & Business Media.
4.	Jacqueline Stanley., (2002) *Essentials of Immunology and Serology*" Publisher: Cengage Learning

Semester - III

Course Code	Course Name	Credits
AMI2306N	AGRICULTURAL MICROBIOLOGY	Credits: 03

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	-	-	03	-	-	03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Demonstrate a thorough understanding of the various functions and roles of microorganisms in agricultural systems.
2.	Perform basic laboratory techniques for isolating, identifying, and studying agricultural microorganisms, applying these techniques in both controlled and field settings.
3.	Analyze the relationships between soil microorganisms, plant health, and crop productivity, and apply this knowledge to improve agricultural practices.
4.	Understand and apply the use of microbial products such as biofertilizers and biopesticides to enhance soil fertility and manage pests and diseases.
5.	Identify key microbial pathogens in plants and animals and implement biological control measures to manage these diseases in an environmentally sustainable manner.

6.	Integrate microbiological knowledge into agricultural practices to improve crop yield, soil health, and overall farm productivity.

Course Objective	
1.	To introduce students to the diverse roles of microorganisms in agriculture
2.	To provide a comprehensive understanding of the ecology of agricultural microorganisms and their interactions with plants
3.	To familiarize students with the laboratory techniques used to study and manipulate agricultural microorganisms
4.	To explore the applications of microbiology in agriculture
5.	To examine the complex interactions between soil
6.	To understand the role of microorganisms in plant and animal diseases

Detailed syllabus

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage (%)**
Module I	**History and introduction**		05	12
1	1.1	History and development of agricultural microbiology.		
	1.2	Introduction to soil microorganisms – bacteria (cyanobacteria and actinobacteria),		
	1.3	Introduction to soil microorganisms- algae, fungi, protozoans, nematodes, and viruses),		
	1.4	Role of microbes in soil fertility		
Module II	**Role of microbes in soil fertility**		10	20
2	2.1	Role of microbes in soil fertility;		
	2.2	Microbial associations in phytosphere:		
	2.3	Microbial associations in rhizosphere,		

	2.4	Microbial associations in phyllosphere,		
	2.5	Microbial associations in spermosphere.		
	2.6	Methods for enumeration of culturable and non-culturable soil microbes		
Module III	**Association of microbes with plants**			
3	3.1	Different interfaces of interactions - soil-plant-microbe interactions leading to symbiotic, associative,	07	17
	3.2	Different interfaces of interactions -endophytic and pathogenic interactions.		
	3.3	Mycorrhiza – types and importance to agriculture		
	3.4	Mycorrhiza -organic matter decomposition – humus formation;		
	3.5	Plant growth promoting rhizobacteria (PGPR).		
	3.6	Mechanism of plant growth promotion by PGPR		
Module IV	**Soil and Biogeochemical cycles**			
4	4.1	Introduction to Soil and its properties.	06	15
	4.2	Factors affectingmicroorganisms in soil.		
	4.3	Microbial groups in soil. Role of microbes in soil fertility and crop production		
	4.4	Biogeochemical cycling of nutrients – carbon cycle, nitrogen cycle, Sulphur cycle, phosphoruscycle.		
	4.5	Ecology of soil microorganism.		
Module V	**Plant pathogens and biopesticides**			
5	5.1	Plant pathogens, Disease, symptoms, mode of entry of pathogens, Algal diseases, fungal diseases, bacterial diseases, viral diseases.	07	16
	5.2	Plant disease resistance. Control measures.		
	5.3	Plant growth promoting rhizobacteria – Biological control of phytopathogens –		

	5.4	Mechanism of control – *Trichoderma* sp. and *Pseudomonas fluorescens* as biocontrol agents – Disease suppressive soils –		
	5.5	Biopesticide and their importance: Bacterial, fungal and viral		
	5.6	Plant pathogens, Disease, symptoms, mode of entry of pathogens, Algal diseases, fungal diseases, bacterial diseases, viral diseases.		
Module VI	**Microbiology for sustainable agriculture**			
6	6.1	Microorganisms in agriculture.	10	20
	6.2	Biofertilizers – definition, importance – types and their application methods –		
	6.3	Steps in mass production of bacterial biofertilizers – quality guidelines for biofertilizers.		
	6.4	Mass production of blue green algae, *Azolla,* and mycorrhiza.		
		Plant response to biofertilizers application.		
Total			**45**	**100%**

References:	
1.	Sylvia D.M., Fuhrmann, J.J., Hartel P.J. and Zuberer D.A. (2005) Principles and Applications of Soil Microbiology, 2nd Edn. Pearson, Prentice Hall.
2.	Subba Rao N.S. (2001) Soil Microorganisms and plant growth, Oxford and IBH PublishingCo. Pvt. Ltd.
3.	Glick B.R. (2015) Beneficial Plant Bacterial Interactions, Springer.
4.	Paul E.A. (Ed.) (2015) Soil Microbiology, Ecology and Biochemistry, 4thEdn, Academic Press.
5.	Madigan M.T., Bender K.S., Buckley D.H., Sattley W.M. and Stahl D.A. (2017) Brock Biology of Microorganisms, 15thEdn. (Global Edn.) Pearson Education.

Semester - III

Course Code	Course Name	Credits
FTT2307N	FERMENTATION TECHNOLOGY	03

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	-	-	03	-	-	03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Knowledge of the evolution of fermentation technology and an understanding of the historical context and contributions to modern fermentation practices.
2.	Understanding of the chemical and biological mechanisms underlying fermentation processes, including energy production and substrate utilization.
3.	Ability to select appropriate fermentation modes based on process requirements and operational constraints.
4.	Insight into how different fermentation conditions affect microbial growth, product yield, and process efficiency.
5.	Knowledge of fermenter design principles, material selection, and the ability to evaluate the suitability of different fermenter types for specific applications.

6.	Proficiency in managing fermentation conditions through control systems, ensuring optimal process performance and product quality.

Course Objective	
1.	To familiarize with the history and evolution of fermentation
2.	To examine the diverse array of microorganisms utilized in fermentation processes & biochemical reactions
3.	To examine the diverse array of biochemical reactions in fermentation processes
4.	Gain insight into the operational intricacies of fermentation
5.	Gain insights into fermenter design principles
6.	Gain insights into fermenter control system

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**History of Fermentation**		03	15
1	1.1	Fermentation – discovery		
	1.2	Timeline of historical developments		
	1.3	Microorganisms used in fermentation process.		
Module II	**Biochemistry of fermentation**		08	15
2	2.1	Aerobic fermentation		
	2.2	Anaerobic fermentation		
	2.3	Chemical reactions		
	2.4	Microorganisms		
	2.5	Bioenergetics		

Module III	**Types of fermentation – Operation mode**		06	20
3	3.1	Types of fermentation process		
	3.2	Batch, Fed batch and continuous fermentation		
	3.3	Characteristics, advantages, disadvantages & examples of each		
Module IV	**Types of fermentation - conditions**		09	20
4	4.1	Types of fermentation process		
	4.2	Surface, Submerged, Solid state fermentation		
	4.3	Characteristics, advantages, disadvantages & examples of each.		
Module V	**Fermenter design & types**		09	15
5	5.1	Basic configuration of fermenter		
	5.2	Compressor, Sparger, Impeller, Baffles, Stirrer glands		
	5.4	Fermenter design – construction material, durability, shelf life		
	5.5	Fermenter types		
Module VI	**Control systems in fermentation**		10	15
6	6.1	Design of fermentation control systems		
	6.2	Sensors and controllers		
	6.3	Control of temperature, pH, oxygen		
	6.4	Control of incubation, aeration, agitation;		
	6.5	Offline/online measurements		
Total			**45**	**100%**

References:

1.	Biotreatment, Downstream Processing and Modelling (Vol 56), T. Schepler et al, Springer Verlag
2.	Protein Purification, MR Ladisch, RC Wilson, CC Painton, SE Builder, American Chemical Society
3.	Principles of Fermentation Technology by P.F. Stanbury, A. Whitaker, and S.J. Hall, Aditya Books (P) LTD
4.	Industrial Microbiology by L.E.Casida, JR.New Age International (P) LTD
5.	Biotechnology, A Textbook of Industrial Microbiology, W. Crueger and A. Crueger, Sinauer Association.
6.	Bioseparations: Downstream Processing for Biotechnology, P.A. Belter et al, John Wiley & Sons Inc.
7.	Downstream Processing, J.P. Hamel, J.B. Hunter and S.K. Sikdar, American Chemical Society.

Semester - III

Course Code	Course Name	Credits
LAD2308N	LAB COURSE ON ADVANCED DIAGNOSTIC TECHNIQUES	01

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
-	2	-	-	1	-	01

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	4 Hours	-	-	-	100

Course Outcome	
1.	Accurately enumerate red blood cells using a hemocytometer.
2.	Estimate hemoglobin levels using Sahli's Hemoglobinometer.
3.	Perform total and differential white blood cell counts.
4.	Measure blood glucose levels using glucose biosensors.
5.	Conduct lateral flow immunoassays to estimate hCG hormone levels.
6.	Understand and apply advanced diagnostic techniques like real-time PCR and ELISA for detecting infectious diseases, including HBV.

Course Objective	
1.	Teach students how to enumerate red blood cells using a hemocytometer.

2.	Equip students with the skills to estimate hemoglobin levels using Sahli's Hemoglobinometer
3.	Provide training on enumerating total and differential white blood cell counts
4.	Demonstrate the estimation of blood glucose levels using glucose biosensors.
5.	Introduce students to lateral flow immunoassays, specifically for estimating hCG hormone levels.
6.	Familiarize students with advanced diagnostic techniques like real-time PCR and ELISA for detecting infectious diseases and HBV (demonstrations)

Detailed syllabus

Module/ Unit	**Course Module / Contents**	**Hours**	**Marks Weightage** (%)
List of practical		26	100 %
1.	Enumeration of red blood cells using a hemocytometer.		
2.	Estimation of hemoglobin using Sahli's Hemoglobinometer.		
3.	Enumeration of total and differential count of white blood cells.		
4.	Estimation of blood glucose by glucose biosensors.		
5.	Lateral flow immunoassay – Estimation on hCG hormone		
6.	Real-time PCR – Diagnosis of infectious diseases- (Demo)		
7.	ELISA- Detection of HBV (Demo)		
Total		**26**	**100%**

References:	
1.	Barrett, K. E., Barman, S. M., Boitano, S., & Brooks, H. L. (2010). *Ganong's review of medical physiology*. McGraw-Hill Companies, Inc..

2.	Shier, D., Butler, J., & Lewis, R. (2003). *Hole's essentials of human anatomy and physiology*. McGraw-Hill.

Semester - III

Course Code	Course Name	Credits
LAM2309N	LAB COURSE ON AGRICULTURAL MICROBIOLOGY	01

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
-	2	-	-	1	-	01

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	4Hours	-	-	-	100

Course Outcome	
1.	Demonstrate proficiency in performing key laboratory techniques in agricultural microbiology, including the isolation, cultivation, and identification of soil and plant-associated microorganisms.
2.	Analyze soil and plant samples to determine the presence and activity of beneficial and harmful microorganisms and understand their impact on agricultural productivity.
3.	Apply laboratory skills to develop and evaluate microbial products such as biofertilizers, biopesticides, and microbial inoculants for enhancing crop yield and soil health.

4.	Design and conduct experiments to investigate microbial processes and their applications in agriculture and analyze the results using appropriate scientific methods.
5.	Identify microbial pathogens in agricultural systems and implement biological control strategies to manage plant and animal diseases effectively.
6.	Present experimental results clearly and accurately in both written reports and oral presentations, demonstrating the ability to communicate scientific findings to a broader audience.

Course Objective	
1.	To provide students with practical, hands-on experience in the fundamental laboratory techniques used in agricultural microbiology, such as microbial isolation, cultivation, and identification.
2.	To help students understand the role and significance of microorganisms in soil and plant health by conducting experiments related to microbial ecology and interactions.
3.	To teach students how to apply microbial methods in real-world agricultural contexts, such as developing biofertilizers, biopesticides, and other microbial-based products.
4.	To instruct students on designing, conducting, and analyzing experiments related to agricultural microbiology, including data collection, interpretation, and reporting.
5.	To equip students with the skills to identify and manage plant and animal diseases caused by microorganisms through biological control and other microbiological methods.
6.	To promote teamwork and communication skills through collaborative lab work and the presentation of experimental findings.

Detailed syllabus

Module/ Unit	Course Module / Contents	Hours	Marks Weightage (%)
List of practical			
1.	Isolation and enumeration of microbes from soil		
2.	Demonstration of different steps in nitrogen cycle		
3.	Isolation of symbiotic and non-symbiotic nitrogen fixing bacteria		
4.	Isolation and characterization of PGPR		
5.	Isolation of plant pathogenic bacteria and fungi from diseased plants		
6.	Study on important bio-control agents		
Total		**26**	**100%**

References:	
1.	Dube, H. C. (2018). *A Textbook of Fungi, Bacteria and Viruses* (5th ed.). Scientific Publishers.
2.	Rangaswamy, G., & Bagyaraj, D. J. (2019). *Agricultural Microbiology* (3rd ed.). PHI Learning Pvt. Ltd.
3.	Atlas, R. M., & Bartha, R. (1997). *Microbial Ecology: Fundamentals and Applications* (4th ed.). Benjamin Cummings.
4.	Subba Rao, N. S. (1999). *Soil Microbiology* (4th ed.). Science Publishers.
5.	Glick, B. R., & Pasternak, J. J. (2003). *Molecular Biotechnology: Principles and Applications of Recombinant DNA* (3rd ed.). ASM Press.
6.	Sylvia, D. M., Fuhrmann, J. J., Hartel, P. G., & Zuberer, D. A. (2005). *Principles and Applications of Soil Microbiology* (2nd ed.). Pearson Prentice Hall.

Semester - III

Course Code	Course Name	Credits
LCF2310N	LAB COURSE ON FERMENTATION TECHNOLOGY	01

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
-	2	-	-	1	-	01

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	4 Hours	-	-	-	100

Course Outcome	
1.	Ability to optimize growth conditions to maximize microorganism productivity.
2.	Competence in media preparation and optimization for various fermentation processes.
3.	Knowledge of different fermentation techniques and their applications.
4.	Practical experience in fermentation and product recovery.
5.	Data analysis skills and ability to assess the efficiency of fermentation processes.
6.	Understanding of commercial aspects and scalability of fermentation products.

Course Objective

1.	To equip students with knowledge about optimizing key growth parameters for industrially important microorganisms
2.	To enable students to formulate and optimize fermentation media for the efficient growth of microorganisms and the production of desired metabolites.
3.	To provide students with an understanding of different fermentation conditions and their effects on product formation.
4.	To allow students to perform laboratory-scale fermentation experiments, using various substrates to produce commercially important fermented products.
5.	To develop students' ability to analyze and compare the efficiency of product formation under different fermentation conditions and media compositions.
6.	To assess the commercial potential and scalability of fermented products produced in the lab, including considerations of yield, quality, and economic factors.

Detailed syllabus

Module/ Unit	**Course Module / Contents**	**Hours**	**Marks Weightage (%)**
List of practical			
1.	Optimization of growth characteristics of industrially important microorganisms with respect to optimum pH		
2.	Optimization of growth characteristics of industrially important microorganisms with optimal temperature		
3.	Optimization of growth characteristics of industrially important microorganisms with respect to optimum carbon source		
4.	Preparation of optimized fermentation media		
5.	Study the product formation under surface, submerged or solid-state fermentation condition		
6.	Lab production of a fermented product of commercial importance using different substrates		

Total	26	100%

References:	
1.	Fermentation and Biochemical Engineering Handbook: Principles, Process, and Products. H. J. Rehm and G. Reed. 2nd Edition (2009) Artech House
2.	Laboratory Techniques in Biochemistry and Molecular Biology. J. H. Wilson and L. M. Walker. 1st Edition (2010) Elsevier
3.	Fermentation Microbiology and Biotechnology. P. Rehm and G. Reed. 2nd Edition (2015) CRC Press
4.	Principles of Fermentation Technology. Peter F. Stanbury, Allan Whitaker, and Stephen J. Hall. 3rd Edition (2016) Elsevier
5.	Bioprocessing Technology: Methods and Protocols. R. Michael. 1st Edition (2013) Humana Press
6.	Microbiological Applications: Laboratory Manual in General Microbiology. Charles E. C. and Ronald M. Atlas. 10th Edition (2012) McGraw-Hill Education
7.	Practical Handbook of Microbiology. Michael A. W. and Lisa A. G. and K. J. B. Michael. 3rd Edition (2021) CRC Press

Semester - III

Course Code	Course Name	Credits
FLF2311N	FRENCH-III	2

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
02	-	-	02	-	-	02

Theory						Term Work / Practical/Oral			Total
Internal Assessment					End Sem Exam	Duration Of End Sem Exam	Term Work	Pract.	Oral	
Mid Term	Viva	Continuous Evaluation	Attendance	Total Internal						
15	20	10	05	50	50	75 mins	-	-	-	100

Course Objectives

The course is designed:

1. To engage the students to continue to refine pronunciation, focusing on more subtle aspects of accent and intonation.
2. To describe the placements of the objects etc.
3. To talk about recent experiences or of recent plans.
4. To understand biographical information.
5. To master complex grammatical structures, including the subjunctive mood, advanced tenses, and nuanced sentence structures.

Course Outcomes

After the completion of this course Students will be able to:

1. Get in depth Knowledge of accents and French phonetics.
2. Write about placements of objects.
3. Talk about recent experiences or of recent plans.
4. Understand the important geographic locations and culture of France.
5. Gain mastery over complex grammatical structures, including the subjunctive mood, advanced verb tenses, and intricate sentence formations.

Detailed Curriculum

Reading exercises, writing tasks and grammar of:

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage**
	Module I		7	50
1	Leçon 1	Une journée sur Terre		
	Leçon 2	Une journée « écolo »		
	Leçon 3	Une journée avec…		
	Leçon 4	Une journée en Pologne		
2	**Module II**		6	20
	Leçon 1	Sortir « à la française »		
	Leçon 2	Soyez les bienvenus !		
	Leçon 3	Apprendre autrement		
	Module III		6	30
3	Leçon 1	Jeunes talents		
	Leçon 2	Écrivains francophones		
	Leçon 3	Un livre, un jour		
	Module IV		5	30
4	Leçon 1	Il a choisi la France		
	Leçon 2	Informons-nous		
	Total		**26**	**100%**

References :
1. Berthet, Hugot et al. Alter Ego - Méthode de Français, A1: Hachette,2012.
2. Bruno Girardeau et Nelly Mous. Réussir le DELF A1. Paris : Didier, 2011.
3. Loiseau Y.,Mérieux R. Connexions 1, cahier d'exercices. Didier, Paris, 2017.
4. Loiseau Y. & Mérieux R. Connexions 1, Guide pédagogique. Didier, Paris, 2017.
5. Connexions 1, livre de l'élève – Loiseau Y. & Mérieux R., éd. Didier, Paris,2017.
6. Latitudes 1, cahier d'exercices – Loiseau Y. & Mérieux R., éd. Didier, Paris,2018.
7. Latitudes 1, Guide pédagogique – Loiseau Y. & Mérieux R., éd. Didier, Paris,2018.
8. Latitudes 1, Guide pédagogique téléchargeable – Loiseau Y. & Mérieux R., éd. Didier,2018.
9. Latitudes 1, livre d'élève + CD – Loiseau Y. & Mérieux R., éd. Didier, Paris,2018.
10. Nathalie Hirschsprung, Tony Tricot, Cosmopolite 1 Méthode de Français A1. Hachette, 2017.
11. Nathalie Hirschsprung, Tony Tricot. Cosmopolite 1 Cahier d'activités A1. Hachette, 2017.

Semester – III

Course Code	Course Name	Credits
FLG2311N	GERMAN-III	2

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
2	-	-	2	-	-	2

Theory							Term Work / Practical/Oral			Total
Internal Assessment					End Sem Exam	Duration Of End Sem Exam	Term Work	Pract.	Oral	
Mid Term	Continuous Evaluation	Attendance	Oral	Total Internal						
15	**10**	**05**	**20**	**50**	**50**	75 mins	-	-	-	100

Course Objectives

The course is desinged :

1. To listen and comprehend.
2. To understand and respond to audio texts, telephonic messages, and announcements.
3. To listen and speak.
4. To have proficiency in pronunciation.
5. To communicate in routine situations where exchange of basic information is required.

Course Outcomes

After completion of this course students will be able to:

1. Listen and comprehend.

2. Understand and respond to audio texts, telephonic messages, and announcements.
3. Listen and speak.
4. Have proficiency in pronunciation.
5. Communicate in routine situations where exchange of basic information is required.

Detailed Curriculam

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage**
	Kapitel 7			
1	**Grammatischer Aspekt**	- Präpositionen mit Dativ, z.B. aus, bei - Artikelwörter: bestimmt, unbestimmt, negativ im Nom., Akku., Dativ - Possessivartikel im Dativ	**06**	**25**
	Kapitel 7			
2	**Thematischer Aspekt**	- Termine absprechen - Anleitungen verstehen und geben - Briefe verstehen und beantworten - über Sprachenlernen sprechen - Informationen in Texten finden	**07**	**25**
	Kapitel 8			
3	**Grammatischer Aspekt**	- Adjektiv mit sein Thema:Wohnungsbeschreibung - Adjektiv sehr, zu - Wohin: in+Akku. - Wo: in+Dativ - Wechselpräpositionen z.B. über, auf, unter, vor	**06**	**25**
	Kapitel 8			

4	**Thematischer Aspekt**	- Wohnungsanzeigen verstehen - eine Wohnung beschreiben - die Wohnungseinrichtung planen - eine Einladung schriftlich beantworten - über eine Wohnungseinrichtung sprechen - einen Text über eine Wohnung schreiben	**07**	**25**
Total			**26**	**100%**

References:

1. Aufderstraße, Hartmut. *Lagune 1. Deutsch als Fremdsprache: Kursbuch und Arbeitsbuch*. Ismaning: Max Hueber Verlag 2012.
2. Braun, Anna, and Daniela Wimmer. *Schritte Plus A1/1: Arbeitsbuch*. Hueber Verlag, 2020.
3. Dengler, Stefanie. *Netzwerk A1. Teil2. Kurs- Und Arbeitsbuch: Deutsch Als Fremdsprache*. Langenscheidt, 2012.
4. Funk, Hermann, et al. *studio d A1: Deutsch als Fremdsprache*. Cornelsen Verlag, 2015.
5. Langenscheidt. *Langenscheidt Pocket Dictionary German: German-English, English-German*. Langenscheidt Publishing Group, 2022.
6. Niebisch, Daniela, et al. *Lagune A1: Kursbuch*. Hueber Verlag, 2016.

Semester – III

Course Code	Course Name	Credits
FLS2311N	SPANISH III	2

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
2	-	-	2	-	-	2

Theory							Term Work / Practical/Oral			Total
Internal Assessment					End Sem Exam	Duration Of End Sem Exam	Term Work	Pract.	Oral	
Mid Term	Continuous Evaluation	Attendance	Oral	Total Internal						
15	**10**	**05**	**20**	**50**	**50**	75 mins	-	-	-	100

Course Objectives

The course is designed:

1. To enable the students to talk and discuss about their routine and/or daily routine of others effectively and express the frequency.
2. To enable the students to understand time.
3. To enable the student to understand the geography of Spanish speaking countries along with local cuisines and food.
4. To teach the students how to write an informal E-mail.
5. To teach how to conjugate irregular verbs and incorporate them in day-to-day life.

Course Outcomes

After completion of this course, students will be able:

1. To speak and write about his/her daily routine and will be able to describe the daily routine of others and express the frequency.
2. To effectively understand time, tell time and ask questions using time.

3. To understand and explain the geographical structure such as area, population etc. of Spanish speaking countries along with food and local cuisines.
4. To effectively write an informal E-mail.
5. To conjugate irregular verbs and use them in their day-to-day life.

Detailed Curriculum

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
	¿Tus amigos son mis amigos?		3	20
1	1.1	La geografía de España		
	1.2	Los verbos en presente de indicativo		
	¿Dónde está mi reloj?		7	30
2	2.1	La hora en español		
	2.2	El verbo Tener en la forma TENER QUE + Infinitivo		
	¿Sabes estos verbos?		6	20
3	3.1	Los verbos irregulares		
	¿Día a día		10	30
4	4.1	Los verbos reflexivos		
	4.2	La frecuencia para la rutina diaria		
	4.3	Hablar de la rutina diaria		
Total			**26**	**100**

References:

1. Espinosa, Nat. *100 Reflexive Verbs In Spanish That You Need To Know*. Independently Published, 2022.
2. Floréz, Raphaela. *Verbos Irregulares (Español)*. 2023.
3. Gordon, Ronni, and David Stillman. *The Big Red Book of Spanish Verbs, Second Edition*. McGraw-Hill, 2008.

4. Palencia, Ramon, and Luis Aragones. *McGraw-Hill Education Intermediate Spanish Grammar*. McGraw-Hill Education, 2014.
5. Powell. *Autodisciplina*. Create Your Reality, 2019.
6. Reid, Stephanie. *La hora (Time) (Early Childhood Themes) (Spanish Edition)*. 2013.
7. Richmond, Dorothy. *Practice Makes Perfect: Spanish Pronouns and Prepositions, Premium Fourth Edition*. McGraw-Hill Education, 2020.
8. Saavedra, Eduardo. *La Geografía de España del Idrisi (Classic Reprint)*. Forgotten Books, 2017.
9. Tormo, Alejandro Bech, Francisco Del Moral Manzanares, et al. *El Cronómetro en clase*. 2020.
10. Tormo, Alejandro Bech. *Cronometro. Nivel B1. Con espansione online. Con CD. Per le Scuole superiori (El)*. Edinumen Editorial, 2013.

Semester – III

Course Code	Course Name	Credits
CSE2312N	READING AND COMPREHENSION	1

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
01	-	-	01	-	-	01

Internal				External		Total
Mid- Sem Exam	**Continuous Evaluation**	**Attendance**	**Total Internal**	**End Sem Exam**	**Duration Of End Sem Exam**	
15	**30**	**05**	**50**	**50**	**2 Hours**	**100**

Course Objectives

The course is designed:

1. To discuss the techniques of reading and comprehension
2. To illustrate the methods of reading technical and non-technical texts
3. To enhance the knowledge of graphic, mind maps and pyramids
4. To guide about ways of gathering information and processing it through effective reading strategies
5. To teach how to do review writing after effectively applying appropriate reading methods.

Course Outcomes

After completion of this course Students will be able to:

1. Attain and enhance competence in reading and comprehension skills and develop reading skills, speed and keen interest in reading different genres.

2. Read university text, manuals, technical contents and expand their vocabulary.
3. Produce best reviews after analytical and critical reading.
4. Employ various reading techniques and strategies to gain maximum output from reading.
5. Understand the nuances of reading as a skill.

Detailed Curriculum

Module/ Unit	Course Module / Contents		Hours	Marks Weightage
	Effective Reading		04	31
1	1.1	What is reading comprehension? Process of reading, Types of reading: (Academic reading, Professional reading, Literary reading, Technical reading & Critical reading) Strategies and Techniques of reading: (Skimming, Scanning, Intensive, Extensive, Loud & Silent reading, SQ3R etc.) Reading speed & Tips for improving reading skills		
	1.2	Strategies for Reading Comprehension		
	1.3	Note taking and Note Making,		
	Technical Language Development		04	31
2	2.1	Reading Manuals: What is technical language? Characteristics of technical texts User guide – manuals: (Lab reports, Brochures, Proposals, Technical specifications & descriptions) Instructions & warnings etc.		
	2.2	Difference between Literary and Technical reading		
3	**Summarization**		03	23

	3.1	Summarization of reading passages, reports, chapters, books & selected passages from competitive examinations.		
	3.2	Graphic organizers for summaries: Mind maps, flow charts, tree diagrams, pyramids		
4	**Activities**		02	15
	4.1	News reading, Picture reading,		
	4.2	Review of a book/journal, Paraphrasing		
Total			**13**	**100**

References:

1. Fitikides, T. J. *Common Mistakes in English*. London: Orient Longman, 1984.
2. Hasson, Gill. *Brilliant Communication Skills*. Great Britain: Pearson Education, 2012.
3. Krishnaswamy N & T Sriraman. *Creative English for Communication*, Macmillan India Limited, 2000
4. Lesikar, Raymond V and Marie E. Flatley. *Basic Business Communication: Skills for Empowering the Internet Generation*: Ninth Edition. New Delhi: Tata McGraw-Hill, 2002.
5. Mascull, Bill. *Business Vocabulary in Use Advanced*, Cambridge University Press, 2004
6. Raman, Meenakshi & Singh, Prakash. *Business Communication*, Oxford University Press, 2006.
7. Neuliep, James W. *Intercultural Communication: A Contextual Approach*. Boston: Houghton Mifflin Co., 2003.
8. Rizvi, Ashraf M. *Effective Technical Communication*, McGraw Hill Education, 2017.
9. Sethi, Anjanee & Adhikari, Bhavana. *Business Communication*, Tata McGraw Hill, 2009.
10. Varinder Kumar & Bodh Raj, *Comprehension and Communication Skills in English*, Kalyani Publishers, 2022.

Semester – III

Course Code	Course Name	Credits
BEH2313N	BEHAVIORAL SCIENCE-III (GROUP DYNAMICS AND TEAM BUILDING)	1

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
01			01			01

Theory							Total
Internal Assessment					End Sem Exam	Duration of End Sem Exam	
Activity	**Assignment**	**Viva**	**Attendance**	**Total Internal**			
20	40	35	05	100	00	-	100

Course Outcome	
1.	Enhanced communication and understanding among team members
2.	Increased trust and respect within the team.
3.	Improved collaboration and problem-solving abilities.
4.	Greater appreciation for diversity and different perspectives.
5.	Clearer roles, responsibilities, and accountability.
6.	Stronger team unity and alignment towards common goals.

Course Objective	
1.	To Foster open communication and active listening among team members.
2.	To Build trust and mutual respect within the group.
3.	To Encourage collaboration and shared decision-making.
4.	To Promote diversity and inclusion within the team.
5.	To Develop clear roles and responsibilities for each member.
6.	To Strengthen team cohesion through shared goals and experiences.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Group formation**		02	20
1	1.1	Definition and Characteristics of group		
	1.2	Importance of groups formation		
	1.3	Classification and stages of groups formation		
	1.4	Benefits of group formation		
Module II	**Teams**		02	20
2	2.1	Meaning and nature of teams		
	2.2	External and internal factors affecting team.		
	2.3	Building Effective Teams		
	2.4	Consensus Building and Collaboration		
Module III	**Group Functions**		02	20
3	3.1	External Conditions affecting group functioning: Authority, Structure, Org. Resources, Organizational policies etc.		

	3.2	Internal conditions affecting group functioning: Roles, Norms, Conformity, Status, Cohesiveness, Size, Inter group conflict.		
	3.3	Group Cohesiveness and Group Conflict		
	3.4	Adjustment in Groups		
Module IV	**Leadership**		02	20
4	4.1	Meaning, Nature, and Functions		
	4.2	Self-leadership		
	4.3	Leadership styles in organization		
	4.4	Leadership in Teams		
Module V		**Power to empower: Individual and Teams**	02	20
5	5.1	Meaning, Nature, and Types of Power and Empower		
	5.2	Identify the sources and uses of Power		
	5.3	Relevance in organization and Society		
	5.4	Feeling power and powerlessness		
Total			**10**	**100%**

References:

1. Forsyth, D. R. (2018). Group Dynamics. Wadsworth, Cengage Learning.
2. Robbins, S. P., & Judge, T. A. (2019). Organizational Behavior (18th ed.). Pearson.
3. Kouzes, J. M., & Posner, B. Z. (2017). The Leadership Challenge: How to Make Extraordinary Things Happen in Organizations (6th ed.). Jossey-Bass.
4. Pfeffer, J. (2010). Power: Why Some People Have It—and Others Don't. Harper Business.
5. Lencioni, P. (2002). The Five Dysfunctions of a Team: A Leadership Fable. Jossey-Bass.

6.	Hackman, J. R., & Wageman, R. (2005). A theory of team coaching. Academy of Management Review, 30(2), 269-287.

Semester - III

Course Code	Course Name	Credits
IBI2315N	Insights of Biotechnology Industry-I	03

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Identify and describe the transformative technologies driving the Biotechnology Industry Revolution 6.0.
2.	Demonstrate the application of biological system engineering techniques in medical and industrial contexts, with proficiency in integrating omics technologies.
3.	Utilize genomic approaches to devise strategies for disease prevention, diagnosis, and treatment, and apply advancements in regenerative medicine.
4.	Apply biotechnological methods to enhance crop improvement, livestock breeding, and sustainable agriculture practices.

5.	Assess and implement advanced biofuel production technologies and develop biomaterials for use in biomedical and industrial applications.
6.	Evaluate and address ethical considerations related to gene editing and other biotechnological advancements and analyse regulatory frameworks at both national and international levels.

Course Objective	
1.	Gain a comprehensive overview of transformative technologies driving Biotechnology Industry Revolution 6.0.
2.	Examine the engineering of biological systems for medical and industrial applications, with a focus on integrating omics technologies.
3.	Analyse genomic approaches for disease prevention, diagnosis, and treatment, alongside advancements in regenerative.
4.	Investigate biotechnological approaches to genetic modification in crop improvement and livestock breeding, sustainable agriculture practices.
5.	Evaluate advanced biofuel production technologies for sustainable energy solutions, the development and application of biomaterials in biomedical and industrial sectors.
6.	Critically examine ethical considerations surrounding gene editing and other biotechnological advancements, analyse regulatory frameworks at national and international levels.

Detailed syllabus

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage (%)**
Module I	**Industry Revolution 6.0 in Biotechnology**		7	15
1	1.1	Historical overview of the biotechnology industry.		

	1.2	Biotechnology Industry Revolution 6.0, its characteristics, and distinguishing features.		
	1.3	Overview of transformative technologies shaping Biotechnology Industry Revolution 6.0.		
Module II	**Synthetic biology advancements**			
2	2.1	Overview of omics technologies: Genomics, proteomics, and metabolomics in biotechnological research.	7	15
	2.2	Bioinformatics: Data analysis and computational approaches in biotechnological research		
	2.3	Applications of engineered biological systems for applications in medicine and industry.		
Module III	**Biotechnology in Healthcare**			
3	3.1	Genomic and proteomic approaches for diagnosis, and treatment.	8	18
	3.2	Regenerative medicine: Stem cell therapies and tissue engineering.		
	3.3	3D bioprinting; and drug delivery systems.		
Module IV	**Biotechnology in Food security, Agriculture, and Environment**			
4	4.1	Genetic modification.	7	15
	4.2	Biotechnological approaches to crop improvement.		
	4.3	Biotechnological approaches to livestock breeding.		
	4.4	Sustainable agriculture practices: Biofertilizers.		

	4.5	Biopesticides, and integrated pest management.		
	4.6	Bioremediation: Applications of biotechnology in environmental cleanup and pollution control.		
Module V	**Quality control in Biotechnology Industries**		9	22
5	5.1	Understanding the concepts of Quality.		
	5.2	Quality management System, Quality Assurance, Quality Control.		
	5.3	Responsibilities of QA and QC department.		
	5.4	GLP, cGMP, ISO and BIS, ICH - Scope, concept and definitions.		
Module VI	**Ethical, Legal, and Social Issues in Biotechnology**		7	15
6	6.1	Ethical considerations in gene editing and biotechnological advancements.		
	6.2	Regulatory frameworks: National and international policies governing biotechnological innovations public perception and engagement.		
	6.3	Communicating biotechnological advancements to diverse stakeholders.		
Total			**45**	**100%**

References:

1. Doudna, J. A., & Charpentier, E. (2014). The new frontier of genome engineering with CRISPR-Cas9. SCIENCE, 346(6213), 1258096. https://doi.org/10.1126/science.1258096
2. Wang, B., & Kitney, R. I. (2014). Synthetic biology: A key enabling technology for the next generation of chemical and energy production. CHEMICAL SOCIETY REVIEWS, 43(20), 6894-6902. https://doi.org/10.1039/C4CS00147F

3.	Collins, F. S., & Varmus, H. (2015). A new initiative on precision medicine. NEW ENGLAND JOURNAL OF MEDICINE, 372(9), 793-795. https://doi.org/10.1056/NEJMp1500523
4.	Langer, R., & Vacanti, J. P. (1993). Tissue engineering. SCIENCE, 260(5110), 920-926. https://doi.org/10.1126/science.8493529
5.	Glick, B. R., & Pasternak, J. J. (2019). MOLECULAR BIOTECHNOLOGY: PRINCIPLES AND APPLICATIONS OF RECOMBINANT DNA (5th ed.). ASM Press.
6.	Regenberg, A. C., Hutchinson, J. W., & Nelson, K. E. (2009). Ethics and policy issues for biotechnology: The views of companies in the yeast industry. NATURE BIOTECHNOLOGY, 27(10), 900-902. https://doi.org/10.1038/nbt1009-900

Semester – III

Course Code	Course Name	Credits
ANM2317N	ANIMATION II (ADVANCED ANIMATION TECHNIQUES)	02

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
01	02	-	01	02	-	02

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam Practical /Project Presentation	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
35	10	05	50	50	02 Hours	-	02	-	100

Course Outcome	
1.	Advanced Animation Skills: Students will develop advanced skills in character animation, including character posing, movement, and expression, applying the 12 principles of animation effectively.
2.	Technical Proficiency: Students will gain proficiency in advanced rigging techniques, character setup for complex movements, and the use of advanced features in animation software.

3.	Visual Storytelling: Students will understand narrative structure in animation, create storyboards and animatics, and apply visual language and symbolism to enhance storytelling in their animations.
4.	Application of Innovative Methods: Students will apply cutting-edge animation techniques to create professional-quality projects.

Course Objective	
1.	Enhanced Animation Skills: Develop advanced skills in character animation, including character posing, movement, and expression, applying the 12 principles of animation effectively.
2.	Technical Proficiency: Gain proficiency in advanced rigging techniques, character setup for complex movements, and the use of advanced features in animation software.
3.	Creative Storytelling: Understand narrative structure in animation, create storyboards and animatics, and apply visual language and symbolism to enhance storytelling in animations.
4.	Professional Portfolio Development: Create a professional animation portfolio that showcases advanced skills, creativity, and understanding of industry practices, preparing for careers in animation.

Detailed syllabus

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage** (%)
Module I	**Foundations of Animation**		**06**	**20%**
01	1.1	Principles of Animation: Explore and apply the 12 principles of animation to create believable and dynamic motion.		

	1.2	Storyboarding Techniques: Learn to develop and present visual stories through storyboards, focusing on composition and narrative flow.		
	1.3	Character Design Basics: Understand the fundamentals of character design, including silhouette, shape language, and visual appeal.		
	1.4	Introduction to 3D Animation: Gain a basic understanding of 3D animation software and its interface, focusing on keyframe animation.		
Module II	**Intermediate Animation Techniques**			
02	2.1	Character Rigging and Weighting: Learn advanced rigging techniques to create flexible and realistic character movements.	**06**	**20%**
	2.2	Advanced Keyframe Animation: Refine keyframe animation skills, focusing on timing, spacing, and character performance.		
	2.3	Lip Sync and Facial Animation: Explore techniques for syncing character dialogue with lip movements and expressive facial animations.		
	2.4	Camera and Cinematography: Understand the principles of camera movement and shot composition to enhance storytelling and visual interest.		
Module III	**Specialized Animation Skills**		**06**	**30%**

03	3.1	Creature Animation: Study the principles of creature animation, focusing on animalistic movement and behaviour.		
	3.2	Physics-based Animation: Learn to create realistic animations using physics simulations for objects like cloth, hair, and fluid.		
	3.3	Character Animation for Games: Explore the unique challenges and techniques involved in creating animations for interactive game environments.		
	3.4	Advanced Techniques and Styles: Exploration of niche animation styles and techniques, such as motion capture, effects animation, or advanced 3D modeling.		
Module IV	**Advanced Character Animation and Dynamics**		**08**	**30%**
04	4.1	Complex Character Rigging: Advanced rigging techniques for creating detailed and flexible character rigs. Setup of facial rigs and body deformations for realistic movement.		
	4.2	Dynamic Motion and Simulation: Implementation of physics-based simulations for natural movement, including cloth and hair simulations. Techniques for simulating natural forces and interactions.		
	4.3	Dynamic Motion: Physics-based simulations for natural movement.		
	4.4	Complex Rigging: Advanced character rigging and facial deformation		

Total	**26**	**100%**

References:	
1.	Williams, R. (2012). THE ANIMATOR'S SURVIVAL KIT. Faber & Faber.
2.	Hooks, E. (2017). ACTING FOR ANIMATORS: 4TH EDITION. Routledge.
3.	Maestri, G. (2006). DIGITAL CHARACTER ANIMATION 3. New Riders.
4.	Kerlow, I. V. (2017). THE ART OF 3D COMPUTER ANIMATION AND EFFECTS (4th ed.). Wiley.
5.	Roberts, S. (2007). ADVANCED ANIMATION: AN ILLUSTRATED APPROACH. Focal Press.
6.	Osipa, J. (2013). STOP STARING: FACIAL MODELING AND ANIMATION DONE RIGHT (3rd ed.). Wiley

Semester - III

Course Code	Course Name	Credits
PHT2317N	PHOTOGRAPHY-II (CAMERA DESIGN & TYPES OF LENSES)	02

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
01	02	-	01	02	-	02

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam- End Semester Practical/Project/ presentation	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
35	10	05	50	50	02 Hours	-	-	-	100

Course Outcome	
1.	Students will know Camera modes
2.	Student will know about lenses
3.	Students will know about different cameras & lenses
4.	Field visit Studios or art gallery, Outdoor Photography Practice.

Course Objective

1.	Students will gain a basic knowledge of camera parts.
2.	Gain knowledge about controlling light to get desired Results.
3.	Technicalities to take photographs during nighttime & Day Time
4.	The aim of the course is to train the mind in how to see the world through a camera.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Camera and its Parts**		06	20
1	1.1	Introduction to Camera parts & Different Modes of Camera Dial		
	1.2	Shutter speed		
	1.3	Aperture, ISO		
	1.4	Exposure		
Module II	**Different types of cameras**		06	20
2	2.1	Pinhole camera		
	2.2	Compact camera		
	2.3	Mirrorless		
	2.4	SLR & DSLR		
Module III	**Different types of Lenses**		06	30
3	3.1	Wide Angle		
	3.2	Tele-photo lens		
	3.3	Macro Lens		
	3.4	Prime Lens		

Module IV	**Assignment: Use of Mirror Less cameras & Large Format Cameras, Sensor Size**		08	30
4	4.1	Mirror less cameras		
	4.2	DSLR Crop Sensor		
	4.3	Full Frame Sensor		
	4.4	Large Format Cameras		
Total			26	**100%**

References:	
1.	Prescribed Textbooks: Mastering Shutter Speed By Al Judge
2	Reference Material: The Photography Journal
3	Name and Publication: Melanie Pullen
4	Horenstein, H. (2012). Digital Photography: A Basic Manual. Little, Brown and Company.
5	Shore, S. (2007). The nature of photographs. Aperture.
6	Birnbaum, B. (2010). The art of photography: A personal approach to artistic expression. Rocky Nook.

Semester – III

Course Code	Course Name	Credits
POL2317N	POLITICAL SCIENCE- II- (FUNDAMENTALS OF INDIA'S FOREIGN POLICY)	02

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
13	-	13	01	-	01	02

Internal Assessment				End Semester Evaluation	Total
Mid Term	Continuous Evaluation	Attendance	Total	End Semester Evaluation/ Project/ Report/ Presentation	Internal Assessment + End Semester Evaluation
15	30	5	50	50	100

Course outcome

1. Recall the historical events and milestones that have shaped India's foreign policy.
2. Explain the underlying principles and ideologies guiding India's foreign policy decisions.
3. Apply theoretical frameworks to analyse contemporary challenges and opportunities in India's foreign relations.
4. Compare and contrast India's foreign policy approaches with those of other major powers, such as China and the United States.
5. Critically assess the successes and failures of India's foreign policy initiatives in promoting national interests and global stability.
6. Develop policy recommendations to enhance India's role in regional and global governance structures.

Course Objectives

1. To comprehend the historical evolution and underlying principles of India's foreign policy.
2. To analyze contemporary challenges and opportunities in India's foreign relations.
3. To evaluate the effectiveness and impact of India's diplomatic strategies

Detailed Syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage
	Determinants of India's Foreign Policy		5	20
1	1.1	Domestic sources of India's Foreign Policy		
	1.2	International sources of India's Foreign Policy		
	Objectives and Principles of India's Foreign Policy		**6**	20
2	2.1	Objectives of India's Foreign Policy		
	2.2	Principles of India's Foreign Policy		
	Non-Alignment in Indian Foreign Policy		7	30
3	3.1	Conceptual Framework & Principles of Non-Alignment Policy		
	3.2	Relevance of Non-Alignment Policy		
	India & the World		8	30
4	4.1	India and the major powers- US, Russia, China		
	4.2	India and Global Institutions		
Total			26	**100**

References:

1. Bandhopadhyaya, The Making of India's Foreign Policy, Allied Publishers, New Delhi (1970).

2. R. Basu, The United Nations: Structure and Functions of an International Organisation, Revised and Enlarged ed., Sterling, New Delhi (2004).
3. A. Mattoo & H. Jacob (eds.), India and the Contemporary International System, Manohar Publications in collaboration with RCSS Colombo, New Delhi (2014).
4. S. Cohen, India: Emerging Power, Brookings Institution Press (2002).

Semester - III

Course Code	Course Name	Credits
TSM2317N	TOURISM MANAGEMENT-II (TOURISM PRODUCT)	02

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
13	-	13	01	-	01	02

Internal Assessment				End Sem Exam- End Semester Evaluation/ Project/ Report/ Presentation	Duration of End Sem Exam	Total
Mid Term	**Continuous Evaluation**	**Attendance**	**Total Internal**			**Internal Assessment + End Semester Evaluation**
15	**30**	**5**	**50**	**50**	**2 Hours**	**100**

Course Outcome	
1	Students will be able to remember and identify the basic concepts and types of tourism products, including heritage, wildlife, religious, and cultural tourism.
2	Students will be able to describe the different types of heritage tourism, the role of heritage management organizations, and identify major wildlife sanctuaries, national parks, and biological reserves in India.
3	Students will apply their understanding of religious and cultural tourism concepts to identify key centers for various religions, as well as important cultural sites and events, such as classical and folk dances, handicrafts, and tourism fairs and festivals.
4	Students will critically evaluate the impact of different tourism products on the promotion and preservation of heritage, wildlife, religious, and cultural tourism in India.

5	Students will evaluate the contributions of organizations like UNESCO, ASI, and INTACH in preserving and promoting heritage sites and will assess the importance of these sites in the context of tourism.
6	Students will synthesize their learning by creating a comprehensive presentation or case study on a chosen tourism product, analysing its significance, impact, and potential for tourism development.

Course Objective	
1	To gain knowledge about the characteristics of tourist attractions in India.
2	To study the Cultural aspects, Fair & festivals of India.
3	To gain destination knowledge of India through different tangible and non-tangible aspects

Detailed Syllabus

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage**
Module I	**Tourism Products**		5	15
1	1.1	Tourism Products: Definition, Concept, and classification		
Module II	**Heritage & Wildlife-based Tourism Products**		**7**	30
2	2.1	Heritage – Meaning, Types of Heritage Tourism, Heritage Management Organizations- UNESCO, ASI, INTACH		
	2.2	Major places for heritage tourism, important monuments, circuits etc		
	2.3	Major wildlife sanctuaries, national parks and biological reserves		
Module III	**Religious and Cultural Tourism Products**		7	25
3	3.1	Religious Tourism- concept and definition, two major centers of religious tourism of each religion.		
	3.2	Cultural Tourism – Concept		

	3.3	Classical and Folk dances of India, Handicrafts and textiles: important handicraft objects and centers, Tourism Fairs and festivals.		
Module IV	**Case Study**		7	30
4	4.1	Prepare a presentation on any one of the above themes and explain in detail the tourism products		
Total			26	**100**

References:	
1.	Cultural Tourism in India: A Case Study of Kerala by N. Jayaram and A. P. Krishna (2017)
2.	Heritage Tourism: Theories and Practices by Dallen J. Timothy (2018)
3.	Wildlife Tourism: Theory and Practice by David Newsome and Susan A. Moore (2017)
4.	Religious Tourism in Asia: Tradition and Change through Case Studies and Narratives edited by Courtney Bruntz and Brooke Schedneck (2020)
5.	Indian Classical Dance and Cultural Tourism: The Global Approach by Priyanka Verma (2019)

Semester – III

Course Code	Course Name	Credits
SCW2317N	SOCIAL WORK-II (INTRODUCTION TO URBAN AND RURAL DEVELOPMENT)	02

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
13	13	-	01	01	-	02

Internal Assessment				End Semester Evaluation	Total
Mid Term	**Continuous Evaluation**	**Attendance**	**Total**	**End Semester Evaluation/ Project/ Report/ Presentation**	**Internal Assessment + End Semester Evaluation**
-	**45**	**5**	**50**	**50**	**100**

Course outcome

1. To understand the concepts of rural, urban and tribal communities.
2. To understand the issues of rural, urban and tribal communities.
3. To understand policies and programmes of Urban and Rural Development and aspects of Panchayati Raj Institutions.
4. To understand how to practice social work in different social work fields.

Course Objectives

1. The knowledge of this subject is essential to understand the concepts of rural, urban and tribal communities.
2. It will be helpful to understand the issues of rural, urban and tribal communities.
3. It will be helpful to gain a fundamental knowledge on policies and programmes of Urban and Rural Development and Panchayati Raj Institutions.

4. The insights from this subject will help the students to understand how to practice social work in different social work fields.

Detailed Syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage
	Introduction to Rural Society		**13**	50
1	1.1	Introduction to Rural Society. Characteristics of Rural society.		
	1.2	Problems – Issues faced by the rural poor such as indebtedness, Bonded labour, Low wages, Unemployment.		
2	**Introduction to urban community**		**13**	50
	4.1	**Introduction to urban community.** Characteristics of urban community. for urban development.		
	4.2	Problems- issues faced by urban community.		
	4.3	Government programmes for urban development.		
Total			**26**	**100**

References:
1. Alexander, K.C., Prasad R.R., Jahagirdar M.P. (1991) Tribals - Rehabilitation and Development, Jaipur: Rawat Publications
2. Ashok Narang (2006) Indian Rural Problems, New Delhi : Murari Lal & Sons
3. Baluchamy, S. (2004) Panchayat Raj Institutions, New Delhi : Mittal Publication
4. C.G.Pickvance, (Ed.) (1976) Urban Sociology: Critical Essays, UK : Methuen
5. Chahar, S.S. (Ed.) (2005) Governance of Grassroots Level in India, New Delhi : Kanishka

Semester – III

Course Code	Course Name	Credits
BPS2317N	BIOPRENEURSHIP-II	02

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
02			02			02

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	30	05	50	50	3 Hours	-	-	-	100

Course Outcome	
1.	Able to create detailed business plans for biotech startups, encompassing market research, SWOT analysis, competitive landscape assessment, team building, and pitch deck preparation.
2.	Gain knowledge of the innovation process in biotechnology, including R&D, technology transfer, and commercialization, and will learn to assess technology readiness levels.
3.	Manage the financial aspects of biotech startups, including budgeting, cash flow analysis, financial forecasting, and exploring diverse funding sources.
4.	Explore and evaluate the bioentrepreneurial support systems available in India, including E-cells and incubation centers, and assess their impact on startup success.
5.	Present and discuss key concepts related to innovation, finance, and business plan development, enhancing their communication and critical thinking skills.

6.	Assignments, group discussions, and activities focused on innovation, intellectual property rights (IPR), finance, and business plan development, fostering teamwork and practical application of knowledge.

Course Objective	
1.	Understand the importance of innovation and intellectual property management in the biotech sector.
2.	Develop skills in financial planning and fundraising specific to biotech startups.
3.	Apply theoretical knowledge to develop a realistic and feasible business plan.
4.	To introduce students to financial management principles tailored to biotech startups, including funding options and financial planning strategies.
5.	To explore the support systems available for bioentrepreneurs in India, including E-cells, incubation centers, and government initiatives.
6.	To provide a step-by-step approach to developing comprehensive business plans for biotech startups, including market research and organizational structuring.

Detailed syllabus

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage (%)**
Module I	**Business Plan Development**		6	**20**
1	1.1	Step-by-step process on developing a comprehensive business plan for a biotech startup		
	1.2	Conducting market research		
	1.3	Identifying opportunities		
	1.4	Project development		
	1.5	SWOT analysis and competitive landscape assessment		

	1.6	Team building and organizational structure and pitch deck		
Module II	**Innovation and technology readiness level**			
2	2.1	Examination of the innovation process in biotechnology	**7**	**25**
	2.2	Research and development, technology transfer, and commercialization		
	2.3	Technology Readiness level (as per NASA and BIRAC)		
	2.4	Drugs, vaccines, biosimilars, medical devices and diagnosis, agriculture, and industrial biotechnology etc		
	2.5	Bioentrepreneur support system in India		
	2.6	E-cell and Incubation centers		
Module III	**Entrepreneurial Finance for Biotech Startups**			
3	3.1	Introduction to financial management principles specific to biotech startups	7	**25**
	3.2	Budgeting, cash flow analysis, and financial forecasting		
	3.3	Exploration of funding sources available to biotech entrepreneurs		
	3.4	Venture capital and angel investors		
	3.5	Government grants (BIRAC, Start-up India, DST-NIDHI, TBI)		
	3.6	Schemes for women entrepreneurs		
Module IV	**Presentation**			
4	4.1	Concepts of innovation in biopreneurship	**6**	**15**
	4.2	Finance in biopreneurship		
	4.3	Business plan development in biopreneurship		

	4.4	IPR in biopreneurship		
	4.5	Investors in biopreneurship		
	4.6	Government grants in biopreneurship		
Module V				
5	5.1	Concepts of innovation in biopreneurship	**4**	**15**
	5.2	Finance in biopreneurship		
	5.3	Business plan development in biopreneurship		
	5.4	IPR in biopreneurship		
	5.5	Investors in biopreneurship		
	5.6	Government grants in biopreneurship		
Total			**30**	**100**

References:

1. Allen, K. R. (2022). *Launching New Ventures: An Entrepreneurial Approach*. Cengage Learning.
2. Blank, S., & Dorf, B. (2020). *The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company*. K&S Ranch.
3. Rothaermel, F. T. (2023). *Strategic Management of Technological Innovation*. McGraw-Hill Education.
4. Metrick, A., & Yasuda, A. (2021). *Venture Capital and the Finance of Innovation*. Wiley.
5. Huggett, B., & Cacciuttolo, M. (2021). *Commercializing Biotech Innovation: The Practical Guide to New Biotech Companies and Products*. Woodhead Publishing.
6. Pisano, G. P. (2019). *Science Business: The Promise, the Reality, and the Future of Biotech*. Harvard Business Review Press.

Semester - III

Course Code	Course Name	Credits
CES2319N	COMMUNITY OUTREACH	03

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial/ NTCC**	**Theory**	**Practical**	**Tutorial/ NTCC**	**Total**
-	-	-	-	-	03	03

Theory						Term Work/ Practical/ Oral			Total Marks
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
-	50	-	-	-	-	50	-	-	100

Internal-Continuous Evaluation (50 Marks)		
Choice of the problem (10)	Mode and quality of engagement (20)	Performance indicator (20)

Term Work/ Community Outreach Report (50 Marks)			
Content (10)	Data collection & Analysis (20)	Report presentation (10)	Outreach Impact (10)

Course Outcome

1.	Demonstrate an understanding of key issues related to health, nutrition, food security, agriculture, and the environment.
2.	Successfully design and implement community outreach programs, workshops, or campaigns addressing these issues.
3.	Collaborate effectively with community members and stakeholders to achieve common goals in raising awareness.
4.	Utilize different forms of media and communication strategies to engage and educate target audiences.
5.	Apply problem-solving skills to real-world challenges, resulting in impactful community interventions.
6.	Exhibit a strong sense of social responsibility and contribute to the well-being of communities through active participation in outreach activities.

Course Objective	
1.	Equip students with knowledge of health, nutrition, food security, agriculture, and environmental issues.
2.	Develop students' skills in creating and implementing awareness programs and community outreach activities.
3.	Foster collaboration with community members, stakeholders, and experts to address pressing local and global issues.
4.	Enhance students' ability to use various mediums, such as digital campaigns, street plays, and field activities, to effectively communicate their messages.
5.	Encourage critical thinking and problem-solving through the design and execution of targeted outreach initiatives.
6.	Promote social responsibility and active citizenship by involving students in community-based projects and activities.

Detailed syllabus

Module/ Unit	**Course Module / Contents**	**Hours**	**Marks Weightage** (%)

	Guidelines		
	• Involves activities that would expose students to the socio-economic issues in society. • Students will be involved in the community outreach activities to create and/or spread awareness on issues related to: ✓ Health, nutrition, food security ✓ Agriculture and environment through awareness programs/ workshops/ seminars/ expert talks/ field activity/ extension activities/ digital media campaign/ street play/ questionnaire. • Duration: Minimum 2 Weeks (Total 60 Hrs.)	60	100%
Total		60	**100%**

References:	
1.	Doustmohammadian, A., Mohammadi-Nasrabadi, F., Keshavarz-Mohammadi, N., Hajjar, M., Alibeyk, S., & Hajigholam-Saryazdi, M. (2022). Community-based participatory interventions to improve food security: A systematic review. *Frontiers in nutrition*, *9*, 1028394.
2.	Al Daccache, M., Abi Zeid, B., Hojeij, L., Baliki, G., Brück, T., & Ghattas, H. (2024). Systematic review on the impacts of agricultural interventions on food security and nutrition in complex humanitarian emergency settings. *BMC nutrition*, *10*(1), 60.
3.	An, R., Wang, J., Liu, J., Shen, J., Loehmer, E., & McCaffrey, J. (2019). A systematic review of food pantry-based interventions in the USA. Public health nutrition, 22(9), 1704-1716.
4.	Babu, S. C., Singh, M., Hymavathi, T. V., Rani, U., Kavitha, G. G., & Karthik, S. (2017). Improved nutrition through agricultural extension and advisory services: case studies of curriculum review and operational lessons from India.
5.	Capitão, C., Martins, R., Feteira-Santos, R., Virgolino, A., Graça, P., Gregório, M. J., & Santos, O. (2022). Developing healthy eating promotion mass media campaigns: A qualitative study. Frontiers in Public Health, 10, 931116.

6.	Tshuma, N., Elakpa, D. N., Moyo, C., Soboyisi, M., Moyo, S., Mpofu, S., ... & Mtapuri, O. (2024). The Transformative Impact of Community-Led Monitoring in the South African Health System: A Comprehensive Analysis. International Journal of Public Health, 69, 1606591.

Detailed Curriculum: Semester IV

Semester-IV								Evaluation Scheme		
Types of courses		Course Code	Course Title	Lecture (L) credits	Tutorial (T) credits	Practical (P) Credits	Total credits	Internal Marks	External Marks	Total Marks
Discipline Specific Courses	**Discipline-I (Core)**						**8**			
	Discipline-I (Compulsory)	BGE2401N	Basics of Genetic Engineering	3	0	0	3	**30**	**70**	**100**
		BBI2402N	Basics of Bioinformatics	3	0	0	3	**30**	**70**	**100**
		LGE2403N	Lab course on Genetic Engineering	0	0	1	1	**30**	**70**	**100**
		LBI2402N	Lab course on Bioinformatics	0	0	1	1	**30**	**70**	**100**
	Discipline II (any one from the basket)						**4**			
	Discipline II (Select any one from basket)	SCB2405N	Stem cells and Cancer Biology	4	0	0	4	**30**	**70**	**100**
		PIT2406N	Plant Improvement Technologies	4	0	0	4	**30**	**70**	**100**
		DSP2407N	Downstream Processing	3	0	0	3	**30**	**70**	**100**
		LCD2408N	Lab course on Downstream Processing	0	0	1	1	**30**	**70**	**100**
	Total (Discipline I + II)						**12**			
Foundation courses	Ability Enhancement Courses	**Foreign Language (any one from the basket)**					**2**			
		FLF2411N	French-IV	2	-	-	2	**50**	**50**	**100**
		FLG2411N	German-IV	2	-	-	2	**50**	**50**	**100**
		FLS2411N	Spanish-IV	2	-	-	2	**50**	**50**	**100**
		CSE2412N	Effective Writing Skills	1	-	-	**1**	**50**	**50**	**100**
	Subtotal						**3**			
	Skill Enhancement Program	BEH2413N	Behavioural Science-IV	1	-	-	1	**100**	**0**	**100**
		IBI2415N	Insights of Biotechnology Industry-II	3	-	-	3	**30**	**70**	**100**
	Subtotal						**4**			

		VAC-II (any one course from basket)					**2**			
	Value Added Course	ANM2417N	Animation-III	2	-	-	2	**50**	**50**	**100**
		PHT2417N	Photography-III	2	-	-	2	**50**	**50**	**100**
		POL2417N	Political Science-III	2	-	-	2	**50**	**50**	**100**
		TSM2417N	Tourism Management-III	2	-	-	2	**50**	**50**	**100**
		SCW2417N	Social Work-III	2	-	-	2	**50**	**50**	**100**
		BPS2417N	Biopreneurship-III	2	-	-	2	**50**	**50**	**100**
						Subtotal	**2**			
	Co-Curricular Courses	**VAC-III**					**0**			
		PHE2318N	Physical Education and Sports**				0			
						Subtotal	**0**			
	Total (Foundation Courses)						**9**			
Grand Total							**21**			
***Continued till Semester VI*										

Semester - IV

Course Code	Course Name	Credits
BGE2401N	BASICS OF GENETIC ENGINEERING	03

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	-	-	03	-	-	03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Understanding Fundamental Concepts: Students will be able to explain the fundamental principles of genetics, including DNA structure, gene function, and heredity.
2.	Knowledge of Genetic Engineering Techniques: Students will gain knowledge of various genetic engineering techniques such as recombinant DNA technology, CRISPR-Cas9, gene cloning, and gene editing.
3.	Application of Genetic Tools and Methods: Students will learn how to apply genetic tools and methods to modify organisms for research, medical, agricultural, and industrial purposes.
4.	Ethical and Social Implications: Students will be able to evaluate the ethical, legal, and social implications of genetic engineering, including concerns related to genetic modification, cloning, and gene therapy.

5.	Lab Skills and Experimentation: Students will acquire practical laboratory skills in genetic engineering, such as DNA extraction, PCR, gel electrophoresis, and transformation techniques.
6.	Awareness of Regulatory Frameworks: Students will understand the regulatory frameworks and guidelines governing genetic engineering practices in different regions, including the approval process for genetically modified organisms (GMOs)

Course Objective	
1.	To provide students with a foundational understanding of genetic concepts, including the structure and function of DNA, genes, and chromosomes.
2.	To teach the basic principles of genetic engineering, including gene manipulation, recombinant DNA technology, and gene editing.
3.	To familiarize students with essential laboratory techniques used in genetic engineering, such as DNA extraction, polymerase chain reaction (PCR), gel electrophoresis, and CRISPR-Cas9 gene editing.
4.	To enhance students' ability to analyze genetic data, interpret experimental results, and apply genetic engineering techniques to solve biological problem
5.	To understand the significance of biotechnology in food technology and modern agricultural practices
6.	To explore various applications of genetic engineering in medicine, agriculture, industry, and environmental science.

Detailed syllabus

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage (%)**
Module I	Tools used in Genetic Engineering		07	20
1	1.1	Introduction		

	1.2	Essential enzymes used in essential enzymes used		
	1.3	restriction endonucleases		
	1.4	types, recognition sequences, properties, nomenclature		
	1.5	DNA ligase: Properties and specificity,		
	1.6	DNA polymerase, DNA modifying enzymes and their use. Linkers, adaptors.		
Module II	Cloning vectors			
2	2.1	Introduction to vectors	07	20
	2.2	Plasmids pBR322, pUC. Bacteriophage vectors		
	2.3	Plasmids pBR322, pUC. Bacteriophage vectors		
	2.4	Lamba (insertional and replacement vectors, phagemids		
	2.5	Lamba (insertional and replacement vectors, phagemids		
	2.6	Cosmids, artificial chromosomes (YAC)		
Module III	Gene cloning and expression			
3	3.1	Introduction, Definition and scope of Gene cloning and expression	07	10
	3.2	Basic cloning strategy and expression		
	3.3	Basic cloning strategy and expression		
	3.4	Gene libraries-genomic and c-DNA libraries.		
	3.5	Gene libraries-genomic and c-DNA libraries.		
	3.6	Methods for screening of recombinant clones.		
Module IV	Nucleic acid amplification and its applications		07	10

4	4.1	Introduction to PCR		
	4.2	Principle and application of PCR		
	4.3	Basics of PCR, primer designing,		
	4.4	Types of PCR: Multiplex, nested, reverse transcriptase		
	4.5	Real Time PCR Methods, Applications		
	4.6	Molecular Diagnostics- Applications of Polymerase Chain Reaction (PCR)		
Module V	Sequencing of DNA		07	10
5	5.1	DNA sequencing (Maxam Gilbert, Sanger's and automated),		
	5.2	DNA sequencing (Maxam Gilbert, Sanger's and automated),		
	5.3	DNA sequencing (Maxam Gilbert, Sanger's and automated),		
	5.4	Overview of Next generation sequencing.		
	5.5	Overview of Next generation sequencing.		
	5.6	Overview of Next generation sequencing.		
Module VI	Techniques and application of genetic Engineering		10	30
6	6.1	Blotting techniques and hybridization		
	6.2	Southern, Northern and Western blotting techniques		
	6.3	Radioactive and non-radioactive probes		
	6.4	Physical & Genetic Maps -molecular markers in genome analysis		
	6.5	RFLP, RAPD and AFLP analysis		
	6.6	Cloning and production of interferon and insulin. Applications of Genetically engineered micro-organisms		

Total	**45**	**100%**

References:	
1.	Gene cloning and analysis: An Introduction by T. A Brown, Blackwell Publishing
2.	Principles of gene manipulation: An introduction to genetic engineering by R.W Old and S.B Primrose, Blackwell Publishing.
3.	Russell, B., & Herbert, F. (2017). DNA Is the Genetic Material. It's in Your DNA: From Discovery to Structure, Function and Role in Evolution, Cancer, and Aging, 17.
4.	From Genes to Genomes: Concepts & Applications of DNA Technology by J. W. Dale & M. V. Schartz
5.	"Molecular Biotechnology: Principles and Applications of Recombinant DNA" by Bernard R. Glick, Cheryl L. Patten, and Terry L. Delovitch
6.	"Recombinant DNA: Genes and Genomes – A Short Course" by James D. Watson, Amy A. Caudy, Richard M. Myers, and Jan A. Witkowski

Semester - IV

Course Code	Course Name	Credits
BBI2402N	BASICS OF BIOINFORMATICS	03

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	-	-	03	-	-	03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Understand and explain the basic concepts of bioinformatics
2.	Make acquainted with different biological data types and respective databases
3.	Retrieve and analyze biological data using bioinformatics tools
4.	Perform sequence alignment and construct phylogenetic trees
5.	Utilize bioinformatics tools for protein structure prediction
6.	Comprehend with molecular modeling techniques and applications

Course Objective	
1.	Utilize Biological Databases

2.	perform sequence and phylogenetic analysis
3.	Predict protein structure
4.	evaluate genomics and proteomics data
5.	Use Bioinformatics Tools and software's
6.	Develop Problem-Solving Skills

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Introduction to Computers**		5	10
1	1.1	General introduction (characteristics, capabilities, generations)		
	1.2	Software, hardware: organization of hardware (input devices, memory, control unit arithmetic logic unit, output devices)		
	1.3	Software: (System software; application software, languages -low level, high level),		
	1.4	Interpreter, compiler, data processing;		
	1.5	batch, on-line, real-time (examples from bioindustries, e.g. application of computers in coordination of solute concentration, ph, temperature, etc)		
	1.6	Internet application		

Module II	**Biological Data**		6	10
2	2.1	Types and sources of biological data,		
	2.2	nucleic acid and amino acid data		
	2.3	sequencing project		
	2.4	Genome & proteome: Uniprot, Ensemble		
	2.5	Transcriptome: SRA, GEO		
	2.6	Metabolome: KeGG, Reactome		
Module III	**Sequence Alignment**		8	20
3	3.1	Global and local alignments		
	3.2	statistical significance of alignments		
	3.3	scoring matrices and gap penalties		
	3.4	position specific scoring matrices		
	3.5	programs and methods for Pairwise and multiple alignment		
	3.6	pattern searching programs, family and superfamily representation		
Module IV	**Phylogenetic Analysis**		7	20
4	4.1	Phylogenetic analysis,		
	4.2	Evolutionary Models,		
	4.3	Character and distance-based Tree building methods;		
	4.4	tree evaluation,		
	4.5	phylogenetic analysis		
	4.6	parsimony, maximum likelihood tree		

Module V	**Protein Structure Databases**		8	20
5	5.1	PDB and MMDB,		
	5.2	CATH, SCOP, structure file formats,		
	5.3	Secondary and tertiary structure prediction methods in proteins,		
	5.4	software to visualize secondary and tertiary		
	5.5	structural information in protein		
	5.6	Protein structure prediction		
Module VI	**Molecular modelling and docking**		8	20
6	6.1	Potential energy calculations using semiempirical potential energy function		
	6.2	Electrostatic energy surface generation, three-dimensional structure using dynamic programming methods		
	6.3	Molecular mechanics and dynamics		
	6.4	Structure prediction in protein,		
	6.5	Molecular docking		
	6.6	Virtual screening		
Total			**45**	**100%**

References:	
1.	Bioinformatics – Sequence, Structure and Databanks, Des Higgins & Willie Taylor
2.	Bioinformatics – Managing Scientific Data, Zoe‟ Lacroix and Terence Critchlow
3.	Structural Bioinformatics, Philip E. Bourne, Helge Weissig 2003
4.	Statistical Methods in Bioinformatics: An Introduction, G.R. Grant, W.J. Ewens, Springer Verlag

5.	A book on C by Kelley: Programming in C, Addison-Wesley Publishing
6.	Introduction to C++ for Engineers and Scientists, Prentice-Hall

Semester - IV

Course Code	Course Name	Credits
LGE2403N	LAB COURSE ON GENETIC ENGINEERING	01

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
-	2	-	-	1	-	01

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	4 Hours	-	-	-	100

Course Outcome	
1.	Students will be able to proficiently perform essential genetic engineering laboratory techniques, such as DNA extraction, polymerase chain reaction (PCR), gel electrophoresis, and bacterial transformation.
2.	Students will demonstrate the ability to construct recombinant DNA molecules, insert them into host cells, and analyze the outcomes of gene cloning experiments.
3.	Students will gain hands-on experience with modern gene editing tools, such as CRISPR-Cas9, and understand their mechanisms, applications, and limitations.
4.	Students will develop skills to accurately collect, analyze, and interpret experimental data, including understanding the significance of controls and replicates in genetic engineering experiments.

5.	Students will enhance their problem-solving abilities by troubleshooting experimental issues, optimizing protocols, and designing alternative approaches to overcome technical challenges in the lab.
6.	Students will demonstrate a comprehensive understanding of biosafety practices, ethical considerations, and regulatory guidelines associated with genetic engineering experiments.

Course Objective	
1.	To teach students the essential laboratory techniques used in genetic engineering, including DNA extraction, polymerase chain reaction (PCR), gel electrophoresis, and bacterial transformation.
2.	To familiarize students with the processes involved in molecular cloning, including gene insertion, plasmid construction, and bacterial expression systems.
3.	To provide hands-on experience with contemporary gene editing technologies, such as CRISPR-Cas9, and to understand their application in genetic engineering.
4.	To develop students' abilities to analyze and interpret experimental data, including the use of software and statistical tools for evaluating results.
5.	To encourage students to identify, troubleshoot, and solve technical issues that arise during laboratory experiments, and to optimize protocols for successful outcomes.
6.	To enable students to design and carry out independent genetic engineering projects, including hypothesis formulation, experimental design, and data collection.

Detailed syllabus

Module/ Unit	**Course Module / Contents**	**Hours**	**Marks Weightage** (%)
List of practical		26	100

6.	Restriction digestion of the genomic DNA and plasmid DNA		
7.	Ligation of the digested DNA and vector		
8.	Preparation of competent cells for transformation		
9.	Transformation of the competent cells using a foreign DNA		
10.	PCR amplification of the DNA fragment of interest obtained from environmental/bacterial/animal/plant tissue sample		
Total		**26**	**100%**

References:	
1.	Genetic Engineering: Principles & Methods, Edited by Jane L. Setlow, 1996, Volume 18, ISBN : 978-1-4899-1768-3, Springer nature
2.	Techniques in genetic engineering by Isil Aksan Kurnaz, 1st Edition, 2015, ISBN: 9780367658816, Routledge, Taylor & Francis Group
3.	Principles and Techniques of Molecular Biology-Wilson & Walkar, Cambridge University Press
4.	" Genetic engineering by Tariq Bhat, 1st Edition, 2023, Apple Academic Press, ISBN: 9781003378266
5.	Principles & Methods, Edited by Jane L. Setlow, 1996, Volume 18, ISBN : 978-1-4899-1768-3, Springer nature

Semester - IV

Course Code	Course Name	Credits
LBI2404N	LAB COURSE ON BIOINFORMATICS	01

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
-	02	-	-	01	-	01

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	4 Hours	-	-	-	100

Course Outcome	
1.	Gain hands-on experience with key bioinformatics tools and software.
2.	Retrieve, align, and analyze biological sequences
3.	Construct and interpret phylogenetic trees.
4.	Predict protein structures and understand their biological significance.
5.	Analyze genomic and proteomic data using practical approaches
6.	Develop skills in data interpretation, presentation, and scientific reporting.

Course Objective	
1.	Understand Fundamental Concepts
2.	Utilize Biological Databases

3.	Perform Sequence Analysis
4.	Construct Phylogenetic Trees
5.	Predict Protein Structures
6.	Use Bioinformatics Tools and Software

Detailed syllabus

Module/ Unit	**Course Module / Contents**	**Hours**	**Marks Weightage (%)**
	List of Practicals	26	10
1.	Nucleotide databases- NCBI EMBL		
2.	Protein databases - SWISSPROT, PDB		
3.	Metabolic pathway databases - KEGG, Reactome		
4.	Pairwise sequence alignment – BLAST		
5.	Needle-Wunch, PHI, and PSI BLAST		
6.	Multiple sequence alignment		
7.	phylogenetic tree prediction		
8.	Secondary structure prediction		
9.	3D structure prediction and molecular modelling		
10.	Molecular docking		
11.	KeGG pathway database		
Total		26	**100%**

References:	
1.	Bioinformatics – Sequence, Structure and Databanks, Des Higgins & Willie Taylor
2.	Bioinformatics – Managing Scientific Data, Zoe‟ Lacroix and Terence Critchlow
3.	Structural Bioinformatics, Philip E. Bourne, Helge Weissig 2003
4.	Statistical Methods in Bioinformatics: An Introduction, G.R. Grant, W.J. Ewens, Springer Verlag

5.	A book on C by Kelley: Programming in C, Addison-Wesley Publishing
6.	Introduction to C++ for Engineers and Scientists, Prentice-Hall

Semester - IV

Course Code	Course Name	Credits
SCB2405N	STEM CELLS AND CANCER BIOLOGY	04

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	-	-	04	-	-	04

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Students will demonstrate an understanding of stem cell biology and its applications in therapy.
2.	Students will analyze the role of stem cells in diseases such as cancer and neurodegenerative disorders.
3.	Students will understand the genetic basis and stages of cancer, along with key concepts in carcinogenesis.
4.	Students will critically evaluate major signaling pathways and gene functions in cancer.
5.	Students will identify and apply appropriate diagnostic methods for various cancer types.

6.	Students will evaluate and compare different cancer treatment strategies, with a focus on future advancements.

Course Objective	
1.	Understand the biology, types, and therapeutic potential of stem cells.
2.	Explore the role of stem cells in disease pathology and regenerative medicine.
3.	Learn the etiology, genetics, and progression of cancer.
4.	Analyze key signaling pathways involved in carcinogenesis and tumor progression.
5.	Understand various diagnostic techniques and biomarkers used in cancer detection.
6.	Study the different treatment modalities, including surgery, chemotherapy, and personalized medicine.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Basics of Stem cells**		10	16.65
1	1.1	Stem cell biology and therapy		
	1.2	Types: Embryonic stem cell, adult stem cell		
	1.3	Stem cell biology and therapy		
	1.4	Embryonic stem cells		
	1.5	Culture and the potential benefits of stem cell technology		
Module II	**Stem cells in various diseases**		10	16.65
2	2.1	Stem cell pathways		

	2.2	Stem cells in disease pathology- Cancer		
	2.3	Neurodegenerative disorders, and cardiovascular disease		
	2.4	Stem cells and regenerative medicine		
Module III	**Basics of cancer biology**		10	16.65
3	3.1	Major agencies working on cancer		
	3.2	Cancer etiology, incidence, and mortality		
	3.3	Cancer as a genetic disease		
	3.4	Cancer grades and stages, Mutation and DNA repair pathway in cancer		
	3.5	Carcinogens and carcinogenesis		
	3.6	Hallmarks of cancer, Metastasis		
Module IV	**Signaling pathways in cancer**		10	16.65
4	4.1	Oncogenes, Oncogenes/Proto Oncogenes activity		
	4.2	Role of growth factors and receptors in carcinogenesis		
	4.3	RAS, NFkB, Wnt signaling in cancer		
	4.4	Sporadic and hereditary cancers		
	4.5	p53, pRb, BRCA and other major genes, their discovery and significance		
	4.6	Epigenetics of cancer		
Module V	**Cancer diagnosis**		10	16.65
5	5.1	Cancer diagnosis and screening		
	5.2	Minimally invasive and non-invasive diagnosis		
	5.3	Biopsy and histopathology, other diagnostic techniques		
	5.4	Serum markers: PSA, CEA, CA125		

	5.5	Circulating tumor cells		
	5.6	Genetic testing, NGS, relapse prediction methods		
Module VI	**Cancer therapeutics**			
6	6.1	Different forms of therapy: Surgery, Chemotherapy: Adjuvent and Neo adjuvent	10	16.65
	6.2	Chemotherapy- paclitaxel, gemcitabine, cisplatin		
	6.3	Radiation Therapy		
	6.4	Targeted drug therapy: Immunotherapy- trastuzumab, imatinib		
	6.5	Combination Therapy, Precision/ Personalized medicine		
	6.6	Future scope of Cancer diagnosis and therapeutics		
Total			**60**	**100%**

References:	
1.	Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2014). *Molecular biology of the cell* (6th ed.). Garland Science.
2.	Lanza, R., Gearhart, J., Hogan, B., Melton, D., Pedersen, R., Thomson, J., & West, M. (2019). *Essentials of stem cell biology* (3rd ed.). Academic Press.
3.	Weinberg, R. A. (2014). *The biology of cancer* (2nd ed.). Garland Science.
4.	Lodish, H., Berk, A., Kaiser, C. A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A., & Scott, M. P. (2021). *Molecular cell biology* (9th ed.). W.H. Freeman.
5.	Verfaillie, C., & Hu, W. S. (2011). *Stem cells in regenerative medicine: Science, regulation, and business strategies*. Wiley-VCH.
6.	Hanahan, D., & Weinberg, R. A. (2011). *Hallmarks of cancer: The next generation*. Cell Press.

Semester – IV

Course Code	Course Name	Credits
PIT2406N	PLANT IMPROVEMENT TECHNOLOGIES	04

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	-	-	04	-	-	04

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Understand the fundamentals of Plant Improvement.
2.	Apply Genetic Principles to Plant Breeding.
3.	Utilize Conventional and Tissue Culture Techniques.
4.	Implement Molecular Techniques in Breeding Programs.
5.	Develop Genetic Improvement Strategies.
6.	Analyze Case Studies and Real-World Applications.

Course Objective	
1.	To provide students with a historical background and a thorough introduction to the objectives and goals of plant improvement and breeding.

2.	To impart knowledge of Mendelian genetics, inheritance patterns, and selection methods, with a focus on their application in plant breeding.
3.	To familiarize students with conventional breeding techniques and the application of tissue culture in plant breeding.
4.	To educate students on the use of molecular techniques such as MAS, genomic selection, and gene editing technologies in plant breeding programs.
5.	To guide students in designing and implementing genetic improvement strategies for self-pollinating and cross-pollinating plant species.
6.	To engage students in the analysis of successful plant breeding programs and real-world applications, emphasizing the challenges and future directions in plant improvement.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Introduction to Plant Improvement**		**9**	**15**
1	1.1	Historical background and significance of plant improvement		
	1.2	Introduction to Plant Breeding		
	1.3	Objectives and goals of plant breeding		
	1.4	Overview of conventional and modern plant improvement techniques		
Module II	**Principles of Genetics and Plant Breeding**		**10**	**20**
2	2.1	Basics of Mendelian genetics and inheritance patterns		
	2.2	Allelic and Non-Allelic Interactions		
	2.3	Quantitative genetics and heritability		

	2.4	Selection methods in plant breeding: phenotypic and genotypic selection		
Module III	**Conventional Breeding Techniques/ Application of Tissue culture in Plant Breeding**		**12**	**20**
3	3.1	Hybridization techniques in plants		
	3.2	Selection methods and breeding strategies		
	3.3	Understanding heterosis and hybrid vigor		
	3.4	General principles of plant cell and tissue culture		
	3.5	Clonal propagation, Embryo culture, Pollen and anther culture		
	3.6	Doubled haploid production, Somatic cell hybridization		
Module IV	**Molecular Techniques in Plant Breeding**		**9**	**15**
4	4.1	Marker-assisted selection (MAS) and its applications		
	4.2	Genomic selection principles and techniques		
	4.3	Introduction to gene editing technologies		
	4.4	CRISPR/Cas9		
	4.5	TALENs		
Module V	**Genetic improvement strategies**		**13**	**20**
5	5.1	Fundamentals of genetic engineering in plants		
	5.2	Techniques for plant transformation		
	5.3	Genetic Improvement of Self-pollinating Species: a. Basic selection methods b. Pedigree selection c. Bulk population d. Single-seed descent e. Double haploid f. Backcrossing		

	5.4	Genetic Improvement of Cross-pollinating Species: a. Genetic theory related to cross-pollinated plants b. Basic selection methods c. Selection methods using progeny testing d. Hybrid breeding		
	5.5	Synthetics Regulatory considerations		
	5.6	Biosafety aspects of transgenic plants		
Module VI	**Case Studies and Applications**		**7**	**10**
6	6.1	Analysis of successful plant breeding programs		
	6.2	Real-world applications of plant improvement technologies		
	6.3	Discussion on challenges and prospects in plant improvement		
Total			**60**	**100%**

References:	
1.	Singh, B. D., & Singh, A. K. (2021). *Plant Breeding: Principles and Methods*. Kalyani Publishers.
2.	Acquaah, G. (2020). *Principles of Plant Genetics and Breeding* (3rd ed.). Wiley-Blackwell.
3.	Razdan, M. K. (2019). *Introduction to Plant Tissue Culture* (3rd ed.). Oxford & IBH Publishing Co.
4.	Bhatia, S., Sharma, K., Dahiya, R., & Bera, T. (2017). *Modern Applications of Plant Biotechnology in Pharmaceutical Sciences*. Academic Press.
5.	Moose, S. P., & Mumm, R. H. (2019). *Molecular Plant Breeding: Principles and Practices*. Springer Nature.
6.	Fehr, W. R. (2015). *Principles of Cultivar Development: Theory and Technique*. Springer.

Semester - IV

Course Code	Course Name	Credits
DSP2407N	DOWNSTREAM PROCESSING	03

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03	-	-	03	-	-	03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	**Continuous Evaluation**	**Attendance**	**Total Internal**						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Demonstrate a comprehensive understanding of downstream processes, including the separation, purification, and concentration of biological products.
2.	Analyze the properties of bioproducts and fermentation broths and assess their significance in downstream processing.
3.	Apply the core principles of downstream process technologies, such as cell disruption, chromatography, and filtration, to practical scenarios.
4.	Utilize principles of product characterization and purification technologies, including electrophoresis, spectroscopy, and crystallography, to effectively analyze and purify bioproducts.

5.	Implement and manage quality control practices, including quality assurance and maintenance, to ensure the production of high-quality bioproducts.
6.	Interpret and apply regulatory guidelines, Good Laboratory Practices (GLPs), and Good Manufacturing Practices (GMPs) to ensure compliance and the production of quality products.

Course Objective	
1.	Develop in depth understanding of downstream processes including the separation, purification, and concentration of biological products.
2.	Learn about the properties of bioproducts and fermentation broth and their significance during downstream processing.
3.	Explain the core principles of downstream process technologies like cell disruption, chromatography, filtration etc.
4.	Explain the core principles of products characterization and purification technologies like electrophoresis, spectroscopy, crystallography etc.
5.	Gain acquaintance of product quality, quality assurance and maintenance.
6.	Learn about regulatory guidelines, GLPs and GMPs. to assure the production of quality product.

Detailed syllabus

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage (%)**
Module I	**Introduction**		3	8
1	1.1	Overview of a biotechnological process and its various components.		
	1.2	Importance of downstream processing in biotechnology.		
Module II	**Bio product characteristics & fermentation broth**		9	22

2	2.1	Categories of bio-products and basis of separation.		
	2.2	Characteristics of bio-products.		
	2.3	Characteristics of fermentation broth.		
Module III	**Techniques for product separation**		9	22
3	3.1	Bio product Isolation: Cell disruption.		
	3.2	Filtration.		
	3.3	Centrifugation.		
	3.4	Membrane based separation.		
Module IV	**Product characterization**		9	22
4	4.1	Principle, types and applications of Electrophoretic		
	4.2	Principle, types, and applications of spectroscopic techniques		
Module V	**Product purification**		10	16
5	5.1	Basic principle of purification technique, such as precipitation.		
	5.2	Principle, types and instrumentation of chromatography.		
	5.3	Principle, types and instrumentation of crystallization.		
Module VI	**Regulatory guidelines**		5	10
6	6.1	Regulatory guidelines: Quality Assurance and Control.		
	6.2	Standard Operating Procedures (SOPs)		

	6.3	Good Manufacturing Practices (GMPs).		
Total			**45**	**100%**

References:	
1.	Stanbury, P. F., Whitaker, A., & Hall, S. J. (2013). *Principles of fermentation technology*. Elsevier.
2.	Casida, L. E. (1968). Industrial microbiology.
3.	Belter, P. A., Cussler, E. L., & Hu, W. S. (1991, August). Bioseparations—Downstream processing for biotechnology. In *Abstracts Papers Am Chem Soc* (Vol. 202, pp. 224-BIOT).
4.	Hamel, J. F. P., Hunter, J. B., & Sikdar, S. K. (1990). *Downstream processing and bioseparation*. American Chemical Society.
5.	Prasad, K. K., & Prasad, N. K. (2010). *Downstream process technology: a new horizon in biotechnology*. PHI Learning Pvt. Ltd..
6.	Strube, J., Grote, F., Josch, J. P., & Ditz, R. (2011). Process development and design of downstream processes. *Chemie Ingenieur Technik*, *83*(7), 1044-1065.

Semester - IV

Course Code	Course Name	Credits
LCD2408N	LAB COURSE ON DOWNSTREAM PROCESSING	01

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
-	2	-	-	1	-	01

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	4 Hours	-	-	-	100

Course Outcome	
1.	Remember and describe fundamental principles of techniques related to downstream processing.
2.	Understand the theoretical concepts of various experiments related to downstream processing.
3.	Apply the concepts for the execution of experiments independently or in groups.
4.	Record the observation and analyze the results of performed experiments.
5.	Evaluate the experiments for troubleshooting and designing of alternative strategy.
6.	Demonstrating proficiency in practical skills related to downstream processing.

Course Objective	
1.	Develop skills in the separation of biomass using centrifugation techniques, including understanding centrifuge operation and optimizing conditions for effective separation.
2.	Demonstrate proficiency in separating biomass through filtration methods, including the selection of appropriate filter media and understanding the factors affecting filtration efficiency.
3.	Apply precipitation techniques to purify products, including the preparation of precipitating agents and optimizing conditions for effective product recovery.
4.	Utilize UV-Visible spectroscopy to quantify product concentrations, including the preparation of samples, calibration of the spectrophotometer, and interpretation of absorbance data.
5.	Characterize products using SDS-PAGE to analyze protein size and purity, including the preparation of samples, running gels, and interpreting electrophoresis results.
6.	Employ chromatography techniques for the purification of products, including the selection of suitable chromatographic methods, preparation of samples, and analysis of chromatographic data.

Detailed syllabus

Module/ Unit	Course Module / Contents	Hours	Marks Weightage (%)
List of practical		26	100
1.	Biomass separation through centrifugation.		
2.	Biomass separation through filtration.		
3.	Product purification through precipitation.		
4.	Product quantification through UV-Visible spectroscopy.		
5.	Product characterization through SDS-PAGE.		

6.	Product purification through chromatography.		
Total		**26**	**100%**

References:	
1.	Crowley, T. E., & Kyte, J. (2014). *Experiments in the purification and characterization of enzymes: a laboratory manual*. Academic Press.
2.	Oelkers, P. (2016). Molecular Biology Laboratory Manual.
3.	Walker, J. M. (2002). *The protein protocols handbook*. Humana press.
4.	Dubey, R. C., & Maheshwari, D. K. (2002). *Practical Microbiology, 4/e*. S. Chand Publishing.
5.	Shanmugam, S., Kumar, T. S., & Panneer Selvam, K. (2019). *Laboratory handbook on biochemistry*. PHI Learning Pvt. Ltd..
6.	Masoodi, K. Z., Lone, S. M., & Rasool, R. S. (2020). *Advanced methods in molecular biology and biotechnology: a practical lab manual*. Academic Press.

Semester - IV

Course Code	Course Name	Credits
FLF2411N	FRENCH-IV	2

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
02	-	-	02	-	-	02

Theory							Term Work / Practical/Oral			Total
Internal Assessment					End Sem Exam	Duration Of End Sem Exam	Term Work	Pract.	Oral	
Mid Term	Viva	Continuous Evaluation	Attendance	Total Internal						
15	20	10	05	50	50	75 mins	-	-	-	100

Course Objectives

The course is designed:

1. To strengthen the language of the students in both oral and written
2. To revise the grammar in application and the communication tasks related to topics covered already.
3. To get acquainted with the current social communication skills, oral (dialogue, telephone conversations, etc.) and written and perform simple communication tasks.
4. To engage the students to speak with near-native pronunciation and intonation, effectively conveying meaning and emotion.
5. To differentiate positively or negatively.

Course Outcomes

After the completion of this course Students will be able to:

1. Enhance students' language skills in both spoken and written forms.
2. Apply and the communicate tasks related to topics covered already
3. Acquire current social communication skills, oral (dialogue, telephone conversations, etc.) and written and perform simple communication tasks.
4. To speak with near-native pronunciation and intonation, effectively conveying meaning and emotion.

To differentiate positively or negatively.

Detailed Curriculum

Reading exercises, writing tasks and grammar of:

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage**
	DOSSIER 6 – Nous rêvons d'aller dans un pays francophone		13	50
1	Leçon 1	100% photo		
	Leçon 2	Voyager autrement		
	Leçon 3	Tour de France		
	Leçon 4	Séjour au Maroc		
	Leçon 5	Quand partir ?		
	Leçon 6	Carnets de voyages		
2	DOSSIER 7 – Nous allons vivre « à la française »		13	50
	Leçon 1	Manger français à Bogota		
	Leçon 2	La France à Budapest		
	Leçon 3	Les français et les livres		
	Leçon 4	Retour aux sources		
	Leçon 5	S'habiller « à la française »		
	Leçon 6	Petits coins de France		

Total	**26**	**100%**

References :
1. Berthet, Hugot et al. Alter Ego - Méthode de Français, A1: Hachette,2012.
2. Bruno Girardeau et Nelly Mous. Réussir le DELF A1. Paris : Didier, 2011.
3. Loiseau Y.,Mérieux R. Connexions 1, cahier d'exercices. Didier, Paris, 2017.
4. Loiseau Y. & Mérieux R. Connexions 1, Guide pédagogique. Didier, Paris, 2017.
5. Connexions 1, livre de l'élève – Loiseau Y. & Mérieux R., éd. Didier, Paris,2017.
6. Latitudes 1, cahier d'exercices – Loiseau Y. & Mérieux R., éd. Didier, Paris,2018.
7. Latitudes 1, Guide pédagogique – Loiseau Y. & Mérieux R., éd. Didier, Paris,2018.
8. Latitudes 1, Guide pédagogique téléchargeable – Loiseau Y. & Mérieux R., éd. Didier,2018.
9. Latitudes 1, livre d'élève + CD – Loiseau Y. & Mérieux R., éd. Didier, Paris,2018.
10. Nathalie Hirschsprung, Tony Tricot, Cosmopolite 1 Méthode de Français A1. Hachette, 2017.
11. Nathalie Hirschsprung, Tony Tricot. Cosmopolite 1 Cahier d'activités A1. Hachette, 2017.

Semester – IV

Course Code	Course Name	Credits
FLG2411N	GERMAN-IV	2

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
2	-	-	2	-	-	2

Theory							Term Work / Practical/Oral			Total
Internal Assessment					End Sem Exam	Duration Of End Sem Exam				
Mid Term	Continuous Evaluation	Attendance	Oral	Total Internal			Term Work	Pract.	Oral	
15	**10**	**05**	**20**	**50**	**50**	75 mins	-	-	-	100

Course Objectives

The course is designed:

1. To communicate in every-day situations in writing.
2. To talk about their daily routine.
3. To communicate verbally with a dialogue-partner with respect to basic topics, provided the partner speaks slowly, clearly and is willing to help.
4. To frame and understand simple sentences in past tense.
5. To have a basic conversation using the vocabulary related to clothes and apparels.

Course Outcomes

After completion of this course students will be able to:

1. Communicate in every-day situations in writing.
2. Talk about their daily routine.
3. Communicate verbally with a dialogue-partner with respect to basic topics, provided the partner speaks slowly, clearly and is willing to help.
4. Frame and understand simple sentences in past tense.
5. Have a basic conversation using the vocabulary related to clothes and apparels.

Detailed Syllabus				
Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage**
	Kapitel 9			
1	**Grammatischer Aspekt**	- Perfekt - Partizip II - Konnektoren und Konjunktionen (und,oder, aber)	**06**	**25**
	Kapitel 9			
2	**Thematischer Aspekt**	- einen Tagesablauf beschreiben - über Vergangenes sprechen - Stellenanzeigen verstehen - Meinung über Jobs äußern, Blogs über Jobs verstehen - ein Telefongespräch vorbereiten, telefonieren und nachfragen - über Jobs sprechen	**07**	**25**
	Kapitel 10			
3	**Grammatischer Aspekt**	- Interrogativartikel: welch im Nom. U. Akku. - Demonstrativartikel: dies im Nom. U. Akku. - Partizip II: Trennbare u. nicht trennbare Verben - Personalpronomen im Dativ	**06**	**25**

		- Verben im Dativ		
	Kapitel 10			
4	**Thematischer Aspekt**	- über Kleidung sprechen - Farben - Chat über einen Einkauf verstehen - über Vergangenes berichten - Gespräche beim Kleiderkauf führen - sich im Kaufhaus orientieren - Informationen über Berlin verstehen und recherchieren	**07**	**25**
Total			**26**	**100%**

References:

1. Aufderstraße, Hartmut. *Lagune 1. Deutsch als Fremdsprache: Kursbuch und Arbeitsbuch*. Ismaning: Max Hueber Verlag 2012.
2. Braun, Anna, and Daniela Wimmer. *Schritte Plus A1/1: Arbeitsbuch*. Hueber Verlag, 2020.
3. Dengler, Stefanie. *Netzwerk A1. Teil2. Kurs- Und Arbeitsbuch: Deutsch Als Fremdsprache*. Langenscheidt, 2012.
4. Funk, Hermann, et al. *studio d A1: Deutsch als Fremdsprache*. Cornelsen Verlag, 2015.
5. Langenscheidt. *Langenscheidt Pocket Dictionary German: German-English, English-German*. Langenscheidt Publishing Group, 2022.
6. Niebisch, Daniela, et al. *Lagune A1: Kursbuch*. Hueber Verlag, 2016.

Semester – IV

Course Code	Course Name	Credits
FLS2411N	SPANISH IV	2

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
2	-	-	2	-	-	2

Theory							Term Work / Practical/Oral			Total
Internal Assessment					End Sem Exam	Duration Of End Sem Exam	Term Work	Pract.	Oral	
Mid Term	Continuous Evaluation	Attendance	Oral	Total Internal						
15	10	05	20	50	50	75 mins	-	-	-	100

Course Objectives

The course is designed:

1. To strengthen the language of the students in both oral and written form.
2. To enable the students to use interrogatives in Spanish.
3. To enable the students to use simple future tense to frame and speak sentences about future.
4. To enable students to write and speak about past tense.
5. To teach how to write a formal E-mail.

Course Outcomes

After completion of this course, students will be able to:

1. Write and speak about geography, food, culture, and themselves effectively.
2. Demonstrate effective use of interrogatives in Spanish and use them appropriately to form questions and answer them.

3. Get a deep knowledge about the future tense, and they will be able to frame sentences using simple future.
4. Use past perfect tense to talk about activities and events that happened in the past.
5. Understand how to write a formal or business E-mail.

Detailed Curriculum

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage (%)**
	María tiene suerte		**8**	**31**
1	1.1	El verbo TENER		
	1.2	Las expresiones con el verbo TENER		
	1.3	Acuerdo y desacuerdo		
	¿Sabes conducir?		**7**	**27**
2	2.1	El verbo Saber y Conocer		
	2.2	Las diferencias entre Saber y Conocer		
	2.3	El futuro simple en español		
	2.4	Un ensayo basado en el futuro simple		
	¿Quién quiere aprender español?		**5**	**19**
3	3.1	Los interrogativos y las preguntas usando el interrogativo		
	3.2	La cultura de España		
	¿Dónde has estado?		**6**	**23**
4	4.1	El pretérito perfecto en español		
	4.2	Escribir correo electrónico usando el pretérito perfecto.		
Total			**26**	**100**

References:

1. Balea, Amalia, and Pilar Ramos Vicent. *Cultura en España, B1-B2*. 2015.
2. Cantarino, Vicente. *Civilización y cultura de España*. Prentice Hall, 2006.
3. Gambluch, Carina. *Diverso 1*. 2015.

4. Melero, Pilar, and Enrique Sacristán. *Protagonistas B1. Libro del alumno + CD [Internacional]*. 2010.
5. Ortega, María Luisa Hortelano, et al. *Colega*. 2009.
6. Pereira-Muro, Carmen. *Culturas de Espana*. Cengage Learning, 2014.
7. Prisma, Equipo Nuevo, and Evelyn Aixalà I. Pozas. *Nuevo prisma A2*. 2014.
8. Prisma, Equipo Nuevo. *Nuevo prisma*. 2015.
9. Richmond, Dorothy. *Practice Makes Perfect: Spanish Verb Tenses, Premium Fifth Edition*. McGraw-Hill Companies, 2023.
10. Skelton, Adam, and Laura Garrido. *Essential Spanish Phrasebook. Over 1500 Most Useful Spanish Words and Phrases for Everyday Use*. 2012.

Semester - IV

Course Code	Course Name	Credits
CSE2412N	EFFECTIVE WRITING SKILLS	1

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
01	-	-	01	-	-	01

Internal				External		Total
Mid-Sem Exam	Continuous Evaluation	Attendance	Total Internal	End Sem Exam	Duration Of End Sem Exam	
15	30	05	50	50	2 Hours	100

Course Objectives

The course is designed:

1. To demonstrate understanding of effective writing fundamentals.
2. To master various forms of writing.
3. To develop proficiency in official correspondence.
4. To acquire report writing skills.
5. To explore the professional aspects of writing.

Course Outcomes

After completion of this course Students will be able to:

1. Articulate and apply guidelines for effective writing, avoiding common errors in various contexts.

2. Demonstrate proficiency in crafting well-structured paragraphs, assignments, and letters, adhering to prescribed formats and guidelines.
3. Compose official documents, including memos, notices, circulars, agendas, and minutes, following established formats and guidelines.
4. Understand the principles of report writing, distinguish between types of reports, and effectively create project reports.
5. Recognize the advantages and opportunities of social networking for professional growth, and they will be able to make meaningful contacts.

Detailed Curriculum

Module/ Unit	Course Module / Contents		Hours	Marks Weightage
	Introduction to Writing Skills		**03**	23
1	1.1	Guidelines to Effective Writing Skills, Avoiding Common Errors		
	1.2	Paragraph Writing Assignment Writing		
	1.3	Plagiarism		
2	**Letter Writing**		**03**	23
	2.1	Types of letters		
	2.2	Formats & Guidelines		
3	**Official Correspondence**		**04**	31
	3.1	Memo & Notice		
	3.2	Circulars, Agenda and Minutes		
4	**Report Writing**		**03**	23
	4.1	Principles of Report Writing,		
	4.2	Types of Report Writing		
	4.3	Project Report Writing		
	4.4	Social Networking: Advantages, Opportunities, Making Contacts		
Total			**13**	**100**

References:
1. Adair, John. *Effective Communication: The most important management skill of all*. Rev. ed. Pan Macmillan, 2011.
2. Crystal, D. *The Cambridge Encyclopaedia of the English Language*. Cambridge: Cambridge University Press.1997
3. Jones, Leo. *Working in English*, Cambridge University Press, 2001
4. Krishnaswamy N & T Sriraman. *Creative English for Communication*, Macmillan India Limited, 2000.
5. Lesikar, Raymond V., & John D. Pettit, Jr. *Report Writing for Business*: Tenth Edition. Delhi: McGraw-Hill, 1998.
6. Mascull, Bill. *Business Vocabulary in Use Advanced*, Cambridge University Press, 2004.
7. Prasad, H. M. *How to Prepare for Group Discussion and Interview*. New Delhi: Tata McGraw-Hill Publishing Company Limited, 2001.
8. Raman, Meenakshi & Singh, Prakash. *Business Communication*, Oxford University Press, 2006.
9. Seely, John. *Writing Reports*. New York: Oxford University Press, 2002.
10. Sharma, R. C. & Krishna Mohan. *Business Correspondence and Report Writing*: Third Edition. New Delhi: Tata McGraw-Hill Publishing company Limited, 2007.
11. Smoke, Trudy. *A Writer's Workbook: A Writing Text with Readings*, Cambridge University Press, 2005

Semester – IV

Course Code	Course Name	Credits
BEH2413N	BEHAVIORAL SCIENCE-IV (STRESS AND COPING STRATEGIES)	1

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
01	-	-	01	-	-	01

Theory							Total
Internal Assessment					End Sem Exam	Duration of End Sem Exam	
Activity	Assignment	Viva	Attendance	Total Internal			
20	**40**	**35**	**05**	**100**	**00**	**-**	**100**

Course Outcome	
1.	The knowledge of this subject is essential to understand about Stress and Coping Strategies as a human is very important concept to understand Stress as stress.
2.	To help students become aware of the signs and symptoms of stress early, to prevent chronic stress.
3.	To help students identify potential sources of stress and to develop an awareness that they can cope with the stress in their lives.
4.	To Enhanced emotional resilience and stability.
5.	Better work-life balance and reduced burnout.
6.	Strengthened support networks and relationships.

Course Objective

1.	To introduce the student about stress and coping mechanisms.
2.	To take students, step by step, through an interactive understanding of each of the basic related to stress and coping mechanisms.
3.	To give the student a basic understanding of stress and coping mechanisms so that they can have a better understanding of how to cope with stressors.
4.	To give the student a basic understanding which will act as a foundation for dealing with general life stress.
5.	To develop an understanding of stress and coping mechanisms
6.	To understand ability to recognize and manage stress triggers.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Introduction of Stress**		02	20
1	1.1	Nature, Meaning & characteristics of Stress.		
	1.2	Psychological meaning of Stress		
	1.3	Primary appraisal, secondary appraisal, and past experiences		
	1.4	Sign and Symptoms of Stress		
Module II	**Types & Sources of stress**		02	20
2	2.1	Stages of stress, The physiology of stress		
	2.2	Stimulus-oriented approach.		
	2.3	The transactional and interactional model.		
	2.4	Pressure – environment fit model of stress.		
Module III	**Causes and symptoms of stress**		02	20
3	3.1	Personal, Organizational and Environmental		

	3.2	Cognitive & Behavioral symptoms		
	3.3	Stress and Immune system		
	3.4	GAD and symptoms in general life		
Module IV	**Consequences of stress**		02	20
4	4.1	Effect on behavior and personality		
	4.2	Effect of stress on performance		
	4.3	Individual and Organizational consequences with special focus on health		
	4.4	Effect of stress on physical health		
Module V		**Strategies for stress management**	02	20
5	5.1	Coping with Stress: Stress management techniques, Meditation procedure		
	5.2	Meditation procedure and Biofeedback		
	5.3	Positive health, happiness, and wellbeing		
	5.4	Relaxation Techniques		
Total			**10**	**100%**

References:

1. McEwen, B. S. (2002). The End of Stress as We Know It. Dana Press
2. Sapolsky, R. M. (2004). Why Zebras Don't Get Ulcers (3rd ed.). Holt Paperbacks.
3. Marmot, M. G., & Wilkinson, R. G. (2006). Social Determinants of Health (2nd ed.). Oxford University Press.
4. Cohen, S., Janicki-Deverts, D., & Miller, G. E. (2007). Psychological stress and disease. JAMA, 298(14), 1685-1687.
5. Seligman, M. E. P. (2011). Flourish: A Visionary New Understanding of Happiness and Well-being. Atria Books.
6. Ganster, D. C., & Rosen, C. C. (2013). Work stress and employee health: A multidisciplinary review. Journal of Management, 39(5), 1085-1122.

Semester -IV

Course Code	Course Name	Credits
IBI2415N	Insights of Biotechnology Industry-II	03

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	-	-	03	-	-	03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Demonstrate a comprehensive understanding of advanced biotechnological tools such as CRISPR/Cas9, TALENs, and zinc finger nucleases, and their applications in genetic engineering and research.
2.	Explain the principles of protein engineering and evaluate the role and potential impact of biosimilars within the biotechnology industry.
3.	Describe the fundamentals of nanotechnology and its application in biotechnology, including drug delivery, biosensing, and bioimaging.
4.	Critically analyze recent industry breakthroughs, including advancements in product purification strategies and the application of simulation software or computer programs in industrial contexts.
5.	Understand and apply concepts of advanced biomanufacturing, with an emphasis on automation and robotics, to improve production efficiency and quality.

6.	Assess the influence of artificial intelligence and machine learning on innovation and development within the biotechnology field.

Course Objective	
1.	Give overview of advanced biotechnological tools like CRISPR/Cas9, TALENs, and zinc finger nucleases and their applications.
2.	Understand concepts of protein engineering and explore the potential of biosimilars in biotechnology industry.
3.	Grasps the concept of nanotechnology and its integration with biotechnology for various applications like drug delivery, biosensing, bioimaging etc.
4.	Analyse recent breakthroughs in industries, especially product purification strategies, simulated computer programs or software having demand in the industries.
5.	Understand advanced biomanufacturing with a focus on automation and robotics.
6.	Assess AI and machine learning's impact on biotechnology innovation.

Detailed syllabus

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage (%)**
Module I	**Advanced Biotechnological Tools**		9	22
1	1.1	Brief overview of advanced tools in Biotechnology.		
	1.2	Applications in industries: CRISPR/Cas9, TALENs, and zinc finger nucleases.		
	1.3	Microbiome engineering to enhance industrial processes, agriculture, and human health.		

Module II	**Protein Engineering and Biosimilars**			
2	2.1	Protein engineering-concept, techniques, applications in industries.	6	13
	2.2	Biosimilars-Introduction, applications-monoclonal and non-monoclonal antibodies.		
	2.3	Development of diagnosis kits/methods-based on ELISA, lateral flow, flow cytometry, biosensors, non-invasive methods.		
Module III	**Industrial Applications of Nanobiotechnology**			
3	3.1	Integration of nanotechnology with biotechnology to create functional materials and devices at the nanoscale.	6	13
	3.2	Nano-bio interfaces facilitate targeted drug delivery, biosensing, and imaging with high specificity and efficiency.		
	3.3	Organ-on-a-Chip Technology that mimic the structure and function of human organs for accurate drug testing, disease modelling, and personalized medicine approaches.		
Module IV	**Biotechnology Industry Trends and Emerging Technologies**			
4	4.1	Innovations in important laboratory scale instrumentation-filtration, centrifugation, distillation, extractors, crystallizers etc.	7	15
	4.2	Overview and applications of process simulated programs e.g. Simulated Moving Bed (SMB) technology.		
	4.3	BioProcess Simulator™ (BPS).		
	4.4	SuperPro Designer® (SPD).		
	4.5	BioSTEAM, Aspen Batch Plus (ABP) etc.		

Module V	**Advanced Biomanufacturing: Automation and Robotics**			
5	5.1	Introduction to advanced biomanufacturing, bioprocessing and drug manufacturing with a focus on automation and robotics.	9	22
	5.2	Case studies emphasizing the integration of automation and robotics for efficiency and scalability in biotechnology industries.		
Module VI	**Future Perspectives in Biotechnology: AI and Machine Learning**			
6	6.1	Role of AI and machine learning (ML) in driving innovation in biotechnology industry.	7	15
	6.2	AI and ML applications in drug discovery.		
	6.3	personalized medicine, and bioprocessing.		
	6.4	Case studies about AI and machine learning in biotechnology industry research and development.		
Total			**45**	**100%**

References:

1. McCarthy, J. J., & Mendelsohn, B. (2017). Precision medicine: A guide to genomics in clinical practice.
2. Doran, P. M. (1995). *Bioprocess engineering principles*. Elsevier.
3. Xing, L., Giger, M. L., & Min, J. K. (Eds.). (2020). *Artificial intelligence in medicine: technical basis and clinical applications*. Academic Press.
4. Cleophas, T. J., & Zwinderman, A. H. (2015). *Machine learning in medicine-a complete overview* (Vol. 21). Cham; Heidelberg: Springer International Publishing.
5. Wang, C., Chen, J., Wen, P., Sun, P., & Xi, R. (2016). Regenerative medicine-from protocol to patient.

6.	Carter, P. J. (2011). Introduction to current and future protein therapeutics: a protein engineering perspective. *Experimental cell research*, *317*(9), 1261-1269.

Semester - IV

Course Code	Course Name	Credits
ANM2417N	ANIMATION-III (ADVANCED ANIMATION STUDIO)	02

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
01	02	-	01	01	-	02

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam Practical /Project Presentation	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
35	10	05	50	50	02 Hours	-	02	-	100

Course Outcome	
1.	Advanced Animation Skills: Students will demonstrate proficiency in advanced animation techniques, including character animation, rigging, and effects.
2.	Creative Storytelling: Students will develop the ability to create compelling narratives and visual stories through animation.
3.	Technical Proficiency: Students will gain advanced technical skills in animation software and tools.
4.	Professional Portfolio: Students will create a professional animation portfolio showcasing their skills and creativity.

Course Objective

1.	To enhance students' proficiency in advanced animation software and techniques.
2.	To develop a deep understanding of character animation, storytelling, and visual communication.
3.	To cultivate critical thinking and problem-solving skills in animation production.
4.	To prepare students for careers in animation through the creation of a professional animation portfolio.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Advanced Character Animation**		**06**	**20%**
1	1.1	Character Acting and Emotion: Explore advanced techniques for character acting, conveying emotions, and creating believable performances.		
	1.2	Advanced Rigging and Controls: Learn advanced rigging techniques to create flexible and expressive character rigs.		
	1.3	Lip Sync and Facial Animation: Master the art of lip syncing and facial animation to bring characters to life.		
	1.4	Advanced Animation Exercises: Practice advanced animation exercises to refine animation skills and techniques.		
Module II	**Visual Storytelling and Cinematography**		**06**	**20%**

2	2.1	Storyboarding for Animation: Develop storyboarding skills for animation, focusing on shot composition, pacing, and visual storytelling.		
	2.2	Cinematic Techniques in Animation: Explore advanced cinematic techniques, such as camera angles, lighting, and mood, to enhance storytelling.		
	2.3	Editing and Timing: Animating to Audio: Sync animation with audio tracks, including dialogue, music, and sound effects, to create cohesive storytelling.		
	2.4	Animating to Audio: Sync animation with audio tracks, including dialogue, music, and sound effects, to create cohesive storytelling.		
Module III	**Advanced Animation Production**			
3	3.1	Short Film Production: Collaborate with peers to produce a short, animated film, applying advanced animation techniques and principles.	**06**	**30%**
	3.2	Visual Effects and Dynamics: Learn to create visual effects and dynamics, such as particle systems, cloth simulations, and fluid dynamics, in animation.		
	3.3	Motion Capture and Performance Capture: Explore the use of motion capture and performance capture technologies in animation production.		
	3.4	Interactive Animation: Learn about interactive animation techniques for games and other interactive media.		

Module IV	**Advanced Rigging Techniques**:			
4	4.1	Character and Object Rigging: Development of complex rigs for characters and objects with advanced controls and deformations.	**08**	**30%**
	4.2	Sophisticated Animation Methods: Character Animation: Techniques for animating detailed character interactions and nuanced movements.		
	4.3	Motion Capture Integration: Data Utilization: Importing and refining motion capture data for enhanced realism in character animations.		
	4.4	Advanced Visual Effects: Effects Creation: Techniques for creating and integrating complex visual effects, including particle systems and fluid dynamics.		
Total			**26**	**100%**

References:

1. Williams, R. (2012). THE ANIMATOR'S SURVIVAL KIT. Faber & Faber.
2. Hooks, E. (2017). ACTING FOR ANIMATORS: 4TH EDITION. Routledge.
3. Vaughan, W. (2012). DIGITAL MODELING. New Riders.
4. Kerlow, I. V. (2017). THE ART OF 3D COMPUTER ANIMATION AND EFFECTS (4th ed.). Wiley.
5. Goldberg, E. (2008). CHARACTER ANIMATION CRASH COURSE! Silman-James Press.
6. Osipa, J. (2013). STOP STARING: FACIAL MODELING AND ANIMATION DONE RIGHT (3rd ed.). Wiley.

Semester - IV

Course Code	Course Name	Credits
PHT2417N	PHOTOGRAPHY-III (DIFFERENT GENRES OF PHOTOGRAPHY)	2

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
1	2	-	1	2	-	02

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Students will know about Product Photography
2.	Student will learn about Glamour Studio Photography
3.	How to control exposure during event photography
4.	How to use camera in wildlife photography

Course Objective	
1.	Students will get an overview on different genres of photography
2.	Analyzing the difference of the photography culture
3.	Analyzing the difference of the photography, composition and technical aspects used in shooting related subjects.

4.	The aim of the course is to train the mind in how to see the world through a camera.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Photojournalism**		6	20
1	1.1	What is Photojournalism		
	1.2	How to deal with people		
	1.3	How to get information		
	1.4	How to find perfect frame		
Module II	**Table-top Photography**		6	20
2	2.1	Product Selection		
	2.2	Props Selection		
	2.3	Gear-Camera selection		
	2.4	How to use light		
Module III	**Glamour Photography**		6	30
3	3.1	How to use Artificial light		
	3.2	One point – Two point – Three Point lighting		
	3.3	Makeup		
	3.4	Retouching		
Module IV	**Assignment: Assignment: Shooting Travel Photography, Portrait Photography**		8	30
4	4.1	Framing		
	4.2	Composition		
	4.3	Color Palette		
	4.4	Techniques		

Total	26	**100%**

References:	
1.	Prescribed Textbooks: World of DSLR
2.	Reference Material: The British Journal of Photography
3.	Name and Publication: online Journal Ang, T., & Studd, R. (2013). Digital Photography Step by Step. DK.
4.	Frost, L. (2019). Creative Photography Ideas Using Adobe Photoshop: 75 Workshops to Enhance Your Photographs. Ilex Press.

Semester – IV

Course Code	Course Name	Credits
POL2417N	POLITICAL SCIENCE- III- (INDIAN GOVT & POLITICS)	02

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
13	-	13	01	-	01	02

Internal Assessment				End Semester Evaluation	Total
Mid Term	**Continuous Evaluation**	**Attendance**	**Total**	**End Semester Evaluation/ Project/ Report/ Presentation**	**Internal Assessment + End Semester Evaluation**
15	**30**	**5**	**50**	**50**	**100**

Course Outcome

1. Memorize the structure and functions of different branches of the Indian government, including the legislature, executive, and judiciary.
2. Explain the principles of Indian democracy and the features of its political system, including federalism, secularism, and parliamentary democracy.
3. Apply theoretical concepts and frameworks to analyse current political issues and trends in Indian society.
4. Compare and contrast different political ideologies and movements influencing Indian politics, such as socialism, liberalism, and nationalism.
5. Critically assess the strengths and weaknesses of India's democratic institutions and governance structures.
6. Develop strategies for enhancing political participation, accountability, and representation in the Indian political system.

Course Objectives

1. To understand the structure and functioning of the Indian political system: This objective aims to provide students with a comprehensive understanding of the institutions, processes, and principles that govern the Indian political system.
2. To analyze the dynamics of Indian democracy and governance: This objective focuses on examining the various dimensions of Indian democracy, including electoral politics, political parties, federalism, and governance challenges.
3. To evaluate the impact of socio-economic and cultural factors on Indian politics: This objective aims to explore the interplay between socio-economic, cultural, and political factors in shaping the Indian polity.

Detailed Syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage
	Introduction to Indian Political System		5	20
1	1.1	Introduction to key concepts: democracy, federalism, secularism		
	1.2	Historical background of Indian political system		
	Institutions of Indian Democracy		**6**	20
2	2.1	Parliament and Legislative Process		
	2.2	Executive Branch		
	2.3	Judiciary and Legal System		
	Political Dynamics in India		7	30
3	3.1	Evolution of party system in India		
	3.2	Electoral process, party competition, and electoral reforms		
	Contemporary Issues and Challenges		8	30
4	4.1	Regionalism in Indian Politics		

	4.2	New Social Movements since the 1970s, Environmental Movements, Women's Movements, Human Rights Movements		
Total			26	**100%**

References:
1. B. Chandra, Essays on Colonialism, Orient Longman, Delhi, (1999).
2. S. Sarkar, Modern India, Macmillan, Delhi (1983).
3. B. Chandra et. al. (eds.), India's Struggle for Independence, Penguin UK, 2016.
4. P. Brass, The Politics of India since Independence, Cambridge University Press, Cambridge (1994).
5. B.Chakrabarty & R.K.Pandey, Indian government and Politics. SAGE Publications India, New Delhi (2008).
6. Hoveyda, Indian Government and Politics, Pearson Education India, New Delhi (2010).

Semester - IV

Course Code	Course Name	Credits
TSM2417N	TOURISM MANAGEMENT-III (TOURISM TRENDS)	02

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
13	-	13	01	-	01	02

Internal Assessment				End Sem Exam- End Semester Evaluation/ Project/ Report/ Presentation	Duration of End Sem Exam	Total
Mid Term	**Continuous Evaluation**	**Attendance**	**Total Internal**			**Internal Assessment + End Semester Evaluation**
15	**30**	**5**	**50**	**50**	**2 Hours**	**100**

Course Outcome	
1	Students will be able to remember and identify significant patterns and factors that have influenced the growth and development of tourism in India.
2	Students will be able to interpret and describe the factors contributing to the growth of Indian tourism and explain the patterns in foreign tourist arrivals.
3	Students will be able to map and analyze tourism trends in states like Tamil Nadu, Uttar Pradesh, Karnataka, Madhya Pradesh, Delhi, and Maharashtra, and understand the impact of these trends on state tourism organizations.
4	Students will critically evaluate and analyze emerging tourism trends, products, and technologies that are shaping the future of the industry.
5	Students will evaluate the implications of the latest trends and emerging tourism products, considering their potential impact on the industry

6	Students will create comprehensive presentations or case studies on the latest tourism trends, synthesizing information from various sources to provide detailed explanations and insights.

Course Objective	
1	To obtain knowledge on new emerging trends of Tourism in India.
2	To study the effect of the emerging trends on Indian Economy.

Detailed Syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage
Module I	**Mapping Trends in Tourism**		7	25
1	1.1	Domestic and International Trends and Patterns in Indian Tourism Travel.		
	1.2	Factors responsible for growth and development of Indian tourism		
	1.3	Foreign Tourist Arrivals accounting.		
Module II	**Current Tourism Scenario in India**		**7**	30
2	2.1	State Tourism Organizations: - Changing pattern observed on the arrival of tourists.		
	2.2	Mapping and analyzing of tourism trends of the following states: - Tamil Nadu, Uttar Pradesh, Karnataka, Madhya Pradesh, Delhi, Maharashtra.		
Module III	**Emerging Tourism Trends**		7	30
3	3.1	Emerging trends within tourists and travelers		
	3.2	Emerging tourism products of India		
	3.3	Emerging technologies, change in scope of tourism		

Module IV	**Case Study**		5	15
4	4.1	Presentation on any latest/emerging tourism trend in the country and explain in detail.		
Total			26	**100%**

References:	
1	Tourism: Principles and Practice by John Fletcher, Alan Fyall, David Gilbert, and Stephen Wanhill (2017)
2	Emerging Trends in Tourism and Hospitality by B. I. Mahajan and S. R. Vyas (2018)
3	Indian Tourism: Past, Present, and Future by Patrick M. Casabona (2020)
4	Tourism in India: New Trends and Opportunities by Ratandeep Singh (2016)
5	Sustainable Tourism Practices in the Tourism Industry by James E. S. Higham and Michael Lück (2016)

Semester – IV

Course Code	Course Name	Credits
SCW2417N	SOCIAL WORK-III (UNDERSTANDING SOCIAL PROBLEMS IN INDIA)	02

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
13	13	-	01	01	-	02

Internal Assessment				End Semester Evaluation	Total
Mid Term	**Continuous Evaluation**	**Attendance**	**Total**	**End Semester Evaluation/ Project/ Report/ Presentation**	**Internal Assessment + End Semester Evaluation**
-	**45**	**5**	**50**	**50**	**100**

Course outcome

1. Students will understand conceptual and theoretical aspects of social problems in India.
2. Student will be aware about the problems and crimes of society.
3. Students will be able to understand the problems and effects individual, family & society.
4. Students should be able to handle social problems and treatment. In future, they would contribute to social policy making as a social work professional.

Course Objectives

1. To study the basic concepts of social problem and social work approaches.

2. To understand various social problems and its management and legislative measures.
3. To understand role of social work and social worker in management of social problems.
4. To study social development and social change process to deal with social problems.

Detailed Syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage
	Social Problems		7	25
1	1.1	Social problems: Meaning, Concept and Definitions,		
	1.2	Classification of social problems.		
2	1.3	Causes and consequences of social problems.	7	30
	1.4	Social work approach in the prevention, control, and management of social problems.		
	Various Social Problems in India		7	30
3	2.1	Extent, causes, management, and legislative measures		
	2.2	Youth Unrest, Human Trafficking, Substance Abuse, Beggary, Commercial Sex Work, Corruption, Terrorism, Child labour, Role of social worker in identifying social problems and developing strategies for help		
4	2.3	Case-studies	5	15
Total			26	**100%**

References:

1. Ahuja, Ram (1992), Social Problems in India, Rawat Publications, Jaipur.
2. Keneth, Henry (1978), Social Problems: Institutional and Interpersonal Perspectives, Scott, Foresman and Company, Illinois, London.

3. Merton, Robert K, and Robert Nisbet (1971), Contemporary Social Problems, Fourth Edition, Harcourt Brace and Co., New York.

Semester – IV

Course Code	Course Name	Credits
BPS2417N	BIOPRENEURSHIP-III	02

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
02	-	-	02	-	-	02

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	30	05	50	50	3 Hours	-	-	-	100

Course Outcome	
1.	Understand Biotech Enterprise Setup
2.	Comprehend Quality Control and Export Opportunities
3.	Navigate Regulatory Affairs in Biotech
4.	Apply Ethical and Social Principles in Biopreneurship
5.	Develop and Present Regulatory and Commercialization Strategies
6.	Engage in Group Discussions on Biotech Challenges

Course Objective	
1.	Understand regulatory requirements and compliance standards applicable to biotech product development.

2.	Develop effective marketing and commercialization strategies for biotech products.
3.	Understanding ethical and social considerations to prepare students for industry challenges.
4.	Understand quality control measures in biotech industries and identify incentives, subsidies, and export opportunities available to biotech enterprises.
5.	Familiarize the regulatory agencies and requirements that govern the biotech industry, including compliance for product development and clinical trials.
6.	Engage group activities and discussions that delve into regulatory compliance, marketing strategies, and the ethical implications of biotech entrepreneurship.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Biotech enterprises and commercialization Strategies for Biotech Products**		**7**	**25**
1	1.1	Procedure for registering start-up in India		
	1.2	Setting up small, medium, and large-scale industries		
	1.3	Quality control in biotech industries		
	1.4	Incentives and subsidies		
	1.5	Export opportunities		
	1.6	Commercialization Strategies for Biotech Products		
Module II	**Regulatory Affairs and Compliance in Biotech sector**		**7**	**25**
2	2.1	Overview of regulatory agencies governing the biotech industry		
	2.2	FDA, EMA, and other international regulatory bodies		

	2.3	Examination of regulatory requirements for product development and clinical trials		
	2.4	Examination of regulatory requirements for marketing authorization		
	2.5	IPR, exit and licensing strategies		
	2.6	IPR valuation		
Module III	**Ethical and Social Considerations in biopreneurship**		**6**	**20**
3	3.1	Ethical Considerations in biopreneurship		
	3.2	Social Considerations in biopreneurship		
	3.3	Examining ethical dilemmas in biotechnology entrepreneurship		
	3.4	Examining social responsibilities in biotechnology entrepreneurship		
	3.5	Addressing issues related to bioethics		
	3.6	Addressing issues related to sustainability, and public perception		
Module IV	**Presentation**		**6**	**15**
4	4.1	Regulatory affairs		
	4.2	Compliance		
	4.3	Commercialization strategies		
	4.4	Ethical considerations in biopreneurship		
	4.5	Marketing Strategies		
	4.6	Social considerations in biopreneurship		
Module V	**Assignment/group discussion/activity**		**4**	**15**
5	5.1	Regulatory affairs		
	5.2	Compliance		
	5.3	Marketing and commercialization strategies		
	5.4	Ethical considerations in biopreneurship		
	5.5	Marketing Strategies		

	5.6	Social considerations in biopreneurship		
Total			**30**	**100%**

References:	
1.	Wright, P., & Kumra, G. (2023). *Biotech Entrepreneurship: From Science to Market*. Academic Press.
2.	Tzotzos, G. T. (2021). *Biotechnology Entrepreneurship: Starting, Managing, and Leading Biotech Companies*. Elsevier.
3.	Rao, M., & Gunasekaran, A. (2022). *Regulatory Affairs in the Pharmaceutical Industry: Compliance and Quality Assurance*. CRC Press.
4.	Shapiro, C. E., & Varian, H. R. (2020). *Information Rules: A Strategic Guide to the Network Economy*. Harvard Business Review Press.
5.	Dawson, A., & Yentis, S. M. (2019). *The Cambridge Textbook of Bioethics*. Cambridge University Press.
6.	Gostin, L. O., & Wiley, L. F. (2021). *Public Health Law: Power, Duty, Restraint*. University of California Press.

Detailed Curriculum: Semester V

Semester-V								Evaluation Scheme		
Types of courses		**Course Code**	**Course Title**	**Lecture (L) credits**	**Tutorial (T) credits**	**Practical (P) Credits**	**Total credits**	**Internal Marks**	**External Marks**	**Total Marks**
Discipline Specific Courses	**Discipline-I (Core)**						**12**			
	Discipline-I (Compulsory)	PBT2501N	Introduction to Plant Biotechnology	3	0	0	3	**30**	**70**	**100**
		BST2502N	Biostatistics	3	0	0	3	**30**	**70**	**100**
		RMI2503N	Research Methodology and IPR	3	0	0	3	**30**	**70**	**100**
		LPB2504N	Lab course on Plant Biotechnology	0	0	2	1	**30**	**70**	**100**
		LBS2505N	Lab course on Biostatistics	0	0	1	1	**30**	**70**	**100**
	Discipline II (any one from the basket)						**4**	**30**	**70**	**100**
	Discipline II (Select any one from basket)	DDM2506N	Drug Development and Molecular Modelling	3	0	0	3	**30**	**70**	**100**
		PGE2507N	Plant Genetic Engineering	4	0	0	4	**30**	**70**	**100**
		FPP2508N	Food processing and Packaging	3	0	0	3	**30**	**70**	**100**
		LDD2509N	Lab Course on Drug Development and Molecular Modelling	0	0	1	1	**30**	**70**	**100**
		LFP2510N	Lab Course on Food processing and Packaging	0	0	1	1	**30**	**70**	**100**
	Total (Discipline I + II)						**16**			
Foundation courses	Ability Enhancement Courses	**Foreign Language (any one from the basket)**					**2**			
		FLF2511N	French- V	2	-	-	2	**50**	**50**	**100**
		FLG2511N	German-V	2	-	-	2	**50**	**50**	**100**
		FLS2511N	Spanish-V	2	-	-	2	**50**	**50**	**100**
		CSE2512N	Employability Skills	1	-	-	**1**	**50**	**50**	**100**
	Subtotal						**3**			

	Skill Enhancement Program	BEH2513N	Behavioural Science-V	1	-	-	1	**100**	**0**	**100**
						Subtotal	**1**			
	Co-Curricular Courses	**VAC-III**					**0**			
		PHE2318N	Physical Education and Sport**				0			
						Subtotal	**0**			
						Total (Foundation Courses)	**4**			
Non-Teaching Credit Courses						**Summer Internship**	**5**			
	SIP/ Internship/ Project/ Dissertation/ Field Visit	SUI2521N	Summer Internship	-	-	-	5	**100**	**0**	**100**
						subtotal	**5**			
						Total (NTCC)	**5**			
Grand Total							**25**			
***Continued till Semester VI*										

Semester - V

Course Code	Course Name	Credits
PBT2501N	INTRODUCTION TO PLANT BIOTECHNOLOGY	03

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
7.	Students will be able to explain the historical development of plant tissue culture, perform sterilization techniques, prepare different types of nutrient media, and understand the role of phytohormones in plant growth and development within a tissue culture setting.
8.	Students will be able to effectively implement advanced cell culture techniques, including the cultivation of cells, tissues, organs, and protoplasts
9.	Students will be able to apply techniques of organogenesis and somatic embryogenesis, perform micropropagation in improving plant breeding and biotechnology outcomes.

10.	Students will be able to effectively use plant transformation vectors and gene transfer techniques to create transgenic plants
11.	Students will be able to evaluate the development of transgenic crops with new traits
12.	Students will be able to analyze and address bioethical issues, environmental, and societal impacts of plant biotechnology advancements.

Course Objective	
7.	To gain a historical perspective on plant tissue culture, along with practical knowledge of lab organization, sterilization techniques, nutrient media preparation, and the role of phytohormones in plant tissue culture.
8.	To develop a comprehensive understanding of various cell culture techniques, including cell, tissue, and organ cultures, as well as specialized methods such as anther and ovule culture, haploids, doubled haploids, callus culture, suspension culture, and protoplast cultures, along with their applications.
9.	To develop a thorough understanding of organogenesis and somatic embryogenesis, including micropropagation in plant biotechnology.
10.	To gain expertise in plant transformation vectors, gene transfer techniques, and the development of transgenic plants
11.	To develop an understanding of the creation and applications of transgenic crops that express new traits, such as herbicide tolerance, insect and disease resistance, therapeutic proteins, and oral vaccines.
12.	To develop an understanding of the bioethical considerations associated with plant biotechnology, including the implications of field trials and the release of transgenic plants.

Detailed syllabus

Module/ Unit	**Course Module / Contents**	**Hours**	Marks **Weightage** (%)

Module I	**Introduction to plant tissue culture**		8	18%
1	1.1	Historical perspective of plant tissue culture.		
	1.2	Tissue culture lab and organization, Sterilization techniques;		
	1.3	Types of nutrient media and media composition, stock solutions; Role of phytohormones		
Module II	**Techniques in Plant Tissue Culture- I**		8	18%
2	2.1	Cell culture techniques		
	2.2	cell, tissue, organ cultures, anther and ovule culture.		
	2.3	haploids, doubled haploids, callus culture, suspension culture; protoplast cultures and their applications		
Module III	**Techniques in Plant Tissue Culture- II**		9	20%
3	3.1	Organogenesis and somatic embryogenesis		
	3.2	Micropropagation, virus free plant production		
	3.3	Somaclonal variation and its applications		
Module IV	**Introduction to Transgenic Plants**		9	20%
4	4.1	Plant transformation vectors		
	4.2	Gene transfer techniques		
	4.3	Transgenic plants: selection, transgene integration and expression		
Module V	Applications of Transgenic Plants		8	18%
5	5.1	Transgenic crop expressing new traits- herbicide tolerance		

	5.2	insect and disease resistance		
	5.3	Therapeutic proteins, oral vaccines production		
Module VI	**Bioethical issues related to plant biotechnology**			
6	6.1	Bioethical issues related to plant biotechnology	3	7%
	6.2	Field trials and release of transgenic		
Total			45	100

References:	
1.	Slater, A., Scott, N., & Fowler, M. (2008). *Plant biotechnology: the genetic manipulation of plants*. OUP Oxford.
2.	Misra, S. P. (2009). *Plant tissue culture*. Ane Books Pvt Ltd.
3.	Srivastava, D. K., Thakur, A. K., & Kumar, P. (Eds.). (2021). *Agricultural biotechnology: latest research and trends* (pp. 1-36). Singapore: Springer.
4.	Gahlawat, S. K., Salar, R. K., Siwach, P., Duhan, J. S., Kumar, S., & Kaur, P. (Eds.). (2017). *Plant biotechnology: recent advancements and developments* (pp. 1-390). Singapore: Springer.
5.	Singh, K. P., Jahagirdar, S., & Sarma, B. K. (Eds.). (2021). *Emerging trends in plant pathology* (pp. 577-590). Singapore: Springer.
6.	Khurana, S. P., & Gaur, R. K. (Eds.). (2019). *Plant biotechnology: Progress in Genomic era*. Springer.

Semester - V

Course Code	Course Name	Credits
BST2502N	BIOSTATISTICS	03

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	To able to apply appropriate statistical techniques to analyze and interpret data from biomedical research, including descriptive statistics, hypothesis testing, regression analysis, and survival analysis
2.	To demonstrate the ability to manage, clean, and prepare datasets for analysis, including handling missing data, outliers, and data transformations.
3.	To interpret statistical results and understand their implications in the context of biomedical research, including assessing the significance, confidence intervals, and effect sizes.
4.	To gain proficiency in using statistical software (such as R, SAS, SPSS, or Stata) for conducting analyses, generating statistical reports, and visualizing data.

5.	To develop the skills to critically evaluate statistical methods and results in published biomedical research, including assessing study design, statistical validity, and the robustness of conclusions
6.	To communicate statistical findings and their implications to both technical and non-technical audiences, including writing clear and concise reports and presenting results in a meaningful way.

Course Objective	
1.	To develop a solid understanding of fundamental statistical concepts such as probability distributions, sampling methods, and the principles of hypothesis testing.
2.	To learn to apply various statistical methods to analyze data, including t-tests, chi-square tests, ANOVA, linear and logistic regression, and survival analysis.
3.	To gain hands-on experience with statistical software tools (such as R, SAS, SPSS, or Stata) for data analysis, including data entry, manipulation, and generating statistical outputs.
4.	To develop the ability to interpret the results of statistical analyses, including understanding p-values, confidence intervals, and model parameters, and making evidence-based conclusions.
5.	To learn how to design appropriate statistical analyses for various types of biomedical research questions, including understanding study design and ensuring the validity and reliability of statistical results.
6.	To enhance skills in presenting statistical findings clearly and effectively through written reports and oral presentations, ensuring that results are accessible to both technical and non-technical audiences.

Detailed syllabus

Module/ Unit	**Course Module / Contents**	**Hours**	**Marks Weightage (%)**
Module	**Introduction**	6	14

I				
1	1.1	Data and its types		
	1.2	Methods of collecting data		
	1.3	Primary data		
	1.4	Secondary data		
	1.5	Scale of measurement		
	1.6	Diagrammatic representation of data.		
Module II	**Basics of statistics**			
2	2.1	Distinguish between statistics and Bio statistics	7	16
	2.2	Measures of Central Tendency		
	2.3	Mean		
	2.4	Median		
	2.5	Mode Measures of Dispersion: Range		
	2.6	Standard deviation, Variance.		
Module III	**Probability**			
3	3.1	Random Experiments, Trial and Event, Sample Space	9	20
	3.2	Mutually Exclusive or Disjoint Events, Mutually Exhaustive Events,		
	3.3	Equally Probable Events, Complementary Event		
	3.4	Classical definition of Probability, Statistical definition of Probability, Axiomatic definition of Probability		
	3.5	Addition theorem, Multiplication theorem, Conditional Probability		
	3.6	Bayes' Theorem.		
Module	**Distribution**		9	20

IV				
4	4.1	Discrete (Binomial and Poisson)		
	4.2	Continuous (Normal)		
	4.3	Properties of Distribution.		
Module V	**Correlation**			
5	5.1	Bivariate distribution Correlation, Types of Correlation, Simple Correlation	8	18
	5.2	Coefficient for ungrouped data		
	5.3	Properties and Interpretation of Correlation Coefficient, Coefficient of determination		
	5.4	Scatter diagram, Standard Error, Probable error of Correlation Coefficient.,		
	5.5	Rank correlation, Some examples		
	5.6	Linear Regression, least square method		
Module VI	**Introduction to the following Statistical terms**			
6	6.1	Parameter, Statistic	7	16
	6.2	Null hypothesis, Alternative hypothesis		
	6.3	Critical region, Type1 Error, Type 11 Error		
	6.4	Level of significance, P-value, and its applications		
	6.5	Test of Significance for Small and Large samples		
	6.6	Chi-square Test.		
Total			**45**	**100%**

References:	
1.	Fundamentals of Biostatistics by Irfan Ali Khan and Atiya Khanum
2.	Introductory Biostatistics by Chap T Le
3.	Biostatistics: The Bare Essentials by Geoffrey R. Norman, David L. Streiner

4.	Introduction to Biostatistics, Ronald N. Forthfer and Eun Sun Lee. Publisher: Elsevier.
5.	Biostatistics: A foundation for analysis in the Health Sciences, W.W Daniel. Publisher: John Wiley and Sons.
6.	Statistical Methodology, S.P Gupta. Publisher: S. Chand & Co.

Semester - V

Course Code	Course Name	Credits
RMI2503N	RESEARCH METHODOLOGY AND IPR	03

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03	-	-	03	-	-	03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	To remember the differences between different types of research and its importance
2.	To remember the types of research and to understand how to do literature review
3.	To understand the process behind citation and referencing
4.	To analyze the different types of data comparison and understand it's correlation
5.	To evaluate the importance of biosafety and bioethics
6.	To create and understand the report writing and the importance of plagiarism and citation

Course Objective	
1.	To study different types of research and research design.
2.	To learn about the registration processes for patents.
3.	To learn about copyright, trademark, and geographical indication.
4.	To deal with infringement cases.
5.	To understand the punishments for infringement cases
6.	To understand the rules and regulations of bioethics and biosafety.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Objectives and Types of Research**		10	22
1	1.1	Research – Definition		
	1.2	Importance and meaning of research – Characteristics of research		
	1.3	Types of Research		
	1.4	Steps in research – Identification, Selection, and formulation of research problem		
	1.5	Research questions – Research design – Formulation of Hypothesis – Review of Literature.		
	1.6	Role of a researcher in different stages of a project, Article writing and case studies.		
Module II	**Research Formulation**		9	20
2	2.1	Meaning of research design		

	2.2	Features of good design, Different research design		
	2.3	Basic principles of experimental design, Collection of Data		
	2.4	Measurement in research, Measurement scales, error in measurement, Important scaling techniques, collection of primary datas, observation methods, interview method		
	2.5	Different methods of collection of data.		
	2.6	Data Collection and computing.		
Module III	**Patent**		8	18
3	3.1	Patent - Basic requirements of Patentability		
	3.2	Patentable Subject Matter		
	3.3	Procedure for Obtaining Patent		
	3.4	Provisional and Complete Specification		
	3.5	Types of claims, Claim drafting, Patent Drafting		
	3.6	Infringement and anticipation of Patent.		
Module IV	**Copyright and Trademark**		7	16
4	4.1	Copyright - Objectives of copyright,		
	4.2	Registration and subject matters of Copyright		
	4.3	Rights conferred by registration of copyright, Infringement of copyright.		
Module V	**Trademarks**		5	11
5	5.1	Trademarks-Basic Principles of Trademark		
	5.2	Rights conferred by Registration of Trademark, Trademark registration and Infringement of Trademark.		

	5.3	Remedies against copyright and trademark infringement.		
Module VI		**Geographical Indication and Plant Protection act**	6	13
	6.1	Geographical Indications		
	6.2	Objectives of Geographical Indications		
	6.3	Registration procedure		
	6.4	Rights conferred, Infringement of Geographical Indications		
	6.5	Bioprospecting and Biopiracy.		
	6.6	Plant Protection Act, farmers, and breeder's rights.		
Total			**45**	**100%**

References:	
1.	Research Methodology Methods and Techniques by C.R.Kothari
2.	Statistics by B.N.Gupta
3.	Scientific journal and magazines.
4.	Law Relating To Intellectual Property Rights" by V K Ahuja.
5.	Government documents of IP law.

Semester V

Course Code	Course Name	Credits
LPB2504N	LAB COURSE ON PLANT BIOTECHNOLOGY	01

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
-	2	-	-	1	-	01

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	4 Hours	-	-	-	100

Course Outcome	
1.	Students will be able to accurately prepare and sterilize glassware and culture media, ensuring a contamination-free environment for plant tissue culture.
2.	Students will demonstrate the ability to prepare and manage stock solutions and culture media, tailored to specific requirements for successful plant tissue growth
3.	Students will be proficient in sterilizing and inoculating plant explants into culture media, managing cultures effectively for optimal growth.
4.	Students will be capable of assessing the viability of in vitro cultures, identifying signs of growth or contamination, and making necessary adjustments.
5.	Students will be able to induce callus formation and maintain healthy callus cultures by optimizing culture conditions and media.
6.	Students will successfully implement micropropagation techniques and initiate embryo culture, as well as study and apply pollen/ovule culture methods

Course Objective	
1.	To acquire the skills necessary for the proper preparation and sterilization of glassware and culture media used in plant tissue culture.
2.	To learn to prepare various types of culture media, including the preparation of stock solutions and the formulation of media for specific culture needs.
3.	To gain proficiency in the preparation, sterilization, and inoculation of different plant explants into culture media.
4.	To develop techniques to evaluate the viability and growth of in vitro cultures to ensure successful plant tissue culture.
5.	To learn the procedures for inducing and maintaining callus cultures, including the optimal conditions and media for callus formation.
6.	To study and apply techniques for micropropagation, as well as the initiation of embryo culture, and explore pollen/ovule culture methods.

Detailed syllabus

Module/ Unit	Course Module / Contents	Hours	Marks Weightage (%)
List of practical			
1.	Preparation and sterilization of glassware.		
2.	Preparation of stocks for culture media		
3.	Preparation of culture media		
4.	Preparation and sterilization of different explants, and inoculation of explants in culture media.		
5.	Study of viability of in vitro cultures.		
6.	Induction and maintenance of callus culture.		
7.	Initiation of embryo culture.		
8.	Study of micropropagation technique		

9.	Study of pollen/ovule culture		
Total		26	100

References:	
1.	Sathyanarayana, B. N., & Varghese, D. B. (2007). *Plant tissue culture: practices and new experimental protocols*. IK International Pvt Ltd.
2.	Bhojwani, S. S., & Razdan, M. K. (1986). *Plant tissue culture: theory and practice*. Elsevier.
3.	Taji, A., Dodd, W. A., & Williams, R. R. (1992). *Plant tissue culture practice*. University of New England.
4.	Smith, R. H. (2013). *Plant tissue culture: techniques and experiments*. academic press.
5.	Smith, R. H. (2013). *Plant tissue culture: techniques and experiments*. academic press.
6.	Bhojwani, S. S., & Dantu, P. K. (2013). *Plant tissue culture: an introductory text* (Vol. 318). India: Springer.

Semester - V

Course Code	Course Name	Credits
LBS2505N	LAB COURSE ON BIOSTATISTICS	01

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
-	2	-	-	1	-	01

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	4 Hours	-	-	-	100

Course Outcome	
1.	To collect, organize, and manage biological and medical data using appropriate techniques and software tools. They will demonstrate proficiency in handling data sets, including cleaning and preparing data for analysis.
2.	To apply various statistical methods to analyze biological data, including descriptive statistics, hypothesis testing, regression analysis, and analysis of variance (ANOVA). They will interpret and evaluate the results in the context of biological research questions.
3.	To use statistical software packages (such as R, SAS, SPSS, or Python) to perform data analysis. They will be able to write and execute scripts or commands for statistical tests and visualize data through graphs and charts.
4.	To interpret the results of statistical analyses, including understanding p-values, confidence intervals, effect sizes, and the practical significance of

	findings. They will be able to communicate these interpretations clearly in written and oral formats.
5.	To design and critique experiments or observational studies by applying principles of statistical design, including sampling methods, randomization, and control. They will evaluate the potential sources of bias and error in biological research.
6.	To recognize and apply ethical considerations related to data handling and statistical analysis. This includes ensuring the integrity of data, respecting confidentiality, and understanding the implications of statistical findings in the context of research ethics and public health.

Course Objective	
1.	To apply a range of statistical techniques to analyze biological and medical data, including descriptive statistics, inferential statistics, and multivariate analysis, with accuracy and appropriate application.
2.	To demonstrate the ability to manage and manipulate data using statistical software such as R, SAS, SPSS, or Python, including tasks such as data entry, cleaning, and transformation.
3.	To design and execute statistical analyses for various types of experimental and observational studies, ensuring correct application of statistical tests and methods based on study design and data characteristics.
4.	To interpret statistical results accurately and communicate findings effectively in written reports and oral presentations, including explaining statistical concepts and their implications in the context of biological research.
5.	To critically evaluate research designs and methodologies, identifying strengths and limitations in experimental setups, sampling methods, and data collection procedures, and providing recommendations for improvement.
6.	To address ethical considerations related to data handling and statistical analysis, including issues of data privacy, integrity, and the responsible reporting of results in scientific research.

Detailed syllabus

Module/ Unit	Course Module / Contents	Hours	Marks Weightage (%)
List of practical		26	100
1.	Descriptive Statistics		
2.	Graphical Representation of data		
3.	Matrix Operations using Excel.		
4.	Correlation Analysis		
5.	Normality of Data		
6.	T-test		
7.	Simple Linear Regression Analysis		
8.	Chi square analysis		
9.	ANOVA		
10.	Turkeys and Duncan's Multiple range tests		
Total		**26**	**100%**

References:	
1.	Fundamentals of Biostatistics by Irfan Ali Khan and Atiya Khanum
2.	Introductory Biostatistics by Chap T Le
3.	Biostatistics: The Bare Essentials by Geoffrey R. Norman, David L. Streiner
4.	Introduction to Biostatistics, Ronald N. Forthfer and Eun Sun Lee. Publisher: Elsevier
5.	Biostatistics: A foundation for analysis in the Health Sciences, W.W Daniel. Publisher: John Wiley and Sons.
6.	Statistical Methodology, S.P Gupta. Publisher: S.Chand & Co.

Semester - V

Course Code	Course Name	Credits
DDM2506N	DRUG DEVELOPMENT AND MOLECULAR MODELLING	03

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03	-	-	03	-	-	03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Understand the drug development process, the entire process pipeline
2.	Apply molecular modeling techniques to simulate molecular interactions and predict drug behavior
3.	Utilize docking studies to identify and optimize potential drug candidates
4.	Develop pharmacophore models and use them for virtual screening
5.	Perform QSAR analysis to predict the biological activity of chemical compounds.
6.	Predict and optimize ADMET properties of drug candidates using computational tools

Course Objective	
1.	Understand the Drug Development Process

2.	Identify and Validate Drug Targets
3.	Apply Molecular Modeling Techniques
4.	Develop Pharmacophore Models
5.	Conduct QSAR Analysis
6.	Develop Problem-Solving and Critical Thinking Skills

Detailed syllabus

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage (%)**
Module I	**Co-ordinate systems**		7	16
1	1.1	Internal and external co-ordinate system		
	1.2	Generation of co-ordinates of biopolymers in Cartesian coordinates		
	1.3	Cylindrical & polar co-ordinate System		
	1.4	Proteins: Ramachandran plot		
	1.5	Secondary structures; Motifs; Domains; Tertiary and quaternary structures,		
	1.6	DNA: A, B, Z DNA, DNA bending		
Module II	**Drug bank and Energy minimization**		7	16
2	2.1	Drug Bank, Cambridge small molecular crystal structure data bank		
	2.2	Calculation of conformational energy for bio-macromolecules		
	2.3	Developing the energy functions		
	2.4	Charge calculation, Energy minimization methods		

	2.5	Inter & Intra molecular interactions		
	2.6	force fields		
Module III	**Drug bank and Energy minimization**		7	16
3	3.1	Definitions of drug,		
	3.2	sources of drug		
	3.3	classical approach of drug design		
	3.4	Impact of omics on drug development		
	3.5	Structure based approach		
	3.6	Ligand based, Me-Too, repurposing,		
Module IV	**Drug targets classification**		7	16
4	4.1	DNA, RNA, as targets		
	4.2	Post-translational, processing enzymes, metabolic enzymes involved in nucleic acid synthesis,		
	4.3	G-protein coupled receptors		
	4.4	Small molecule receptors, neuropeptide receptors,		
	4.5	Ion channels proteins		
	4.6	Ligand-gated ion channels, transporters.		
Module V	**Drug development of combinatorial libraries**		8	18
5	5.1	The molecular diversity problem, drug characterization, molecular docking,		
	5.2	SAR and QSAR		
	5.3	Molecular descriptors 3D QSAR and COMFA,		
	5.4	ADME - pharmacokinetics,		
	5.5	Pharmacodynamics		
	5.6	Drug toxicity,		

Module VI	Pharmacogenomics and Personalized Medicine			
6	6.1	Impact of Genomics on pharmaceutical sciences	8	18
	6.2	Understanding metabolomics of Disease/ Disorder		
	6.3	Novel target identification		
	6.4	Gene therapy		
	6.5	Personalized medicine,		
	6.6	Pharmacogenomics		
Total			**45**	**100%**

References:	
1.	Ramachandran, G.N. and Sasisekharan, V. (1968) Conformation of polypeptides and proteins. Adv. Prot. Chem., 23, 283.
2.	Creighton, T.E.: Proteins: Structure and Molecular Properties. 2nd Edition. New York. W. H. Freeman and Company, (1993).
3.	Leach. A.R: Molecular modelling: principles and applications
4.	Principles of Medicinal Chemistry, W.O. Foye, T.L. Lemke, and D.A. Williams, Williams and Wilkins
5.	Conformations of Biopolymers, Vol. 2. Edited by G.N.Ramachandran.
6.	Drug Delivery: Engineering Principles for Drug Therapy (Topics in Chemical Engineering), W.M. Saltzman, Oxford University Press

Semester-V

Course Code	Course Name	Credits
PGE2507N	PLANT GENETIC ENGINEERING	03

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	-	-	03	-	-	03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Students will be able to trace the development of plant genetic engineering through key historical milestones, and demonstrate a clear understanding of the fundamental concepts and techniques used in genetic engineering
2.	Students will be able to effectively use restriction enzymes, DNA ligase, and plant-specific vectors in cloning procedures, demonstrating proficiency in the practical application of these tools for genetic modification in plants.
3.	Students will be able to explain the principles and applications of CRISPR/Cas9, TALENs, and ZFNs, and critically assess the ethical and regulatory issues surrounding genome editing
4.	Students will be able to effectively apply Agrobacterium-mediated and biolistic methods for plant transformation, and utilize selectable marker genes and reporter genes to select and analyze transformed plants

5.	Students will be able to design and apply genetic engineering strategies to enhance crop plant traits in improving crop performance.
6.	Students will be able to analyze case studies of successful genetically engineered crops

Course Objective	
1.	Gain knowledge of the historical milestones in plant genetic engineering and acquire a foundational understanding of the basic concepts and techniques used in genetic engineering.
2.	Develop a thorough understanding of the enzymes and vectors used in plant genetic engineering
3.	Develop an understanding of the CRISPR/Cas9 system, including its principles and applications, as well as other genome editing tools such as TALENs and ZFNs, and examine the ethical and regulatory considerations associated with genome editing.
4.	Gain knowledge of Agrobacterium-mediated and biolistic methods for plant transformation
5.	Understand and apply genetic engineering techniques to engineer crop plants for improved tolerance to biotic and abiotic stresses
6.	Study the success stories of genetically engineered crops to understand their impact and benefits

Detailed syllabus

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage (%)**
Module I	**Introduction to plant genetic engineering**			
1	1.1	Historical milestones in the development of plant genetic engineering		

	1.2	Basic concepts and overview of genetic engineering		
Module II	**Tools and techniques**			
2	2.1	Enzymes and vectors used with respect to plants e.g. restriction enzyme, DNA ligase, CMVs TMVs, overall cloning procedure		
Module III	**Genome editing technologies**			
3	3.1	CRISPR/Cas9 system: principles and applications,		
	3.2	Other genome editing tools: TALENs, ZFNs, Ethical and regulatory considerations in genome editing		
Module IV	**Transformation techniques**			
4	4.1	Agrobacterium-mediated and biolistic methods		
	4.2	Selectable marker genes and reporter genes		
Module V	**Applications of plant genetic engineering**			
5	5.1	Engineering crop plants for biotic and abiotic stress tolerance		
	5.2	Improvement of nutritional quality and biofortification		
	5.3	Engineering plants for enhanced productivity and yield traits		
Module VI	**Case studies and current research trends**			
6	6.1	Success stories of genetically engineered crops, controversy and challenges		

Total	45	100

References:	
1.	Brown, T. A. (2020). *Gene cloning and DNA analysis: an introduction*. John Wiley & Sons.
2.	Niklas, K. J. (1992). *Plant biomechanics: an engineering approach to plant form and function*. University of Chicago press.
3.	Old, R. W., & Primrose, S. B. (1981). *Principles of gene manipulation: an introduction to genetic engineering* (Vol. 2). Univ of California Press.
4.	Schleif, R. (2023). *Genetics and molecular biology*. The Johns Hopkins University Press.
5.	Chaitanya, K. V. (2019). *Genome and genomics*. Springer Singapore.
6.	Singer, M., & Berg, P. (1991). *Genes and genomes*. University science books.

Semester-V

Course Code	Course Name	Credits
FPP2508N	FOOD PROCESSING AND PACKAGING	03

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03			03			03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Understanding of food preservation's role in food safety and quality, and knowledge of microorganisms that affect food
2.	Practical knowledge of traditional food processing techniques and their impact on preserving food
3.	Insight into contemporary food preservation technologies and their applications in the food industry
4.	Knowledge of food packaging principles and their impact on food quality and safety
5.	Ability to assess packaging materials and their effects on the preservation of food products
6.	Understanding of bio-based packaging options and their role in sustainable food packaging solutions

Course Objective	
1.	To provide students with a foundational understanding of the scope and significance of food preservation
2.	To familiarize students with traditional food preservation techniques
3.	To enable students to understand contemporary food preservation techniques
4.	To introduce students to the fundamental concepts of food packaging and various attributes of packaging
5.	To provide students with knowledge about different food packaging materials, their effects on shelf life, and the factors that control and determine shelf life
6.	To explore bio-based packaging materials, including their classification, properties, and their impact on the shelf life of packaged foods.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Scope of food preservation**		03	15
1	1.1	Traditional processing in India		
	1.2	Scope and importance of food processing		
	1.3	Microorganisms associated with foods- bacteria, yeast, and mold		
Module II	**Traditional methods of food preservation**		05	15
2	2.1	Introduction to Washing, Sorting, Slicing		
	2.2	Introduction to chopping, mixing, mincing		
	2.3	Introduction to boiling, pasteurizing, canning/bottling		

	2.4	Introduction to concentrating, extruding, baking, roasting		
	2.5	Introduction to frying, freezing, Chilling, Distilling		
Module III	**Food Preservation methods**		08	20
3	3.1	Food Preservation by Low Temperature, High Temperature		
	3.2	Food Preservation by Moisture control		
	3.3	Food Preservation by Irradiation		
Module IV	**Introduction to food packaging**		09	20
4	4.1	Role of Food Packaging; Containment; Protection		
	4.2	Role of attributes & package environments		
	4.3	Protection; Convenience; Communication		
Module V	**Materials for food packaging**		09	15
5	5.1	Food Packaging Materials		
	5.2	Shelf life; Shelf Life Determination		
	5.4	Factors Controlling Shelf Life		
Module VI	**Bio based packaging**		10	15
6	6.1	Introduction and Classification		
	6.2	Properties of Bio based Packaging- Safety, Stability		
	6.3	Properties of Bio based Packaging- Barrier Properties, Mechanical Properties		
	6.4	Bio based Materials and Shelf Life		
Total			45	100

References:

1.	Food Packaging Technology by Richard Coles, Derek McDowell, Mark J. Kirwan. Blackwell Publishing, 2003.
2.	Principles of Food Processing and Preservation by Richard W. Hartel 1st Edition (2019) Springer
3.	Food Packaging: Principles and Practice" by Gordon L. Robertson, 4th Edition (2019), CRC Press
4.	Food Processing and Preservation by John W. Mount 1st Edition (2016) CRC Press
5.	Food Microbiology: An Introduction by Dr. Michael J. Waites, Dr. Neil J. Morgan, Dr. James R. Kelly, and Dr. Graham G. G. Davies 3rd Edition (2007) Wiley-Blackwell
6.	Bio-Based Plastics and Polymers by A. K. S. Bhatnagar and V. K. Gupta 1st Edition (2014) Springer

Semester - V

Course Code	Course Name	Credits
LDD2509N	LAB COURSE ON DRUG DESIGN & MOLECULAR MODELING	01

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
-	2	-	-	1	-	01

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	4 Hours	-	-	-	100

Course Outcome	
1.	Gain hands-on experience with key drug design tools and software.
2.	Use of molecular modeling software
3.	Perform Molecular Docking Studies
4.	Develop and Apply Pharmacophore Models
5.	Conduct QSAR Analysis
6.	Predict ADMET Properties & Optimize Lead Compounds

Course Objective

1.	Understand Fundamental Concepts of drug design and application of molecular modeling
2.	Master Molecular Modeling Software
3.	Develop Pharmacophore & QSAR models
4.	Predict Drug-Like Properties
5.	Integrate Computational Approaches in Drug Design
6.	Conduct Molecular Dynamics Simulations

Detailed syllabus

Module/ Unit	Course Module / Contents	Hours	Marks Weightage (%)
List of practical		**26**	**100**
1.	Overview of Drug Bank and other ligand databases.		
2.	Ligand Drawing tools		
3.	Active site prediction methods		
4.	Reference guided docking		
5.	Drug metabolic analysis		
6.	ADME property mapping of drugs		
7.	Molecular docking		
8.	Secondary structure prediction		
9.	3D structure prediction and molecular modelling		
10.	Batch Docking		
11.	Virtual Screening		
Total		**26**	**100%**

References:

1.	Ramachandran, G.N. and Sasisekharan, V. (1968) Conformation of polypeptides and proteins. Adv. Prot. Chem., 23, 283.
2.	Creighton, T.E.: Proteins: Structure and Molecular Properties. 2nd Edition. New York. W. H. Freeman and Company, (1993).
3.	Leach. A.R: Molecular modelling: principles and applications
4.	Principles of Medicinal Chemistry, W.O. Foye, T.L. Lemke, and D.A. Williams, Williams, and Wilkins
5.	Conformations of Biopolymers, Vol. 2. Edited by G. N. Ramachandran.
6.	Drug Delivery: Engineering Principles for Drug Therapy (Topics in Chemical Engineering), W.M. Saltzman, Oxford University Press

Semester - V

Course Code	Course Name	Credits
LFP2510N	LAB COURSE ON FOOD PROCESSING AND PACKAGING TECHNOLOGY	01

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
-	2	-	-	1	-	01

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	4 Hours	-	-	-	100

Course Outcome	
1.	Students will be able to perform efficient oil extraction using the Soxhlet apparatus, achieving high yield and purity.
2.	Students will demonstrate the ability to operate a rotary flash evaporator for the effective removal of solvents and concentration of solutions.
3.	Students will analyze and interpret the drying characteristics of different materials to optimize drying processes.
4.	Students will design and produce biodegradable or eco-friendly packaging materials with appropriate properties for various applications.
5.	Students will develop and apply processing and packaging techniques to extend the shelf life of traditional Indian foods while maintaining quality.

6.	Students will conduct quality assurance tests on packaging materials, including assessments of bursting strength and tearing strength to ensure product reliability.

Course Objective	
1.	To equip students with practical skills in using laboratory equipment for efficient extraction and concentration processes.
2.	To enable students to analyze and evaluate the drying characteristics of various materials, understanding factors that affect drying efficiency and quality
3.	To provide students with the knowledge and skills required to develop and evaluate biodegradable and eco-friendly packaging materials for environmental sustainability.
4.	To train students in developing processing and packaging methods that extend the shelf life of traditional Indian foods while maintaining quality and safety.
5.	To familiarize students with testing methodologies for packaging materials, focusing on quality assurance parameters such as bursting strength and tearing strength.
6.	To train students in developing and implementing processing and packaging methods to extend the shelf life of traditional Indian foods while preserving quality and safety.

Detailed syllabus

Module/ Unit	**Course Module / Contents**	**Hours**	**Marks Weightage (%)**
List of practical			
1.	Experiments on oil extraction by Soxhlet apparatus		
2.	Experiments in rotary flash evaporator		
3.	Study of drying characteristics of the given material		
4.	Development of bio-degradable/eco-friendly packaging materials		

5.	Development of processing and packaging methods for extending shelf life of traditional Indian foods		
6.	Testing of packaging materials for quality assurance, like bursting strength, tearing strength		
Total		**26**	**100%**

References:	
1.	Food Processing Technology: Principles and Practice, Fellows PJ, 2005, CBS Publishers
2.	Food Packaging Technology. Richard Coles, Derek McDowell, Mark J. Kirwan. Blackwell Publishing, 2003.
3.	Handbook of Industrial Drying. Arun S. Mujumdar. 4th Edition (2014) CRC Press
4.	Extraction of Natural Products: Principles and Techniques. W. S. Hedges and R. A. Anderson. 1st Edition (2012) CRC Press
5.	Biodegradable Polymers and Plastics. R. A. Auras, L. A. Auras, and M. R. J. Braskem. CRC Press
6.	Packaging Technology: Principles and Practice. M. A. R. G. Robertson. 3rd Edition (2012) CRC Press

Semester - V

Course Code	Course Name	Credits
FLF2511N	FRENCH-V	2

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
02	-	-	02	-	-	02

Theory							Term Work / Practical/Oral			Total
Internal Assessment					End Sem Exam	Duration Of End Sem Exam	Term Work	Pract.	Oral	
Mid Term	Viva	Continuous Evaluation	Attendance	Total Internal						
15	20	10	05	50	50	75 mins	-	-	-	100

Course Objectives

The course is designed:

1. To strengthen the language of the students in both oral and written.
2. To get the students acquainted with the current social communication skills, oral (dialogue, telephone conversations, etc.) and written and perform simple communication tasks.
3. To talk about a film or a show.
4. To describe a person using good vocabularies and different adjectives
5. To use the different tenses, different moods in French.

Course Outcomes

After the completion of this course Students will be able to:

1. Enhance proficiency in both spoken and written language.
2. Develop familiarity with modern social communication skills, both oral (such as

dialogues and telephone conversations) and written, and to perform basic communication tasks effectively.

3. Write a review of a movie or a show.
4. Describe a person using good vocabulary and different adjectives.
5. Apply various tenses and moods in French using subjunctive tense.

Detailed Curriculum

Reading exercises, writing tasks and grammar of:

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage**
1	**Module I**		8	50
	Leçon 1	Histoires d'étudiants		
	Leçon 2	Un dîner en ville		
2	**Module II**		6	30
	Leçon 1	Soirée déguisée Un dîner en ville		
	Leçon 2	Chez l'habitant		
	Module III		6	10
3	Leçon 1	Un peu de culture ?		
	Module IV		6	10
4	Leçon 1	Une soirée originale		
	Total		**26**	**100**

References :	
1.	Berthet, Hugot et al. Alter Ego - Méthode de Français, A1: Hachette,2012.
2.	Bruno Girardeau et Nelly Mous. Réussir le DELF A1. Paris : Didier, 2011.
3.	Loiseau Y.,Mérieux R. Connexions 1, cahier d'exercices. Didier, Paris, 2017.
4.	Loiseau Y. & Mérieux R. Connexions 1, Guide pédagogique. Didier, Paris, 2017.
5.	Connexions 1, livre de l'élève – Loiseau Y. & Mérieux R., éd. Didier, Paris,2017.
6.	Latitudes 1, cahier d'exercices – Loiseau Y. & Mérieux R., éd. Didier, Paris,2018.
7.	Latitudes 1, Guide pédagogique – Loiseau Y. & Mérieux R., éd. Didier, Paris,2018.

8. Latitudes 1, Guide pédagogique téléchargeable – Loiseau Y. & Mérieux R., éd. Didier,2018.
9. Latitudes 1, livre d'élève + CD – Loiseau Y. & Mérieux R., éd. Didier, Paris,2018.
10. Nathalie Hirschsprung, Tony Tricot, Cosmopolite 1 Méthode de Français A1. Hachette, 2017.
11. Nathalie Hirschsprung, Tony Tricot. Cosmopolite 1 Cahier d'activités A1. Hachette, 2017.

Semester - V

Course Code	Course Name	Credits
FLG2511N	GERMAN-V	2

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
2	-	-	2	-	-	2

Theory						Term Work / Practical/Oral			Total
Internal Assessment					End Sem Exam	Duration Of End Sem Exam	Term Work	Pract.	Oral	
Mid Term	Continuous Evaluation	Attendance	Oral	Total Internal						
15	10	05	20	50	50	75 mins	-	-	-	100

Course Objectives

The course is desinged:

1. To handle situations which one normally encounters while travelling.
2. To take part in conversations and discussions pertaining to familiar topics such as family, hobbies, travel etc. without prior preparation.
3. To develop the listening comprehension skills.
4. To understand programs on television or radio and informing oneself about current events or areas of interest/ provided the speaker speaks clearly.
5. To have a basic conversation using the vocabulary related to body parts and basic diseases.

Course Outcomes

After completion of this course students will be able to:

1. Handle situations which one normally encounters while travelling.
2. Take part in conversations and discussions pertaining to familiar topics such as family, hobbies, travel etc. without prior preparation.
3. Develop the listening comprehension skills
4. Understand programs on television or radio and informing oneself about current events or areas of interest/ provided the speaker speaks clearly.
5. Have a basic conversation using the vocabulary related to body parts and basic diseases.

Detailed Curriculam				
Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage**
	Kapitel 11			
1	**Grammatischer Aspekt**	- Imperativ: du, ihr, Sie - Modalverben: dürfen, sollen	**06**	**25**
	Kapitel 11			
2	**Thematischer Aspekt**	- persönliche Angaben machen - Körperteile nennen - eine Sportübung verstehen und erklären - Aufforderungen wiedergeben - Gespräche beim Arzt führen - Anweisungen verstehen und geben - Gesundheitstipps verstehen und geben Wörter erschließen	**07**	**25**
	Kapitel 12			
3	**Grammatischer Aspekt**	- Pronomen: man - Fragewörter: wer, wen, wem, was(Nom. u. Akk.) Ort: wo, wohin, woher, wann & wie - Zeitadverbien: zuerst, dann, später,	**06**	**25**

		zum Schluss		
	Kapitel 12			
4	**Thematischer Aspekt**	- Vorschläge für eine Stadttour verstehen - einen Weg beschreiben - eine Postkarte schreiben - die Jahreszeiten kennen lernen - das Wetter beschreiben - Reiseberichte verstehen - Probleme im Hotel beschreiben - sich im Hotel beschweren - über Reiseziele sprechen	**07**	**25**
Total			**26**	**100**

References:

1. Aufderstraße, Hartmut. *Lagune 1. Deutsch als Fremdsprache: Kursbuch und Arbeitsbuch*. Ismaning: Max Hueber Verlag 2012.
2. Braun, Anna, and Daniela Wimmer. *Schritte Plus A1/1: Arbeitsbuch*. Hueber Verlag, 2020.
3. Dengler, Stefanie. *Netzwerk A1. Teil2. Kurs- Und Arbeitsbuch: Deutsch Als Fremdsprache*. Langenscheidt, 2012.
4. Funk, Hermann, et al. *studio d A1: Deutsch als Fremdsprache*. Cornelsen Verlag, 2015.
5. Langenscheidt. *Langenscheidt Pocket Dictionary German: German-English, English-German*. Langenscheidt Publishing Group, 2022.
6. Niebisch, Daniela, et al. *Lagune A1: Kursbuch*. Hueber Verlag, 2016.

Semester-V

Course Code	Course Name	Credits
FLS2511N	SPANISH V	2

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
2	-	-	2	-	-	2

Theory							Term Work / Practical/Oral			Total
Internal Assessment					End Sem Exam	Duration Of End Sem Exam				
Mid Term	Continuous Evaluation	Attendance	Oral	Total Internal			Term Work	Pract.	Oral	
15	10	05	20	50	50	75 mins	-	-	-	100

Course Objectives

The course is designed:

1. To enable the students to comprehend and make use of verbs with vocal changes.
2. To revise the grammar in application and the communication tasks related to topics covered already.
3. To enable the students to use preterit tense to describe events that happened in the past.
4. To enhance the vocabulary of the students based on shops, restaurants and airport.
5. Simulate and participate in mock Vivas and conversations.

Course Outcomes

After completion of this course, students will be able to:

1. Understand how to conjugate verbs with vocal changes and use them effectively in sentences.

2. Revise all the grammar topics which were taught in the previous semesters.
3. Describe events, activities and incidents that occurred in the past using preterit tense effectively and efficiently.
4. Understand and apply vocabulary based on shops, restaurants and airports and will be able to communicate at the given places.
5. Actively engage in mock viva sessions, applying the skills learned throughout the course. This practical experience will enhance their ability to handle real-life conversations with native speakers.

Detailed Curriculum

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage**
	El español y tú		**5**	**20**
1	1.1	Las preposiciones del lugar		
	1.2	Expresiones cotidianas		
	¿Sabes verbos con cambios vocales?		**5**	**20**
2	2.1	Los verbos regulares en español		
	2.2	Los verbos con cambios vocales. (AR, ER, IR)		
	¿Qué comiste ayer?		**8**	**30**
3	3.1	Introducción del pretérito indefinido en español.		
	3.2	Los verbos regulares en el pretérito indefinido		
	¿Dónde estuviste ayer, Juan?		**8**	**30**
4	4.1	Los verbos irregulares en el pretérito indefinido		
	4.2	Un ensayo usando el pretérito indefinido.		
Total			**26**	**100**

References:

1. Ballesteros, Margarita Porroche. *Ser, estar y verbos de cambio*. Arco Libros, 1988.
2. Bregstein, Barbara. *Advanced Spanish Step-by-Step*. McGraw Hill Professional, 2011.
3. Butt, John, et al. *A New Reference Grammar of Modern Spanish*. Routledge, 2019.

4.	Castromil, Javier Díaz, and Laura Gil-Merino. *Objetivo DELE A2 – B1*. 2016.
5.	Hollis, Maria Rosario. *Essential Spanish Verbs*. Teach Yourself, 2010.
6.	Holodyk, Daniel. *Ultimate Spanish*. 2003.
7.	Howkins, Angela, et al. Practising Spanish Grammar. 2019.
8.	Kattán-Ibarra, Juan, and Angela Howkins. Spanish Grammar in Context. Languages in Context, 2014.
9.	Loaeza, Pablo Garcia. Easy Spanish Phrase Book NEW EDITION. Courier Corporation, 2013.
10.	Mahler, Michael. Dictionary of Spanish Slang and Colloquial Expressions. Barron's Educational Series, Incorporated, 2008.

Semester – V

Course Code	Course Name	Credits
CSE2512N	EMPLOYABILITY SKILLS	1

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
01	-	-	01	-	-	01

Internal				External		Total
Mid-Sem Exam	**Continuous Evaluation**	**Attendance**	**Total Internal**	**End Sem Exam**	**Duration Of End Sem Exam**	
15	**30**	**05**	**50**	**50**	**2 Hours**	**100**

Course Objectives

The course is designed:

6. To understand and apply interview techniques.
7. To develop effective interview skills.
8. To conduct self-discovery through swot analysis.
9. To master Professional Etiquette.
10. to simulate and participate in mock interview sessions.

Course Outcomes

After completion of this course Students will be able to:

1. Categorize different types of interviews, recognize various interview styles, and demonstrate fundamental skills required when facing interviews.
2. Create professional resumes, covering letters, and follow-up letters, showcasing their ability to articulate their qualifications and experiences during job applications and interviews.

3. Perform a SWOT analysis, identifying their strengths, weaknesses, opportunities, and threats, fostering self-awareness, and aiding in strategic career planning.
4. Understand and apply social etiquette, including the proper way to shake hands and exchange business cards. They will also demonstrate knowledge of dining etiquette and appropriate behavior in a professional setting such as the cubicle.
5. Enact in mock interview sessions, applying the skills learned throughout the course. This practical experience will enhance their ability to handle real-life interview scenarios.

Detailed Curriculum

Module/ Unit	Course Module / Contents		Hours	Marks Weightage
	Interviews		**05**	38%
1	1.1	Types of Interviews and Styles of Interview		
	1.2	Facing Interviews-Fundamentals		
	1.3	Practice Session Conducting Interviews		
	1.4	Fundamentals and Practice Session, Mock Interview Sessions		
2	**Interview Skills**		**05**	38%
	2.1	Resume Writing,		
	2.2	Covering Letters		
	2.3	Interview Follow Up Letters		
3	**Self- Discovery**		**01**	8%
	3.1	SWOT [Strengths, Weakness, Opportunities, and Threats] Analysis		
4	**Employability Skills**		**02**	16%
	4.1	Conflict Management		
	4.2	Work Ethics		
Total			**13**	**100**

References:

1. Amos, Julie-Ann. *Handling Tough Job Interviews*. Mumbai: Jaico Publishing, 2004.
2. Anjanee Sethi & Bhavana Adhikari, *Business Communication*, Tata McGraw Hill.2009.
3. Brown, Michele & Gyles Brandreth. *How to Interview and be Interviewed*. London: Sheldon Press, 1994.
4. https://resumewriterusa.com
5. https://youtu.be/45uNWLmAZR8
6. Jermy Comfort, *Speaking Effectively*, et.al, Cambridge University Press.1994
7. Krishnaswamy, N, *Creative English for Communication*, Macmillan.2022
8. Patcher, Barbara. *The Essentials of Business Etiquette: How to Greet, Eat, and Tweet Your Way to Success.*Paperback.2013
9. Raman Prakash, *Business Communication*, Oxford.2012
10. Rizvi, M. Ashraf. *Effective Technical Communication*. Tata McGraw Hill.2017
11. Taylor, Grant. *Conversation in Practice*. McGraw-Hill Education.2001.
12. Thorpe, Edgar & Showick Thorpe. Winning at Interviews. 2nd Edition. Delhi: Dorling Kindersley, 2006.

Semester – V

Course Code	Course Name	Credits
BEH2513N	BEHAVIORAL SCIENCE-III (PERSONALITY, NATIONALISM AND HUMAN VALUES)	1

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
01			01			01

Theory							Total
Internal Assessment					End Sem Exam	Duration of End Sem Exam	
Activity	Assignment	Viva	Attendance	Total Internal			
20	40	35	05	100	00	-	100

Course Outcome	
1.	A strong personality fosters resilience and adaptability in diverse life situations.
2.	Nationalism fosters a sense of belonging and unity among citizens.
3.	Human values form the foundation of ethical behavior and moral integrity.
4.	Personality development enhances effective communication and interpersonal relationships.

5.	It strengthens cultural identity and promotes the preservation of traditions and heritage.
6.	They promote empathy, compassion, and respect for others, fostering harmonious societies.

Course Objective	
1	To Understand the importance of individual differences
2	Better understanding of self in relation to society and nation
3	Facilitation for a meaningful existence and adjustment in society
4	Inculcating patriotism and national pride
5	To develop an understanding of importance of human values.
6	To Understand the Value of individual

Detailed syllabus

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage** (%)
Module I	**Individual differences& Personality**		02	20
1	1.1	Personality: Definition& Relevance		
	1.2	Importance of nature & nurture in Personality Development		
	1.3	Importance and Recognition of Individual differences in Personality		
	1.4	Accepting and Managing Individual differences (adjustment mechanisms) Intuition, Jugement, Perception & Sensation (MBTI), BIG5 Factors		

Module II	**Managing Diversity**			
2	2.1	Defining Diversity	02	20
	2.2	Affirmation Action and Managing Diversity		
	2.3	Increasing Diversity in Work Force		
	2.4	Barriers and Challenges in Managing Diversity		
Module III	**Socialization**			
3	3.1	Nature of Socialization	02	20
	3.2	Social Interaction		
	3.3	Interaction of Socialization Process		
	3.4	Contributions to Society and Nation		
Module IV	**Patriotism and National Pride**			
4	4.1	Sense of pride and patriotism	02	20
	4.2	Importance of discipline and hard work		
	4.3	National Integrity, Integrity, accountability, and national pride.		
	4.4	National pride and prejudice.		
Module V		**Human Rights, Values and Ethics**		
5	5.1	Meaning and Importance of human rights	02	20
	5.2	Human rights awareness		
	5.3	Obligation to respect, character-based system of human rights.		
	5.4	Values and Ethics- Learning based on project work on Scriptures like- Ramayana, Mahabharata, Gita etc.		

Total	**10**	**100%**

References:	
1.	Pervin, L. A., & John, O. P. (2001). Personality: Theory and Research (8th ed.). Wiley.
2.	Jayne, M. E. A., & Dipboye, R. L. (2004). Workforce diversity: A key to improve productivity. Journal of Human Resource Management, 43(4), 409-424.
3.	Nettle, D. (2007). The Nature of Personality: Genes, Culture, and National Character. MIT Press.
4.	Kirton, G., & Greene, A. M. (2015). The Dynamics of Managing Diversity: A Critical Approach (4th ed.). Routledge.
5.	Funder, D. C. (2019). The Personality Puzzle (8th ed.). W. W. Norton & Company.
6.	Barak, M. E. M. (2021). Managing Diversity: Toward a Globally Inclusive Workplace (5th ed.). SAGE Publications.

Semester-V

Course Code	Course Name	Credits
SUI2521N	SUMMER INTERNSHIP (HANDS-ON /LAB EXPERIENCE IN BIOTECHNOLOGY RESEARCH)	05

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial/ NTCC	Theory	Practical	Tutorial/ NTCC	Total
-	-	-	-	-	05	05

Theory						Term Work/ Practical/ Oral			Total Marks
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
-	-	-	-	-	-	50	-	50	100

Evaluation Scheme (100 Marks)				
Internship Presentation/ Oral (Out of 50 Marks)				
PPT and presentation skills (10)	Concept understanding Techniques Learned (10)	Technical Knowledge (10)	Result analysis (10)	Viva (10)
Term Work/ Internship report (Out of 50 Marks)				
Format of the report (10)	Methodology (30)	Writing structure and style (10)		

Course Outcome	
1.	Demonstrate practical knowledge of biotechnology processes.
2.	Apply theoretical concepts to real-world situations.
3.	Exhibit proficiency in using biotechnology tools and techniques.
4.	Work effectively in team-based projects.
5.	Solve problems using biotechnological approaches.
6.	Show preparedness for professional roles in biotechnology.

Course Objective	
1.	Provide students with exposure to real-world biotechnology practices.
2.	Enhance understanding of fundamental biotechnology concepts.
3.	Develop practical skills in laboratory techniques and tools.
4.	Foster the ability to work collaboratively in a professional environment.
5.	Encourage critical thinking and problem-solving in biotechnological applications
6.	Prepare students for future careers in biotechnology through industry experience

Detailed syllabus

Module/ Unit	Course Module / Contents	Hours	Marks Weightage (%)
	General guidelines		

	Students will undergo summer internship for duration 4 weeks. Submission of internship report followed by presentation and viva voce. Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution. Evaluation will compose of two components - Project report assessment and Viva - voce. Project report assessment will be done by the internal faculty members in respective fields. A committee of two faculty members will conduct Viva-voce. Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project will be assessed as per evaluation format.		
	General guidelines for report		

	In general, the file should be comprehensive and include. • A short account of the activities that were undertaken as part of the project. • A statement about the extent to which the project has achieved its stated goals. • A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project. • Any problems that have arisen may be useful to document for future reference. • Scientific names in Italics • Cover Page containing - Title, Students Name, Supervisors Name, University, Name (along with logo), Course name & year of Submission in the prescribed format. • 2 copies to be submitted.		
	Report Layout		
	The report should contain the following components: • Title page • Certificate • Acknowledgement • Abbreviations • Contents with page numbers • Content of project report • Introduction • Techniques performed with principle and method. • Result • Application • References		
	Font size and other guidelines		

	• 1.5-inch Margin on left side & 1 inch each on other sides. • Single side of the paper to be used. • Times New Roman. • 12 (Bold for headings) • 12 (Normal for Matter) • 14 (for Chapter Names) • 1.5 line spacing • Numbering on the right hand Top of the page • Numbers on pages before chapters to be done in Roman at the bottom of the page		
	References and style		
	References This should include papers and books referred to in the body of the report. These should be ordered alphabetically by the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognized system. Example: Research article Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. Clin Microbiol Infect, 8 (suppl 1): 116–117. Book: Voet, D., Voet, J. G., & Pratt, C. W. (2016). Fundamentals of Biochemistry: Life at the Molecular Level (5th ed.). Wiley.		
Total		**-**	**100%**

Detailed Curriculum: Semester VI

Semester-VI								Evaluation Scheme		
Types of courses		**Course Code**	**Course Title**	**Lecture (L) credits**	**Tutorial (T) credits**	**Practical (P) Credits**	**Total credits**	**Internal Marks**	**External Marks**	**Total Marks**
Discipline Specific Courses	**Discipline-I (Core)**						**16**			
	Discipline-I (Compulsory)	CGP2601N	Concepts and Techniques in Genomics and Proteomics	3	0	0	3	**30**	**70**	**100**
		BIB2602N	Basics of Industrial Biotechnology	3	0	0	3	**30**	**70**	**100**
		EBT2603N	Environmental Biotechnology	3	0	0	3	**30**	**70**	**100**
		IAB2604N	Introduction to Animal Biotechnology	3	0	0	3	**30**	**70**	**100**
		LGP2605N	Lab course on Genomics and Proteomics	0	0	1	1	**30**	**70**	**100**
		LIB2606N	Lab course on Industrial Biotechnology	0	0	1	1	**30**	**70**	**100**
		LEB2607N	Lab course on Environmental Biotechnology	0	0	1	1	**30**	**70**	**100**
		LCA2608N	Lab course on Animal Biotechnology	0	0	1	1	**30**	**70**	**100**
	Discipline II (any one from the basket)						**4**			
	Discipline II (any one from the basket)	PHB2609N	Pharmaceutical Biotechnology	4	0	0	4	**30**	**70**	**100**
		CSA2610N	Climate Smart Agriculture	4	0	0		**30**	**70**	**100**
		FSR2611N	Food safety Regulations	4	0	0		**30**	**70**	**100**
	Total (Discipline I + II)						**20**			
Foundation courses	Co-Curricular Courses	**VAC-III**					**0**			
		PHE2318N	Physical Education and Sport**				0			
	Total (Foundation Courses)						**0**			
Grand Total							**20**			
***Continued till Semester VI*										

Semester - VI

Course Code	Course Name	Credits
CGP2601N	CONCEPTS AND TECHNIQUES IN GENOMICS AND PROTEOMICS	03

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	-	-	03	-	-	03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Define the genomics and proteomics and uses of tools and techniques in various fields.
2.	Describe basic principles that underlying the structure, function, expression and evolution of diverse genomes and proteomes.
3.	The comprehensive overview for utilization of analytical platforms, computational tools; experimental design, analysis methods and databases.
4.	Analyze gene expression and protein structure as well as the implications of this research.
5.	Efficacy of different application to analyses biological data.
6.	Design and develop the strategies for analysis of biological data.

Course Objective	
1.	Explain the processes and mechanisms underlying gene and genome evolution
2.	Describe the structure and organization of chromosomes and genomes, and compare various genome sequencing technologies
3.	Utilize comparative genomics tools and databases to perform whole genome alignments, analyze gene order and synteny, and annotate genomes.
4.	Conduct transcriptome analysis using techniques for detecting differential gene expression.
5.	Implement genome mapping techniques and apply molecular markers.
6.	Apply protein chemistry techniques for protein purification and separation

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Gene and Genome Evolution**		6	16
1	1.1	Origin of genomes, genome evolution		
	1.2	Role of repetitive DNA in genome evolution		
	1.3	Role of gene duplication, transitions		
	1.4	Transversions- chromosomal deletions and insertions, in evolution.		
	1.5	Transposable elements		
	1.6	Junk DNA in evolution.		
Module II	**Structural Genomics and genome sequencing**		6	16
2	2.1	Chromosome structure and Genome organization,		

	2.2	Genome sequencing methods, Introduction to NGS		
	2.3	Roche/454 FLX, Illumina/Solexa, ABI SOLiD system, Ion torrent		
	2.4	Nanopore sequencing technology		
	2.5	Genome browser,		
	2.6	Human genome project		
Module III	**Comparative Genomics**			
3	3.1	Basic concepts and applications	7	17
	3.2	whole genome alignments: understanding the significance		
	3.3	Artemis, BLAST		
	3.4	synteny and gene order comparisons		
	3.5	Comparative genomics databases: COG, VOG		
	3.6	Genome annotation and gene identification methods		
Module IV	**Transcriptome analysis and functional Genomics**			
4	4.1	Detection of differential gene expression: ESTs, SAGE	7	17
	4.2	DNA Microarrays, Application of Microarrays,		
	4.3	Real Time PCR		
	4.4	Sequence based and structure-based approaches for gene functions identification		
	4.5	sequence comparison, structure analysis and comparison		
	4.6	pattern identification		

Module V	**Genome mapping: background and Applications**			
5	5.1	Genetic and physical mapping	7	17
	5.2	Introduction to molecular markers-RFLP, RAPD, AFLP, SSRs, FISH for genome analysis		
	5.3	DNA fingerprinting; allocation of genome mapping		
	5.4	Single nucleotide polymorphisms		
	5.5	RNA interference, antisense RNA		
	5.6	siRNA, miRNA		
Module VI	**Protein chemistry and Proteomics**			
6	6.1	Basic protein Purification and separation techniques:	7	17
	6.2	2D Gel Electrophoresis,		
	6.3	Mass spectrometry,		
	6.4	Protein Microarray and applications.		
	6.5	Protein-Protein Interaction, PPI server		
Total			45	100

References:

1. Brown T. A. 2007, Genomes 3. Garland Science Publishing, New York.
2. Dunham, I., 2003. Genome Mapping and sequencing. Horizon Scientific
3. Discovering Genomics, Proteomics and Bioinformatics 2nd edition - by A. Malcolm Campbell and Laurie J. Heyer. by Cold Spring Harbor Laboratory Press 2006.
4. Bioinformatics and Functional Genomics (3rd Ed.) by Pevsner, J., John Wiley and Sons, New Jersey, USA. 2015

5.	Boerma, H. R., & Kropff, M. J. (2007). *Genetic and Physical Mapping in Plants*. *In Genetic Mapping and Marker Assisted Selection: Basics, Applications and Advances* (pp. 78-112). Springer.
6.	Wilson, D. B. (2010). *Proteomics: Principles and Applications*. *Springer*.

Semester-VI

Course Code	Course Name	Credits
BIB2602N	BASICS OF INDUSTRIAL BIOTECHNOLOGY	03

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	-	-	03	-	-	03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Analyze the role of microorganisms in fermentation processes and their contribution to the production of various bioproducts.
2.	Analyze the role of microorganisms in fermentation processes and their contribution to the production of various bioproducts.
3.	Apply techniques for improving microbial strains through mutation and strain enhancement methods.
4.	Explain the principles of scaling up fermentation processes and describe the key components and functions of fermenters.
5.	Utilize appropriate processes and techniques for product recovery and downstream processing in biotechnological applications.
6.	Assess and integrate the components of bioprocesses for the production of a range of bioproducts.

Course Objective	
1.	Understand the concepts of fermentation and involvement of microorganisms to produce bioproducts.
2.	Gain knowledge of fermentation media preparation, sterilization, optimization.
3.	Learn about mutant strains and microbial strain improvement methods and techniques.
4.	Develop understanding about the concept of scaling up and components of fermenters.
5.	Get familiarize with the process and techniques of products recovery and downstream processing.
6.	Get an overview of bioprocess to produce a variety of bioproducts.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Introduction**		5	10
1	1.1	Fermentation and fermentation products.		
	1.2	Types of fermentation: batch, continuous, fed Batch.		
	1.3	Types of fermentation: surface, submerged and Solid state.		
Module II	**Fermentation media**		9	22
2	2.1	Components of fermentation media and their role. Criteria for media formulation and optimization.		

	2.2	Sterilization of media, Methods of sterilization, Batch sterilization and Continuous sterilization.		
	2.3	Kinetics of media sterilization.		
Module III	**Strain improvement**		8	16
3	3.1	Screening and Strain development methods for industrially important organisms.		
	3.2	Objective of strain improvement. Methods for strain improvement.		
	3.3	Selection of different types of mutants, application of rDNA technology.		
Module IV	**Scale up**		9	22
4	4.1	Various components of fermenter.		
	4.2	Types of fermenters.		
	4.3	Objective of scale-up.		
	4.4	Levels of fermentation (laboratory, pilot-plant and production levels).		
	4.5	Criteria of scale-up for critical parameters (aeration and agitation, broth rheology and sterilization).		
Module V	**Basic principles and methods for downstream processing of fermented products**		6	14
5	5.1	Methods for Cell disruption, Filtration.		
	5.2	Centrifugation, chromatography in downstream processing.		
Module VI	**Production of industrially important products/Metabolites**		8	16
6	6.1	Enzymes, Organic acids. Vitamins.		
	6.2	Amino acids, Antibiotic.		
	6.3	Food and Dairy products.		

Total	**45**	**100**

References:	
1.	Crueger, W., Crueger, A., Brock, T. D., & Brock, T. D. (1990). Biotechnology: a textbook of industrial microbiology.
2.	Doran, P. M. (1995). *Bioprocess engineering principles*. Elsevier.
3.	Stanbury, P. F., Whitaker, A., & Hall, S. J. (2013). *Principles of fermentation technology*. Elsevier.
4.	Casida, L. E. (1968). Industrial microbiology.
5.	Prasad, K. K., & Prasad, N. K. (2010). *Downstream process technology: a new horizon in biotechnology*. PHI Learning Pvt. Ltd..
6.	Thangadurai, D., & Sangeetha, J. (Eds.). (2017). *Industrial Biotechnology: Sustainable Production and Bioresource Utilization*. CRC Press.

Semester-VI

Course Code	Course Name	Credits
EBT2603N	ENVIRONMENTAL BIOTECHNOLOGY	03

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03	**-**	**-**	**03**	**-**	**-**	**03**

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	**10**	**05**	**30**	**70**	**3 Hours**	**-**	**-**	**-**	**100**

Course Outcome	
1.	To understand the significance of renewable and non-renewable energy resources
2.	To gain proficiency in classifying, managing, and recycling various types of solid and liquid wastes.
3.	To learn the sources, types, and effects of pollution, and apply standard methods for treatment such as bioremediation.
4.	To gain insights into the concepts of nitrogen fixation, rhizobium, and mycorrhizae and explore the types and applications of biopesticides.
5.	To acquire an understanding of international and national environmental laws, and their evolution.
6.	To comprehend the principles of sustainable development, including the integration of economic, social, and environmental aspects.

Course Objective	
1.	Gain foundational knowledge in environmental biotechnology, including bioremediation, and bioenergy production.
2.	Examine various biotechnological applications for environmental protection, such as pollution cleanup, the development of biofuels, and the role of microorganisms in waste treatment.
3.	Examine various biotechnological applications for waste management, such as bioremediation
4.	Gain foundational knowledge about biofertilizers and biopesticides
5.	Critically evaluate the environmental, economic, and ethical implications of biotechnological solutions, and understand the regulatory frameworks guiding their use.
6.	Design and propose biotechnological solutions to real-world environmental problems, incorporating interdisciplinary approaches and considering sustainability and feasibility.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I			8	
1	1.1	Renewable (sun, wind, waves, geothermal)		
	1.2	Non-renewable (fossil fuels- coal, petroleum, and natural gas)		
	1.3	Bioethanol		
	1.4	Biodiesel		
	1.5	Biogas		

	1.6	Algal Fuels		
Module II				
2	2.1	Solid-waste: Types, sources and consequences	8	
	2.2	Classification of wastes – (Domestic, Industrial, Municipal, Hospital, Nuclear, Agriculture)		
	2.3	Waste management for energy production		
	2.4	Disposal methods & management methods - Sanitary land filling		
	2.5	Composting, Vermicomposting		
	2.6	Incineration.		
Module III				
3	3.1	Sources, generation, classification of pollution- natural and anthropogenic sources of pollution	8	
	3.2	primary and secondary pollutants		
	3.3	Water pollutants		
	3.4	Bioremediation and Biodegradation of major environmental pollutants- heavy metals		
	3.5	pesticides		
	3.6	textile dyes and hydrocarbons.		
Module IV				
4	4.1	Concept of N2-fixation nodule formation	5	
	4.2	azolla, cyanobacteria		
	4.3	Rhizobium		
	4.4	VAM- phosphate solubilizers		

	4.5	Biopesticides- types		
	4.6	IPM and applications		
Module V				
5	5.1	International Environmental Laws	8	
	5.2	Evolution and development of International Environmental laws		
	5.3	Environmental laws in India		
	5.4	Environmental policy and laws		
	5.5	Constitutional and statutory laws in India.		
	5.6	Sustainable Development: Definition and concepts of sustainable development,		
Module VI				
6	6.1	Toxic chemicals in the environment (air and water)	8	
	6.2	their effects and biochemical interactions		
	6.3	Biochemical aspects: of arsenic, cadmium, lead, mercury,		
	6.4	Biochemical aspects:carbon monoxide, ozone and PAN pesticide		
	6.5	Mode of entry of toxic substance, its breakdown and detoxification		
	6.6	Biotransformation of xenobiotics.		
Total			**45**	**100**

References:	
1.	Textbook of Biotechnology, RC Dubey/ PK Gupta
2.	Environmental Biotechnology, Pradipta Kumar Mohapatra

3.	Biotechnology- Expanding Horizons, BD Singh
4.	Introduction to Environmental Biotechnology, Milton Wainwright
5.	Wastewater Engineering, Metcalf and Eddy
6.	Environmental Biotechnology- Concepts and Applications, Hans-Joachim Jordening and Jesef Winter

Semester-VI

Course Code	Course Name	Credits
IAB2604N	INTRODUCTION TO ANIMAL BIOTECHNOLOGY	03

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	-	-	03	-	-	03

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Students will understand the historical development and organizational principles of animal biotechnology, including the significance and diverse applications of model animals.
2.	Students will learn various techniques involved in animal cell culture, including substrate selection, media preparation, initiation, maintenance, and cryopreservation techniques.
3.	Students will apply knowledge of organ culture and engineering methods, including 2D and 3D culture techniques, in the context of biotechnological applications.
4.	Students will analyze the broad spectrum of applications of animal cell culture, including the production of cell lines, hybridoma technology, and in vitro fertilization techniques.

5.	Students will evaluate the principles and methods of transgenic technology in animals, encompassing gene transfer methods, vectors, and gene editing techniques.
6.	Sudents will evaluate the principles and methods of transgenic technology in animals, encompassing gene transfer methods, vectors, and gene editing techniques.

Course Objective	
1.	Explain the historical perspectives and organizational structure of laboratories involved in animal biotechnology.
2.	Demonstrate proficiency in various sterilization methods used in laboratory settings relevant to animal biotechnology.
3.	Differentiate between natural and artificial culture media and justify their use in different stages of animal cell culture.
4.	Perform and interpret results from organ culture techniques such as plasma clot, raft methods, and agar gel in laboratory settings.
5.	Apply knowledge of gene transfer methods such as microinjection, gene gun, and viral vectors to manipulate genetic material in animals.
6.	Discuss specific applications of transgenic animals, including their role as disease models and bioreactors for pharmaceutical production, in ethical and regulatory contexts.

Detailed syllabus

Module/ Unit	**Course Module / Contents**		**Hours**	**Marks Weightage (%)**
Module I	**Introduction to Animal Biotechnology**		8	18
1	1.1	Historical perspectives		
	1.2	Laboratory organization		

	1.3	Sterilization methods		
	1.4	Introduction to model animals		
	1.5	Importance and their applications		
Module II	**Techniques in Animal Cell Culture**			
2	2.1	Cell culture substrates	11	24
	2.2	Culture media- Natural and artificial media,		
	2.3	Initiation, maintenance and cryopreservation techniques of cell cultures		
	2.4	Organ culture - culture techniques, plasma clot, raft methods, agar gel, grid method		
	2.5	2D and 3D culture		
	2.6	Organ engineering, Cryopreservation techniques		
Module III	**Applications of Animal Cell Culture**			
3	3.1	Applications of animal cell culture-cell lines and their uses	6	13
	3.2	Cell culture products		
	3.3	Somatic cell hybridization		
	3.4	Hybridoma technology		
	3.5	*In vitro* fertilization, embryo transfer		
	3.6	Cloning in animals		
Module IV	**Transgenic Technology in Animals**			
4	4.1	Animal genetic engineering	9	20
	4.2	Vectors		

	4.3	Gene transfer methods – microinjection		
	4.4	Gene gun		
	4.5	Virus mediated and other methods of gene transfer		
	4.6	Gene editing methods		
Module V	**Applications of Transgenic Animals**		7	15
5	5.1	Development and maintenance of transgenic animals with new traits		
	5.2	Applications of transgenic animals		
	5.3	Disease models		
	5.4	Transgenic animals as bioreactors for producing pharmaceutically important compounds and therapeutic etc		
Module VI	**Ethical issues related to animal biotechnology**		4	10
6	6.1	Bioethical issues related to animal biotechnology		
	6.2	Regulatory agencies- Institutional ethics committee		
	6.3	Institutional biosafety committee.		
Total			45	100

References:

1. Boulianne, M. (2016). *Animal Cell Culture and Technology* (3rd ed.). CRC Press.
2. Freshney, R. I. (2015). *Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications* (7th ed.). Wiley-Blackwell.
3. Gordon, J. W., & Ruddle, F. H. (2013). *Genetic Manipulation of Animals* (2nd ed.). Springer.

4.	Harris, D., & Houghton, R. A. (2019). *Animal Biotechnology: Science and Technology* (2nd ed.). CRC Press.
5.	Reed, W. A., & Dinsmore, C. (2020). *Animal Models in Drug Development: Practical Methods and Applications* (1st ed.). Academic Press.
6.	Zhou, Q. (2021). *Principles and Applications of Animal Cloning* (1st ed.). Springer.

Semester-VI

Course Code	Course Name	Credits
LGP2605N	LAB COURSE ON GENOMICS AND PROTEOMICS	01

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
-	2	-	-	1	-	01

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	4 Hours	-	-	-	100

Course Outcome	
1.	Demonstrate the ability to effectively use genome browsers to retrieve, interpret, and visualize genomic data for various research applications
2.	Access and analyze gene expression data from the GEO database, and draw meaningful conclusions about gene expression patterns and their biological implications.
3.	Employ gene finding and genome annotation tools to identify and annotate genes within genomic sequences, producing accurate and detailed annotations.
4.	Compare two given genomes using computational tools, identifying key genomic features and differences that contribute to understanding evolutionary relationships.
5.	Students will effectively use online restriction mapping tools to analyze DNA sequences, identify restriction sites, and visualize the resulting restriction maps.

6.	Predict protein structures and demonstrating a comprehensive understanding of protein function and interactions.

Course Objective	
1.	Equip students with the skills to navigate and extract information from genome browsers like UCSC and Ensembl, and to interpret genomic data effectively.
2.	Enable students to access, retrieve, and analyze gene expression data from the Gene Expression Omnibus (GEO) database to understand gene regulation and expression patterns.
3.	Teach students to use gene finding tools and genome annotation methods to identify and annotate genes within a given genomic sequence.
4.	Develop students' ability to compare two genomes to identify similarities, differences, and evolutionary relationships using appropriate computational tools.
5.	Train students to use online tools for restriction mapping to analyze and visualize restriction enzyme cut sites within DNA sequences.
6.	Provide students with techniques to predict protein structures, assess protein-protein interactions, and utilize peptide mass fingerprinting methods

Detailed syllabus

Module/ Unit	**Course Module / Contents**	**Hours**	**Marks Weightage (%)**
List of practical		26	100
1.	Genome Browser (UCSC, ensemble)		
2.	Gene Expression Omnibus database		
3.	Gene finding tools and Genome annotation		
4.	Comparison of two given genomes		
5.	Restriction mapping using online tool		
6.	Analysis of 2D – IEF data		

7.	Prediction of protein structure		
8.	Protein-Protein Interaction prediction.		
9.	Peptide mass fingerprinting using MASCOT.		
Total		26	100

References:	
1.	Kent, W. J., Zweig, A. S., Barber, G., Hsu, F., Karolchik, D., Kuhn, R. M., & Haussler, D. (2002). The UCSC genome browser database. Nucleic Acids Research, 31(1), 51-54.
2.	Cunningham, F., Allen, J., Allen, J., Alvarez-Jarreta, J., Amode, R., Armean, I., & Yates, A. (2019). Ensembl 2019. *Nucleic Acids Research, 47*(D1), D745-D751.
3.	Edgar, R., Domrachev, M., & Lash, A. E. (2002). Gene Expression Omnibus: NCBI gene expression and hybridization array data repository. *Nucleic Acids Research, 30*(1), 207-210.
4.	Lander, E. S., Linton, L. M., Birren, B., Nusbaum, C., Zody, M. C., Baldwin, J., & International Human Genome Sequencing Consortium. (2001). Initial sequencing and analysis of the human genome. *Nature, 409*(6822), 860-921.
5.	Görg, A., Weiss, W., & Dunn, M. J. (2004). Current two-dimensional electrophoresis technology for proteomics. *Proteomics, 4*(12), 3665-3685.
6.	Bagos, P. G., & Nikolopoulos, S. (2009). A survey of protein-protein interaction prediction methods. *Current Bioinformatics, 4*(4), 229-238.

Semester-VI

Course Code	Course Name	Credits
LIB2606N	LAB COURSE ON INDUSTRIAL BIOTECHNOLOGY	01

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
-	2	-	-	1	-	01

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	4 Hours	-	-	-	100

Course Outcome	
1.	Students will be able to prepare selective and differential media effectively for enzyme production.
2.	Students will demonstrate the ability to isolate and identify industrially important microorganisms.
3.	Students will effectively perform preliminary screening to select amylase/cellulase-producing microbes.
4.	Students will accurately determine and interpret the growth curve, growth rate, and specific growth rate of isolated important microorganisms.
5.	Students will successfully produce industrially important enzymes and understand the underlying processes.
6.	Students will critically compare and contrast enzyme production outcomes under different fermentation conditions.

Course Objective	
1.	To learn the techniques for preparing selective and differential media for enzyme production.
2.	To gain skills in isolating industrially important microorganisms essential for various microbial processes.
3.	To develop the ability to screen for amylase/cellulase-producing microbes using selective media
4.	To understand the methods for determining the growth curve, growth rate, and specific growth rate of microorganisms
5.	To learn the processes involved in the production of industrially important enzymes
6.	To compare enzyme production across different fermentation methods—surface, submerged, and solid-state

Detailed syllabus

Module/ Unit	Course Module / Contents	Hours	Marks Weightage (%)
	List of practical		
1.	Preparation of selective and differential media for enzyme production		
2.	Isolation of industrially important microorganisms for microbial processes		
3.	Preliminary screening to select amylase/cellulase producing microbes on selective media		
4.	Determination of growth curve, growth rate and specific growth rate of isolated microorganisms		
5.	Production of industrially important enzymes		
6.	Compare the production of enzymes under surface, submerged and solid-state fermentation		

Total	26	**100**

References:	
1.	Stanbury, P. F., Whitaker, A., & Hall, S. J. (2016). Principles of Fermentation Technology (3rd ed.). Butterworth-Heinemann.
2.	Prescott, L. M., Harley, J. P., & Klein, D. A. (2011). Microbiology (9th ed.). McGraw-Hill Education.
3.	Crueger, W., & Crueger, A. (1990). Biotechnology: A Textbook of Industrial Microbiology (2nd ed.). Sinauer Associates.
4.	Shuler, M. L., & Kargi, F. (2002). Bioprocess Engineering: Basic Concepts (2nd ed.). Prentice Hall.
5.	Mehta, N., & Singh, A. (2007). Industrial Microbiology: A lab manual. Aavishkar Publishers, Distributors.
6.	Thankappan, S.. Practical Manual cum Workbook on Industrial Microbiology. Tamil Nadu Agricultural University.

Semester-VI

Course Code	Course Name	Credits
LEB2607N	LAB COURSE ON ENVIRONMENTAL BIOTECHNOLOGY	01

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
-	**2**	**-**	**-**	**1**	**-**	**01**

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	**10**	**05**	**30**	**70**	**4 Hours**	**-**	**-**	**-**	**100**

Course Outcome	
1.	Remember and describe fundamental principles of experiments related to Environmental Biotechnology.
2.	Understand the theoretical concepts of various experiments related to Environmental Biotechnology.
3.	Apply the concepts for the execution of experiments independently or in groups.
4.	Record the observation and analyze the results of performed experiments.
5.	Evaluate the experiments for troubleshooting and designing of alternative strategy.
6.	Demonstrating proficiency in practical skills related to Environmental Biotechnology.

Course Objective	
1.	Develop practical skills in employing biotechnological techniques for environmental applications
2.	Gain proficiency in analyzing and interpreting experimental data related to environmental biotechnology
3.	Understand the underlying biological, chemical, and physical processes involved in environmental biotechnology applications
4.	Design and conduct experiments to address specific environmental problems
5.	Adhere to laboratory safety protocols and ethical considerations in the use of biotechnological methods for environmental applications, including handling of microorganisms and hazardous materials.
6.	Develop skills in effectively communicating experimental results and interpretations through written reports

Detailed syllabus

Module/ Unit	Course Module / Contents	Hours	Marks Weightage (%)
List of practical			
1.	Isolation of microbes from polluted environment soil/water resources/Air		
2.	Wastewater analysis for pH, conductivity, TDS and TSS		
3.	Determination of alkalinity in water sample by titration method.		
4.	Estimation of chlorides in water sample by titration method.		
5.	Estimation of NO_3 in water samples by spectrophotometry		
6.	Estimation of PO_4 in water samples by spectrophotometry		

Total	26	100

References:	
1.	Microbiology: A laboratory Manual, Seventh Edition, by: Cappuccino and Sherman
2.	Bergey's Manual® of Systematic Bacteriology - Volume 2 - Part C
3.	An Introduction to environmental toxicology: Michael H.Dong.
4.	Environmental biotechnology: Alan Scragg

Semester-VI

Course Code	Course Name	Credits
LCA2608N	Lab course on Animal Biotechnology	01

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
-	2	-	-	1	-	01

Practical						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	4Hours	-	-	-	100

Course Outcome	
1.	Student will demonstrate proficiency in preparing and sterilizing glassware for animal cell culture to ensure a contamination-free environment.
2.	Student will apply techniques for the preparation, standardization, and sterilization of culture media to support optimal cell growth and maintenance.
3.	Student will perform accurate inoculation of specific cells or tissues for callusing or primary cell culture, ensuring the establishment of viable cultures.
4.	Student will perform accurate inoculation of specific cells or tissues for callusing or primary cell culture, ensuring the establishment of viable cultures.
5.	Student will inoculate and maintain cell lines effectively, demonstrating the ability to manage and sustain long-term cell cultures.
6.	Student will execute cryopreservation and thawing procedures to preserve and recover cell lines while maintaining cell viability and functionality.

Course Objective	
1.	Prepare and sterilize glassware following standard protocols to prevent contamination in animal cell culture experiments.
2.	Standardize and sterilize culture media, understanding the requirements for different types of media and their impact on cell culture outcomes.
3.	Inoculate specific cells or tissues into appropriate culture systems for primary cell culture or callusing, ensuring proper technique and conditions.
4.	Measure cell number and assess cell viability using established methods such as hemocytometer counting or viability assays.
5.	Manage the growth and maintenance of cell lines, including routine passaging and monitoring of cell viability and morphology.
6.	Perform cryopreservation and thawing of cell lines, ensuring proper handling and recovery of cells for future use.

Detailed syllabus

Module/ Unit	Course Module / Contents	Hours	Marks Weightage (%)
List of practical		26	100
1.	Preparation of glassware for Animal Cell Culture		
2.	Preparation, standardization, and sterilization of culture media.		
3.	Inoculation of specific cells/tissues for callusing/primary cell culture.		
4.	Estimation of cell number and cell viability.		
5.	Inoculation and maintenance of cell lines.		
6.	Cryopreservation and thawing.		
7.	Study of toxicity on cell lines		
Total		**26**	**100**

References:	
1.	Freshney, R. I. (2016). Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications (7th ed.). Wiley-Blackwell.
2.	Pugh, M., & Wachtel, J. (2018). *Basic Cell Culture: A Practical Approach* (4th ed.). Oxford University Press
3.	Master, M. (2020). *Animal Cell Culture: Methods and Protocols* (3rd ed.). Springer.
4.	Boulianne, M. (2021). *Animal Cell Culture and Technology* (4th ed.). CRC Press.
5.	Boulianne, M. (2021). *Animal Cell Culture and Technology* (4th ed.). CRC Press.
6.	Zhou, Q. (2022). *Principles and Applications of Animal Cloning* (2nd ed.). Springer.

Course Code	Course Name	Credits
PHB2609N	PHARMACEUTICAL BIOTECHNOLOGY	04

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	-	-	04	-	-	04

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Students will be able to describe the basics of pharmaceutical sciences, including how drugs are classified, where they come from, and their physical properties.
2.	Students will learn how to classify drugs based on their solubility, permeability, and dissolution, and understand how these factors affect drug absorption and effectiveness.
3.	Students will understand the different forms in which drugs are made (like tablets or injections) and the various ways they can be administered to patients.
4.	Students will learn how different drug delivery systems are developed and how polymers are used to improve the delivery of drugs in the body.
5.	Students will become familiar with the techniques used in drug production, such as filtering and drying, and understand the importance of following industry standards like Good Manufacturing Practices (GMPs).
6.	Students will learn how to administer drugs correctly, understand personalized medicine, and how to handle adverse drug reactions to ensure patient safety.

Course Objective	
1.	To introduce students to the foundational concepts of pharmaceutical sciences, including drug classification, sources, and physical properties.
2.	To educate students on the principles of the Biopharmaceutical Classification System (BCS) and how drug solubility, permeability, and dissolution influence drug absorption and effectiveness.
3.	To familiarize students with various dosage forms and routes of administration, highlighting the principles behind different drug delivery methods.
4.	To provide students with an understanding of the development and application of advanced drug delivery systems, including the role of polymers in enhancing drug efficacy.
5.	To equip students with knowledge of physical pharmacy techniques and industrial practices, emphasizing the importance of Good Manufacturing Practices (GMPs) and Good Laboratory Practices (GLPs).
6.	To prepare students to handle personalized medicine and manage adverse drug reactions, ensuring proper medication administration and patient safety.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Pharmaceutical Sciences**		12 L	20
1	1.1	Introduction to Pharmaceutical Sciences, Pharmacology and branches,		
	1.2	Drug and its nomenclature and classification,		
	1.3	Sources of drugs (plants, micro-organisms and animals),		
	1.4	Physical properties of drugs		

	1.5	Recombinant therapeutics,		
	1.6	Micromeritic, Viscosity & Rheology, Dispersion Systems, Diffusion & Dissolution, Kinetics and drug stability		
Module II	**Biopharmaceutical classification system**			
2	2.1	Introduction and Classification to BCS (Class I. II, III and IV),	10 L	17
	2.2	Parameters for drug classification (Solubility, permeability and dissolution),		
	2.3	Dose number, dissolution number and Absorption number, USP apparatus,		
	2.4	Pharmacokinetics and Pharmacodynamics,		
	2.5	Bioavailability, Bioequivalence		
	2.6	Biowaiver		
Module III	**Dosage form and routes of administration**			
3	3.1	Principles of dosage forms,	8 L	13
	3.2	need of dosage forms,		
	3.3	Stages of pharmaceutical manufacturing,		
	3.4	Principles of drug delivery via dosage forms, (eg, liquid, solid, semi-solid, controlled release, patches, and implants),		
	3.5	Route of administration (oral, topical, rectal, parenteral, vaginal, inhaled, ophthalmic, otic).		
Module IV	**Drug Delivery system**			
4	4.1	Development of drug delivery system	8 L	13
	4.2	controlled release, sustained release, extended release.		
	4.3	NDDS, liposomes,		

	4.4	Polymers, biopolymers and their applications		
Module V	**Physical Pharmacy and Industrial Guidelines**		12 L	20
5	5.1	Importance of DSP in biotechnology,		
	5.2	basic principle of Isolation and purification technique; unit operations such as cell disruption, extraction, filtration, membrane separation, centrifugation, precipitation,		
	5.3	chromatography and crystallization.		
	5.4	Particulate Technology (Particle Size; Powder Flow and Compaction, Size reduction, Size Separation, Mixing, Evaporation and Drying),		
	5.5	Good Manufacturing Practice (GMPs),		
	5.6	Good Lab Practices, Packaging.		
Module VI	**Personalized medicine and Adverse drug reactions**		10 L	17
6	6.1	Administration of medicines,		
	6.2	Rules of administration		
	6.3	Category of drugs, nursing process in administering drugs,		
	6.4	Essentials of medication order and types of medication order,		
	6.5	Rights of medication administration, Personalized medicine,		
	6.6	Adverse drug reactions and medical error		
Total			45	100

References:	
1.	Singh, Y. (2006). Martin's physical pharmacy and pharmaceutical sciences. New Jersey: Department of Pharmaceutics Ernest Mario School of Pharmacy Rutgers, The State University of New Jersey.

2.	Ghosh, R. (2006). Principles of bioseparations engineering. World Scientific Publishing company.
3.	Crommelin, D. J., Sindelar, R. D., & Sindelar, R. (2002). Pharmaceutical biotechnology. Taylor & Francis.
4.	Goodman, L. S. (1996). Goodman and Gilman's the pharmacological basis of therapeutics (Vol. 1549, pp. 1361-1373). New York: McGraw-Hill.
5.	Tashjian, A. H., & Armstrong, E. J. (2011). Principles of pharmacology: the pathophysiologic basis of drug therapy. Lippincott Williams & Wilkins.

Semester VI

Course Code	Course Name	Credits
CSA2610N	CLIMATE SMART AGRICULTURE	04

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	-	-	04	-	-	04

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Understand the science of climate change and its impact on agriculture
2.	Implement climate-resilient crop management practices
3.	Apply water conservation techniques in agriculture
4.	Utilize precision farming and technology
5.	Integrate agroforestry into climate-resilient farming systems
6.	Analyze policy and governance for climate-smart agriculture

Course Objective

1.	The objective of this course is to understand changing weather patterns, temperature, precipitation and its impact on crop yields, livestock, and overall food security
2.	Introduction to the principles of Climate-Smart Agriculture, including resilience, adaptation, and mitigation strategies.
3.	To impart knowledge and skills in water conservation, including efficient irrigation techniques, rainwater harvesting, and drought-resistant cropping practices.
4.	To familiarize students with precision farming techniques, including the use of remote sensing, GIS, and farm management software to enhance agricultural productivity and sustainability.
5.	To teach students about agroforestry systems, their integration into agricultural landscapes, and the role of agroforestry in enhancing climate resilience and biodiversity.
6.	To analyze government policies, economic incentives, and market opportunities that facilitate the adoption and implementation of climate-smart agricultural practices.

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	**Introduction to Climate Change and Agriculture**		9	15
1	1.1	Overview of climate change science		
	1.2	Impacts of climate change on agriculture		
	1.3	Climate variability and extreme weather events		
	1.4	Introduction to Climate-Smart Agriculture (CSA) principles		
Module II	**Climate-Resilient Crop Management**		10	20

2	2.1	Selection of Climate-Resilient Crop Varieties		
	2.2	Sustainable Soil Management and Conservation Practices		
	2.3	Integrated Pest Management Strategies for Climate Smart Agriculture		
Module III	**Water Conservation in Agriculture**		12	20
3	3.1	Efficient Irrigation Techniques		
	3.2	Rainwater Harvesting and Storage		
	3.3	Drought-Resistant Crop Practices		
Module IV	**Precision Farming and Technology Integration**		9	15
4	4.1	Introduction to Precision Agriculture		
	4.2	Use of Remote Sensing and GIS in Agriculture		
	4.3	Farm Management Software		
	4.4	Decision Support Systems		
Module V	**Agroforestry for Climate Resilience**		13	20
5	5.1	Understanding Agroforestry Systems		
	5.2	Integration of Trees into Agricultural Landscapes		
	5.3	Agroforestry Benefits for Biodiversity and Climate Adaptation		
Module VI	**Policy and Governance for Climate Smart Agriculture**		7	10
6	6.1	Government policies and programs supporting climate-smart agriculture		
	6.2	Economic incentives for adopting sustainable agricultural practices		
	6.3	Market opportunities for climate-smart agricultural products		

Total	60	100

References:	
1.	Smith, J. (2019). *Climate-smart agriculture: Building resilience to climate change*. Springer.
2.	Gliessman, S. R. (2021). *Agroecology: The ecology of sustainable food systems* (4th ed.). CRC Press.
3.	Lipper, L., McCarthy, N., & Zilberman, D. (2017). *Climate-smart agriculture: Building resilience to climate change*. Springer.
4.	Food and Agriculture Organization of the United Nations (FAO). (2013). *Climate-smart agriculture sourcebook*. FAO.
5.	Tengberg, A. M., Fraser, E. D. G., & Kurukulasuriya, P. (2018). *Adaptation to climate change in agriculture*. Springer.
6.	Thornton, P. K., & Herrero, M. (2021). *Climate-Smart Agriculture: Building Resilience to Climate Change*. Springer.

Semester VI

Course Code	Course Name	Credits
FSR2611N	Food Safety Regulations	04

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	-	-	04	-	-	04

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	Students will learn the basics of food safety, including how to design and maintain safe food establishments, practice good hygiene, and manage packaging, labeling, transportation, and product recalls.
2.	Students will understand and apply the principles of HACCP, including identifying hazards, setting up control points, and taking corrective actions.
3.	Students will be able to identify different types of food contaminants and adulterants, and understand the role of preservatives, additives, and residues in food safety.
4.	Students will become familiar with the regulations of the Food Safety and Standards Authority of India (FSSAI) and learn how to follow rules related to food safety and quality control.

5.	Students will understand the importance of food safety policies in the food industry and learn how to create and follow policies for environmental safety, handling glass and jewelry, and managing visitors.
6.	Students will gain knowledge of key food safety regulations and learn about laws that protect consumers, ensure export quality, and protect the environment.

Course Objective	
1.	To introduce students to the fundamental principles of food safety, including the design, maintenance, and hygiene practices required in food establishments.
2.	To educate students on the HACCP system, guiding them through hazard analysis, identifying critical control points, and establishing monitoring and corrective action procedures.
3.	To provide students with the knowledge to identify and understand various food contaminants and adulterants, and the role of preservatives and additives in maintaining food safety.
4.	To familiarize students with the regulations and guidelines set by the Food Safety and Standards Authority of India (FSSAI), and to teach them how to comply with national food safety standards.
5.	To help students understand the importance of implementing food safety policies in the food processing industry, including environmental, glass, jewelry, and visitor management policies.
6.	To equip students with an understanding of the key food safety regulations and legislation, including consumer protection, export quality control, and environmental protection laws.

Detailed syllabus

Module/ Unit	**Course Module / Contents**	**Hours**	**Marks Weightage (%)**
Module I	**Food Safety**	8L	13

1	1.1	Principles of food safety –Establishment:		
	1.2	design and facilities –		
	1.3	emergency preparedness –		
	1.4	Maintenance cleaning and sanitation		
	1.5	personal hygiene – packaging and labeling –		
	1.6	transportation – traceability – recall procedure.		
Module II	**HACCP principles and guidelines**			
2	2.1	HACCP – principles – Hazard analysis –	12L	20
	2.2	determine CCP – establish critical limit –		
	2.3	establish monitoring procedure – establish corrective action		
	2.4	record keeping – verification.		
	2.5	AOQL (Average Outgoing Quality Limit)		
	2.6	HACCP plan chart		
Module III	**Contaminants and adulterants**			
3	3.1	Intentional and unintentional - Preservatives - antioxidants, sweeteners,	12L	20
	3.2	flavors, colors, vitamins, stabilizers		
	3.3	indirect additives.		
	3.4	organic residues		
	3.5	inorganic residues		
	3.6	and contaminants		

Module IV	Food Safety and Standards Authority of India		8L	13
4	4.1	FSSAI,		
	4.2	Essential Commodities Act,		
	4.3	BIS,		
	4.4	organizational chart		
	4.5	prohibition and regulation of sales		
	4.6	Laboratory and sampling analysis		
Module V	**Food safety policy**		8L	13
5	5.1	Importance of food safety for a desired food processing industry;		
	5.2	scope and objective of food safety policy.		
	5.3	Implementation of environmental policy,		
	5.4	glass policy.		
	5.5	jewelry policy,		
	5.6	visitor policy		
Module VI	**Food safety regulations**		12L	20
6	6.1	Compulsory and voluntary trade and Company standards.		
	6.2	Consumer Protection Act (1986) and relevant Food Legislation (Act, orders, standards),		
	6.3	Export Quality Control and Inspection act (1963),		
	6.4	Environment, Protection Act (1986),.		
	6.5	WTO & GATT		
Total			60	100

References:	
1.	Food safety and standards regulations, 2010.
2.	Joint FAO/WHO Codex Alimentarius Commission, Joint FAO/WHO Food Standards Programme, & World Health Organization. (2003). Codex Alimentarius: Food hygiene, basic texts. Food & Agriculture Org..
3.	COUNCIL, I. N. (2021). THE GAZETTE OF INDIA EXTRAORDINARY PART III—SECTION 4. PDM.

Detailed Curriculum: Semester VII

Semester-VII								Evaluation Scheme		
Types of courses		**Course Code**	**Course Title**	**Lecture (L) credits**	**Tutorial (T) credits**	**Practical (P) Credits**	**Total credits**	**Internal Marks**	**External Marks**	**Total Marks**
Discipline Specific Courses	**Discipline-I (Core)**						**12**			
	Discipline-I (Compulsory)	TMP2701N	Term Paper-I	-	4	-	4	**100**	**0**	**100**
		RAP2702N	Research article presentation-I	-	4	-	4	**100**	**0**	**100**
		RME2703N	Research Methodology and ethics	4	-	-	4	**30**	**70**	**100**
	Research based course						**4**			
	Research based course	SCR2704N	Scientific Writing	4	-	-	**4**	**30**	**70**	**100**
	Total (Discipline specific courses)						**16**			
Non-Teaching Credit Courses	SIP/ Internship/ Project/ Dissertation/ Field Visit	**Dissertation**					**5**			
		DSP2722N	Dissertation project - I	-	-	-	**5**	**100**	**0**	**100**
	Total (NTCC)						**5**			
Grand Total							**21**			

Semester - VII

Course Code	Course Name	Credits
TMP2701N	TERM PAPER-I	04

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial/NTCC	Theory	Practical	Tutorial/NTCC	Total
-	-	-	-	-	04	04

Theory						Term Work/ Practical/ Oral			Total Marks
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
-	50	-	-	-	-	50	-	-	100

Evaluation Scheme (Out of 100 Marks)	
Continuous evaluation	Term Paper Submission
50 Marks	50 Marks
Following will be the evaluation criteria for Continuous Evaluation:	
1. Attendance 2. General approach 3. Understanding the concept 4. Research orientation	
Following will be the evaluation criteria for term paper submission	
1. Organization of paper 2. Comprehensiveness of the data 3. Overall presentation of report	

Course Outcome	
1	Students will demonstrate the ability to conduct comprehensive research on a chosen topic by effectively reviewing and synthesizing information from multiple sources.
2	Students will exhibit critical thinking skills by evaluating and interpreting research findings, identifying key arguments, and making informed judgments about the subject matter.
3	Students will produce a well-organized and clearly articulated term paper that adheres to academic writing standards, including proper citation and referencing practices.
4	Students will manage their research project effectively by setting milestones, adhering to deadlines, and integrating feedback from faculty to refine their work.
5	Students will engage constructively with faculty through regular consultations and progress updates, demonstrating the ability to incorporate feedback and make iterative improvements.
6	Students will present their research findings confidently and effectively, showcasing their understanding of the topic and defending their conclusions during the evaluation by the Board of Examiners.

Course Objective	
1	Equip students with the ability to locate, evaluate, and synthesize information from a variety of scholarly sources relevant to their chosen topic.
2	Foster the development of critical analysis skills, enabling students to assess the credibility of sources and the validity of arguments within their research.
3	Teach students the principles of academic writing, including structure, clarity, and adherence to citation standards, to ensure the production of a polished research paper.
4	Guide students in planning and executing their research project efficiently, including setting goals, managing time effectively, and integrating iterative feedback.
5	Encourage students to engage actively with faculty during the research process, utilizing feedback to enhance their paper and communication skills.

6	Prepare students to present and defend their research findings in a formal setting, demonstrating their understanding and ability to engage with scholarly critique.

Detailed syllabus			
Module/ Unit	**Course Module / Contents**	**Hours**	**Marks Weightage (%)**
	GUIDELINES FOR TERM PAPER	-	-
	The procedure for writing a term paper may consist of the following steps: 1. Choosing a subject 2. Finding sources of materials 3. Collecting the notes 4. Outlining the paper 5. Writing the first draft 6. Editing & preparing the final paper		
1	**Choosing a Subject**	-	-
	The subject chosen should not be too general.		
2	**Finding Sources of materials**		
	a) The material sources should be no more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view. b) Begin by making a list of subject-headings under which you might expect the subject to be listed. **c)** The sources could be books and magazine articles, news stories, periodicals, scientific journals etc.		
3	**Collecting the notes**		

	Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes. a) Get facts, not just opinions. Compare the facts with author's conclusion. b) In research studies, notice the methods and procedures, results & conclusions. c) Check cross references.		
4	**Outlining the paper**		
	a) Review notes to find main sub-divisions of the subject. b) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.		
5	**Writing the first draft**		
	Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following: a) statement of purpose b) main body of the paper c) statement of summary and conclusion Avoid short, bumpy sentences and long straggling sentences with more than one main idea.		
6	**Editing & preparing the final Paper**		
	a. Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to		

	the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section. b. Read the written content to ensure that the language is not awkward. c. Check for proper spelling, phrasing and sentence construction. d. Check for proper form on footnotes, quotes, and punctuation. e. Check to see that quotations serve one of the following purposes: i. Show evidence of what an author has said. ii. Avoid misrepresentation through restatement. iii. Save unnecessary writing when ideas have been well expressed by the original author. f. Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory. Term papers should be composed of the following sections: i. Title page ii. Table of contents iii. Introduction iv. Review v. Discussion & Conclusion vi. References **g. Appendix** Generally, the introduction, discussion, conclusion and bibliography part should account for a third of		

	the paper and the review part should be two thirds of the paper. h. **Discussion** The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.		
7	**Conclusion**		
	The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include: a) Summary of question posed. b) Summary of findings c) Summary of main limitations of the study at hand d) Details of possibilities for related future research		
8	**References**		
	From the very beginning of a research project, you should be careful to note all details of articles gathered. The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography. The key to a good bibliography is consistency. Choose a particular convention and stick to this. **Conventions** **Monographs** Crystal, D. (2001), Language and the internet. Cambridge: Cambridge University Press.		

	Edited volumes Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter. [(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].		
	Edited articles Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea. In: Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter: 285-316. **Journal articles** McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. Journal of consumer research 19, 180-197. **Electronic book** Chandler, D. (1994), Semiotics for beginners [HTML document].Retrieved [5.10.'01] from the World Wide Web, http://www.aber.ac.uk/media/Documents/S4B/. **Electronic journal articles** Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document].German as a Foreign Language Journal [online] 1.Retrieved [12.09.'00] from the World Wide Web, http://www.gfl-journal.com/. **Other websites**		

	Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document].Retrieved [13.10.'01] from the World Wide Web, http://olaf.hiof.no/~sverrev/eng.html. **Unpublished papers** Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu. **Unpublished theses/ dissertations** Möhl, S. (1996), AlltagssituationeniminterkulturellenVergleich: Realisierung von Kritik und AblehnungimDeutschen und Englischen. Unpublished MA thesis, University of Hamburg. Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin.		
9	**Appendix**		
	The appendix should be used for data collected (e.g. questionnaires, transcripts, ...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.		

Semester - VII

Course Code	Course Name	Credits
RAP2702N	RESEARCH ARTICLE PRESENTATION-I	04

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial/NTCC	Theory	Practical	Tutorial/NTCC	Total
-	-	-	-	-	04	04

Theory						Term Work/ Practical/ Oral			Total Marks
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
-	-	-	-	-	-	-	-	100	100

Evaluation Scheme (Out of 100 Marks)	
Oral Presentation: A	**Oral Presentation: B**
50 Marks	50 Marks
Following will be the evaluation criteria for Oral Presentation A and B:	
1. Preparation of presentation 2. Understanding of topic 3. Presentation skills 4. Viva voce based on ppt and paper presentation	

Course Outcome

1	Research Competency: Students will be able to critically evaluate and interpret scientific research articles, demonstrating an understanding of research methodologies and data analysis.
2	Presentation Skills: Students will be proficient in creating and delivering clear, concise, and engaging presentations on complex scientific topics.
3	Literature Synthesis: Students will be able to synthesize information from multiple sources, identifying research trends, gaps, and future directions.
4	Critical Analysis: Students will demonstrate the ability to critically assess the strengths and weaknesses of research studies, providing well-supported critiques.
5	Communication Proficiency: Students will develop the ability to communicate scientific information effectively to a diverse audience, including peers and faculty.
6	Peer Review Skills: Students will gain experience in providing constructive feedback on peers' presentations and incorporating feedback into their own work for continuous improvement.

Course Objective	
1	Enhance Research Skills: To develop students' abilities to critically analyze and evaluate scientific research articles in the field of biotechnology.
2	Presentation Development: To guide students in creating and delivering effective presentations that clearly communicate complex scientific information.
3	Literature Review: To train students in conducting comprehensive literature reviews, identifying key research gaps, and understanding current advancements.
4	Critical Thinking: To foster critical thinking by encouraging students to question methodologies, data interpretations, and conclusions in research articles.
5	Effective Communication: To improve students' skills in articulating scientific concepts and findings clearly and effectively to both specialist and non-specialist audiences.
6	Collaboration and Feedback: To promote collaboration among students and the ability to provide and receive constructive feedback during presentations.

Detailed syllabus

Module/ Unit	Course Module / Contents	Hours	Marks Weightage (%)
	GUIDELINES		
	Students must choose two research articles (Scopus indexed research article of 2 or above impact factor) The procedure for choosing an article may consist of the following steps: **Choosing a subject:** The subject chosen should not be too general. **Finding research article:** The research article should be no more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view. **Preparing the final presentation:** The final power point presentation should be of 15 mins to justify the understanding of the student for the research article chosen. Then 10 mins will be for questionnaire	-	-

References:	
1.	Day, R. A., & Gastel, B. (2012). How to write and publish a scientific paper (7th ed.). Cambridge University Press.
2.	Booth, W. C., Colomb, G. G., & Williams, J. M. (2016). The craft of research (4th ed.). University of Chicago Press.

Semester - VII

Course Code	Course Name	Credits
RME2703N	RESEARCH METHODOLOGY AND ETHICS	04

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	-	-	04	-	-	04

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	To remember the differences between different types of research and its importance
2.	To remember the types of research and to understand how to do literature review
3.	To understand the process behind citation and referencing
4.	To analyze the different types of data comparison and understand it’s correlation
5.	To create and understand the report writing and the importance of plagiarism and citation
6.	To understand the ethics of publication and strategies to promote integrity

Course Objective

1.	To study different types of research and research design.
2.	To learn about the formulation of research
3.	To learn about different research designs
4.	To deal with data collection and analysis
5.	To understand the research ethics
6.	To understand the ethics of publication

Detailed syllabus

Module/ Unit	Course Module / Contents		Hours	Marks Weightage (%)
Module I	Objectives and types of research		6	14%
1	1.1	Motivation and objectives – Research methods vs Methodology		
	1.2	Types of research		
	1.3	Descriptive vs. Analytical		
	1.4	Applied vs. Fundamental		
	1.5	Quantitative vs. Qualitative		
	1.6	Conceptual vs. Empirical.		
Module II	Research Formulation		7	16%
2	2.1	Defining and formulating the research problem - Selecting the problem		
	2.2	Necessity of defining the problem, Importance of literature review in defining a problem		

	2.3	Literature review – Primary and secondary sources – reviews, treatise, monograph, patents		
	2.4	Web as a source – searching the web		
	2.5	Critical literature review – Identifying gap areas from literature review		
	2.6	Development of working hypothesis.		
Module III	Research design and methods		9	20%
3	3.1	Research design- Basic Principles, need of research design		
	3.2	Features of good design		
	3.3	Important concepts relating to research design - Observation and Facts, Laws and Theories, Prediction and explanation		
	3.4	Induction, Deduction, Development of Models.		
	3.5	Developing a research plan - Exploration, Description, Diagnosis, Experimentation.		
	3.6	Determining experimental and sample designs.		
Module IV	Data Collection and analysis		8	18%
4	4.1	Execution of the research		
	4.2	Observation and Collection of data		
	4.3	Methods of data collection		
	4.4	Sampling Methods- Data Processing and Analysis strategies		
	4.5	Data Analysis with Statistical Packages		
	4.6	Hypothesis-testing - Generalization and Interpretation.		

Module V	Research ethics			
5	5.1	Definition and importance of research ethics	8	18%
	5.2	Historical perspective and major ethical codes		
	5.3	Role of institutional review boards and ethical committee		
	5.4	Informed consent and its components		
	5.5	Confidentiality and privacy issues-handling of sensitive data and vulnerable populations		
	5.6	Conflict of interest and bias in research		
Module VI	Publication ethics			
6	6.1	Definition and significance of publication ethics; Authorship criteria and contributions	7	16%
	6.2	Plagiarism and its types; Data presentation and manipulation		
	6.3	Proper citation practices and referencing		
	6.4	Dealing with conflicting interests and financial disclosures		
	6.5	Strategies for promoting transparency and integrity in scholarly publishing		
	6.6	Ethical responsibilities towards readers and the public.		
Total			**45**	**100%**

References:	
1.	Research Methodology Methods and Techniques by C.R.Kothari
2.	Statistics by B.N.Gupta
3.	Scientific journal and magazines.
4.	Law Relating To Intellectual Property Rights" by V K Ahuja.
5.	Government documents of IP law.

Semester - VII

Course Code	Course Name	Credits
SCR2704N	SCIENTIFIC WRITING	04

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	-	-	04	-	-	04

Theory						Term Work/ Practical/ Oral			Total
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
15	10	05	30	70	3 Hours	-	-	-	100

Course Outcome	
1.	To organize and structure scientific papers, including creating clear and logical sections such as Introduction, Methods, Results, Discussion, and References, following established conventions and guidelines.
2.	To demonstrate the ability to write clearly and precisely, avoiding ambiguity and ensuring that their arguments and findings are communicated effectively to a scientific audience.
3.	To develop skills to critically analyze and synthesize scientific literature, identifying key findings, methodologies, and gaps in research to inform their own writing and research.
4.	To adhere to the standards and conventions of scientific writing, including proper use of scientific terminology, adherence to style guides (such as APA, AMA, or specific journal guidelines), and correct formatting.

5.	To integrate and present data and evidence effectively, including accurate reporting of results, appropriate use of tables and figures, and sound interpretation of findings in the context of the research question.
6.	To understand and apply ethical principles in scientific writing, including proper citation of sources, avoidance of plagiarism, and adherence to ethical guidelines in the reporting of research.

Course Objective	
1.	To construct well-organized scientific documents with a clear structure, including an introduction, methods, results, discussion, and conclusion, to effectively convey their research.
2.	To write with precision and clarity, ensuring that their scientific arguments and findings are presented in an understandable and unambiguous manner.
3.	To become proficient in the conventions and style of scientific writing, including adherence to specific formatting guidelines, proper use of terminology, and appropriate citation practices.
4.	To gain skills in integrating and interpreting data within their writing, including the effective presentation of tables, figures, and statistical results to support their research conclusions.
5.	To learn to conduct comprehensive literature reviews, critically evaluate existing research, and synthesize relevant studies to provide context and background for their own research.
6.	To understand ethical considerations in scientific writing, including how to properly attribute sources, avoid plagiarism, and ensure the integrity and authenticity of their work.

Detailed syllabus

Module/ Unit	**Course Module / Contents**	**Hours**	**Marks Weightage** (%)

Module I	Introduction to Scientific Writing		6	14%
1	1.1	Understand the importance of scientific writing		
	1.2	Scientific writing - its purpose, and audience		
	1.3	Overview of scientific communication		
	1.4	Characteristics of scientific writing (clarity, precision, objectivity)		
	1.5	Types of scientific documents (research articles, reviews, proposals, short communication, reports, editorials, chapters, book)		
	1.6	Ethical considerations in scientific writing (plagiarism, authorship)		
Module II	Structure and Organization		7	16%
2	2.1	Learn to structure scientific documents		
	2.2	Effectively to convey research findings		
	2.3	IMRAD structure (Introduction, Methods, Results, Discussion)		
	2.4	Hourglass and King model, Abstracts and keywords		
	2.5	Sections of a research paper and their purpose, writing effective titles and subtitles		
	2.6	Referencing.		
Module III	Writing Techniques and Style		9	20%
3	3.1	Develop writing skills specific to scientific discourse		
	3.2	Writing clear and concise sentences		
	3.3	Use of active vs. passive voice		
	3.4	Technical writing style and vocabulary		
	3.5	Grammar, and punctuation in scientific writing		

	3.6	Referencing styles.		
Module IV	Data Presentation and Visual Communication		8	18%
4	4.1	Understand how to effectively present data		
	4.2	Using visuals in scientific writing		
	4.3	Types of figures and tables		
	4.4	Guidelines for creating effective visuals (graphs, charts, diagrams),		
	4.5	Caption writing and referencing visuals		
	4.6	Ethical considerations in data presentation		
Module V	Review, Editing, and Publishing		8	18%
5	5.1	Learn the process of reviewing the manuscript		
	5.2	Editing the manuscript		
	5.3	Preparing scientific manuscripts for publication		
	5.4	Manuscript submission and publication process		
	5.5	Peer review process, Self-editing techniques		
	5.6	Responding to reviewer comments		
Module VI	Assignment, presentation, group discussion on scientific writing		7	16%
6	6.1	Assignment		
	6.2	Presentation		
	6.3	Group Discussion		
Total			**45**	**100%**

References:	
1.	Kothari, C. R. (2004). Research methodology: Methods and techniques. New Age International.
2.	Scientific journal and magazines.

Semester - VII

Course Code	Course Name	Credits
DSP2722N	DISSERTATION PROJECT-I (FUNDAMENTAL TECHNIQUES IN BIOTECHNOLOGY)	5

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial/ NTCC	Theory	Practical	Tutorial/ NTCC	Total
-	-	-	-	-	5	5

Theory						Term Work/ Practical/ Oral			Total Marks
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
-	35	-	-	-	-	35	-	30	100

Evaluation Scheme (Out of 100 Marks)	
Continuous evaluation and Term work	**Oral Presentation**
70 Marks	30 Marks
Following will be the evaluation criteria for Continuous evaluation and Term work **Term work:**	
1. Marks from Research supervisor (Based on attendance of student, laboratory skills, understanding the concepts, literature writing) 2. Dissertation thesis evaluation (Based on literature review, methodology, writing structure and style)	
Following will be the evaluation criteria for oral presentation:	

Audibility, command over language, confidence, technical knowledge, conclusion, data collection and analysis, viva voce.

Course Outcome	
1.	Students will understand foundational biotechnology concepts.
2.	Students will demonstrate basic laboratory skills.
3.	Students will comprehend essential biotechnological processes.
4.	Students will be able to operate key biotechnological instruments
5.	Integration of literature with experimental design.
6.	Effective data analysis and interpretation.

Course Objective	
1.	Introduce foundational concepts in biotechnology
2.	Develop basic laboratory skills and techniques.
3.	Understand essential biotechnological processes.
4.	Learn to operate key biotechnological instruments.
5.	Design and perform simple experiments.
6.	Analyse and interpret experimental data.

Detailed syllabus

Module/ Unit	**Course Module / Contents**	**Hours**	**Marks Weightage (%)**
	Guidelines	-	-
	Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It		

	usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation. Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But, whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student. Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.		
	General guidelines for report		
	In general, the file should be comprehensive and include. • A short account of the activities that were undertaken as part of the project. • A statement about the extent to which the project has achieved its stated goals. • A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project. • Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project. • Any problems that have arisen that may be useful to document for future reference.	-	-
	Thesis Writing Instructions:	-	-
1	**GENERAL INSTRUCTIONS**		

	The thesis should contain the following components: • Title page • Abstract (max 1 page) • Acknowledgements (optional) • Abbreviations and Definitions • Index • List of Tables • List of Figures • Introduction • Review of Literature • Materials and Methods • Results & Discussion • Summary and conclusions • References • Appendix		
2	**LAYOUT**	-	-
	The following parameters are used: • Page: A4, horizontal Text. Vertical Text can be used in case of tables/figures. • Margins: all margins 2.5 cm • Columns: single column • Alignment: Align both edges of your text • Page numbers: Centre bottom margin. Pages are counted from TITLE PAGE, but page numbers are shown starting from Introduction. Page numbering starts from the beginning in each appendix. • Font type and size: Times New Roman. Main text font size 12. Main headings CAPITAL, **bold**, font size 14. The 1st category heading CAPITAL, **bold** and font size 12. The 2nd category and lower-level headings **bold**, not caps, font size 12. • Spacing: 1.5 (summary and references with spacing 1)	-	-

	• Spaces: After chapters, headings, figures and tables, leave empty space so that layout of the text is clear and consistent. Do not use indentations. • Actual text starting from Introduction can be printed either one-sided or double-sided.		
3	**TABLES AND FIGURES**		
	➢ Tables and figures are meant to illustrate the results and as such shorten the text. ➢ Tables/figures should contain the most important results. ➢ When making figures/tables pay attention to: • Always refer to table/figure in text. • Tables/figures should fit to one page (this means no page breaks). Place the tables/figures close after to the text that refers the table/figure. • Title of the table is placed on top of the table. Title of the figure is placed at the bottom of the figure. Title should include all the information required to understand the figure/table. • Tables/Figures are numbered by the order of appearance (both tables and figures have separate numberings i.e. Table 1, Figure 1) • All the variables should include the SI units. • Tables and figures should be easy to read. In tables, the leftmost paragraph is used for the parameters, or the phenomenon studied. Observations are placed to different rows. • Avoid unnecessary lines in the table. Avoid raster. • If figures are illustrated black and white, pay attention to line types and raster. The differences should be easy to see.	-	-

	• Use appropriate program for figures. Different figure types are presented in more detailed in the following subchapters		
4	**STRUCTURE**	-	-
4.1	**Title Page**		
	Title page includes: • Title of the work • Author • Name of the university and name of the department • Month and year when published		
4.2	**Abstract**		
	The length of the abstract page is always 1 page. Abstract is short, independent disquisition on the thesis. The purpose of the abstract is to briefly explain the purpose of the work, what was studied, why it was studied, what the methods were and what the main results and conclusions were. Abstract helps the reader to decide if the work should be read completely. As such it can give information for reader who is not totally familiar with the subject.		
4.3	**Acknowledgements**		
	An acknowledgment is normally one page. The time and place of the performance of the work is mentioned together with possible sponsors (if any) and the purpose of the work. If more people are involved, the role of them is described in general level. Also, those persons and institutions who have involved in the study should be acknowledged. The supervisors and reviewers of the work should be acknowledged. Acknowledgment can be signed by the author.		
4.4	**Index**		

	Contents include all the titles from acknowledgments, but not the first pages of the report. Pages are counted from title page, but page numbers are shown from the actual text (introduction). In text main chapters are separated into separate pages. Chapters are numbered, indentation when the level of chapter is changing (chapters, subchapters, sub-subchapters). Appendixes are listed, but general title "Appendix" is neither numbered nor included into total number of pages. However, individual appendixes are numbered and titled. In the index, titles are given in the same form as in the main text. Main chapters: capital letters, font size 14, bold. The first level subchapters: capital letters font size 12, bold. From the second level onwards: not caps, font size 12, bold		
4.5	**Introduction**		
	Introduction is normally 1-2 pages. The purpose of the introduction is to familiarize the reader to the subject of the thesis. Introduction describes the most crucial background information related to the subject studied, including research problem, the history and state of art of the subject in general level. Introduction is not a literature review, and as such it is not required to refer to literature in it. Introduction is written in standard language, special terms and abbreviation should be avoided. The last paragraph of the introduction includes the aims of the work condensed into a few words. In short report no such paragraph is required. However, when literature review is long and the subject is discussed widely in it, the aims of the work should be written down in more detailed prior the materials and the methods		
4.6	**Review of Literature**		

	The purpose of the literature review is to give the reader a general idea concerning the subject of the thesis. Literature review can cover the theory behind the research problem, the development of the theories, the occurrence of the problem/phenomenon, the importance of the phenomenon, the factors affecting the phenomenon, the methods used for studying the problem/phenomenon, and/or the guides, instructions, recommendations, limiting values. Literature review should be planned carefully: all the subjects raised up in the literature review should have a clear connection with the work reported in the thesis. The reader of the thesis should be able to piece together the connection between the literature review and the work. The structure of the literature review should be clear. All the subjects should be presented in logical order. The structure can be formed from general overview to more detailed subjects or from historical development into the present state of art and further to the future perspectives. Subtitles make the structure clearer. However, too many subtitles make the structure fragmented and hard to follow. A general rule is that a subtitle should include at least two paragraphs. Special attention should be paid on the division into paragraphs. Paragraphs with one or two sentences can stress the message, but if used continuously they make text harder to read.		
	Materials and Methods		
	In this chapter all the materials and methods are described so that the study can be repeated if necessary. This chapter can be rather long, since it includes detailed information concerning the analysis,		

	analytical devices etc. Using appropriate subchapters makes this chapter easier to read. The selection criterion for the materials (or testee) is described. Methods include the criteria for selecting such methods and the suitability for the study, the principles, detection limits, sources of errors, quality control and detailed description of the study performed. If the methods are described in detail in literature, only the essential information is written and the reference is used. If the method is not followed completely, the differences from the original methods are stated clearly. Research frame and/or the progression of the study are described using graph or table if possible. The conditions and order used should be included in the description. In case many people are involved, the distribution of the work can be indicated here. The statistical analyses used are described in this chapter.		
	Results and Discussion		
	Results are presented in logical order using subchapters. Raw data can be presented in appendix, if required. Results should be given clearly, using illustrative figures/tables. The main results should be presented shortly in the text and the related tables and figures following the text should be referred. The data given in the figure or table should not be directly repeated in the text. The data is given either in figure or in table, not in both. Discussion is authors' interpretation from his/her results. It also includes comparison to previously published data. In discussion author gives reader his ideas from the study performed. Author gives his/her		

	opinions to reader. This is why it is important to make discussion accurate, with expertise. Though discussion includes authors opinions, all the opinions must be based on the results from the work or from the published results by the others. Opinions that are not based on the results should not be presented. Last paragraph of the discussion is the generalization. A successful study gives new observations, and these observations can be generalized to create new theories. The usability of the results should be explained, especially if the report does not include separate conclusions.		
	Conclusion and Summary		
	Conclusions and summary should be presented in one chapter. In conclusions and summary, the text is condensed, and no references are given. The length of this chapter is max 1page. No individual results are given, but the generalization and the importance of the results are explained. Each conclusion is given in separate paragraph. The importance and usability of the results, together with possible applications are explained. The possible effect to studies in future is speculated. Author should clearly write down those conclusions he/she wants the reader to remember from the study.		
	References/ Bibliography		
	The bibliographical information from all the literature referred in the text must be presented. This way the references can be identified, and the original publications can be found. Text should include references to the original publications used.		

References are shown also, when presenting tables/figure etc. collected from data in publications.

There are several ways to organize the references. At Amity Institute of Biotechnology, it is suggested to use the following way.

In so called Harvard-system the references are listed in alphabetical order. All the references are given in text in form "name of the author, year of publication, e.g. (Smith, 1997) or "According to Smith (1997) ..." List of references is organized in alphabetical order. If two or more references have same authors, the references are organized by the year of publication. If referred to the publications from the same author published in same year, the references are separated by small letters, e.g Smith 1997a and Smith 1997b).

In the reference list, line spacing is 1. Various references are separated from each other with one empty line without indentation.

List of references should include following information:

Articles:

- authors: last name and initial(s) of the first name(s)
- publication year
- title of the article
- name of the journal (or official abbreviation)
- volume of the journal, page numbers of the article

For Example

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002).

	Antibacterial activity of Thai medicinal plants against enterohaemorrhagic Escherichia coli O157: H7. Clin Microbiol Infect, 8 (suppl 1): 116–117. Books: • authors and/or editors: last name and initial(s) of the first name(s) • publication year • title of the book • number of editions if 2nd or later • publisher, place of publishing • If referred only to one section (chapter) of book, give the reference to authors of the section/chapter, and include title of that chapter, and • authors/editors of the book, title of the book, page numbers, publisher, place of publishing For Example Percival SL, Walker JT, and Hunter PR. (2000). Microbiological aspects of biofilms and drinking water. CRC Press, Boca Raton, FL. Schneider T. (2000). Synthetic vitreous fibers. In: Spengler J.D., Samet J.M. and McCarthy J.F. (eds.). The Indoor Air Quality Handbook, p. 391-399. McGraw-Hill, New York. Proceedings, e.g. in conference proceedings • Authors: last name and initial(s) of the first name(s) • publication year • Tile of the article		

	• Editor(s); last name and initial(s) of the first name(s) • Name of the proceeding, volume, publisher. Also, information concerning. • from where the publication can be found, e.g. the organization and its address. For example: Manninen AM, Holopainen T, Vuorinen M and Holopainen JK. (1999). Possible use of mycorrhizas and host plant secondary metabolites for control of insect herbivores on Scots pine. In: Lilja A and Sutherland Jr (eds.). Proceedings of the 4th Meeting of IUFRO Working Party 7.03.04 Diseases and Insects in Forest Nurseries. Suonenjoki, Finland. Finnish Forest Research Institute, Research Papers 781:163-175. Reports, standards, other official documents etc. • Authors: last name and initial(s) of the first name(s) or the organization that made the report. • publication year • Name of the report, and identification codes (register number, code, page numbers etc.) • Publisher, name and number of the series, organization published the report, • place of publication For example: Comité Européen de Normalisation (CEN). (1993). Workplace atmospheres – Size fraction definitions for measurement of airborne particles (EN 481). Standard Brussels CEN.		

	Scharf B. (2006). Long term effects of ozone depletion on anatomy and physiology of *Eriophorum russeolum* Fries ex Hartm: a field experiment in Finnish Lapland. Diploma thesis, University of Osnabrück, Germany. Letters, interviews, other unpublished or non-printed references are given according to the general instructions concerning reference listing. All the published material is written according to these instructions. Also, electronic material is reported using the same principles. Electronic material reference must include all the same information as the printed reference. The format is then given in square brackets e.g. [online] or [CD-ROM]. URL address and date is mentioned when referring www pages. Be careful with special symbols. It is suggested that you print a copy for yourself from electronic material (with date), if technically possible. By doing this, you can proof the existence of referred material at least at that time. For example: IARC (International Agency for Research on Cancer). 2007. Monographs on the Evaluation of Carcinogenic Risks to Humans: "Wood dust and formaldehyde". http://monographs.iarc.fr/ENG/Monographs/vol62/volume62.pdf. Accessed 14.9.2007.		
Total		**-**	**100**

References:	
1.	Sambrook, J., & Russell, D. W. (2001). Molecular Cloning: A Laboratory Manual (3rd ed.). Cold Spring Harbor Laboratory Press.

2.	Erlich, H. A., & Gelfand, D. H. (1995). Polymerase Chain Reaction (PCR). In Methods in Molecular Biology (Vol. 3, pp. 1-10). Springer.
3.	Creswell, J. W. (2013). Qualitative Inquiry and Research Design: Choosing Among Five Approaches (3rd ed.). Sage Publications.
4.	Field, A. (2013). Discovering Statistics Using IBM SPSS Statistics (4th ed.). Sage Publications.
5.	Resnik, D. B. (2011). What Is Ethics in Research & Why Is It Important? National Institute of Environmental Health Sciences.

Detailed Curriculum: Semester VIII

Semester-VIII								Evaluation Scheme		
Types of courses		**Course Code**	**Course Title**	**Lecture (L) credits**	**Tutorial (T) credits**	**Practical (P) Credits**	**Total credits**	**Internal Marks**	**External Marks**	**Total Marks**
Discipline Specific Courses	**Discipline-I (Core)**						**8**			
	Discipline-I (Compulsory)	TMP2801N	Term Paper-II	-	4	-	4	**100**	**0**	**100**
		RAP2802N	Research article presentation-II	-	4	-	4	**100**	**0**	**100**
	Research based course						4			
	Research based course	CLS2803N	Certification course in Life sciences	-	4	-	**4**	**100**	**0**	**100**
	Total (Discipline specific courses)						**12**			
Non-Teaching Credit Courses	SIP/ Internship/ Project/ Dissertation/ Field Visit	**Dissertation**					**12**			
		DSP2822N	Dissertation project-II	-	-	-	**12**	**200**	**0**	**200**
	Total (NTCC)						**12**			
Grand Total							**24**			

Semester - VIII

Course Code	Course Name	Credits
TMP2801N	TERM PAPER-II	04

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial/NTCC	Theory	Practical	Tutorial/NTCC	Total
-	-	-	-	-	04	04

Theory						Term Work/ Practical/ Oral			Total marks
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
-	50	-	-	-	-	50	-	-	100

Evaluation Scheme (Out of 100 Marks)	
Continuous evaluation	Term work/ Paper Submission
50 marks	50 marks
Following will be the evaluation criteria for Continuous Evaluation:	
1. Attendance 2. General approach 3. Understanding the concept 4. Research orientation	
Following will be the evaluation criteria for Term work/ Paper submission	
1. Organization of paper 2. Comprehensiveness of the data 3. Overall presentation of report	

Course Outcome	
1	Students will demonstrate the ability to conduct comprehensive research on a chosen topic by effectively reviewing and synthesizing information from multiple sources.
2	Students will exhibit critical thinking skills by evaluating and interpreting research findings, identifying key arguments, and making informed judgments about the subject matter.
3	Students will produce a well-organized and clearly articulated term paper that adheres to academic writing standards, including proper citation and referencing practices.
4	Students will manage their research project effectively by setting milestones, adhering to deadlines, and integrating feedback from faculty to refine their work.
5	Students will engage constructively with faculty through regular consultations and progress updates, demonstrating the ability to incorporate feedback and make iterative improvements.
6	Students will present their research findings confidently and effectively, showcasing their understanding of the topic and defending their conclusions during the evaluation by the Board of Examiners.

Course Objective	
1	Equip students with the ability to locate, evaluate, and synthesize information from a variety of scholarly sources relevant to their chosen topic.
2	Foster the development of critical analysis skills, enabling students to assess the credibility of sources and the validity of arguments within their research.
3	Teach students the principles of academic writing, including structure, clarity, and adherence to citation standards, to ensure the production of a polished research paper.
4	Guide students in planning and executing their research project efficiently, including setting goals, managing time effectively, and integrating iterative feedback.

5	Encourage students to engage actively with faculty during the research process, utilizing feedback to enhance their paper and communication skills.
6	Prepare students to present and defend their research findings in a formal setting, demonstrating their understanding and ability to engage with scholarly critique.

Detailed syllabus			
Module/ Unit	**Course Module / Contents**	**Hours**	**Marks Weightage (%)**
	GUIDELINES FOR TERM PAPER		
	The procedure for writing a term paper may consist of the following steps: 1. Choosing a subject 2. Finding sources of materials 3. Collecting the notes 4. Outlining the paper 5. Writing the first draft 6. Editing & preparing the final paper	-	-
1	**Choosing a Subject**		
	The subject chosen should not be too general.		
2	**Finding Sources of materials**		
	d) The material sources should be no more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view. e) Begin by making a list of subject-headings under which you might expect the subject to be listed. **f)** The sources could be books and magazine articles, news stories, periodicals, scientific journals etc.	-	-
3	**Collecting the notes**		

	Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes. d) Get facts, not just opinions. Compare the facts with author's conclusion. e) In research studies, notice the methods and procedures, results & conclusions. f) Check cross references.		
4	**Outlining the paper**		
	c) Review notes to find main sub-divisions of the subject. d) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.		
5	**Writing the first draft**		
	Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following: d) statement of purpose e) main body of the paper f) statement of summary and conclusion Avoid short, bumpy sentences and long straggling sentences with more than one main idea.		
6	**Editing & preparing the final Paper**		
	i. Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but		

	not to your readers. To avoid this, ensure you briefly explain the relevance of every section. j. Read the written content to ensure that the language is not awkward. k. Check for proper spelling, phrasing and sentence construction. l. Check for proper form on footnotes, quotes, and punctuation. m. Check to see that quotations serve one of the following purposes: iv. Show evidence of what an author has said. v. Avoid misrepresentation through restatement. vi. Save unnecessary writing when ideas have been well expressed by the original author. n. Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory. Term papers should be composed of the following sections: vii. Title page viii. Table of contents ix. Introduction x. Review xi. Discussion & Conclusion xii. References **o. Appendix** Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper. p. **Discussion** The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion		

	of the results of the study focusing on the question posed in the research paper.		
7	**Conclusion**		
	The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include: e) Summary of question posed. f) Summary of findings g) Summary of main limitations of the study at hand h) Details of possibilities for related future research		
8	**References**		
	From the very beginning of a research project, you should be careful to note all details of articles gathered. The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography. The key to a good bibliography is consistency. Choose a particular convention and stick to this. **Conventions** **Monographs** Crystal, D. (2001), Language and the internet. Cambridge: Cambridge University Press. **Edited volumes** Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter. [(eds.) is used when there is more than one editor; and		

	(ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].		
	Edited articles Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea. In: Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter: 285-316. **Journal articles** McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. Journal of consumer research 19, 180-197. **Electronic book** Chandler, D. (1994), Semiotics for beginners [HTML document].Retrieved [5.10.'01] from the World Wide Web, http://www.aber.ac.uk/media/Documents/S4B/. **Electronic journal articles** Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document].German as a Foreign Language Journal [online] 1.Retrieved [12.09.'00] from the World Wide Web, http://www.gfl-journal.com/. **Other websites** Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document].Retrieved [13.10.'01] from the World Wide Web, http://olaf.hiof.no/~sverrev/eng.html. **Unpublished papers**		

	Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu. **Unpublished theses/ dissertations** Möhl, S. (1996), AlltagssituationeniminterkulturellenVergleich: Realisierung von Kritik und AblehnungimDeutschen und Englischen. Unpublished MA thesis, University of Hamburg. Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin.		
9	**Appendix**		
	The appendix should be used for data collected (e.g. questionnaires, transcripts, ...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.		

Semester - VIII

Course Code	Course Name	Credits
RAP2802N	RESEARCH ARTICLE PRESENTATION-II	04

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial/NTCC	Theory	Practical	Tutorial/NTCC	Total
-	-	-	-	-	04	04

Theory						Term Work/ Practical/ Oral			Total Marks
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
-	-	-	-	-	-	-	-	100	100

Evaluation Scheme (Out of 100 Marks)	
Oral Presentation: A	**Oral Presentation: B**
50 Marks	50 Marks
Following will be the evaluation criteria for Oral Presentation A and B:	
1. Preparation of presentation 2. Understanding of topic 3. Presentation skills 4. Viva voce based on ppt and paper presentation	

Course Outcome

1	Research Competency: Students will be able to critically evaluate and interpret scientific research articles, demonstrating an understanding of research methodologies and data analysis.
2	Presentation Skills: Students will be proficient in creating and delivering clear, concise, and engaging presentations on complex scientific topics.
3	Literature Synthesis: Students will be able to synthesize information from multiple sources, identifying research trends, gaps, and future directions.
4	Critical Analysis: Students will demonstrate the ability to critically assess the strengths and weaknesses of research studies, providing well-supported critiques.
5	Communication Proficiency: Students will develop the ability to communicate scientific information effectively to a diverse audience, including peers and faculty.
6	Peer Review Skills: Students will gain experience in providing constructive feedback on peers' presentations and incorporating feedback into their own work for continuous improvement.

Course Objective	
1	Enhance Research Skills: To develop students' abilities to critically analyze and evaluate scientific research articles in the field of biotechnology.
2	Presentation Development: To guide students in creating and delivering effective presentations that clearly communicate complex scientific information.
3	Literature Review: To train students in conducting comprehensive literature reviews, identifying key research gaps, and understanding current advancements.
4	Critical Thinking: To foster critical thinking by encouraging students to question methodologies, data interpretations, and conclusions in research articles.
5	Effective Communication: To improve students' skills in articulating scientific concepts and findings clearly and effectively to both specialist and non-specialist audiences.
6	Collaboration and Feedback: To promote collaboration among students and the ability to provide and receive constructive feedback during presentations.

Detailed syllabus

Module/ Unit	Course Module / Contents	Hours	Marks Weightage (%)
	GUIDELINES		
	Students must choose two research articles (Scopus indexed research article of 2 or above impact factor) The procedure for choosing an article may consist of the following steps: **Choosing a subject:** The subject chosen should not be too general. **Finding research article:** The research article should be no more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view. **Preparing the final presentation:** The final power point presentation should be of 15 mins to justify the understanding of the student for the research article chosen. Then 10 mins will be for questionnaire	-	-

References:	
1.	Day, R. A., & Gastel, B. (2012). How to write and publish a scientific paper (7th ed.). Cambridge University Press.
2.	Booth, W. C., Colomb, G. G., & Williams, J. M. (2016). The craft of research (4th ed.). University of Chicago Press.

Semester - VIII

Course Code	Course Name	Credits
CLS2803N	CERTIFICATION COURSE IN LIFE SCIENCES	**Credits: 04**

Contact Hours			Credits Assigned			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
-	-	04	-	-	04	04

Theory						Term Work/ Practical/ Oral			Total Marks
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
-	-	-	-	-	-	**50**	-	**50**	**100**

Evaluation scheme (Out of 100 Marks)	
Term Work/ Report	**Oral presentation**
50 Marks	50 Marks
Following will be the criteria for evaluation of submitted course completion/ Term work report: a) Format of the report b) Scientific Language/Concept	
Following will be the criteria for evaluation of oral presentation of completed certification course: Based on audibility, command over language, confidence, concept understanding, technical Knowledge, data collection & analysis, PPT, viva.	

Course Outcome	
1.	Demonstrate a strong understanding of the core principles and concepts across various domains of life sciences.
2.	Apply essential laboratory techniques and methodologies in conducting experiments related to biology, genetics, molecular biology, and biochemistry.
3.	Integrate knowledge from different branches of life sciences to analyze complex biological systems and processes.
4.	Critically evaluate scientific data, draw meaningful conclusions, and present findings effectively in written and oral formats.
5.	Utilize theoretical knowledge to address real-world challenges in health, agriculture, environmental conservation, and industrial applications.
6.	Recognize and articulate the ethical issues associated with life sciences research and its applications, advocating for ethical and sustainable practices.

Course Objective	
1.	Provide students with a comprehensive understanding of the fundamental concepts in life sciences
2.	Introduce students to the interdisciplinary nature of life sciences
3.	Equip students with essential laboratory skills and techniques used in life sciences research and industry
4.	Develop students' abilities to design experiments
5.	Encourage students to apply their knowledge to solve real-world problems in health
6.	Raise awareness about the ethical and social awareness

Detailed syllabus

Module/ Unit	Course Module / Contents	Hours	Marks Weightage (%)

	Guidelines:			
	1	**Choosing the Platform**		
		1. **Reliable Platforms**: Look for reputable platforms known for offering quality courses in Life Sciences. Examples include Coursera, edX, NPTEL, SWAYAM, FutureLearn, and others. 2. **Check Courses offered**: Explore the courses available on these platforms specifically in Life Sciences or related fields such as Biology, Biotechnology, Bioinformatics, Genetics, etc. 3. **Read Reviews and Ratings**: Pay attention to reviews and ratings from past students to gauge the course quality and instructor effectiveness.		
	2	**Course Selection Criteria**		
		1. **Course Content**: Review the course syllabus to ensure it covers topics relevant to your interests or career goals in Life Sciences. 2. **Instructor Credentials**: Check the background and credentials of the instructors teaching the course. Look for courses taught by experts or faculty from reputed institutions. 3. **Course Format**: Consider the format of the course—whether it's self-paced or follows a specific schedule. Choose one that fits your learning style and availability.		

		4. **Assessment and Certification**: Understand how the course is assessed, and it offers a certification upon completion. 5. **Verification by the faculty:** Verify the suitability of the course from the faculty.		
	3	**Enrollment and Learning Experience**		
		1. **Enrollment Process**: Follow the platform's guidelines for enrollment. Some courses may require payment for certification, while others might be free to audit. 2. **Learning Resources**: Evaluate the resources provided—lecture videos, readings, quizzes, assignments, discussion forums, etc. 3. **Interactive Elements**: Look for courses that offer interactive elements such as labs, case studies, or projects to enhance your learning experience.		
	4	**Additional Considerations**		
		1. **Career Relevance**: Choose courses that align with your career aspirations within Life Sciences—whether it's in research, healthcare, biotechnology, or academia. 2. **Feedback Mechanism**: Platforms often provide a feedback mechanism for students to rate courses. Use this to inform your decision-making process. 3. **Support Services**: Check if the platform offers student support		

		services such as technical assistance, academic advising, or community forums.		
	5	**Course Duration**		
		Minimum 4 hrs./Week (Total 60 Hrs.)		
		Example Courses • Introduction to Biology (Coursera, edX) • Fundamentals of Genetics (NPTEL) • Bioinformatics Algorithms (Coursera) • Molecular Biology (edX) • Biotechnology and Genetic Engineering (SWAYAM)		

Semester - VIII

Course Code	Course Name	Credits
DSP2822N	DISSERTATION PROJECT-II (COMPREHENSIVE TECHNIQUES IN BIOTECHNOLOGY)	12

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial/ NTCC	Theory	Practical	Tutorial/ NTCC	Total
-	-	-	-	-	12	12

Theory						Term Work/ Practical/ Oral			Total Marks
Internal Assessment				End Sem Exam	Duration of End Sem Exam	Term Work	Prac.	Oral	
Test	Continuous Evaluation	Attendance	Total Internal						
-	50	-	-	-	-	75	-	75	200

Evaluation Scheme (Out of 200 Marks)		
Continuous evaluation	**Term work**	**Oral Presentation**
50 Marks	75 Marks	75 Marks
Following will be the evaluation criteria for Continuous evaluation and Term work:		
1. Marks from Research supervisor (Based on attendance of student, laboratory skills, understanding the concepts, literature writing) 2. Dissertation thesis evaluation (Based on literature review, methodology, writing structure and style)		
Following will be the evaluation criteria for oral presentation:		
Audibility, command over language, confidence, technical knowledge, conclusion, data collection and analysis, viva voce.		

Course Outcome	
1.	Students will understand foundational biotechnology concepts.
2.	Students will demonstrate basic laboratory skills.
3.	Students will comprehend essential biotechnological processes.
4.	Students will be able to operate key biotechnological instruments
5.	Integration of literature with experimental design.
6.	Effective data analysis and interpretation.

Course Objective	
1.	Introduce foundational concepts in biotechnology
2.	Develop basic laboratory skills and techniques.
3.	Understand essential biotechnological processes.
4.	Learn to operate key biotechnological instruments.
5.	Design and perform simple experiments.
6.	Analyse and interpret experimental data.

Detailed syllabus

Module/ Unit	Course Module / Contents	Hours	Marks Weightage (%)
	Guidelines	-	-
	Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation. Research is genuine exploration of		

	the unknown that leads to new knowledge which often warrants publication. But, whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student. Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.		
	General guidelines for report		
	In general, the file should be comprehensive and include. • A short account of the activities that were undertaken as part of the project. • A statement about the extent to which the project has achieved its stated goals. • A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project. • Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project. • Any problems that have arisen that may be useful to document for future reference.	-	-
	Thesis Writing Instructions:	-	-
1	**GENERAL INSTRUCTIONS**		

	The thesis should contain the following components: • Title page • Abstract (max 1 page) • Acknowledgements (optional) • Abbreviations and Definitions • Index • List of Tables • List of Figures • Introduction • Review of Literature • Materials and Methods • Results & Discussion • Summary and conclusions • References • Appendix		
2	**LAYOUT**	-	-
	The following parameters are used: • Page: A4, horizontal Text. Vertical Text can be used in case of tables/figures. • Margins: all margins 2.5 cm • Columns: single column • Alignment: Align both edges of your text • Page numbers: Centre bottom margin. Pages are counted from TITLE PAGE, but page numbers are shown starting from Introduction. Page numbering starts from the beginning in each appendix. • Font type and size: Times New Roman. Main text font size 12. Main headings CAPITAL, **bold**, font size 14. The 1st category heading CAPITAL, **bold** and font size 12. The 2nd category and lower-level headings **bold**, not caps, font size 12. • Spacing: 1.5 (summary and references with spacing 1)	-	-

	• Spaces: After chapters, headings, figures and tables, leave empty space so that layout of the text is clear and consistent. Do not use indentations. • Actual text starting from Introduction can be printed either one-sided or double-sided.		
3	**TABLES AND FIGURES**		
	➢ Tables and figures are meant to illustrate the results and as such shorten the text. ➢ Tables/figures should contain the most important results. ➢ When making figures/tables pay attention to: • Always refer to table/figure in text. • Tables/figures should fit to one page (this means no page breaks). Place the tables/figures close after to the text that refers the table/figure. • Title of the table is placed on top of the table. Title of the figure is placed at the bottom of the figure. Title should include all the information required to understand the figure/table. • Tables/Figures are numbered by the order of appearance (both tables and figures have separate numberings i.e. Table 1, Figure 1) • All the variables should include the SI units. • Tables and figures should be easy to read. In tables, the leftmost paragraph is used for the parameters, or the phenomenon studied. Observations are placed to different rows. • Avoid unnecessary lines in the table. Avoid raster. • If figures are illustrated black and white, pay attention to line types and raster. The differences should be easy to see.	-	-

	• Use appropriate program for figures. Different figure types are presented in more detailed in the following subchapters		
4	**STRUCTURE**	-	-
4.1	**Title Page**		
	Title page includes: • Title of the work • Author • Name of the university and name of the department • Month and year when published		
4.2	**Abstract**		
	The length of the abstract page is always 1 page. Abstract is short, independent disquisition on the thesis. The purpose of the abstract is to briefly explain the purpose of the work, what was studied, why it was studied, what the methods were and what the main results and conclusions were. Abstract helps the reader to decide if the work should be read completely. As such it can give information for reader who is not totally familiar with the subject.		
4.3	**Acknowledgements**		
	An acknowledgment is normally one page. The time and place of the performance of the work is mentioned together with possible sponsors (if any) and the purpose of the work. If more people are involved, the role of them is described in general level. Also, those persons and institutions who have involved in the study should be acknowledged. The supervisors and reviewers of the work should be acknowledged. Acknowledgment can be signed by the author.		
4.4	**Index**		

	Contents include all the titles from acknowledgments, but not the first pages of the report. Pages are counted from title page, but page numbers are shown from the actual text (introduction). In text main chapters are separated into separate pages. Chapters are numbered, indentation when the level of chapter is changing (chapters, subchapters, sub-subchapters). Appendixes are listed, but general title "Appendix" is neither numbered nor included into total number of pages. However, individual appendixes are numbered and titled. In the index, titles are given in the same form as in the main text. Main chapters: capital letters, font size 14, bold. The first level subchapters: capital letters font size 12, bold. From the second level onwards: not caps, font size 12, bold		
4.5	**Introduction**		
	Introduction is normally 1-2 pages. The purpose of the introduction is to familiarize the reader to the subject of the thesis. Introduction describes the most crucial background information related to the subject studied, including research problem, the history and state of art of the subject in general level. Introduction is not a literature review, and as such it is not required to refer to literature in it. Introduction is written in standard language, special terms and abbreviation should be avoided. The last paragraph of the introduction includes the aims of the work condensed into a few words. In short report no such paragraph is required. However, when literature review is long and the subject is discussed widely in it, the aims of the work should be written down in more detailed prior the materials and the methods		
4.6	**Review of Literature**		

	The purpose of the literature review is to give the reader a general idea concerning the subject of the thesis. Literature review can cover the theory behind the research problem, the development of the theories, the occurrence of the problem/phenomenon, the importance of the phenomenon, the factors affecting the phenomenon, the methods used for studying the problem/phenomenon, and/or the guides, instructions, recommendations, limiting values. Literature review should be planned carefully: all the subjects raised up in the literature review should have a clear connection with the work reported in the thesis. The reader of the thesis should be able to piece together the connection between the literature review and the work. The structure of the literature review should be clear. All the subjects should be presented in logical order. The structure can be formed from general overview to more detailed subjects or from historical development into the present state of art and further to the future perspectives. Subtitles make the structure clearer. However, too many subtitles make the structure fragmented and hard to follow. A general rule is that a subtitle should include at least two paragraphs. Special attention should be paid on the division into paragraphs. Paragraphs with one or two sentences can stress the message, but if used continuously they make text harder to read.		
	Materials and Methods		
	In this chapter all the materials and methods are described so that the study can be repeated if necessary. This chapter can be rather long, since it includes detailed information concerning the analysis,		

	analytical devices etc. Using appropriate subchapters makes this chapter easier to read. The selection criterion for the materials (or testee) is described. Methods include the criteria for selecting such methods and the suitability for the study, the principles, detection limits, sources of errors, quality control and detailed description of the study performed. If the methods are described in detail in literature, only the essential information is written and the reference is used. If the method is not followed completely, the differences from the original methods are stated clearly. Research frame and/or the progression of the study are described using graph or table if possible. The conditions and order used should be included in the description. In case many people are involved, the distribution of the work can be indicated here. The statistical analyses used are described in this chapter.		
	Results and Discussion		
	Results are presented in logical order using subchapters. Raw data can be presented in appendix, if required. Results should be given clearly, using illustrative figures/tables. The main results should be presented shortly in the text and the related tables and figures following the text should be referred. The data given in the figure or table should not be directly repeated in the text. The data is given either in figure or in table, not in both. Discussion is authors' interpretation from his/her results. It also includes comparison to previously published data. In discussion author gives reader his ideas from the study performed. Author gives his/her		

	opinions to reader. This is why it is important to make discussion accurate, with expertise. Though discussion includes authors opinions, all the opinions must be based on the results from the work or from the published results by the others. Opinions that are not based on the results should not be presented. Last paragraph of the discussion is the generalization. A successful study gives new observations, and these observations can be generalized to create new theories. The usability of the results should be explained, especially if the report does not include separate conclusions.		
	Conclusion and Summary		
	Conclusions and summary should be presented in one chapter. In conclusions and summary, the text is condensed, and no references are given. The length of this chapter is max 1page. No individual results are given, but the generalization and the importance of the results are explained. Each conclusion is given in separate paragraph. The importance and usability of the results, together with possible applications are explained. The possible effect to studies in future is speculated. Author should clearly write down those conclusions he/she wants the reader to remember from the study.		
	References/ Bibliography		
	The bibliographical information from all the literature referred in the text must be presented. This way the references can be identified, and the original publications can be found. Text should include references to the original publications used.		

	References are shown also, when presenting tables/figure etc. collected from data in publications. There are several ways to organize the references. At Amity Institute of Biotechnology, it is suggested to use the following way. In so called Harvard-system the references are listed in alphabetical order. All the references are given in text in form "name of the author, year of publication, e.g. (Smith, 1997) or "According to Smith (1997) ..." List of references is organized in alphabetical order. If two or more references have same authors, the references are organized by the year of publication. If referred to the publications from the same author published in same year, the references are separated by small letters, e.g Smith 1997a and Smith 1997b). In the reference list, line spacing is 1. Various references are separated from each other with one empty line without indentation. List of references should include following information: Articles: • authors: last name and initial(s) of the first name(s) • publication year • title of the article • name of the journal (or official abbreviation) • volume of the journal, page numbers of the article For Example Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002).		

	Antibacterial activity of Thai medicinal plants against enterohaemorrhagic Escherichia coli O157: H7. Clin Microbiol Infect, 8 (suppl 1): 116–117. Books: • authors and/or editors: last name and initial(s) of the first name(s) • publication year • title of the book • number of editions if 2nd or later • publisher, place of publishing • If referred only to one section (chapter) of book, give the reference to authors of the section/chapter, and include title of that chapter, and • authors/editors of the book, title of the book, page numbers, publisher, place of publishing For Example Percival SL, Walker JT, and Hunter PR. (2000). Microbiological aspects of biofilms and drinking water. CRC Press, Boca Raton, FL. Schneider T. (2000). Synthetic vitreous fibers. In: Spengler J.D., Samet J.M. and McCarthy J.F. (eds.). The Indoor Air Quality Handbook, p. 391-399. McGraw-Hill, New York. Proceedings, e.g. in conference proceedings • Authors: last name and initial(s) of the first name(s) • publication year • Tile of the article		

	• Editor(s); last name and initial(s) of the first name(s) • Name of the proceeding, volume, publisher. Also, information concerning. • from where the publication can be found, e.g. the organization and its address. For example: Manninen AM, Holopainen T, Vuorinen M and Holopainen JK. (1999). Possible use of mycorrhizas and host plant secondary metabolites for control of insect herbivores on Scots pine. In: Lilja A and Sutherland Jr (eds.). Proceedings of the 4th Meeting of IUFRO Working Party 7.03.04 Diseases and Insects in Forest Nurseries. Suonenjoki, Finland. Finnish Forest Research Institute, Research Papers 781:163-175. Reports, standards, other official documents etc. • Authors: last name and initial(s) of the first name(s) or the organization that made the report. • publication year • Name of the report, and identification codes (register number, code, page numbers etc.) • Publisher, name and number of the series, organization published the report, • place of publication For example: Comité Européen de Normalisation (CEN). (1993). Workplace atmospheres – Size fraction definitions for measurement of airborne particles (EN 481). Standard Brussels CEN.		

	Scharf B. (2006). Long term effects of ozone depletion on anatomy and physiology of *Eriophorum russeolum* Fries ex Hartm: a field experiment in Finnish Lapland. Diploma thesis, University of Osnabrück, Germany. Letters, interviews, other unpublished or non-printed references are given according to the general instructions concerning reference listing. All the published material is written according to these instructions. Also, electronic material is reported using the same principles. Electronic material reference must include all the same information as the printed reference. The format is then given in square brackets e.g. [online] or [CD-ROM]. URL address and date is mentioned when referring www pages. Be careful with special symbols. It is suggested that you print a copy for yourself from electronic material (with date), if technically possible. By doing this, you can proof the existence of referred material at least at that time. For example: IARC (International Agency for Research on Cancer). 2007. Monographs on the Evaluation of Carcinogenic Risks to Humans: "Wood dust and formaldehyde". http://monographs.iarc.fr/ENG/Monographs/vol62/volume62.pdf. Accessed 14.9.2007.		
Total		**-**	**100**

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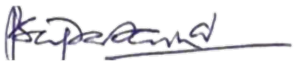

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