

VELS

INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)

(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)

PALLAVARAM - CHENNAI

ACCREDITED BY NAAC WITH 'A' GRADE

Marching Beyond 30 Years Successfully

INSTITUTION WITH UGC 12B STATUS

UNDERGRADUATE DEGREE PROGRAMME

B.Sc., Biochemistry

Three Years

/

B.Sc., (Hons) Biochemistry

Four Years

CURRICULUM & SYLLABUS

REGULATION 2024

Choice Based Credit System (CBCS)

&

Learning Outcomes based Curriculum Framework (LOCF)

Effective from the Academic year

2024-2025

Department of Biochemistry

School of Life Sciences



INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)
PALLAVARAM - CHENNAI
ACCREDITED BY NAAC WITH 'A' GRADE
Marching Beyond 30 Years Successfully
INSTITUTION WITH UGC 12B STATUS

DEPARTMENT OF BIOCHEMISTRY

VISION OF THE DEPARTMENT
1. To gain global recognition within the scientific community, distinguished by expertise and excellence in the field of Biochemistry. 2. To foster an environment conducive to critical thinking, enabling the discernment and interconnectedness of diverse branches such as cell biology, intermediary metabolism, clinical biochemistry, immunology, enzymology, and endocrinology.

MISSION OF THE DEPARTMENT	
M1	To achieve proficiency in the fundamental concepts and principles of Biochemistry
M2	To recognize issues within research protocols in key areas, where the expertise of a biochemist is indispensable.
M3	To acquaint students with research domains and advanced instrumentation techniques.
M4	To explore the correlation between human-induced environmental factors and biochemical alterations in biological organisms, and their implications for human health.
M5	To grasp scientific learning concepts for experimentation and hypothesis validation processes.
M6	To cultivate a robust understanding of practical biochemistry and its societal applications for the greater good.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)	
PEO-1:	To adeptly integrate foundational knowledge from various scientific disciplines in an interdisciplinary fashion, fostering the generation of innovative solutions to globally impactful challenges.
PEO-2:	To proficiently evaluate scientific information, discerning objective insights, and employing this understanding for the betterment of humanity. Students should demonstrate both expertise and ethical awareness in Biochemistry-related domains.
PEO-3:	Upon program completion, students will be well-equipped to pursue diverse career paths in academia, research, and industry, particularly within pharmaceutical and biotechnology sectors.
PEO-4:	To instill a commitment to lifelong learning, enabling the continual development and application of scientific skills for personal and professional growth, including their practical application in everyday life.
PEO-5:	To foster a comprehensive understanding and disciplinary expertise in Biochemistry, encompassing the structures, functions, and mechanisms of biological molecules.

PROGRAM OUTCOME (PO)	
PO-1	**Scientific Intellect**: Graduates will attain specialized knowledge in biochemistry, biotechnology, bioinformatics, or microbiology, including proficiency in contemporary techniques within their respective fields, alongside hands-on and leadership capabilities essential for career success.
PO-2	**Problem Solving**: Graduates will demonstrate the ability to analyze, resolve, and troubleshoot challenges encountered during the implementation of biochemistry, biotechnology, or microbiological protocols.
PO-3	**Solution Design and Development**: Graduates will cultivate creative thinking and collaborative skills to address issues within the realms of biochemistry, biotechnology, bioinformatics, or microbiology.
PO-4	**Complex Problem Investigation**: Graduates will develop practical competencies, enabling them to plan and devise protocols for hypothesis validation, independently execute experimental techniques, and effectively assimilate, analyze, and interpret resultant data.
PO-5	**Utilization of Modern Tools and Communication**: Graduates will proficiently utilize information and communication technologies (ICT) and computer-enabled devices to manage resources and time efficiently, while also possessing the ability to comprehensively understand and communicate ideas.

PO-6	**Environmental Sustainability and Ethical Awareness**: Graduates will acquire sufficient knowledge to implement solutions for environmental protection and remediation, with an understanding of their roles and responsibilities in the handling and utilization of microbes, including genetically modified microorganisms
PO-7	**Commitment to Lifelong Learning**: Graduates will exhibit a continuous learning mindset, adapting to the ever-evolving landscape of technology and knowledge.

PROGRAMME SPECIFIC OUTCOME (PSO)	
PSO1:	To develop a profound understanding of both theoretical and practical aspects of Biochemistry, enabling the application of this knowledge to devise cost-effective solutions within the field.
PSO2:	To comprehend the technical intricacies of current technologies essential for tackling the biological and medical hurdles encountered by humanity.
PSO3:	To utilize Biochemistry knowledge effectively in addressing environmental, intellectual, societal, and ethical concerns, as demonstrated through class-presented case studies.

:

BOARD OF STUDIES

List of Members

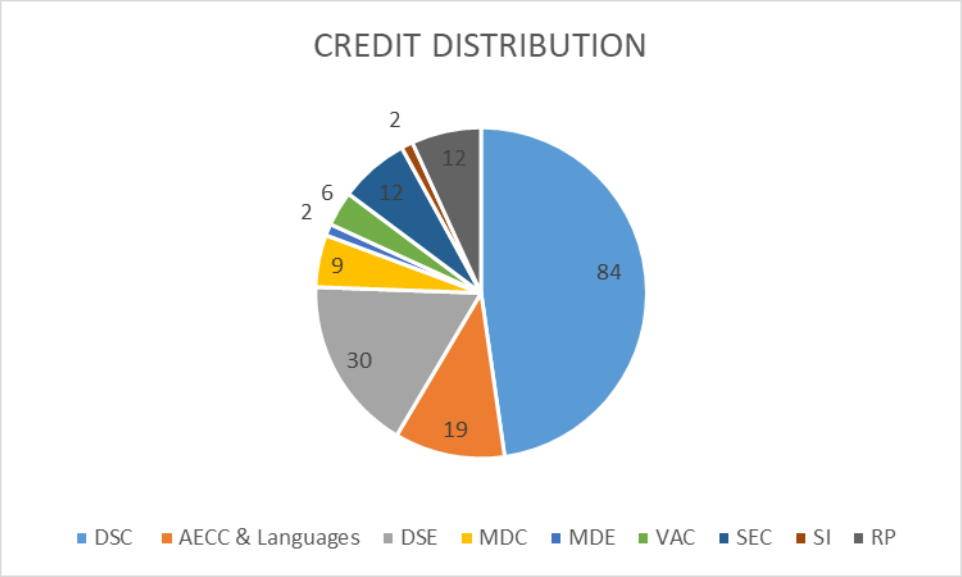
Department of Biochemistry

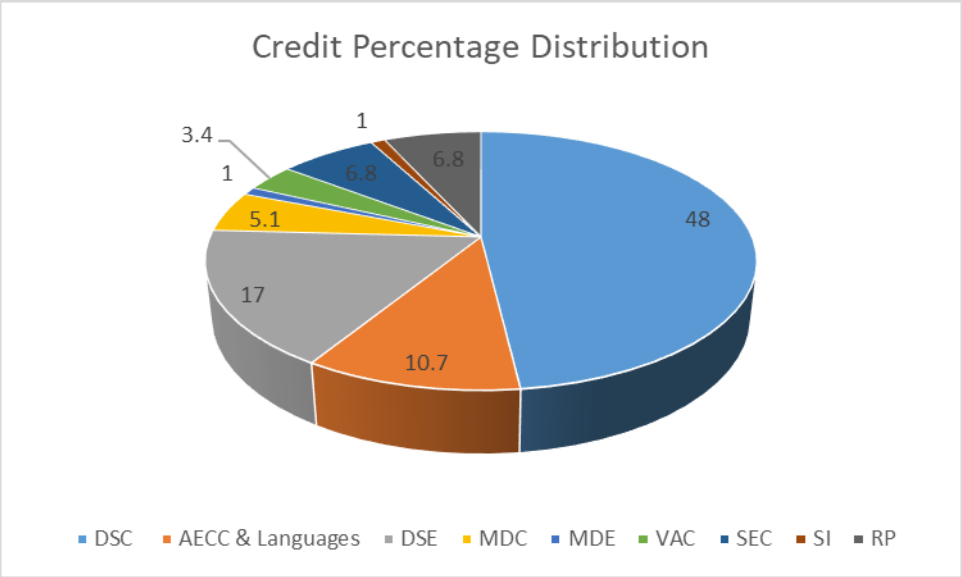
S. No.	Name & Designation	Address	Role
1	Dr.B.Usharani	Associate Professor and Head i/c, Department of Biochemistry, VISTAS, Chennai	Chair person
2	Dr. V. Anuradha	Associate Professor and Head, Department of Biochemistry, Mohamed Sathak College of Arts and Science, Chennai	External expert-Academic
3	Dr. Savitri Shivkumar	Managing director, Aaranya Biosciences, Women's Biotech Park, Siruseri, Chennai	External expert-Industry
4	Dr. R. Padmini	Associate Professor, Department of Biochemistry, VISTAS, Chennai	Internal Member
5	Dr. C. Shobana	Associate Professor, Department of Biochemistry, VISTAS, Chennai	Internal Member
6	Dr. R. Vidya	Assistant Professor, Department of Biochemistry, VISTAS, Chennai	Internal Member
7	Dr. P. Amudha	Assistant Professor, Department of Biochemistry, VISTAS, Chennai	Internal Member
8	Ms. Aarthi	Assistant Professor, Arcot Sri Mahalakshmi Arts and Science College, Villapakkam, Ranipet district	Alumni (MSc Biochemistry-2019-2021 batch)

CREDIT DISTRIBUTION

B.Sc., (Hons) in Biochemistry
Maximum credits to be earned: 176
B.Sc., Biochemistry
Minimum credits to be earned: 132

Component	I Sem	II Sem	III Sem	IV Sem	V Sem	VI Sem	3 Yrs. Total Credits	VII Sem	VIII Sem	4 Yrs. Total Credits
DSC	8	8	8	8	12	16	60	12	12	84
AECC & Languages	4	4	4	7	-	-	19	-	-	19
DSE / IDC / Minor	4	4	3	4	4	3	22	4	4	30
MDC	3	3	3	-	-	-	9	-	-	9
MDE	-	-	2	-	-	-	2	-	-	2
VAC	1	2	-	1	2	-	6	-	-	6
SEC	2	2	2	2	2	2	12	-	-	12
SI	-	-	1	-	1	-	2	-	-	2
RP	-	-	-	-	-	-	-	6	6	12
Total Credits	**22**	**23**	**23**	**22**	**21**	**21**	**132**	**22**	**22**	**176**





ABBREVIATIONS

DSC	Disciplinary Specific Core
AECC	Ability Enhancement Compulsory Courses
DSE	Disciplinary Specific Elective
IDC	Interdisciplinary / Minor Courses
MDC	Multidisciplinary Courses
MDE	Multidisciplinary Elective
VAC	Value Added Courses
SEC	Skill Enhancement Courses
SI	Summer Internship
RP	Research Project

CURRICULUM STRUCTURE

B.Sc., (Hons) in Biochemistry Three Years
B.Sc., Biochemistry Four Years

Total number of Credits: 176

B.Sc Biochemistry Hons Maximum Credits to be earned :176

B.Sc., Biochemistry Minimum Credits to be earned: 132

SEMESTER 1

			Hours/Week					Maximum Marks		
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
LANG 1	24LTAM11/ 24LHIN11/ 24LFRE11	Tamil I / Hindi I/ French I	2	0	0	1	2	40	60	100
ENG 1	24LENG11	English I	2	0	0	1	2	40	60	100
DSC 1	24CBBC11	Introduction to Biomolecules	3	0	0	2	3	40	60	100
DSC 2	24CBBC12	Human Physiology	4	0	0	2	4	40	60	100
MDC 1	24MBBC11	Basic concepts in Nutrition	3	0	0	2	3	40	60	100
DSE 1/ IDC 1 / Minor 1	24DBBC1-	Discipline Specific Elective-I	4	0	0	2	4	40	60	100
DSC 1 (Lab)	24PBBC11	Practical I Qualitative analysis of Biomolecules	0	0	2	1	1	40	60	100
VAC 1	24DVAC11	Universal Human Values	1	0	0	1	1	-	100	100
SEC 1	24SSKU11	Soft Skills 1	2	0	0	1	2	40	60	100
SEC 2		Orientation Programme / Industrial Visit	-	-	-	-	-	-	-	-
			21	-	2	-	22	-	-	-

CIA - Continuous Internal Assessment SEE - Semester End Examination

*L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study, *C-Credits

SEMESTER 2										
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
LANG 2	24LTAM21/ 24LHIN21/ 24LFRE21	Tamil II / Hindi II / French II	2	0	0	1	2	40	60	100
ENG 2	24LENG21	English II	2	0	0	1	2	40	60	100
DSC 3	24CBBC21	Analytical Techniques	3	0	0	2	3	40	60	100
DSC 4	24CBBC22	Enzymology	3	0	0	2	3	40	60	100
MDC 2	24MBBC21	Hospital Management	3	0	0	2	3	40	60	100
DSE 2 / IDC 2 / Minor 2	24DBBC2-	Discipline Specific Elective-II	4	0	0	2	4	40	60	100
DSC 3 (Lab)	24PBBC21	Practical II Analytical biochemistry	0	0	2	1	1	40	60	100
DSC 4 (Lab)	24PBBC22	Practical III Enzymology	0	0	2	1	1	40	60	100
VAC 2	24DVAC21	Communication Skills	2	0	0	1	2	40	60	100
SEC 3	24SSKU21	Soft Skills II	2	0	0	1	2	40	60	100
			21	-	4	-	23	-	-	-

CIA - Continuous Internal Assessment SEE - Semester End Examination

*L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study, *C-Credits

SEMESTER 3										
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
LANG 3	24LTAM31/ 24LHIN31/ 24LFRE31	Tamil III / Hindi III / French III	2	0	0	1	2	40	60	100
ENG 3	24LENG31	English III	2	0	0	1	2	40	60	100
DSC 5	24CBBC31	Hematology	3	0	0	2	3	40	60	100
DSC 6	24CBBC32	Clinical Biochemistry	3	0	0	2	3	40	60	100
MDC 3	24MBBC31	Pathology	3	0	0	2	3	40	60	100
DSE 3 / IDC 3 / Minor 3	24DBBC3-	Discipline Specific Elective-III	3	0	0	2	3	40	60	100
DSC 5 (Lab)	24PBBC31	Practical IV Hematology	0	0	2	1	1	40	60	100
DSC 6 (Lab)	24PBBC32	Practical V Clinical Biochemistry	0	0	2	1	1	40	60	100
MDE		Indian Knowledge system	1	1	0	1	2	40	60	100
SEC 4	24SSKU31	Soft Skills III	2	0	0	1	2	40	60	100
SI 1	24IBBC31	Internship I	0	0	2	1	1	-	100	100
			19	1	6	-	23	-	-	-

CIA - Continuous Internal Assessment SEE - Semester End Examination

*L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study, *C-Credits

SEMESTER 4										
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
LANG 4	24LTAM41/ 24LHIN41/ 24LFRE41	Tamil IV / Hindi IV / French IV	2	0	0	1	2	40	60	100
ENG 4	24LENG41	English IV	2	0	0	1	2	40	60	100
AECC1	24EVS031	Environmental Studies	3	0	0	2	3	40	60	100
DSC 7	24CBBC41	Cell Biology	3	0	0	2	3	40	60	100
DSC 8	24CBBC42	Immunology	3	0	0	2	3	40	60	100
DSE 4 / IDC 4 / Minor 4	24DBBC4-	Discipline Specific Elective-IV	4	0	0	2	4	40	60	100
DSC 7 (Lab)	24PBBC41	Practical VI Methods in Cell Biology	0	0	2	1	1	40	60	100
DSC 8 (Lab)	24PBBC42	Practical VII Immunology	0	0	2	1	1	40	60	100
SEC 5	24SBBC41	Industry Oriented Employability skills	1	0	2	1	2	-	100	100
VAC 3	24DVAC41	Yoga Education / NSS / NCC	0	0	2	1	1	-	100	100
SEC 6		In-plant Training/ Industrial Tour/ Summer Term	-	-	-	-	-	-	-	-
			18	-	8	-	22	-	-	-

CIA - Continuous Internal Assessment SEE - Semester End Examination

*L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study, *C-Credits

SEMESTER 5										
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CA**	**SEE**	**Total**
DSC 9	24CBBC51	Molecular Biology	3	0	0	2	3	40	60	100
DSC 10	24CBBC52	Intermediary Metabolism	3	0	0	2	3	40	60	100
DSC 11	24CBBC53	Plant Biochemistry	4	0	0	2	4	40	60	100
DSE 5 / IDC 5 / Minor 5	24DBBC5-	Discipline Specific Elective-V	4	0	0	2	4	40	60	100
DSC 9 (Lab)	24PBBC51	Practical VIII Molecular Biology	0	0	2	1	1	40	60	100
DSC 10 (Lab)	24PBBC52	Practical IX Plant Biochemistry	0	0	2	1	1	40	60	100
SEC 7	24SBBC51	Entrepreneurial Development	2	0	0	1	2	40	60	100
VAC 4	24DVAC51	Medical Coding	2	0	0	1	2	40	60	100
SI 2	24IBBC51	Internship II	0	0	2	1	1	-	100	100
SEC 8		Skill Enhancement Training / Student Club Activities/ Institution Innovation Council (IIC)Activities	-	-	-	-	-	-	100	100
			18	-	6	-	21	-	-	-

CIA - Continuous Internal Assessment SEE - Semester End Examination

*L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study, *C-Credits

SEMESTER 6										
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CA**	**SEE**	**Total**
DSC 12	24CBBC61	Tissue culture	3	0	0	2	3	40	60	100
DSC 13	24CBBC62	Pharmaceutical Biochemistry	4	0	0	2	4	40	60	100
DSC 14	24CBBC63	Ecology & Environmental Toxicology	4	0	0	2	4	40	60	100
DSC 15	24CBBC64	Forensic Science	4	0	0	2	4	40	60	100
DSE 6 / IDC 6 / Minor 6	24DBBC6-	Discipline Specific Elective-VI	3	0	0	2	3	40	60	100
DSC 12 (Lab)	24PBBC61	Practical X Cell Culture Techniques	0	0	2	1	1	40	60	100
SEC 9	24SBBC61	Mini Project	0	0	4	1	2	-	100	100
SEC 10		On Job Training / Apprenticeship / Startup	-	-	-	-	-	-	-	-
			18	-	6	-	21	-	-	-

CIA - Continuous Internal Assessment SEE - Semester End Examination

*L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study, *C-Credits

SEMESTER 7										
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CA**	**SEE**	**Total**
DSC 16	24CBBC71	Genetics	3	0	0	2	3	40	60	100
DSC 17	24CBBC72	Molecular Developmental Biology	4	0	0	2	4	40	60	100
DSC 18	24CBBC73	Biochemistry of Cell Signaling	4	0	0	2	4	40	60	100
DSE 7 / IDC 7 / Minor 7	24DBBC7-	Discipline Specific Elective-VII	4	0	0	2	4	40	60	100
DSC 16 (Lab)	24PBBC71	PracticaXI Genetics	0	0	2	1	1	40	60	100
RP 1	24RBBC71	Research Project I	0	0	12	4	6	40	60	100
			15	-	14	-	22	-	-	-

CIA - Continuous Internal Assessment SEE - Semester End Examination

*L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study, *C-Credits

SEMESTER 8										
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CA**	**SEE**	**Total**
DSC 19	24CBBC81	Molecular Basis of Infectious Disease	3	0	0	2	3	40	60	100
DSC 20	24CBBC82	Omics Technology	3	0	0	2	3	40	60	100
DSC 21	24CBBC83	Applied Biotechnology	4	0	0	2	4	40	60	100
DSE 8 / IDC 8 / Minor 8	24DBBC8-	Discipline Specific Elective-VIII	4	0	0	2	4	40	60	100
DSC 19 (Lab)	24PBBC81	Practical XII – Infectious Biology	0	0	2	1	1	40	60	100
DSC 20 (Lab)	24PBBC82	Practical XIII- Bioinformatics	0	0	2	1	1	40	60	100
RP 2	24RBBC81	Research Project II	0	0	12	4	6	40	60	100
			14	-	16	-	22	-	-	-

CIA - Continuous Internal Assessment SEE - Semester End Examination

*L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study, *C-Credits

DISCIPLINE SPECIFIC CORE COURSES

Category	Code	Course	L	T	P	O	C
DSC 1	24CBBC11	Introduction to Biomolecules	3	0	0	2	3
DSC 2	24CBBC12	Human Physiology	4	0	0	2	4
DSC 1 (Lab)	24PBBC11	Practical I Qualitative analysis of Biomolecules	0	0	2	1	1
DSC 3	24CBBC21	Analytical Techniques	3	0	0	2	3
DSC 4	24CBBC22	Enzymology	3	0	0	2	3
DSC 3 (Lab)	24PBBC21	Practical II Analytical Biochemistry	0	0	2	1	1
DSC 4 (Lab)	24PBBC22	Practical III Enzymology	0	0	2	1	1
DSC 5	24CBBC31	Hematology	3	0	0	2	3
DSC 6	24CBBC32	Clinical Biochemistry	3	0	0	2	3
DSC 5 (Lab)	24PBBC31	Practical IV Hematology	0	0	2	1	1
DSC 6 (Lab)	24PBBC32	Practical V Clinical Biochemistry	0	0	2	1	1
DSC 7	24CBBC41	Cell Biology	3	0	0	2	3
DSC 8	24CBBC42	Immunology	3	0	0	2	3
DSC 7 (Lab)	24PBBC41	Practical VI Methods in Cell Biology	0	0	2	1	1
DSC 8 (Lab)	24PBBC42	Practical VII Immunology	0	0	2	1	1
DSC 9	24CBBC51	Molecular Biology	3	0	0	2	3
DSC 10	24CBBC52	Intermediary Metabolism	3	0	0	2	3
DSC 11	24CBBC53	Plant Biochemistry	4	0	0	2	4
DSC 9 (Lab)	24PBBC51	Practical VIII Molecular Biology	0	0	2	1	1
DSC 10 (Lab)	24PBBC52	Practical IX Plant Biochemistry	0	0	2	1	1
DSC 12	24CBBC61	Tissue culture	3	0	0	2	3
DSC 13	24CBBC62	Pharmaceutical Biochemistry	4	0	0	2	4
DSC 14	24CBBC63	Ecology & Environmental Toxicology	4	0	0	2	4
DSC 15	24CBBC64	Forensic Science	4	0	0	2	4
DSC 12 (Lab)	24PBBC61	Practical X Cell Culture Techniques	0	0	2	1	1
DSC 16	24CBBC71	Genetics	3	0	0	2	3
DSC 17	24CBBC72	Molecular Developmental	4	0	0	2	4

		Biology					
DSC 18	24CBBC73	Biochemistry of Cell Signaling	4	0	0	2	4
DSC 16 (Lab)	24PBBC71	Practical XI Genetics	0	0	2	1	1
DSC 19	24CBBC81	Molecular Basis of Infectious Disease	3	0	0	2	3
DSC 20	24CBBC82	Omics Technology	3	0	0	2	3
DSC 21	24CBBC83	Applied Biotechnology	4	0	0	2	4
DSC 19 (Lab)	24PBBC81	Practical XII – Infectious Biology	0	0	2	1	1
DSC 20 (Lab)	24PBBC82	Practical XIII- Bioinformatics	0	0	2	1	1

DISCIPLINE SPECIFIC ELECTIVE COURSES

Category	Code	Course	L	T	P	O	C
DSE 1	24DBBC11	LIFESTYLE DISEASES	4	0	0	2	4
	24DBBC12	STEM CELL BIOLOGY	4	0	0	2	4
DSE 2	24DBBC21	BIOENERGETICS AND MEMBRANE BIOLOGY	4	0	0	2	4
	24DBBC22	MOLECULAR EVOLUTION	4	0	0	2	4
DSE 3	24DBBC31	PATHOLOGY	3	0	0	2	3
	24DBBC32	CANCER BIOLOGY	3	0	0	2	3
DSE 4	24DBBC41	ENDOCRINOLOGY	4	0	0	2	4
	24DBBC42	NEUROBIOLOGY	4	0	0	2	4
DSE 5	24DBBC51	APPLIED MICROBIOLOGY	4	0	0	2	4
	24DBBC52	SKILLS IN BIOCHEMISTRY	4	0	0	2	4
DSE 6	24DBBC61	BIOINFORMATICS	3	0	0	2	3
	24DBBC62	DRUG DESIGNING	3	0	0	2	3
DSE 7	24DBBC71	RESEARCH METHODOLOGY	4	0	0	2	4
	24DBBC72	CLINICAL RESEARCH	4	0	0	2	4
DSE 8	24DBBC81	TISSUE ENGINEERING AND REGENERATIVE MEDICINE	4	0	0	2	4
	24DBBC82	ENTREPRENEURSHIP DEVELOPMENT IN BIOCHEMISTRY	4	0	0	2	4

AECC & LANGUAGES

Category	Code	Course	L	T	P	O	C
LANG 1	24LTAM11/ 24LHIN11/ 24LFRE11	Tamil I / Hindi I/ French I	2	0	0	1	2
ENG 1	24LENG11	English I	2	0	0	1	2
LANG 2	24LTAM21/ 24LHIN21/ 24LFRE21	Tamil II / Hindi II / French II	2	0	0	1	2
ENG 2	24LENG21	English II	2	0	0	1	2
LANG 3	24LTAM31/ 24LHIN31/ 24LFRE31	Tamil III / Hindi III / French III	2	0	0	1	2
ENG 3	24LENG31	English III	2	0	0	1	2
LANG 4	24LTAM41/ 24LHIN41/ 24LFRE41	Tamil IV / Hindi IV / French IV	2	0	0	1	2
ENG 4	24LENG31	English IV	2	0	0	1	2
AECC 1	24EVS031	Environmental Studies	3	0	0	2	3

MULTIDISCIPLINARY COURSES

Category	Code	Course	L	T	P	O	C
MDC 1	24MBBC11	Basic concepts in Nutrition	3	0	0	2	3
MDC 2	24MBBC21	Hospital Management	3	0	0	2	3
MDC 3	24MBBC31	Pathology	3	0	0	2	3

MULTIDISCIPLINARY ELECTIVE

Category	Code	Course	L	T	P	O	C
MDE1		Indian Knowledge System	1	1	0	1	2

VALUE ADDED COURSES

Category	Code	Course	L	T	P	O	C
VAC 1	24DVAC11	Universal Human Values	1	0	0	1	1
VAC 2	24DVAC21	Communication Skills	2	0	0	1	2
VAC 3	24DVAC41	Yoga Education / NSS / NCC	0	0	2	1	1
VAC 4	24DVAC51	Medical Coding	2	0	0	1	2

SKILL ENHANCEMENT COURSES

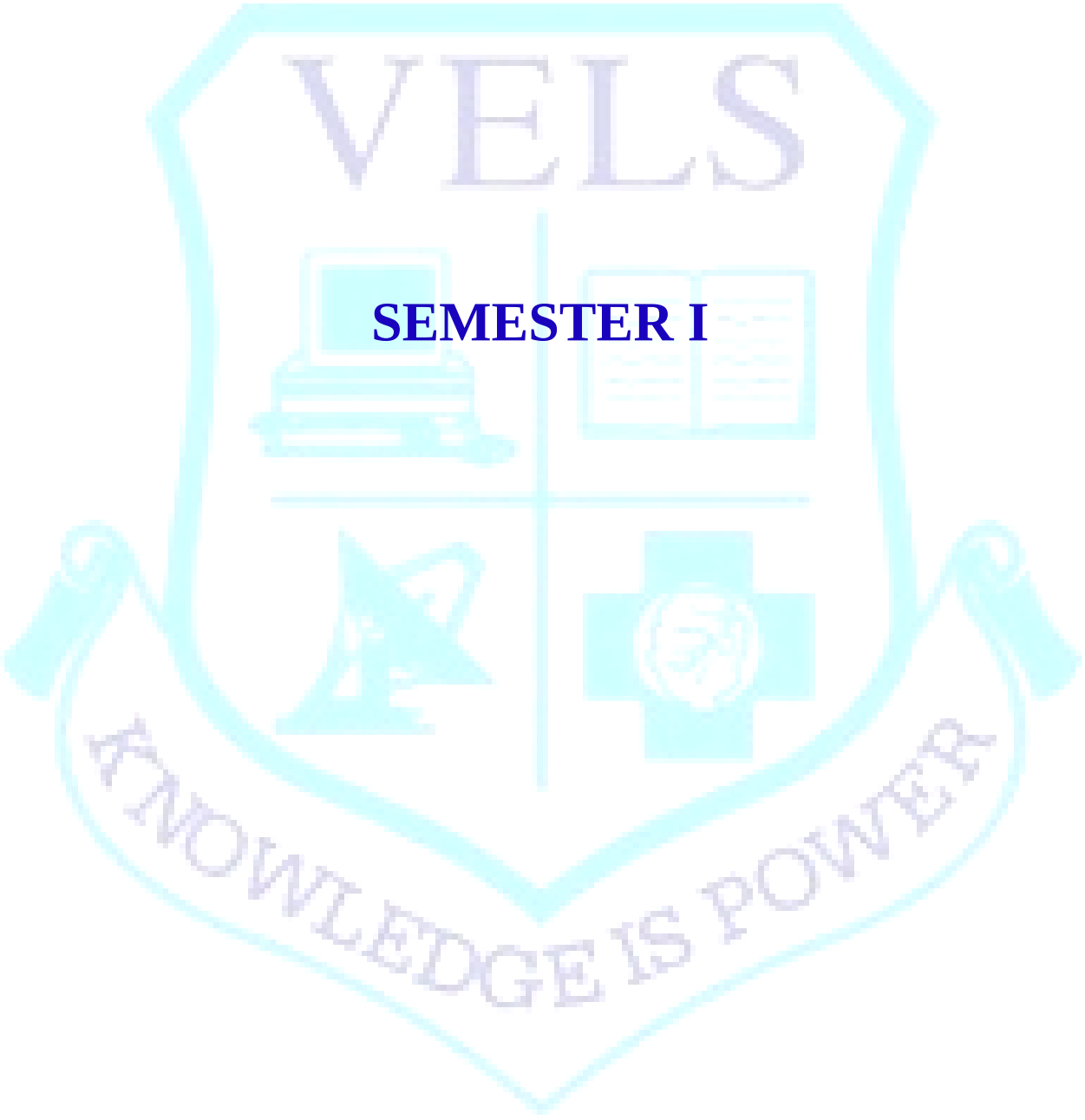
Category	Code	Course	L	T	P	O	C
SEC 1	24SSKU11	Soft Skills 1	2	0	0	1	2
SEC 2		Orientation Programme / Industrial Visit	-	-	-	-	-
SEC 3	24SSKU21	Soft Skills II	2	0	0	1	2
SEC 4	24SSKU31	Soft Skills III	2	0	0	1	2
SEC 5	24SBBC41	Industry Oriented Employability skills	1	0	2	1	2
SEC 6		In-plant Training/ Industrial Tour/ Summer Term	-	-	-	-	-
SEC 7	24SBBC51	Entrepreneurial Development	2	0	0	1	2
SEC 8		Skill Enhancement Training / Student Club Activities/ Institution Innovation Council Activities	-	-	-	-	-
SEC 9	24SBBC61	Mini Project	0	0	4	1	2
SEC 10		On Job Training / Apprenticeship / Startup	-	-	-	-	-

SUMMER INTERNSHIP

Category	Code	Course	L	T	P	O	C
SI 1	24IBBC31	Internship I	0	0	2	1	1
SI 2	24IBBC51	Internship II	0	0	2	1	1

RESEARCH PROJECT

Category	Code	Course	L	T	P	O	C
RP 1	24RBBC71	Research Project I	0	0	12	4	6
RP 2	24RBBC81	Research Project II	0	0	12	4	6



SEMESTER I

24LTAM11 மொழிவரலாறு – சங்க இலக்கியம் – அற இலக்கியம் – மொழித்திறன்

L	T	P	O	C
2	0	0	1	2

பருவம்-1, தமிழ்மொழிப்பாடம்-1, பகுதி-1, தகுதிப்புள்ளி: 2, வாரப் பாட நேரம்: 2.

தாள்-1

பாடத்திட்ட நோக்கம்:

மாணவர்களின் இலக்கிய நாட்டத்தை மேம்படுத்துதல், தற்கால தமிழ் இலக்கிய வகைமைகளான மரபுக்கவிதை, புதுக்கவிதை, உரைநடை ஆகியவற்றை அறிமுகப்படுத்துதல், தமிழர்தம் வாழ்வியல் நெறிகளையும் பண்பாட்டுச் செழுமைகளையும் இன்றைய தலைமுறையினர் அறியச் செய்தல், மாணவர்களுக்குத் தமிழைத் தவறின்றி எழுதுவதற்குத் தேவையான பயிற்சி அளித்து அவர்களின் மொழித்திறனை மேம்படுத்துதல், செய்யுளின் நலத்தைப் பாராட்டும் முறைமையை அறியச் செய்து அதன்வழி சிந்தனை வளத்தைப் பெருகச் செய்தல் என்பனவும் மேற்கண்டவழி மாணவர்களை ஆளுமை மிக்கவர்களாக உருவாக்கி, போட்டித்தேர்வுகளுக்குத் தயார் செய்து அவர்களுக்கு வேலைவாய்ப்பை உருவாக்குவதும் இந்தப் பாடத்திட்டத்தின் முக்கிய நோக்கமாகும்.

அலகு - 1: தமிழ் மொழி வரலாறு — **8**மணி நேரம்

மொழிக்குடும்பம் - இந்திய மொழிக்குடும்பங்கள் - இந்திய ஆட்சி மொழிகள் - திராவிட மொழிக்குடும்பங்கள் - திராவிட மொழிகளின் வகைகள் – திராவிட மொழிகளின் சிறப்புகள் - திராவிட மொழிகளின் வழங்கிடங்கள் - திராவிட மொழிகளுள் தமிழின் இடம் - தமிழ்மொழியின் சிறப்புகள் - தமிழ் பிறமொழித் தொடர்புகள்.

அலகு -2 — **8** மணி நேரம

புறநானூறு- பாடல் எண்: , 182, 183, – இரண்டு பாடல்கள்.

குறுந்தொகை- பாடல் எண்: 2, 167, - இரண்டு பாடல்கள்

பரிபாடல் - முருகன். வையை - இரண்டு பாடல்கள்

அலகு - 3 அற இலக்கியங்கள்

திருக்குறள்- வான்சிறப்பு (அறம்), பெருமை (பொருள்), பிரிவாற்றாமை (இன்பம்),. மூன்று அதிகாரங்கள் முழுமையும்

நாலடியார் - இரண்டு பாடல்கள். (2, 3)

மூதுரை - இரண்டு பாடல்கள். (2, 8)

அலகு **4** மொழி — **7** மணி நேரம்

பிழை நீக்கி எழுதுதல் - ஒற்றுப்பிழை நீக்கி எழுதுதல் - தொடர்பிழை நீக்கி எழுதுதல் - ஒற்று மிகும் இடங்கள் - ஒற்று மிகா இடங்கள் - பிற மொழிச் சொற்களை நீக்கி எழுதுதல் – பயிற்சிகள்.

மொத்தம்: 30 மணி நேரம்

பார்வை நூல்கள்

தமிழர் நாகரிகமும் பண்பாடும், டாக்டர் அ. தட்சிணாமூர்த்தி, ஐந்திணைப் பதிப்பகம், 2001.

தவறின்றித் தமிழ் எழுதுவோம், மா. நன்னன், ஏகம் பதிப்பகம், 1999.

தவறின்றித் தமிழ் எழுத - மருதூர் அரங்கராசன், ஐந்திணைப் பதிப்பகம், 2003.

தமிழ் இலக்கிய வரலாறு, வரதராசன், மு., புது தில்லி : சாகித்திய அக்காதெமி, 2002.

புதிய தமிழ் இலக்கிய வரலாறு, நீல. பத்மநாபன், சிற்பி பாலசுப்ரமணியம், சாகித்திய அகாடெமி, 2007.

செம்மொழி தமிழின் சிறப்பியல்புகள் - முனைவர் மறைமலை இலக்குவனார்; https://www.youtube.com/watch?v=HHZnmJb4jSY

பாடநூல் தேடலுக்கான இணையம் - https://archive.org/

24LHIN11 **HINDI**

L	T	P	O	C
2	0	0	1	2

वर्ष I – सत्र I (गद्य, पत्र लेखन & व्यावहारिक हिन्दी)

I Year-Sem I (Prose, Letter Writing & Functional Words)

Course Objectives :

- To understand the rural life style, social responsibilities and social values
- To create awareness about the importance of varied culture
- To enable the students to develop communication skill in Hindi and to use Azhagi, Azhagi+ fonts

UNIT I : पं.श्रीराम शर्मा कृत 'स्मृति' (कहानी)
'Smruti' (Kahani) by Pandit Sriram Sharma. 6hrs.

UNIT II : शरद जोशी कृत 'अतिथि तुम कब जावोगे' (व्यंग्य)
'Athiti tum kab jaaoge' (Vyangy) by Sharad Joshi. 6hrs.

UNIT III: राहुल सांस्कृतयायन कृत 'अथातो घुमक्कड़ जिज्ञासा' (यात्रा वृत्तान्त)
'Atatho Ghumakkad Jigyasa' (Yatra Vruthanth) by Rahul Sanskrityayan. 6hrs.

UNIT IV: व्यावहारिक हिन्दी- पत्र लेखन में प्रयुक्त वाक्यांश, कौशल विकास – भाव एक भाषा अनेक 6hrs.
Functional Hindi-Phrases used in Letter Writing.
Skill development - Bhav Ek Bhasha Anek

UNIT V : पत्र लेखन – परिचय व प्रकार, 3 अनोपचारिक पत्र
अलगी, अलगी + फ़ॉन्ट का परिचय
Letter Writing- Intro. & Types & 3 Personal Letters 6hrs.
Introduction to Azhagi, Azhagi + fonts

Total: 30hrs.

Course Outcome:

At the end of this course Students will be able to

CO1 Gain knowledge about the rural life style
CO2 Understand social values
CO3 Understand importance of varied culture
CO4 Journalise in Functional Hindi
CO5 Use Azhagi, Azhagi+ fonts

Text Books:

1. Pandit Shriram Sharma, Shikaar, (1932)Sahitya Sadan.
2. Sharad Joshi, Yatha Sambhav, (2014)Bharatiya Gyanpeet.
3. Rahul Sanskrityayan, Ghumakkad Shastra, (1949)Rajkamal Prakashan.

Reference Book:

1. Kendriya Hindi Sansthan, (2012) Banking Hindi Patyakram.
2. NCERT, Sparsh, Class 9.
3. Main Aur Mera Vyakaran, New Saraswati House, New Delhi.
4. Govind Ballabh Sharma, (2022) Hindi Vyavaharik Tankan Kala Evam Tankan Abhyas, Neelkanth Publishers Pvt. Ltd.,

Weblinks :

Pandit Sriram Sharma ka kahani: https://www.evidyarthi.in
Harishankar parasayi ka Vyangy: http://gadyakosh.org
Rahul Sanskrityayan ka yatravruttant: https://www.hindwi.org
Prayojanmoolak Hindi:https://hi.mwikipedia.org
https://www.azhagi.com/hnd/helphtml/Introduction.html

24LFRE11 **FRENCH**

L	T	P	O	C
2	0	0	1	2

Course Objectives :

The lessons are being chosen:

1) to greet, to express excuse and to introduce oneself
2) to introduce another person
3) to express his/her ideas, opinions and weekend projects
4) to request someone to do something, polite manners
5) to accept, refuse, enquire and indicate the time and date
6) to express himself / herself in positive and negative manner

UNITS:

1) Salut
les nombres, Les jours de la semaine et du mois, La nationalité 4 hours
2) Enchanté
Les verbes Etre, Avoir, Aller, Regular ER verbes, Present tense. 6 hours
3) J'Adore
La negation, l'adjectif possessif, le futur proche 4 hours
4) Tu veux bien
Les articles de finis/indéfinis, Les pronoms après une préposition (avec lui, chez moi), Le passé Compose 7 hours
5) On se voit quand
Les pronoms compléments directs me, te, nous, vous, L'interrogation avec est-ce que, L'heure et la date. 5 hours
6) Bonne idée
Les articles partitifs, Le masculin et le féminin des adjectifs, Les pronoms compléments directs le, la, les, La négation : ne… pas de. 4 hours

Total no. of hours - 30 hours

Course Outcome :

1) The students would be able to greet, to excuse and to introduce himself
2) The students would be able to introduce someone
3) The students would be able to express his ideas, opinions and weekend projects
4) The students would be able to ask someone to do something, polite manner
5) The students would be able to accept, refuse enquire and indicate the time and date
6) The students would be able to express himself in positive and negative manner

Text / Reference Book:

Prescribed book: LATITUDES 1 (A1/A2) MÉTHODE DE FRANÇAIS - Régine Mérieux and Yves Loiseau

Reference book:

SAISON A1 - MÉTHODE DE FRANÇAIS - Marie-Noëlle Cocton, Élodie Heu, Catherine Houssa, Émilie Kasazian

24LENG11 **ENGLISH - I**

L	T	P	O	C
2	0	0	1	2

COURSE OBJECTIVES:

CO1: To enable students to develop their communication skills effectively. **CO2:** To make students familiar with usage skills in the English Language. **CO3**: To enrich their vocabulary in English.
CO4: To develop communicative competence.

Credit Hours
06

Unit I- Prose
- Dangers of drug abuse - Hardin B.Jones
- Tight corners - E.V.Lucas

Unit II -Poetry **06**
- Ecology - A.K.Ramanujan
- The owl and the chimpanzee - Jo Camacho

Unit III - Short story **06**
- The Dear Departed - Stanley Houghton
- The Fool's Paradise- Isaac Bashevis Singer

Unit IV -Grammar **06**
- Parts of speech, Articles

Unit V -Grammar **06**
- One-word substitution, prefix, suffix, synonym, antonym.

Total 30 hours

Course Outcomes:

At the end of this course, the students would have learnt to

COC1	understand the characteristic features of the language used in the text.
COC2	strengthen their knowledge of basic grammar
COC3	improve narrative skills after studying diverse prose and play.
COC4	understand to classify parts of speech and articles.
COC5	develop critical writing skills in the textual content of the syllabus.

References:

- English for Communication Enrichment: by Jeya Santhi June 2015.
- Dr. M. Narayana Rao and Dr. B. G.Barki–Anu's Current English for Communication (AnuChitra) June 2012.
- Dr. Ananthan, R. Effective Communication. Ed. Chennai: Anu Chithra Pub.2010.

24CBBC11 **INTRODUCTION TO BIOMOLECULES**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES

To inculcate the knowledge on different types of carbohydrates and their structure. To instill the knowledge on the structure and types of amino acids, proteins and their organization. To impart the fundamental knowledge about lipids and their types. To understand the structural and functional aspects of compound and derived lipids. To provide knowledge on the structure and function of DNA and RNA.

UNIT – I CARBOHYDRATES (9)

Classification of carbohydrates. Occurrence, structure and biological importance of monosaccharide, disaccharide and polysaccharides. Structure, function and biological importance of important carbohydrate derivatives-chitin, pectin, heparin, proteoglvcans, sialic acids, blood group polysaccharides.

UNIT – II AMINO ACIDS (9)

Classification and structures of amino acids. Physical and chemical properties of amino acids. Essential and non-essential amino acids. Protein Structure-Primary, Secondary, Tertiary and Quaternary Non protein amino acids. Proteins-Classification based on solubility, shape, composition and function. Denaturation and renaturation of proteins.

UNIT – III LIPIDS (9)

Definition and classification of lipids. Fatty acids - classification, nomenclature, structure and properties. Classification, structure and function of prostaglandins, triacylglycerols. Chemical properties of fats - iodine value, Sap value, acid number, Rancidity, Rm value.

UNIT – IV NUCLEIC ACIDS (9)

Nature of genetic material. Isolation of RNA and DNA. Composition of RNA and DNA. Structure of purine and pyrimidines, nucleosides and nucleotides. Size and structure of different types of DNA-A, B, Z types of DNA. Structure and role of different types of RNA.

UNIT – V BIOLOGICALLY IMPORTANT COMPOUNDS (9)

Hetero cyclic rings of biologically important compounds. Structure and biological importance of pyridine, pyrrole, pyrimidine, purine, thiazole, imidazole and indole ring containing compounds. Porphyrin - structure and biologically important compounds containing porphyin ring, bile pigments - structure and biological importance.

Total Hours: 45

Course Outcome:

CO 1 Understand biochemistry at the atomic level.
CO 2 Easily Understand on role of biological biomolecules and their functions
CO 3 Demonstrate a broad knowledge of the fundamental concepts of chemistry, biology and physics
CO 4 Identify the different classes of polymeric biomolecules and their monomeric building blocks
CO 5 Analyse and study the chemical and biochemical properties of biomolecules and also Understand the relationships between biological molecules and human health

Text Books:

1. J. L. Jain et al. (1994), Fundamentals of Biochemistry, S. Chand and Company, 4th edition.
2. M.N.Chatterjea and Ranashinde (2005), Text book of Medical biochemistry, 6th edition, Jaypee Brothers Medical Publisher (P) Ltd.

Reference Books:

1. Champe and Harvey (2007), Lippincott's illustrated biochemistry, 6th edition.
2. D.Voet and J.G. Voet (2004), Biochemistry, John Wiley & Sons, USA.

Web Sources:

1. https://www.chem.uci.edu/~unicorn/243/papers/MSlec1.pdf
2.https://oer.unimed.edu.ng/LECTURE%20NOTES/3/2/RASAQ-NURUDEEN-OLAJIDE-UNIMED-BCH-222-VITAMINS.pdf

24CBBC12 **HUMAN PHYSIOLOGY**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES

The objective is to impart knowledge and understanding of the human body. To understand the inter relationships within and between anatomical and physiological systems of the human body.

UNIT 1 BLOOD AND CIRCULATORY SYSTEM (12)

Blood: Composition and function. Types and function of blood cells. Erythropoiesis. Blood grouping- ABO, Rhesus system and Bombay blood group system. Blood coagulation. Intrinsic and extrinsic pathways. Structure and function– Spleen and lymphatic System. Circulatory system and Heart - Structure and functions of heart and associated blood vessels, Cardiac cycle.

UNIT 2 DIGESTIVE SYSTEM & RESPIRATORY SYSTEM (12)

General structure of digestive system – Digestion and absorption of food in the mouth, stomach and intestines. Various movements of digestive system. Pancreas and Liver – structure and function. Defecation. Outline of various components of respiratory system. Mechanism and chemistry of respiration. Mechanism and chemistry of respiration - considerations, transport of gases, exchange of gases. Bohr effect and role of 2,4 DPG.

UNIT 3 REPRODUCTIVE SYSTEM (12)

Structure and functions of male and female reproductive system: Ovulation, menstrual cycle. Spermatogenesis and factors influencing sperm count and viability. Biochemistry of fertilization. Physiological changes during pregnancy, parturition and lactation.

UNIT 4 EXCRETORY SYSTEM (12)

Structure and role of kidney, nephrons. Mechanism of urine formation- Glomerular filtration, tubular secretion and reabsorption

UNIT 5 NERVOUS SYSTEM (12)

Brief outline of nervous system- types of nerve cells and nerve fibres, brain, spinal cord. Communication: Electrical and chemical communications - Transmission of nerve impulse, neurotransmitters and synapse.

Total Hours: 60

Course outcome:

- **CO 1** Discus in-depth the structure and physiology of major human organs and explain their role in the maintenance of healthy individuals.
- **CO 2** Discuss in detail how the activities of organs are regulated for maximum efficiency.
- **CO 3** Explain in-depth the interplay between different organ systems and how organs and cells interact to maintain biological equilibrium in the face of a variable and changing environment.
- **CO 4** Identify how changes in normal physiology lead to disease.
- **CO 5** Implement the knowledge of human physiology in clinical biochemistry to predict and understand the disease.

Text Books

1.Guyton AC (1991), Text book of Medical Physiology, 8th Edition, TATA McGraw-hill publishing Company, Prism books (pvt), Bangalore, India.

2.C.C. Chatterjee (1985), Human Physiology (Vol. I & Vol. II), 11th Edition, Medical Allied Agency, Calcutta.

Reference Books

1. Ganong (Williams) (2015), Review of medical physiology, 25th edition, McGraw-Hill.
2. Ross and Wilson (2014), Anatomy and physiology In health and illness, 12th edition, Elsevier.

Web Sources:

1.https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/nursing_students/ln_human_anat_final.pdf
2.https://laney.edu/rebecca_bailey/wp-content/uploads/sites/10/2017/07/Human-Physiology-Lecture-Notes-update-2017.pdf

24MBBC11 **BASIC CONCEPTS IN NUTRITION**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE

To obtain the knowledge of macronutrients, micronutrients, food, diet, energy and nutrition pattern for normal persons, patients and special cases. Students should also aware about the categories and significance of various forms of foods and to be being healthy.

UNIT I BASIC CONCEPTS IN NUTRITION (9)

History of Nutrition. Definition of nutrition – Under nutrition, over nutrition and Malnutrition. Nutrition: Nutrients-essential, non-essential-General functions of nutrients. Methods of assessing nutritional status, Anthropometric measurements and indices – linear measurement, height, weight, head, chest and mid upper arm circumference.

UNIT II MACRONUTRIENTS (9)

Carbohydrates – sources, requirements, dietary fibre. Proteins- sources, requirements, nutritional classification of amino acids, nutritional value of proteins, effect of protein deficiency and Protein Energy Malnutrition (PEM)- Kwashiorkor and Marasmus, dietary management. Lipids- Food sources, requirements, nutritional classification of fats, effect of fat deficiency and excess of fat in the diet.

UNIT III FOOD (9)

Food group- Definition and physiological functions of foods, food pyramid. ICMR committee percent calories supplied by carbohydrates, fats and proteins in average Indian diets – food and energy requirements for different age groups. RDA.

UNIT IV ENERGY (9)

Energy units – Kilo calories, Mega joules. Bomb calorimeter. Determination of energy requirements, Indirect calorimetry, Benedict Roth basal metabolism apparatus, factors affecting BMR, determination of energy metabolism during work, energy requirements for various types of activities, factorial methods for calculation of the daily energy requirements for an adult for varying degrees of physical activity-recommended allowances for calories.

UNIT V MICRONUTRIENTS (9)

Vitamins- sources, requirements. Functions and effects of deficiency. Importance of Folic acid, vitamin B_{12} pyridoxine, biotin and pantothenic acid.Minerals - Calcium, phosphorus, iron, copper, flourine, zinc, iodine, selenium, chromium and cobalt). Water &electrolytes –distribution in body, functions, requirement, dehydration - causes, effects andprevention.

Course outcome:

CO 1 Understand biochemistry at the atomic level.

CO 2 Easily understand on role of biological biomolecules and their functions.

CO 3 Demonstrate a broad knowledge of the fundamental concepts of Chemistry and Biology.

CO 4 Identify the different classes of polymeric biomolecules and their monomeric building blocks.

CO 5 Analyse and study the chemical and biochemical properties of biomolecules.

Total Hours: 45

Text Books

1. J.LJain *et al*. (1994), Fundamentals of Biochemistry, S.Chand and Company 4th edition.

2. M.N.Chatterjea and Ranashinde (2005). Text book of Medical Biochemistry Jaypee Brothers, Medical Publisher (P) Ltd, 6th edition 2005.

Reference Books

1. Lippincott, (2007). Illustrated Biochemistry – Champe and Harvey; 6th edition.

2. D.Voet and J.G. Voet, (2004). Biochemistry, John Wiley & Sons, USA 2004

Web Sources

1. https://www.chem.uci.edu/~unicorn/243/papers/MSlec1.pdf
2. https://oer.unimed.edu.ng/LECTURE%20NOTES/3/2/RASAQ-NURUDEEN-OLAJIDE- UNIMED-BCH-222-VITAMINS.pd

24DBBC11 **LIFESTYLE DISEASES**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVE:

The objective is to make a connection between knowledge of anatomy and physiology and real-world situations, including healthy lifestyle decisions and homeostatic imbalances.

UNIT I MODERN LIFESTYLES AND HABITS **12**

Modern lifestyles - Sedentary habits, Junk food, Polluted environment, Sleeping habits, Smoking, Alcoholism, Drugs, Stress.

UNIT II FOOD **12**

Elementary knowledge of balanced food. Obesity, Acidity, Dieting, Anorexia, Food poisoning. Deficiency of nutrients- Vitamins, Minerals, Beverages- hot and cold.

UNIT III CARDIOVASCULAR COMPLICATIONS **12**

Elementary knowledge of cardiovascular system: Atherosclerosis, Ischemia, Myocardial infarction (Heart attack), Hypertension.

UNIT IV DISEASES OF THE DIGESTIVE SYSTEM **12**

Elementary knowledge of digestive system and liver- Hepatitis, Fatty liver, Cirrhosis, Gallstones. Stomach- Gastritis, Acidity, Ulcer, Amoebiasis, Constipation, Piles.

UNIT V DISEASES OF THE RESPIRATORY AND EXCRETORY SYSTEM **12**

Elementary knowledge of Respiratory system- Common cold, Asthma, Wheezing, Allergic sinusitis. Elementary knowledge of excretory system, Hypertension, Uncontrolled Diabetes, Kidney Stones.

Total: 60 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Understanding the basics about the human anatomy and physiology.

CO2: Describe the effects of current lifestyle as a consequence of industrialization.

CO3: Understand global scenario on sedentary lifestyle nutrition.

CO4: Understand Basics of nutrition, RDA, balanced diet and BMR.

CO5: Describe about cardiovascular system, respiratory system, digestive system, excretory system and associated disorders.

Text Books:

1. Carl A. Burtis and Edward R. Ashwood. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, 5th edition, 2012. Saunders Publication.
2. M N Chatterjee and Rana shinde. Textbook of Medical Biochemistry-,8th edition, 2011. Jaypee Publishers.

Reference Books:

1. Thomas M. Devlin. Biochemistry with Clinical Correlation, 7th edition, John Wiley & Sons. 2004.
2. Harold Varley, Practical Clinical Biochemistry, fourth edition, 2005. CBS Publisher

Web Sources:

1. Chromeextension://efaidnbmnnnibpcajpcglclefindmkaj/https://saudijournals.com/media/articles/SJMPS_74_179-184.pdf
2. chromeextension://efaidnbmnnnibpcajpcglclefindmkaj/https://drsudhirbhandari.co.in/wp-content/uploads/2021/07/LIFESTYLE-COFFEE-BOOK-by-Dr-Sudhir-Bhandari.pdf

24DBBC12 **STEM CELL BIOLOGY**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

This paper aims to provide thorough information on the basic properties of stem cells and the regulation at molecular level. It also describes the application of stem cell technology in the therapy of different diseases.

UNIT 1 INTRODUCTION TO STEM CELLS (12)

Definition, Classification and Sources. Embryonic Stem Cells. Adult, hematopoietic, fetal, cord blood, placenta, bone marrow, primordial germ cells, cancer stem cells, induced pluripotent stem cells.

UNIT 2 STEM CELL CHARACTERIZATIONS (12)

Isolation & characterizations, markers & their identification, growth factor requirements and their maintenance in culture. Feeder and feeder free cultures. Cell cycle regulators in stem cells. Molecular basis of stem cell renewal and differentiation, Metaplasia and trans differentiation. Molecular basis of pluripotency and stem cell niche.

UNIT 3 GENETIC AND EPIGENETIC GENE REGULATION IN STEM CELLS (12)

Chromatin modification and transcriptional regulation, chromatin modifying factors, epigenetic regulation – expression of receptors, chromosomal inactivation, imprinting mechanism in Drosophila, C. elegans and mammals. Hypoxic condition and gene expression (pre implantation stage), stem cell communications – gap junctions, cell fusion, HOX genes, upstream transcriptional factors, embryonic genes.

UNIT 4 APPLICATION OF STEM CELLS (12)

Overview of embryonic and adult stem cells for therapy neurodegenerative diseases; Parkinson's, Alzheimer, Spinal Code Injuries and other brain Syndromes; Tissue system Failures; Diabetes; Cardiomyopathy; Kidney failure; Liver failure; Cancer; Hemophilia etc.

UNIT 5 REGULATIONS AND ETHICS (12)

Human Embryonic Stem Cells and Society, Human stem cells research: Ethical consideration; Stem cell religion consideration; Stem cell-based therapies: Pre clinical regulatory consideration and Patient advocacy.

Total: 60 hours

COURSE OUTCOMES:

CO 1	Understand the inter relationships of stem cells.
CO 2	Describe the structure of stem cells and their characterization.
CO3	Explain the interplay between genetic and epigenetic gene regulation.
CO4	Describe the applications of stem cells.
CO5	List the regulations and ethics of stem cell in the society.

Text Books

1. Kiessling, A.A. Human Embryonic Stem cells. Jones &Barlett Publishers. (2nd Ed.) 2006
2. Lanza, R. Essentials of Stem Cell Biology. Academic Press. (1st Ed.) 2005.

Reference Books

1. Turksen, K. Adult Stem Cells. Humana Press, Inc., 1st Ed, 2004
2. Thomson, J et al. Handbook of Stem Cells: Embryonic/ Adult and Fetal Stem cells (Vol. 1 & 2). Academic Press, 1st Ed, 2004.

Web sources

1.https://microbenotes.com/stem-cells/

2. https://www.law.berkeley.edu/files/stem_cell_day1_part2_shelanski.pdf

24PBBC11 **QUALITATIVE ANALYSIS OF BIOMOLECULES**

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVE

This course is concerned with basic lab skills. These skills include the accurate use of pipettes, making solutions, and safety measurements along with the identification of biomolecules such as carbohydrates, proteins and amino acids by suitable tests.

LIST OF EXPERIMENTS

1. Qualitative analysis of monosaccharides – aldoses
2. Qualitative analysis of monosaccharides – ketoses
3. Qualitative analysis of reducing disaccharides
4. Qualitative analysis of non-reducing disaccharides
5. Qualitative analysis of polysaccharides
6. Qualitative analysis of pentoses
7. Qualitative analysis of aromatic amino acids
8. Qualitative analysis of Sulphur containing amino acids
9. Qualitative analysis of basic amino acids
10. General color reactions of protein
11. Denaturation and precipitation of proteins
12. Hydrolysis of proteins and color reactions of hydrolysate

Course Outcome:

At the end of this course students will be able to,

CO1: Acquire knowledge in the qualitative estimation of biological biomolecules.

CO2: Understand the different chemical reaction & principles of biomolecules.

CO3: Identify the given solution as carbohydrate or amino acid/protein.

CO4: Understand the different chemical preparation of biomolecules.

CO5: Learn safety and precautionary measures for working in a laboratory and learn the handling of microscope and other laboratory instruments individually.

Text Books:

1. J. Jayaraman (2011), Laboratory Manual in Biochemistry, New Age International Publishers.
2. S. Sadasivam, A. Manickam (2009), Biochemical Methods, New age publishers.

Reference Books:

1. Harold Varley (2006), Practical Clinical Biochemistry, 6 edition, CBS.

2. S. K. Sawhney, Randhir Singh (2005), Introductory Practical Biochemistry, 2nd edition, Alpha Science International, Ltd.

Web Sources:

1. https://unacademy.com/lesson/biochemical-separation-techniques-a-brief overview/NV7POVI5
2. https://www.studocu.com/enau/document/universityoftechnologysybiochemistrynotes/14979547

24DVAC11 UNIVERSAL HUMAN VALUES

L	T	P	O	C
1	0	0	1	1

COURSE OBJECTIVE:

The candidates will be able to appreciate the complementarity between the values and skills for sustained happiness and prosperity. To influence the students to approach the life and profession with a holistic perspective towards a value-based living in a natural way. To highlight plausible implications of holistic understanding of ethical human conduct.

UNIT- I INTRODUCTION TO VALUE EDUCATION 5

Living a fulfilling life. Value education. Skill education. Complementarity of Values and Skills. Development of a holistic perspective. Right understanding, relationship and physical facility. Understanding the happiness and prosperity.

UNIT-II HARMONY AT MULTIPLE LEVELS 5

Human being as co-existence of the self and the human body. Understanding harmony in the self. Harmony in the family and understanding values in human-human relationships. Harmony in the society and understanding universal human order. Harmony in nature and understanding the interconnectedness, self-regulation and mutual fulfillment. Harmony in existence and understanding co-existence at various levels.

UNIT-III IMPLICATIONS OF THE RIGHT UNDERSTANDING 5

Ethical human conduct. Implications of value-based living. Right understanding of professional ethics. Humanistic education. Holistic technologies, production systems and management models. Strategies for transition towards value-based life and profession.

Total: 15 Hours

Course Outcome:

At the end of the course learners will be able to:

CO1: Develop qualities like responsibility and the ability to handle problems with sustainable solutions.

CO2: Appraise human values and the harmony at various levels.

CO3: Perceive a better critical ability.

CO4: Develop qualities pertaining to value-based living.

CO5: Apply what they have learnt to their own self in real life settings.

Text Books:

1. R.R. Gaur, R. Asthana, G.P. Bagaria. (2023). A Foundation Course in Human Values and Professional Ethics. 3rd Revised Edition. Excel Books, New Delhi.

Reference Books:

1. A. Nagaraj, Jeevan Vidya Prakashan, Amar Kantak. Jeevan Vidya: Ek Parichaya . (1999).
2. Rakesh Gupta. (2008). Jeevan Vidya: An Introduction (Introductory Book to Madhyasth Darshan-Coexistentialism). English Version.
3. A. N. Tripathi. (2004). Human Values. First Edition. New Age International Publishers, New Delhi.

24SSKU11 **SOFT SKILLS -I**

L	T	P	O	C
2	0	0	1	2

COURSE OBJECTIVES:

CO1: To learn and apply basic etiquette for personal and professional interactions.

CO2: To develop effective stress management techniques for maintaining mental and emotional well-being.

CO3: To enhance self-awareness for personal growth and informed decision-making.

CO4: To gain an overview of essential 21st-century skills necessary for success in a rapidly changing world.

CO5: To foster creativity and critical thinking skills for innovative problem-solving and adaptability.

Credit Hours

UNIT I INTRODUCTION TO SOFT SKILLS 6

- Soft Skills vs Hard Skills
- 15 important Soft Skills
- Communication Skills, Time Management, Leadership Skills

UNIT II - OVERVIEW OF 21ST CENTURY SKILLS. 6

- Lateral Thinking – Left Brain/Right Brain Functionality
- Problem solving skills

UNIT III - SELF AWARENESS 6

- Human Values
- Mindfulness
- SWOT Analysis
- PDCA Approach

UNIT IV - CREATIVITY/CRITICAL THINKING 6

- Six Thinking Traits
- Creative writing exercises
- Open mindedness

UNIT V - PERSONAL HYGIENE AND STRESS MANAGEMENT 6

- Basic Etiquettes
- Health and Personal Grooming
- Stress-meaning and nature, Eustress, Distress
- Stress management strategies

Total Hours 30

COURSE OUTCOMES:

At the end of this course, the students would have learnt to

COC1	demonstrate basic etiquette in various personal and professional settings.
COC2	effectively manage stress using learned techniques.
COC3	show increased self-awareness and make informed decisions.
COC4	understand and articulate key 21st-century skills.
COC5	apply creativity and critical thinking to solve problems innovatively.

References:

- K. Alex (2014). Soft Skills (1st edition) S Chand & Company
- Taylor. (2005) Grant English Conversation Practice. Tata McGraw Hill Education Pvt. Ltd
- Tiko, Champa& Jaya Sasikumar. (1979) Writing with a purpose. OUP New Delhi
- Nelson-Jones, R. (1992). Life skills, a handbook, Trowbridge, Wilts: Detesios Ltd.
- Tuhovsky, Ian (2019). Communication Skills Training (2nd edition) Rupa PublicationIndia.

SEMESTER II

24LTAM21 காப்பியம், பக்தி இலக்கியம், கலைகள், நாகரிகம்-பண்பாடு

L	T	P	O	C
2	0	0	1	2

பருவம்-2, தமிழ்மொழிப்பாடம்-2, பகுதி-1, தகுதிப்புள்ளி: 2, வாரப் பாட நேரம்: 2. தாள்-2

பாடத்திட்ட நோக்கம்:

மாணவர்களின் இலக்கிய நாட்டத்தை மேம்படுத்துதல், அற இலக்கியங்கள், சிற்றிலக்கியம், சிறுகதை ஆகியவற்றை அறிமுகப்படுத்துதல், தற்காலப் பேச்சுத் தமிழ் எழுத்துத்தமிழ் ஆகியவற்றின் வளர்நிலைகளை மாணவர்களை அறியச் செய்தல், அதன்வழி சிந்தனை வளத்தைப் பெருகச் செய்தல் என்பனவும் மேற்கண்டவழி மாணவர்களை ஆளுமை மிக்கவர்களாக உருவாக்கி, போட்டித்தேர்வுகளுக்குத் தயார் செய்து அவர்களின் மொழித் திறனை மேம்படுத்த அவர்களுக்குக் கடிதம் எழுதும் கலையைக் கற்றுக்கொடுத்தல், அணி இலக்கணத்தை அறியச் செய்தல் என்பன இந்தப் பாடத்திட்டத்தின் முக்கிய நோக்கமாகும்.

அலகு 1 காப்பியங்கள் 8மணி நேரம்

சிலப்பதிகாரம்- கனாத்திறம் உரைத்தக் காதை முழுவதும்.

மணிமேகலை- மலர்வனம் புக்க காதை முழுவதும்.

கம்பராமாயணம் - குகப் படலம் (தேர்ந்தெடுக்கப்பட்ட ஒன்பது பாடல்கள்)

அலகு 2: பக்தி இலக்கியம் 8 மணி நேரம்

1. மாணிக்கவாசகர் - திருவாசகம் – மூன்று பாடல்கள்
   - ✓ புல்லாகி பூடாகி (சிவபுராணம்)
   - ✓ எல்லாப் பிறப்பும் (சிவபுராணம்)
   - ✓ உற்றாரை யான் வேண்டேன் (திருப்புலம்பல்)
2. ஆண்டாள் - திருப்பாவை – மூன்று பாடல்கள் (1, 3, 4)
   - ✓ மார்கழித் திங்கள் … (பாசுரம் 1)
   - ✓ ஓங்கி உலகளந்த… (பாசுரம் 3)
   - ✓ ஆழிமழைக் கண்ணா… (பாசுரம் 4)
3. வீரமாமுனிவர் - தேம்பாவணி – வளன் சினைத்தப் படலம்
4. சீறாப்புராணம்- மானுக்கு பிணை நின்ற படலம்

அலகு 3 கலைகள் 7 மணி நேரம்

சிற்பம் - ஓவியம் - இசை - கூத்து - ஒப்பனை - ஆடை அணிகலன்கள்.

அலகு 4 நாகரிகம், பண்பாடு 7மணி நேரம்

சொற்பொருள் விளக்கம் - பண்டைத் தமிழர் வாழ்வியல் - அகம் - களவு - கற்பு - குடும்பம் - விருந்தோம்பல் - உறவு முறைகள் - சடங்குகள் -

நம்பிக்கைகள் - பொழுதுபோக்கு - புறம் - போர் முறைகள் - நடுகல் வழிபாடு - கொடைப்பண்பு.

மொத்தம்: 30 மணி நேரம்

பார்வை நூல்கள்

1. டாக்டர் அ. தட்சிணாமூர்த்தி (2001), **தமிழர் நாகரிகமும் பண்பாடும்,** ஐந்திணைப் பதிப்பகம்,.
2. மா. நன்னன் **(**1999), **தவறின்றித் தமிழ் எழுதுவோம்,** ஏகம் பதிப்பகம்,.
3. மருதூர் அரங்கராசன் (2003), **தவறின்றித் தமிழ் எழுத** -, ஐந்திணைப் பதிப்பகம்.
4. வரதராசன், மு (2002), **தமிழ் இலக்கிய வரலாறு** புது தில்லி : சாகித்திய அக்காதெம,.
5. நீல. பத்மநாபன், சிற்பி பாலசுப்ரமணியம் (2007), **புதிய தமிழ் இலக்கிய வரலாறு**, சாகித்திய அகாடெமி, .
6. முனைவர் மறைமலை இலக்குவனார், **செம்மொழி தமிழின் சிறப்பியல்புகள்** -; https://www.youtube.com/watch?v=HHZnmJb4jSY
7. **பாடநூல் தேடலுக்கான இணையம் -** https://archive.org/

24LHIN21 **HINDI**

L	T	P	O	C
2	0	0	1	2

वर्ष I – सत्र II (गद्य, पत्र लेखन & व्यावहारिक हिन्दी)

I Year-Sem II (Prose, Official Letter Writing & Functional Hindi)

Course Objectives :

- To inculcate the human values, importance of patriotism and hard work
- To train students in functional Hindi
- To introduce the usage of Inscript keyboard

UNIT I : मुंशी प्रेमचंद कृत 'बूढी काकी' (कहानी)

'Boodee kaki" (Kahani) by Munshi Premchand 6hrs.

UNIT II : जयशंकर प्रसाद कृत 'पुरस्कार' (कहानी)

'Puraskar' (Kahani) by Jaishankar Prasad 6hrs.

UNIT III: हरिशंकर परसाई कृत 'मैं नरक से बोल रहा हूँ' (व्यंग्य)

'Main Narak Se Bhol Raha Hun' (Vyangy) by Harishankar Parsayi, 6hrs.

UNIT IV: व्यावहारिक हिन्दी 1 – 50 – तकनीकि शब्द, 50 – पदनाम व विभागीय नाम, भाव एक भाषा अनेक 6hrs.

Functional Hindi 1 - 50-Technical Words, 50-Designation & Department Names, Bhav Ek Bhasha Anek

UNIT V : व्यावहारिक हिन्दी 2 – पत्र लेखन – 3 औपचारिक पत्र, इन्स्क्रिप्ट कीबोर्ड का परिचय 6hrs.

Functional Hindi 2 -Letter Writing- 3 Official Letters.

Introduction to Inscript Keyboard

Total: 30hrs

Course Outcome:

At the end of this course Students will be able to

CO1 Know to the human values

CO2 Know the importance of patriotism

CO3 Know the value of hardwork in human life

CO4 Journalise in Functional Hindi

CO5 Use inscript keyboard

Text Book:

Ed. Subhash chandar, Boodi Kaki by Premchand (2012) Natioonal Book Trust,

Jaishankar Prasad, Pratinidhi Kahaniyan, (2015) Raj Kamal Prakashan,

Harishankar Parsai, Pratinidhi vyangy, (2007) Rajkamal.

Kendriya Hindi Prashikshan Sansthan, Parangat, (2015) Bharat Sarkar.

Reference book:

Kendriya Hindi Sansthan, (2012) Banking Hindi Patyakram,

Weblink:

Munshi Premchand, Manasarovar, 2007, http://gadyakosh.org

Jaishankar Prasad/ http://gadyakosh.org

Harishankar Parsai/ https://hindikahani.hindi-kavita.com

Prayojanmoolak Hindi:https://hi.mwikipedia.org

https://rajbhasha.gov.in/en/introduction

24LFRE21 **FRENCH**

L	T	P	O	C
2	0	0	1	2

Course Objectives:

The lessons are being chosen:

1) to express his / her where abouts and to ask seek direction
2) to express obligation and restriction
3) to describe a place
4) to narrate and to question
5) to describe someone
6) to express his desire and to speak about the futur

Units:

1. C'est où

L'impératif, Les articles contractés au, à la…, Le passé composé et l'accord du participe passé avec être. 5 hours

2. N'oubliez pas

Le pronom relatif Qui, que, où, Les pronoms compléments indirects (me, te, lui, leur) 5 hours

3. Belle vue sur la mer --

Les adjectifs démonstratifs, Y- pronom complément. 4 hours

4. Quel beau voyage!

Les verbes pronominaux, En- pronom complément. 4 hours

5.Oh ! joli

L'imparfait, L'imparfait ou le passé composé. 5 hours

6. Et après ?

Le futur simple, Le subjonctif présent. 7 hours

Total no. of hours - 30 hours

Course Outcome:

1) The students would be able to express his/her where about and to ask direction
2) The students would be able to express obligation and restriction
3) The students would be able to describe a place
4) The students would be able to narrate and to question

5) The students would be able to describe someone

6) The students would be able to express his desire and to speak about the futur

Text / Reference Book:

Prescribed book: LATITUDES 1 (A1/A2) MÉTHODE DE FRANÇAIS - Régine Mérieux and Yves Loiseau

Reference book: SAISON A1 - MÉTHODE DE FRANÇAIS - Marie-Noëlle Cocton, Élodie Heu,Catherine Houssa, Émilie Kasazian

24LENG21 **ENGLISH – II**

L	T	P	O	C
2	0	0	1	2

Course Objectives:

- To read and understand different types of prose, poetry, and fiction.
- To think critically about texts and express ideas clearly.
- To recognize and discuss key themes and styles in literary works.
- To learn and use grammar rules correctly in writing and speaking.
- To write more effectively by applying grammar and literary techniques.

Credit Hours

Unit I -Prose **06**

- If you are wrong, admit it- Dale Garnegie
- Words of Wisdom- Chetan Bhaghat

Unit II - Poetry **06**

- La Belle Dame Sans Merci - John Keats
- Ozymandias- P.B.Shelley

Unit III - Fiction **06**

- The School for Empathy - E.V. Lucas
- The Lamb to the Slaughter-Roald Dahl

Unit IV - Grammar **06**

- Types of sentences, Concord

Unit V - Grammar **06**

- Tenses, Voices

Total- 30 hours

Course Outcomes:

At the end of this course, the students would have learnt to

CO1	Identify poetic expressions in the course of daily speech
CO2	Students will develop skills that enable them to communicate effectively in writing.
CO3	Students will develop skills that enable them to communicate effectively in writing.
CO4	Discriminate against different sensibilities in approaching life.
CO5	Strengthen the ability to solve life's problems, as highlighted in the selections.

References:

- Dr. M. Narayana Rao and Dr. B. G. Barki–Anu's (2012). Current English for Communication (AnuChitra).
- V.Rajagopalan (2010).General English for competitive examinations by (Mcgraw Hill Education)

24CBBC21 **ANALYTICAL TECHNIQUES**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES

Analytical techniques focuses on the techniques relevant to modern day molecular biology and biochemistry research. To understand the theoretical principles involved and the technical details in Bioinstrumentation. The techniques may be used for the determination of nutrients, major ions and trace elements, biological samples together with the analytical techniques.

UNIT 1 HOMOGENIZATION AND CENTRIFUGATION (9)

Buffers, pH, pOH. Methods of cell disruption and tissue homogenization: mechanical (homogenizer, sonicator, French press) and non-mechanical methods (physical, chemical and enzymatic methods). Centrifugation: Basic Principles of Centrifugation. Differential and Density Gradient Centrifugation, Analytical Ultracentrifugation – ultra centrifuge, applications.

UNIT 2 CHROMATOGRAPHY (9)

Chromatographic - Introduction, types and modes of separation. Principles and applications of Paper, Thin layer & HPTLC, Gas-liquid, Liquid chromatography, HPLC and FPLC

UNIT 3 ELECTROPHORESIS (9)

Paper and gel electrophoresis, Agarose gel electrophoresis, Different variants of polyacrylamide gel electrophoresis (PAGE) like native and SDS-PAGE, 2D-PAGE, Isoelectric Focusing, capillary electrophoresis.

UNIT 4 SPECTROSCOPY (9)

Spectroscopy: Basic Principles of Electromagnetic Radiation, Beer-Lambert's Law. Principle, instrumentation and applications of Colorimetry, UV-Visible, IR, Raman, NMR and ESR and X-Ray spectroscopy, Spectrofluorimetry, Flame Photometry, AAS, X-Ray Diffraction, Mass spectrometry, Fluorescence spectroscopy.

UNIT 5 RADIOACTIVITY (9)

Concept of radioactivity, concept of α, β and γ emitters. Applications of radioactive tracers in biology, principles and applications of phosphor imager. Detection and measurements - GM counter, Scintillation counter. γ- Biological applications: radio dating and autoradiography.

Total Hours: 45

Course outcome

CO 1 Construct broad knowledge in modern analytical instrumentation with deep knowledge its core concepts and its applications.

CO 2 Assess and understand the principle, Instrumentation of different types of analytical technologies in biological field.

CO 3 Discriminate and acquire knowledge about the different detection counters in radioactivity and biosensor

CO 4 Collaborate and understand basics and latest developments in the instrumentation techniques for sedimentation

CO 5 Acquire cognitive, technical and creative skills which enables students to gain an established knowledge and practice concerning modern analytical instrumentation and measurement techniques.

Text Books

1. Keith Wilson and John Walker (2010), Principles and techniques of Practical Biochemistry, Seventh edition, Cambridge University Press.
2. Asokan PA (2009), Analytical Biochemistry, Chinna publication.

Reference Books

1. Holme. D. J. and Peck. H (1998), Longman Analytical Biochemistry, 3rd edition.
2. Chatwal, G & Anand, S (2005), Instrumental methods of chemical analysis, Himalaya Publishing House.

Web Sources:

1. https://open.umn.edu/opentextbooks/textbooks/486
2. https://ocw.mit.edu/courses/earth-atmospheric-and-planetary-sciences/12-119-analytical-techniques-for-studying-environmental-and-geologic-samples-spring-2011/lecture-notes/

24CBBC22 **ENZYMOLOGY**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES:

To acquire fundamental knowledge on enzymes and their importance in biological reactions. To understand ability to difference between a chemical catalyst and biocatalyst. Exposure to the nature of non-protein enzymes such as ribozymes. Understanding the role of enzymes in clinical diagnosis and industries**.**

UNIT I INTRODUCTION TO ENZYMES (9)

Introduction - Definition, Enzyme units, Functions of enzymes. Nomenclature of enzymes, Classification of enzymes. Coenzymes, Isoenzymes, Abzymes, metalloenzymes. Enzyme specificity, Active site, Mode of Enzyme action - Lock and key theory and induced fit theory, Factors affecting enzyme activity - pH, temperature, enzyme concentration and substrate concentration.

UNIT II ENZYME KINETICS (9)

Derivation of Michaelis - Menton Equation. Enzyme inhibition - Competitive, non- competitive and uncompetitive inhibitions (with reference to Example and graphical representation)

UNIT III ENZYME REGULATION (9)

Enzyme regulation: General mechanism of enzyme regulation, feedback inhibition and feed forward stimulation. Covalent modification of enzymes. Allosteric enzymes. Regulation of enzymic activity by products and substrates.

UNIT IV APPLICATIONS OF ENZYMES (9)

Industrial uses of enzymes - sources of industrial enzymes, thermophilic enzymes, amylases, glucose isomerases, cellulose degrading enzymes, lipases, proteolytic enzymes in meat and leather industry, detergents and cheese production. Immobilization of enzymes and their applications. A brief account of non-protein enzymes - ribozymes and DNA enzymes. To visit an Enzyme production Industry.

UNIT V BIOSENSORS (9)

Biosensors - Introduction to Biosensors: Concepts and applications. Principle, types and components of Colorimetric, potentiometric and optical immune sensors, artificial enzymes: abzymes, synzymes and ribozymes.

Total Hours: 45

COURSE OUTCOME

CO 1 This course will provide fundamental knowledge on enzymes and their importance in biological reactions.

CO 2 Students will understand the difference between a chemical catalyst and biocatalyst and understand activation energy.

CO 3 Explain how enzyme activity is (a) regulated, and (b) affected by temperature, pH, and concentration.

CO 4 They will study non-protein enzymes such as ribozymes and will be exposed to the Industrial and biomedical applications of enzymes.

CO 5 Analyze options for applying enzymes and their inhibitors in medicine and industries.

Text Books:

1. Cox, M.M and Nelson, D.L. (2008). Lehninger Principles of Biochemistry, V Edition, W.H. Freeman and Co., New York.
2. Nicholas C. Price, Lewis Stevens, and Lewis stevens, Fundamentals of Enzymology: The cell and molecular Biology of Catalytic Proteins, Oxford University Press, USA.

Reference Books:

1. Voet D and Voet J (2012), Biochemistry, Fifth edition, Wiley.
2. Murray, R.K., Bender, D.A., Botham, K.M., Kennelly, P.J., Rodwell, V.W. and Well, P.A. (2009), Harper's Illustrated Biochemistry, XXVIII Edition, International Edition, The McGraw-Hill Companies Inc.

Web Sources:

1.https://bio.libretexts.org/Courses/University_of_California_Davis/BIS_2A_(2018)%3A_Introductory_Biology_(Singer)/Bis2A_Winter_2019/Lecture_5.5__Enzymology#:~:text=Enzymes%20are%20biological%20catalysts%20that,acid%20R%20groups%20(residues).

2. https://www.slideshare.net/tonyscaria/enzymology-biochemistry-revision-notes

24MBBC21 **HOSPITAL MANAGEMENT**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE

1. To understand the role of administration in patient care, planning and management
2. To understand the importance of information system in hospitals
3. To understand the policy and procedures in clinical services
4. To understand the legal and safety aspects in health care services
5. To understand the aspects of counselling and its importance in hospital management

UNIT I DEPARTMENTS IN HOSPITAL (9)

General features of a hospital, various departments –Outpatient department, Casualty and Emergency services, General surgery department, ICU, Obstetrics department, Clinical laboratory. Supportive services- Admission department, medical records department, Pharmacy, Food services Housekeeping department, Volunteer department.

UNIT II HOSPITAL INFORMATION (9)

Information system in hospital: Communication, Delegation, Decision making, Monitoring, Evaluation, Meetings and Negotiations; Quality assurance

UNIT III BIOMEDICAL RESEARCH (9)

Biomedical research: Ethics; consent, nature of consent. Ethics pertaining to blood transfusion, transplantation-Donor categories, confirmation of brain death, live donation, bio medical waste management.

UNIT IV HOSPITAL ADMINISTRATION (9)

Hospital Administration, Hospital ethics, Challenges in hospital administration, Legal aspects, working conditions, Environmental Safety, Health services, National Health Policy

UNIT V COUNSELLING (9)

Counselling- Types, Techniques, Function, Development of counselling services, Duties of a counsellor

Total: 45 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Analyze the importance and role of variousdepartments, support services in hospitals

CO2: Discuss about information system in hospitals and Quality assurance

CO3: Communicate about Ethics governing various clinical aspects like blood transfusion, transplantation

CO4: Aware of various legal and safety aspectsin hospital administration

CO5: Discuss about counselling and analyze therole of counsellors in Hospital management

Text Books:

1. K.J.Kunders (2008), J Hospitals-Facilities Planning and Management, Tata Mc graw Hill, NewDelhi.
2. R.C.Goyal (2005), Hospital Administration and Human Resource Management, 4th Edition, Prentice Hall of India Pvt Ltd.

Reference Books:

1. R. Kumar S.L. Goel (2009), Hospital Administration and Management: Theory and Practice; Joydeep Das Gupta (2009), Hospital Administration and Management: A Comprehensive Guide, Jaypee Brothers, Medical Publishers Pvt. Limited.
2. BM Sakharkar (2008), Principles of Hospital Administration and Planning, Jaypee brothers, Medical Publishers Pvt. Limited.

Web Sources:

1. https://www.scribd.com/document/332414371/BM-Sakharkar-Principles-of-Hospital-Administration-and-Planning-2nd-Edition-pdf
2. https://www.pdfdrive.com/hospital-administration-books.html

24DBBC21 BIOENERGETICS AND MEMBRANE BIOLOGY

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVE:

The course provides the basic concepts of bioenergetics, mechanisms of oxidative phosphorylation and photophosphorylation and also imparts the knowledge about the composition and structure of bio membranes, transport mechanisms across biological membranes.

UNIT I INTRODUCTION TO BIOENERGETICS 12

Bioenergetics: Definition. Entropy, enthalpy and standard free energy; First and second laws of thermodynamics, standard reduction potentials, membrane potential. Coupled reactions, ATP cycle, phosphorylation potential. Standard energy of hydrolysis of ATP, PEP, 1,3 BPG and thioesters. Redox reactions and Nernst equation. Universal electron carriers.

UNIT II BIO MEMBRANES 12

Historical background, Types of membrane models. Functions of cell membrane. Composition of bio membranes: Lipids - Phospholipids, Glycolipids, sterols; Proteins- Peripheral Proteins, Integral Membrane Proteins and Lipid-Anchored proteins, and carbohydrates. Comparison of the composition of various cellular and subcellular membranes. Role of Flippase, Floppase and Scramblase.

UNIT III MEMBRANE DYNAMICS 12

Membrane fluidity: Definition, Rotational motion, Lateral diffusion and transverse diffusion of lipids. Membrane rafts and caveolins. Factors affecting membrane fluidity: Lipid Composition and Degree of Unsaturation, Cholesterol. Cytoskeleton: Structure and functions of microfilaments, microtubules and intermediate filaments. Techniques to study membrane dynamics: FRAP and TNBS.

UNIT IV TRANSPORT ACROSS MEMBRANES 12

Plasma membrane: composition and function. Transport mechanisms: simple diffusion, osmosis, facilitated diffusion, uniport, antiport, symport and bulk transport (ion channels,

exocytosis, endocytosis, pinocytosis and phagocytosis). Movement of Water (Structure & Function of Aquaporins)

UNIT V PHOSPHORYLATION **12**

Oxidative phosphorylation: Mechanism of oxidative phosphorylation. The electron transport chain - its organization and function. Sequence of electron transport, Peter Mitchell's chemiosmotic theory and Proton gradient. Mechanism of ATP synthesis. Photophosphorylation, Hill reaction. Cyclic and non-cyclic photophosphorylation and its significance.

Total: 60 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Explain the basic concepts of Bioenergetics and thermodynamics.

CO2: Develop an understanding of the fundamental aspects of composition and functioning of biological membranes.

CO3: Compare the techniques to study membrane dynamics that are used for studies of membrane proteins.

CO4: Summarize the transport mechanisms across biological membranes.

CO5: Develop a knowledge and understanding of the possibilities to apply bioenergetics to solve fundamental problems in biomedicine and to use for the applied research in biotechnology.

Text Books:

1. Lehninger: Principles of Biochemistry (2013) 6th edition., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 ISBN: 10:1-4641- 0962-1.
2. Molecular Cell Biology (2013) 7th edition., Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A. and Scott, M.P. W.H. Freeman & Company (New York), 1SBN:13:978-1-4641-0981-2.

Reference Books:

1. Principles of Biochemistry (2008) 3rd edition., Voet, D.J., Voet, J.G. and Pratt, C.W., John Wiley & Sons, Inc. (New York), ISBN:13: 978-0470-23396-2.
2. Biochemistry (2010) 4th Edition., Garret, R. H. and Grisham, C.M., Cengage Learning (Boston), ISBN-13:978-0-495-11464-2.

Web Sources:

1. https://www.nmr.sinica.edu.tw/~thh/lectures/Biophysics/Chap_3Bioenergetics.pdf
2. https://egyankosh.ac.in/bitstream/123456789/74983/1/Unit-3.pdf

24DBBC22 **MOLECULAR EVOLUTION**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVE

The course integrates the descriptive, experimental and biochemical approaches into a conceptual framework for the analysis of development. The course deals with key steps in the transformation of the single-celled zygote into the complex, multicellular, adult organisms and links genetics with embryology.

UNIT-I EVOLUTION AND FERTILIZATION (12)

Introduction, history and evolution – an overview. Development among unicellular eukaryotes Acetabularis, Nigeria. The origins of sexual reproduction. Fertilization: structure of gametes, recognition of sperm and egg –action at distance and contact of gametes. Cleavage: Patterns of embryonic cleavage, radial holoblastic cleavage, spiral holoblastic cleavage, mechanisms of cleavage –regulation of cleavage cycles.

UNIT II MODEL ORGANISMS (12)

Major model organisms. Availability/ culture and cost; access and micromanipulation. Examples: Drosophila, zebrafish, Caenorhabditis elegans, chicks

UNIT III EMBRYONIC DEVELOPMENT IN ANIMALS (12)

Early Embryonic Development, morphogenesis and organogenesis in animals: Blastula formation, Types of Cleavage, Gastrulation and formation of germ layers in animals. Cell aggregation and differentiation in Dictyostelium; axes and pattern formation in Drosophila, organogenesis –vulva formation in Caenorhabditis elegans; eye lens induction, limb development in vertebrates, neuron differentiation, larval formation, metamorphosis; environmental regulation of normal development.

UNIT IV EARLY EMBRYONIC DEVELOPMENT IN PLANTS (12)

Early Embryonic Development in plants: Gametogenesis, Fertilization, Embryo sac development and double fertilization in plants.

UNIT V REGENERATION AND APOPTOSIS (12)

Cell death and regeneration. Concept of regeneration; cell cycle, programmed cell death; aging and senescence. Basics of cancer development

Total: 60 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Develop knowledge and understand the biological process increases by using a historical approach to science.

CO2: Explain the molecular mechanisms that underlie animal development

CO3: Explain underlying developmental biology processes during tissue development and organogenesis

CO4: Develop an understanding about the basic concepts of developmental biology

CO5: Compare and contrast the different process of differentiation to many different types of cells and tissues.

Text Books:

1. T. Subramoniam, Molecular developmental biology. 2nd Edition, 2011.
2. Manju Yadav, Molecular Developmental Biology. Discovery Publishing Pvt. Ltd. 2008.

Reference Books:

1. Scott F. Gilbert, Susan Singer, Developmental Biology. Sinauer Associates Inc.; 8th ed, 2006.
2. Jonathan M. W. Slack, Essential Developmental Biology. Wiley-Blackwell. 3rd Edition, 2012.

Web Sources:

1. https://plato.stanford.edu/entries/biology-developmental/
2. https://edisciplinas.usp.br/pluginfile.php/4481131/mod_resource/content/1/Princeton%20Encyclopedia%20verbete%20de%20evolu%C3%A7%C3%A3o%20molecular.pdf

24PBBC21 **ANALYTICAL BIOCHEMISTRY**

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVES

To isolate and separation of biomolecules from various sources, analyze the presence of specific molecules in isolated sample by different qualitative tests and estimate those molecules in each source

LIST OF EXPERIMENTS

1. Separation of sugars by ascending paper chromatography.
2. Separation of sugars by descending paper chromatography.
3. Separation of amino acids by ascending paper chromatography
4. Separation of amino acids by descending paper chromatography.
5. Separation of amino acids by two dimensional chromatography.
6. Separation of amino acids by radial paper chromatography.
7. Separation of sugars by thin layer chromatography.
8. Separation of amino acids by thin layer chromatography.
9. Separation of lipids by thin layer chromatography.
10. Separation of plant pigments by column chromatography.
11. Separation of proteins by Gel Filtration Chromatography. (Demonstration)
12. Separation of lipoproteins by electrophoresis (Demonstration)

Course Outcomes:

At the end of this course students will be able to,

CO1: Describe the instrumentation required for the various separation techniques and their associated operating principles. Understand the significance, quality, and limitations of the results produced by the various separation techniques.

CO2: Select the operating conditions (mobile phase, temperature, flow rate, program rate, etc.) for the various separation techniques. Gain Knowledge of phase equilibria in two-component and multi-component systems.

CO3: Analyze the separation system for multi-component mixtures. Get the Ability to design separation system for the effective solution of intended

CO4: Acquire the Ability to select appropriate separation technique.

CO5: Chose the operating conditions (mobile phase, temperature, flow rate, program rate, etc.

Text Books

1. J. Jayaraman (2011) (paperback), Laboratory Manual in Biochemistry, New Age International Pvt Ltd Publishers.
2. S. Sadasivam, A. Manickam (2009) (paperback), Biochemical Methods, New age publishers.

Reference Books

1. Harold Varley (2006), Practical Clinical Biochemistry, 6 edition, CBS.
2. S. K. Sawhney, Randhir Singh (2005), Introductory Practical Biochemistry, 2nd edition, Alpha Science International, Ltd.

Web Sources:

1. https://unacademy.com/lesson/biochemical-separation-techniques-a-brief-overview/NV7POVI5
2. https://www.studocu.com/en-au/document/university-of-technology sydney/haematology-1/analytical-biochemistry-notes/14979547

24PBBC22 **ENZYMOLOGY**

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVE

The aim of the laboratory practices is to acquire knowledge about determination of enzyme activities. A part of the practices is optimization of conditions for enzymes isolation, inhibition of enzyme reactions, study of factors that influence enzyme activity and study of enzyme kinetics. During the course of the practices, students are directed to master practical enzyme assays and immobilization techniques.

LIST OF EXPERIMENTS

1. Purification of an enzyme from any natural resource
2. Quantitative estimation of proteins by Bradford/Lowry's method.
3. Calculation of kinetic parameters such as Km, Vmax, Kcat
4. Determination of Optimum pH of Acid Phosphatase
5. Determination of Optimum temperature of Acid Phosphatase.
6. Determination of specific activity of Acid Phosphatase.
7. Determination of Optimum pH of Alkaline Phosphatase
8. Determination of specific activity of Alkaline Phosphatase
9. Determination of Optimum pH of Salivary Amylase.
10. Determination of specific activity of Salivary Amylase.
11. Isoenzyme Separation - Lactate Dehydrogenase
12. Activity Staining - SOD

Course Outcome:

At the end of this course students will be able to,

CO1: Acquire knowledge in the qualitative estimation of biological biomolecules

CO2: Understand the different chemical reaction & principles of biomolecules

CO3: Identify the given solution as carbohydrate or amino acid/protein

CO4: Understand the different chemical preparation of biomolecules

CO5: Learn safety and precautionary measures for working in a laboratory and learn the handling ofmicroscope and other laboratory instruments individually.

Text Books:

1. Sawhney, S. K., and Randhir Singh (2000), Introductory practical biochemistry, Alpha Science Int'l Ltd.

Reference Books:

1. Bisswanger, Hans (2013), Practical enzymology. John Wiley & Sons.
2. Wilchek, Meir and Edward A. Bayer (1990), "Methods in enzymology."

Web Sources:

1.https://www.studocu.com/in/document/amityuniversity/enzymology/experiment4enzymologypractical/9897190

2. https://nios.ac.in/media/documents/dmlt/Biochemistry/Lesson-23.pdf

24DVAC21 COMMUNICATION SKILLS

L	T	P	O	C
2	0	0	1	2

COURSE OBJECTIVES:

CO1: To develop effective verbal and non-verbal communication techniques for various contexts.

CO2: To enhance listening skills for better comprehension and engagement in conversations.

CO3: To improve written communication abilities, focusing on clarity, coherence, and style.

CO4: To build confidence in public speaking through practice and constructive feedback.

CO5: To cultivate interpersonal skills for successful collaboration and professional interactions.

Credit Hours

UNIT I –INTRODUCTION TO COMMUNICATION SKILLS 6

- Fundamentals of Communications
- Elements of Communication, Types of Communication

UNIT II - PRACTICAL ENGLISH 6

- Importance of the language - Word Usage and Jargon
- Tenses and the effectiveness - Basics of grammar (Noun/Verb/Adverb/Conjunction)

UNIT III - EFFECTIVE COMMUNICATION 6

- LSRW (Listening, Speaking, Reading & Writing)
- Pronunciation - Vocabulary Building
- Intonations & its importance

UNIT IV - WORKPLACE COMMUNICATION 6

- Basics of telephone etiquette
- E-Mail writing
- Presentation Skills
- Interpersonal Skills
- Business English

UNIT V - QUANTITATIVE ABILITY 6

- Verbal Ability - Verbal Analogy
- Debating Skills - Public Speaking

Total 30 Hours

COURSE OUTCOMES:

At the end of this course, the students would have learnt to

COC1 enhance participants' business communication skills

COC2 enhance LSRW Skills (LSRW – Listening, Speaking, Reading & Writing)

COC3 express opinions at free will in social/ personal gathering

COC4 impact leadership qualities among participants

COC5 engage in conversation with others to exchange ideas

REFERENCES:

1. Andreja. J. Ruther Ford (2011), Basic communication skills for Technology, 2nd Edition, Pearson Education,
2. Barun K Mitra Elizabeth Harren (2023), 7 April 2022, last updated: 16 November,
3. Kerry Patterson, Joseph Grenny, Ron McMillan, Al Switzler (McGraw-Hill)
4. Ethan Beute and Stephen Pacinelli (Greenleaf)
5. Francis Peters SJ (2011), Soft skills and professional communication, 1st Edition, McGraw Hill Education
6. Soft skills and professional communication, Francis Peters SJ, 1stEdition, McGraw Hill Education, 2011

24SSKU21 **SOFT SKILLS II**

L	T	P	O	C
2	0	0	1	2

COURSE OBJECTIVES

CO1: To develop strategies to enhance teamwork and collaboration in professional settings.

CO2: To cultivate a positive attitude and mindset to foster constructive relationships and productivity.

CO3: To impact leadership, Decision-making, Behaviour and team bonding skills

Credit Hours

UNIT I - PROFESSIONAL BEHAVIOUR 6

- Team Building – Team Bonding
- Inter-Personal Relationship– Intra-Personal Relationship

UNIT II - PERSONALITY DEVELOPMENT 6

- Types of Personality
- Self-Confidence - Confidence Building
- Attitude (Positive/Negative)

UNIT III - TELEPHONE ETIQUETTE 6

- Basics of telephone etiquette
- Giving clear and concise information
- Tone & rate of speech
- Intonations & its Importance
- Whatsapp Communications

UNIT IV - DECISION MAKING 6

- Types of Decisions – planned-unplanned, individual-group, major-minor
- Types of Leadership styles – Autocratic, democratic, lesse-faire, participative, bureaucratic.

UNIT V- PROFESSIONAL ETIQUETTE 6

- Respect – Salutations
- Official Behaviour

Total 30 Hours

COURSE OUTCOMES:

At the end of this course, the students would have learnt to

- COC1: understand the principles of effective team building and apply strategies to foster team bonding and cohesion in professional settings.
- COC2: become self-confident individuals by mastering interpersonal skills, team management skills, and leadership skills.
- COC3: practice techniques for effective communication in telephone conversations.
- COC4: evaluate decision-making processes and their implications in professional settings.
- COC5: exhibit professional conduct and demeanor in various professional situations.

REFERENCES:

- Language Service, University at Oberta de Catalunya
- Taylor. Grant (2005), English Conversation Practice. Tata McGraw Hill Education Pvt. Ltd
- Tiko, Champa & Jaya Sasikumar (1979) Writing with a purpose. OUP New Delhi.
- Alex, Dr. K. (2014). Soft Skills (1st edition) S Chand & Company.
- Nelson-Jones, R. (1992). Life skills, a handbook, Trowbridge, Wilts: Detesios Ltd.



INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)
PALLAVARAM, THALAMBUR, PERIYAPALAYAM-CHENNAI
ACCREDITED BY NAAC WITH 'A++' GRADE

UNDERGRADUATE DEGREE PROGRAMME

B.Sc., Biochemistry

Three Years

/

B.Sc., (Hons) Biochemistry

Four Years

CURRICULUM & SYLLABUS

REGULATION 2024

Choice Based Credit System (CBCS)

&

Learning Outcomes based Curriculum Framework (LOCF)

Effective from the Academic year

2024-2025

Department of Biochemistry

School of Life Sciences

VELS
INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)
PALLAVARAM, THALAMBUR, PERIYAPALAYAM-CHENNAI
ACCREDITED BY NAAC WITH 'A++' GRADE

DEPARTMENT OF BIOCHEMISTRY

VISION OF THE DEPARTMENT

1. To gain global recognition within the scientific community, distinguished by expertise and excellence in the field of Biochemistry.
2. To foster an environment conducive to critical thinking, enabling the discernment and interconnectedness of diverse branches such as cell biology, intermediary metabolism, clinical biochemistry, immunology, enzymology, and endocrinology.

MISSION OF THE DEPARTMENT

M1	To achieve proficiency in the fundamental concepts and principles of Biochemistry
M2	To recognize issues within research protocols in key areas, where the expertise of a biochemist is indispensable.
M3	To acquaint students with research domains and advanced instrumentation techniques.
M4	To explore the correlation between human-induced environmental factors and biochemical alterations in biological organisms, and their implications for human health.
M5	To grasp scientific learning concepts for experimentation and hypothesis validation processes.
M6	To cultivate a robust understanding of practical biochemistry and its societal applications for the greater good.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)	
PEO-1:	To adeptly integrate foundational knowledge from various scientific disciplines in an interdisciplinary fashion, fostering the generation of innovative solutions to globally impactful challenges.
PEO-2:	To proficiently evaluate scientific information, discerning objective insights, and employing this understanding for the betterment of humanity. Students should demonstrate both expertise and ethical awareness in Biochemistry-related domains.
PEO-3:	Upon program completion, students will be well-equipped to pursue diverse career paths in academia, research, and industry, particularly within pharmaceutical and biotechnology sectors.
PEO-4:	To instill a commitment to lifelong learning, enabling the continual development and application of scientific skills for personal and professional growth, including their practical application in everyday life.
PEO-5:	To foster a comprehensive understanding and disciplinary expertise in Biochemistry, encompassing the structures, functions, and mechanisms of biological molecules.

PROGRAM OUTCOME (PO)	
PO-1	**Scientific Intellect**: Graduates will attain specialized knowledge in biochemistry, biotechnology, bioinformatics, or microbiology, including proficiency in contemporary techniques within their respective fields, alongside hands-on and leadership capabilities essential for career success.
PO-2	**Problem Solving**: Graduates will demonstrate the ability to analyze, resolve, and troubleshoot challenges encountered during the implementation of biochemistry, biotechnology, or microbiological protocols.
PO-3	**Solution Design and Development**: Graduates will cultivate creative thinking and collaborative skills to address issues within the realms of biochemistry, biotechnology, bioinformatics, or microbiology.
PO-4	**Complex Problem Investigation**: Graduates will develop practical competencies, enabling them to plan and devise protocols for hypothesis validation, independently execute experimental techniques, and effectively assimilate, analyze, and interpret resultant data.
PO-5	**Utilization of Modern Tools and Communication**: Graduates will proficiently utilize information and communication technologies (ICT) and computer-enabled devices to manage resources and time efficiently, while also possessing the ability to comprehensively understand and communicate ideas.

PO-6	**Environmental Sustainability and Ethical Awareness**: Graduates will acquire sufficient knowledge to implement solutions for environmental protection and remediation, with an understanding of their roles and responsibilities in the handling and utilization of microbes, including genetically modified microorganisms
PO-7	**Commitment to Lifelong Learning**: Graduates will exhibit a continuous learning mindset, adapting to the ever-evolving landscape of technology and knowledge.

PROGRAMME SPECIFIC OUTCOME (PSO)	
PSO1:	To develop a profound understanding of both theoretical and practical aspects of Biochemistry, enabling the application of this knowledge to devise cost-effective solutions within the field.
PSO2:	To comprehend the technical intricacies of current technologies essential for tackling the biological and medical hurdles encountered by humanity.
PSO3:	To utilize Biochemistry knowledge effectively in addressing environmental, intellectual, societal, and ethical concerns, as demonstrated through class-presented case studies.

:

BOARD OF STUDIES

List of Members

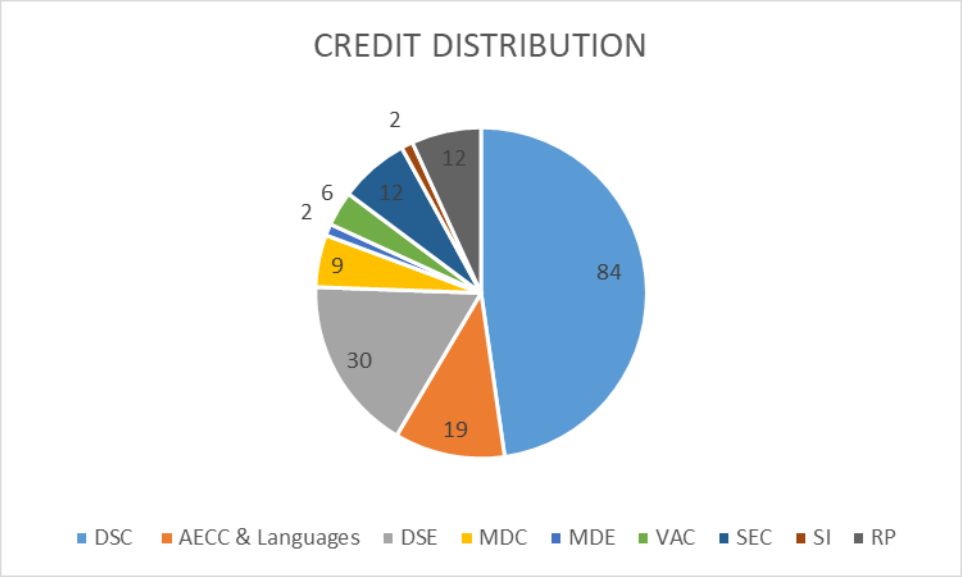
Department of Biochemistry

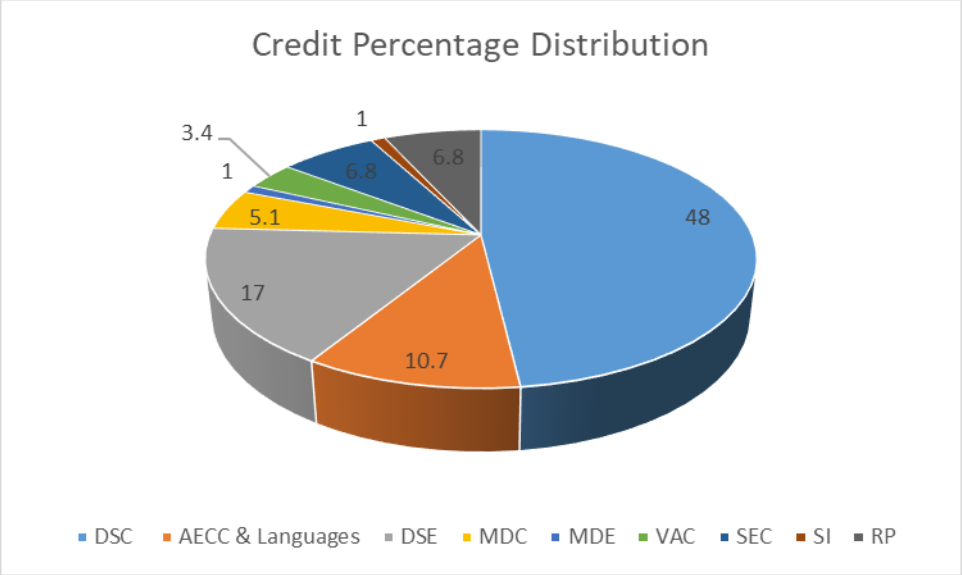
S. No.	Name & Designation	Address	Role
1	Dr.B.Usharani	Associate Professor and Head i/c, Department of Biochemistry, VISTAS, Chennai	Chair person
2	Dr. V. Anuradha	Associate Professor and Head, Department of Biochemistry, Mohamed Sathak College of Arts and Science, Chennai	External expert-Academic
3	Dr. Savitri Shivkumar	Managing director, Aaranya Biosciences, Women's Biotech Park, Siruseri, Chennai	External expert-Industry
4	Dr. R. Padmini	Associate Professor, Department of Biochemistry, VISTAS, Chennai	Internal Member
5	Dr. C. Shobana	Associate Professor, Department of Biochemistry, VISTAS, Chennai	Internal Member
6	Dr. R. Vidya	Assistant Professor, Department of Biochemistry, VISTAS, Chennai	Internal Member
7	Dr. P. Amudha	Assistant Professor, Department of Biochemistry, VISTAS, Chennai	Internal Member
8	Ms. Aarthi	Assistant Professor, Arcot Sri Mahalakshmi Arts and Science College, Villapakkam, Ranipet district	Alumni (MSc Biochemistry-2019-2021 batch)

CREDIT DISTRIBUTION

B.Sc., (Hons) in Biochemistry
Maximum credits to be earned: 176
B.Sc., Biochemistry
Minimum credits to be earned: 132

Component	I Sem	II Sem	III Sem	IV Sem	V Sem	VI Sem	3 Yrs. Total Credits	VII Sem	VIII Sem	4 Yrs. Total Credits
DSC	8	8	8	8	12	16	60	12	12	84
AECC & Languages	4	4	4	7	-	-	19	-	-	19
DSE / IDC / Minor	4	4	3	4	4	3	22	4	4	30
MDC	3	3	3	-	-	-	9	-	-	9
MDE	-	-	2	-	-	-	2	-	-	2
VAC	1	2	-	1	2	-	6	-	-	6
SEC	2	2	2	2	2	2	12	-	-	12
SI	-	-	1	-	1	-	2	-	-	2
RP	-	-	-	-	-	-	-	6	6	12
Total Credits	**22**	**23**	**23**	**22**	**21**	**21**	**132**	**22**	**22**	**176**





ABBREVIATIONS

DSC	Disciplinary Specific Core
AECC	Ability Enhancement Compulsory Courses
DSE	Disciplinary Specific Elective
IDC	Interdisciplinary / Minor Courses
MDC	Multidisciplinary Courses
MDE	Multidisciplinary Elective
VAC	Value Added Courses
SEC	Skill Enhancement Courses
SI	Summer Internship
RP	Research Project

CURRICULUM STRUCTURE

B.Sc., (Hons) in Biochemistry Three Years
B.Sc., Biochemistry Four Years

Total number of Credits: 176

B.Sc Biochemistry Hons Maximum Credits to be earned :176

B.Sc., Biochemistry Minimum Credits to be earned: 132

SEMESTER 1

			Hours/Week					Maximum Marks		
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
LANG 1	24LTAM11/ 24LHIN11/ 24LFRE11	Tamil I / Hindi I/ French I	2	0	0	1	2	40	60	100
ENG 1	24LENG11	English I	2	0	0	1	2	40	60	100
DSC 1	24CBBC11	Introduction to Biomolecules	3	0	0	2	3	40	60	100
DSC 2	24CBBC12	Human Physiology	4	0	0	2	4	40	60	100
MDC 1	24MBBC11	Basic concepts in Nutrition	3	0	0	2	3	40	60	100
DSE 1/ IDC 1 / Minor 1	24DBBC1-	Discipline Specific Elective-I	4	0	0	2	4	40	60	100
DSC 1 (Lab)	24PBBC11	Practical I Qualitative analysis of Biomolecules	0	0	2	1	1	40	60	100
VAC 1	24DVAC11	Universal Human Values	1	0	0	1	1	-	100	100
SEC 1	24SSKU11	Soft Skills 1	2	0	0	1	2	40	60	100
SEC 2		Orientation Programme / Industrial Visit	-	-	-	-	-	-	-	-
			21	-	2	-	22	-	-	-

CIA - Continuous Internal Assessment SEE - Semester End Examination

*L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study, *C-Credits

SEMESTER 2										
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
LANG 2	24LTAM21/ 24LHIN21/ 24LFRE21	Tamil II / Hindi II / French II	2	0	0	1	2	40	60	100
ENG 2	24LENG21	English II	2	0	0	1	2	40	60	100
DSC 3	24CBBC21	Analytical Techniques	3	0	0	2	3	40	60	100
DSC 4	24CBBC22	Enzymology	3	0	0	2	3	40	60	100
MDC 2	24MBBC21	Hospital Management	3	0	0	2	3	40	60	100
DSE 2 / IDC 2 / Minor 2	24DBBC2-	Discipline Specific Elective-II	4	0	0	2	4	40	60	100
DSC 3 (Lab)	24PBBC21	Practical II Analytical biochemistry	0	0	2	1	1	40	60	100
DSC 4 (Lab)	24PBBC22	Practical III Enzymology	0	0	2	1	1	40	60	100
VAC 2	24DVAC21	Communication Skills	2	0	0	1	2	40	60	100
SEC 3	24SSKU21	Soft Skills II	2	0	0	1	2	40	60	100
			21	-	4	-	23	-	-	-

CIA - Continuous Internal Assessment SEE - Semester End Examination

*L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study, *C-Credits

SEMESTER 3										
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
LANG 3	24LTAM31/ 24LHIN31/ 24LFRE31	Tamil III / Hindi III / French III	2	0	0	1	2	40	60	100
ENG 3	24LENG31	English III	2	0	0	1	2	40	60	100
DSC 5	24CBBC31	Hematology	3	0	0	2	3	40	60	100
DSC 6	24CBBC32	Clinical Biochemistry	3	0	0	2	3	40	60	100
MDC 3	24MBBC31	Bio-medical Instrumentation	3	0	0	2	3	40	60	100
DSE 3 / IDC 3 / Minor 3	24DBBC3-	Discipline Specific Elective-III	3	0	0	2	3	40	60	100
DSC 5 (Lab)	24PBBC31	Practical IV Hematology	0	0	2	1	1	40	60	100
DSC 6 (Lab)	24PBBC32	Practical V Clinical Biochemistry	0	0	2	1	1	40	60	100
MDE		Indian Knowledge system	1	1	0	1	2	40	60	100
SEC 4	24SSKU31	Soft Skills III	2	0	0	1	2	40	60	100
SI 1	24IBBC31	Internship I	0	0	2	1	1	-	100	100
			19	1	6	-	23	-	-	-

CIA - Continuous Internal Assessment SEE - Semester End Examination

*L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study, *C-Credits

SEMESTER 4										
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
LANG 4	24LTAM41/ 24LHIN41/ 24LFRE41	Tamil IV / Hindi IV / French IV	2	0	0	1	2	40	60	100
ENG 4	24LENG41	English IV	2	0	0	1	2	40	60	100
AECC1	24EVS031	Environmental Studies	3	0	0	2	3	40	60	100
DSC 7	24CBBC41	Cell Biology	3	0	0	2	3	40	60	100
DSC 8	24CBBC42	Immunology	3	0	0	2	3	40	60	100
DSE 4 / IDC 4 / Minor 4	24DBBC4-	Discipline Specific Elective-IV	4	0	0	2	4	40	60	100
DSC 7 (Lab)	24PBBC41	Practical VI Methods in Cell Biology	0	0	2	1	1	40	60	100
DSC 8 (Lab)	24PBBC42	Practical VII Immunology	0	0	2	1	1	40	60	100
SEC 5	24SBBC41	Industry Oriented Employability skills	1	0	2	1	2	-	100	100
VAC 3	24DVAC41	Yoga Education / NSS / NCC	0	0	2	1	1	-	100	100
SEC 6		In-plant Training/ Industrial Tour/ Summer Term	-	-	-	-	-	-	-	-
			18	-	8	-	22	-	-	-

CIA - Continuous Internal Assessment SEE - Semester End Examination

*L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study, *C-Credits

SEMESTER 5										
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CA**	**SEE**	**Total**
DSC 9	24CBBC51	Molecular Biology	3	0	0	2	3	40	60	100
DSC 10	24CBBC52	Intermediary Metabolism	3	0	0	2	3	40	60	100
DSC 11	24CBBC53	Plant Biochemistry	4	0	0	2	4	40	60	100
DSE 5 / IDC 5 / Minor 5	24DBBC5-	Discipline Specific Elective-V	4	0	0	2	4	40	60	100
DSC 9 (Lab)	24PBBC51	Practical VIII Molecular Biology	0	0	2	1	1	40	60	100
DSC 10 (Lab)	24PBBC52	Practical IX Plant Biochemistry	0	0	2	1	1	40	60	100
SEC 7	24SBBC51	Entrepreneurial Development	2	0	0	1	2	40	60	100
VAC 4	24DVAC51	Medical Coding	2	0	0	1	2	40	60	100
SI 2	24IBBC51	Internship II	0	0	2	1	1	-	100	100
SEC 8		Skill Enhancement Training / Student Club Activities/ Institution Innovation Council (IIC)Activities	-	-	-	-	-	-	100	100
			18	-	6	-	21	-	-	-

CIA - Continuous Internal Assessment SEE - Semester End Examination

*L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study, *C-Credits

SEMESTER 6										
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CA**	**SEE**	**Total**
DSC 12	24CBBC61	Tissue culture	3	0	0	2	3	40	60	100
DSC 13	24CBBC62	Pharmaceutical Biochemistry	4	0	0	2	4	40	60	100
DSC 14	24CBBC63	Ecology & Environmental Toxicology	4	0	0	2	4	40	60	100
DSC 15	24CBBC64	Forensic Science	4	0	0	2	4	40	60	100
DSE 6 / IDC 6 / Minor 6	24DBBC6-	Discipline Specific Elective-VI	3	0	0	2	3	40	60	100
DSC 12 (Lab)	24PBBC61	Practical X Cell Culture Techniques	0	0	2	1	1	40	60	100
SEC 9	24SBBC61	Mini Project	0	0	4	1	2	-	100	100
SEC 10		On Job Training / Apprenticeship / Startup	-	-	-	-	-	-	-	-
			18	-	6	-	21	-	-	-

CIA - Continuous Internal Assessment SEE - Semester End Examination

*L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study, *C-Credits

SEMESTER 7										
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CA**	**SEE**	**Total**
DSC 16	24CBBC71	Genetics	3	0	0	2	3	40	60	100
DSC 17	24CBBC72	Molecular Developmental Biology	4	0	0	2	4	40	60	100
DSC 18	24CBBC73	Biochemistry of Cell Signaling	4	0	0	2	4	40	60	100
DSE 7 / IDC 7 / Minor 7	24DBBC7-	Discipline Specific Elective-VII	4	0	0	2	4	40	60	100
DSC 16 (Lab)	24PBBC71	PracticaXI Genetics	0	0	2	1	1	40	60	100
RP 1	24RBBC71	Research Project I	0	0	12	4	6	40	60	100
			15	-	14	-	22	-	-	-

CIA - Continuous Internal Assessment SEE - Semester End Examination

*L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study, *C-Credits

SEMESTER 8										
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CA**	**SEE**	**Total**
DSC 19	24CBBC81	Molecular Basis of Infectious Disease	3	0	0	2	3	40	60	100
DSC 20	24CBBC82	Omics Technology	3	0	0	2	3	40	60	100
DSC 21	24CBBC83	Applied Biotechnology	4	0	0	2	4	40	60	100
DSE 8 / IDC 8 / Minor 8	24DBBC8-	Discipline Specific Elective-VIII	4	0	0	2	4	40	60	100
DSC 19 (Lab)	24PBBC81	Practical XII – Infectious Biology	0	0	2	1	1	40	60	100
DSC 20 (Lab)	24PBBC82	Practical XIII- Bioinformatics	0	0	2	1	1	40	60	100
RP 2	24RBBC81	Research Project II	0	0	12	4	6	40	60	100
			14	-	16	-	22	-	-	-

CIA - Continuous Internal Assessment SEE - Semester End Examination

*L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study, *C-Credits

DISCIPLINE SPECIFIC CORE COURSES

Category	Code	Course	L	T	P	O	C
DSC 1	24CBBC11	Introduction to Biomolecules	3	0	0	2	3
DSC 2	24CBBC12	Human Physiology	4	0	0	2	4
DSC 1 (Lab)	24PBBC11	Practical I Qualitative analysis of Biomolecules	0	0	2	1	1
DSC 3	24CBBC21	Analytical Techniques	3	0	0	2	3
DSC 4	24CBBC22	Enzymology	3	0	0	2	3
DSC 3 (Lab)	24PBBC21	Practical II Analytical Biochemistry	0	0	2	1	1
DSC 4 (Lab)	24PBBC22	Practical III Enzymology	0	0	2	1	1
DSC 5	24CBBC31	Hematology	3	0	0	2	3
DSC 6	24CBBC32	Clinical Biochemistry	3	0	0	2	3
DSC 5 (Lab)	24PBBC31	Practical IV Hematology	0	0	2	1	1
DSC 6 (Lab)	24PBBC32	Practical V Clinical Biochemistry	0	0	2	1	1
DSC 7	24CBBC41	Cell Biology	3	0	0	2	3
DSC 8	24CBBC42	Immunology	3	0	0	2	3
DSC 7 (Lab)	24PBBC41	Practical VI Methods in Cell Biology	0	0	2	1	1
DSC 8 (Lab)	24PBBC42	Practical VII Immunology	0	0	2	1	1
DSC 9	24CBBC51	Molecular Biology	3	0	0	2	3
DSC 10	24CBBC52	Intermediary Metabolism	3	0	0	2	3
DSC 11	24CBBC53	Plant Biochemistry	4	0	0	2	4
DSC 9 (Lab)	24PBBC51	Practical VIII Molecular Biology	0	0	2	1	1
DSC 10 (Lab)	24PBBC52	Practical IX Plant Biochemistry	0	0	2	1	1
DSC 12	24CBBC61	Tissue culture	3	0	0	2	3
DSC 13	24CBBC62	Pharmaceutical Biochemistry	4	0	0	2	4
DSC 14	24CBBC63	Ecology & Environmental Toxicology	4	0	0	2	4
DSC 15	24CBBC64	Forensic Science	4	0	0	2	4
DSC 12 (Lab)	24PBBC61	Practical X Cell Culture Techniques	0	0	2	1	1
DSC 16	24CBBC71	Genetics	3	0	0	2	3
DSC 17	24CBBC72	Molecular Developmental	4	0	0	2	4

		Biology					
DSC 18	24CBBC73	Biochemistry of Cell Signaling	4	0	0	2	4
DSC 16 (Lab)	24PBBC71	Practical XI Genetics	0	0	2	1	1
DSC 19	24CBBC81	Molecular Basis of Infectious Disease	3	0	0	2	3
DSC 20	24CBBC82	Omics Technology	3	0	0	2	3
DSC 21	24CBBC83	Applied Biotechnology	4	0	0	2	4
DSC 19 (Lab)	24PBBC81	Practical XII – Infectious Biology	0	0	2	1	1
DSC 20 (Lab)	24PBBC82	Practical XIII- Bioinformatics	0	0	2	1	1

DISCIPLINE SPECIFIC ELECTIVE COURSES

Category	Code	Course	L	T	P	O	C
DSE 1	24DBBC11	LIFESTYLE DISEASES	4	0	0	2	4
	24DBBC12	STEM CELL BIOLOGY	4	0	0	2	4
DSE 2	24DBBC21	BIOENERGETICS AND MEMBRANE BIOLOGY	4	0	0	2	4
	24DBBC22	MOLECULAR EVOLUTION	4	0	0	2	4
DSE 3	24DBBC31	PATHOLOGY	3	0	0	2	3
	24DBBC32	CANCER BIOLOGY	3	0	0	2	3
DSE 4	24DBBC41	ENDOCRINOLOGY	4	0	0	2	4
	24DBBC42	NEUROBIOLOGY	4	0	0	2	4
DSE 5	24DBBC51	APPLIED MICROBIOLOGY	4	0	0	2	4
	24DBBC52	SKILLS IN BIOCHEMISTRY	4	0	0	2	4
DSE 6	24DBBC61	BIOINFORMATICS	3	0	0	2	3
	24DBBC62	DRUG DESIGNING	3	0	0	2	3
DSE 7	24DBBC71	RESEARCH METHODOLOGY	4	0	0	2	4
	24DBBC72	CLINICAL RESEARCH	4	0	0	2	4
DSE 8	24DBBC81	TISSUE ENGINEERING AND REGENERATIVE MEDICINE	4	0	0	2	4
	24DBBC82	ENTREPRENEURSHIP DEVELOPMENT IN BIOCHEMISTRY	4	0	0	2	4

AECC & LANGUAGES

Category	Code	Course	L	T	P	O	C
LANG 1	24LTAM11/ 24LHIN11/ 24LFRE11	Tamil I / Hindi I/ French I	2	0	0	1	2
ENG 1	24LENG11	English I	2	0	0	1	2
LANG 2	24LTAM21/ 24LHIN21/ 24LFRE21	Tamil II / Hindi II / French II	2	0	0	1	2
ENG 2	24LENG21	English II	2	0	0	1	2
LANG 3	24LTAM31/ 24LHIN31/ 24LFRE31	Tamil III / Hindi III / French III	2	0	0	1	2
ENG 3	24LENG31	English III	2	0	0	1	2
LANG 4	24LTAM41/ 24LHIN41/ 24LFRE41	Tamil IV / Hindi IV / French IV	2	0	0	1	2
ENG 4	24LENG31	English IV	2	0	0	1	2
AECC 1	24EVS031	Environmental Studies	3	0	0	2	3

MULTIDISCIPLINARY COURSES

Category	Code	Course	L	T	P	O	C
MDC 1	24MBBC11	Basic concepts in Nutrition	3	0	0	2	3
MDC 2	24MBBC21	Hospital Management	3	0	0	2	3
MDC 3	24MBBC31	Bio-medical Instrumentation	3	0	0	2	3

MULTIDISCIPLINARY ELECTIVE

Category	Code	Course	L	T	P	O	C
MDE1		Indian Knowledge System	1	1	0	1	2

VALUE ADDED COURSES

Category	Code	Course	L	T	P	O	C
VAC 1	24DVAC11	Universal Human Values	1	0	0	1	1
VAC 2	24DVAC21	Communication Skills	2	0	0	1	2
VAC 3	24DVAC41	Yoga Education / NSS / NCC	0	0	2	1	1
VAC 4	24DVAC51	Medical Coding	2	0	0	1	2

SKILL ENHANCEMENT COURSES

Category	Code	Course	L	T	P	O	C
SEC 1	24SSKU11	Soft Skills 1	2	0	0	1	2
SEC 2		Orientation Programme / Industrial Visit	-	-	-	-	-
SEC 3	24SSKU21	Soft Skills II	2	0	0	1	2
SEC 4	24SSKU31	Soft Skills III	2	0	0	1	2
SEC 5	24SBBC41	Industry Oriented Employability skills	1	0	2	1	2
SEC 6		In-plant Training/ Industrial Tour/ Summer Term	-	-	-	-	-
SEC 7	24SBBC51	Entrepreneurial Development	2	0	0	1	2
SEC 8		Skill Enhancement Training / Student Club Activities/ Institution Innovation Council Activities	-	-	-	-	-
SEC 9	24SBBC61	Mini Project	0	0	4	1	2
SEC 10		On Job Training / Apprenticeship / Startup	-	-	-	-	-

SUMMER INTERNSHIP

Category	Code	Course	L	T	P	O	C
SI 1	24IBBC31	Internship I	0	0	2	1	1
SI 2	24IBBC51	Internship II	0	0	2	1	1

RESEARCH PROJECT

Category	Code	Course	L	T	P	O	C
RP 1	24RBBC71	Research Project I	0	0	12	4	6
RP 2	24RBBC81	Research Project II	0	0	12	4	6

SEMESTER III

24CBBC31 **HEMATOLOGY**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES

This course designs for students to learn and understand the basic hematological techniques and diagnosis of various diseases with reference to hematology. The course also describes the alterations in normal physiology of blood cells and the impact of disorders on metabolic processes, and novel strategies to prevent the diseases

UNIT I INTRODUCTION TO HEMATOLOGY (9)

Historical perspectives and Importance of hematology in healthcare. Components of blood and their functions, Hematopoietic system of the body. Blood groups and its types, Blood banking and adverse reactions of blood transfusions. Importance of blood group typing in healthcare.

UNIT II BLOOD CELL MORPHOLOGY (9)

Red Blood Cells (Erythrocytes): Structure and function, Hemoglobin synthesis. Erythropoiesis. White Blood Cells (Leukocytes) Different types of white blood cells (neutrophils, lymphocytes, monocytes, eosinophils, basophils). Functions of white blood cells in the immune system. Leukopoiesis. Platelets (Thrombocytes): Structure and function of platelets.

UNIT III BLOOD COAGULATION (9)

Hemostasis: Definition, Blood clotting factors and its functions. Mechanism of blood coagulation – Intrinsic and Extrinsic pathway. Coagulation tests. Role of Vitamin K in coagulation. Hemophilias and its types. Fibrinolysis. Blood Clotting Disorders: types, signs and treatment

UNIT IV HEMATOLOGICAL DISORDERS (9)

Disorders of red blood cells: sickle cell disease, thalassemia, anemia and its types – anemias related to shape and size of RBC, anemias due to nutritional deficiencies, anemias due to excessive destruction of RBC. Disorders of white blood cells: infectious mononucleosis, leukemia. Disorders of platelets: idiopathic thrombocytopenic purpura and thrombocytopenia.

UNIT V CLINICAL HEMATOLOGY (9)

Blood collection methods. Specimen collection for hematological studies. Anticoagulants, Preservatives for Blood, Estimation of Hb, PCV, WBC, RBC, Platelets, ESR. Clotting time, bleeding time - normal value, clinical interpretation. Hematological Techniques and Diagnostics: Complete blood count (CBC), Blood smear interpretation. To Visit a Blood Bank and learn transfusion techniques

Total Hours: 45

COURSE OUTCOME

CO 1 Recall the anatomy and physiology of blood and comprehend the process of hematopoiesis.

CO 2 Describe the mechanism of blood coagulation and its importance.

CO 3 Analyze and interpret basic laboratory tests in hematology.

CO 4 Develop the skills involving the blood collection methods in hematology laboratory

CO 5 Apply knowledge of hematology in diagnosis of diseases.

Text Books

1. Larry, Waterbury, (1988) Hematology, 3rd sub edition, Lippincott Williams & Wilkins.

2. Singh Tejinder, (2014), Atlas & Textbook of Hamatology, 3rd edition, Avichal Publications

Reference Books

1. Dycie and Lewis, 2016, Practical haematology, 12th edition, Elsevier, Amsterdam, Netherlands.

2. Wintrobe's, 2014, Clinical Hematology ,13th edition, Lippincott Williams & Wilkins.

Web Sources:

1. https://www.slideshare.net/mhnsathish/mechanism-of-blood-coagulation
2. https://www.slideshare.net/slideshow/disorders-of-bloodpptx/252498382

24CBBC32 **CLINICAL BIOCHEMISTRY**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE:

The course aims to provide a conceptual background of the clinical principles underlying the application of clinical biochemistry investigations in human disease. The course provides an overall picture with an understanding of various types of disorders and their causes, symptoms, prevention, management and treatment.

UNIT I BASIC CONCEPTS OF CLINICAL BIOCHEMISTRY 9

Scope of clinical biochemistry. Role of lab technician in Hospitals, Quality Control. Normal range- system of international units. Biological specimen – Types of specimen - blood, serum, plasma, urine, feces, CSF, amniotic fluid. Collection and processing of blood and urine samples, anti-coagulants, preservatives for blood and urine.

UNIT II DISORDERS OF THE BLOOD 9

Anemia and its types – anemias related to shape and size of RBC, anemias due to nutritional deficiencies, anemias due to excessive destruction of RBC. Blood clotting mechanism – Blood clotting factors, Intrinsic and Extrinsic pathway. Hemophilias and its types.

UNIT III DISORDERS OF CARBOHYDRATE AND LIPID METABOLISM 9

Disorders of carbohydrate metabolism: Diabetes mellitus- Types, Causes, Clinical manifestations. GTT, Glycogen storage diseases. Galactosemia and Lactose intolerance. Disorders of lipid metabolism: hypo and hyper Lipoproteinemias, Atherosclerosis. Lipid storage diseases and fatty liver.

UNIT IV DISORDERS OF AMINO ACIDS AND NUCLEIC ACID METABOLISM 9

Disorders of Amino acid metabolism: Etiology, clinical manifestation, diagnosis and treatment of Cystinuria, Phenyl ketonuria, Alkaptonuria, Maple syrup diseases, Tyrosinemia and Albinism. Disorders of nucleic acid metabolism – etiology, symptoms and treatment of LeschNyhan syndrome, Gout, Xanthinuria, Orotic aciduria.

UNIT V ORGAN FUNCTION TESTS **9**

Liver function test. Bilirubin metabolism. Differentiation of three types of jaundice. Renal function test: Urine analysis, Clearance test- urea, creatinine and inulin. PAH test, proteinuria and hematuria. Gastric function tests: Collection of gastric contents, Tests of gastric function – Examination of gastric residuum, Fractional Test Meal (FTM), Stimulation tests and Tubeless gastric analysis. Clinical significance of SGOT, SGPT, ALP, ACP, CPK and LDH.

Total: 45 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Elaborate on the role of health and its affliction by various diseases/disorders.

CO2: Demonstrate and discuss the fundamental biochemistry knowledge related to health.

CO3: Interpret and evaluate the abnormalities which commonly occur in the clinical field.

CO4: Describe the disorders of metabolism and its clinical interpretations.

CO5: Summarize the clinical applications of biochemical/clinical tests for disease diagnosis.

Text Books:

1. M.N. Chatterjee & Ranashinde, (2006), Text Book of Medical Biochemistry. 6th edition, Jaypee Brothers Medical Publisher (P) Ltd.
2. Ambika Shanmugam, (2008), Fundamentals of Biochemistry for Medical Students, 7th Edition.

Reference Books:

1. Thomas M. Devlin, 2010, Biochemistry with clinical correlation. 7th Edition, John Wiley & Sons.
2. 2. Allan Gaw, Michael J. Murphy, Rajeev Srivastava, Robert A. Cowan, Denis St. J. O'Reilly, 2013, Clinical Biochemistry, 5th edition..

Web Sources:

1. https://www.slideshare.net/peddanasunilkumar/blood-collection-sunil
2. https://www.slideshare.net/MohanaPratimaKaminen/mechanism-of-clotting

24MBBC31 **BIOMEDICAL INSTRUMENTATION**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE

To impart knowledge about common clinical testings and assays. To expose the students to the various diagnostic tests and scans. To understand the concept the basics of various life support devices and other therapeutic procedures.

UNIT I HEMATOLOGY (9)

Diagnostic procedures – Histology, Microtome, Histopathology, X-ray, Different types of scans – Ultrasound, Computerized Axial Tomography. Methods based on electrical activity – ECG, EEG, Blood pressure measurements, Respiratory gas analyzer.

UNIT II HISTOPATHOLOGY (9)

Therapeutic procedures - Blood banking, Dialysis unit- Hemodialysis and Peritoneal dialysis, Ventilator, Pacemaker, Laser applications in Medicine, Radiotherapy equipment

UNIT III BLOOD BANKING (9)

Biomedical research: Ethics; consent, nature of consent. Ethics pertaining to blood transfusion, transplantation-Donor categories, confirmation of brain death, live donation, bio medical waste management.

UNIT IV BIOCHEMICAL MEASUREMENT (9)

Biochemical sensors - pH, pO2 and pCo2, Blood glucose sensors - Blood gas analyzers, colorimeter, flame photometer, spectrophotometer, blood cell counter, auto analyzer (simplified schematic description).

UNIT V MEASUREMENT OF NON ELECTRICAL PARAMETER (9)

Temperature, respiration rate and pulse rate measurements. Blood Pressure: indirect methods auscultatory method, oscillometric method, direct methods: electronic manometer, Pressure amplifiers - systolic, diastolic, mean detector circuit

Total: 45 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Analyze the common clinical testing's assays

CO2: Discuss about various diagnostic procedures

CO3: Explain the use of life support devices and understand the therapeutic procedures.

CO4: Learn the Principles underlying biochemical Sensors

CO5: Analyze the Different methods of Measurement for blood flow and cardiac output

Text Books:

1. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 2003.
2. Standard Handbook of Biomedical Engineering & Design – Myer Kutz, McGrawHill Publisher, 2003.

Reference Books:

1. Handbook of Biomedical instrumentation-Second edition-R.S.Khandpur, 2008.
2. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 2004

Web Sources:

1. https://www.uou.ac.in/sites/default/files/slm/MSCZO-603.pdf
2. 2.https://maharajacollege.ac.in/fileupload/uploads/5f2c40a46059e20200806174052Hypothesis%20Testing.pdf

24DBBC31 **PATHOLOGY**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE:

Enable the students to carry out routine clinical laboratory investigation. Provide maximum help to the physicians in the diagnosis of diseases. To learn appropriate treatment protocols. Apply knowledge and skills associated with clinical pathology.

UNIT I STRUCTURE AND FUNCTION OF CELL **12**

Normal cell and tissue structure and function. The changes in cellular structure and function in disease. Causes of disease and its pathogenesis. Reaction of cells, tissues, organ systems.

UNIT II STRUCTURE AND FUNCTION OF ORGANS **12**

The study of normal structure and function of various organ systems and the aetiopathogenesis. Broad outline of gross and microscopic alterations of structure of these organ systems in disease and functional correlation with clinical features in brief.

UNIT III CELL INJURY **12**

Concept of diseases, classification of lesions - Inflammation and repair – Cellular adaption, Cell injury, necrosis and gangrene. Hemodynamic disorders including hemorrhage, shock, embolism and thrombosis.

UNIT IV INFECTIONS AND PATHOLOGY **12**

Infections: Tuberculosis - Leprosy and Typhoid. Deficiency diseases: Anemias Tumor Pathology: Tumors – Terminologies, Nomenclature. Differences between benign and malignant tumors, Tumors – Etiology, pathogenesis and spread of tumors. A visit to Hospital to learn about communicable and non-communicable diseases.

UNIT V SYSTEMIC DISORDERS **12**

Systemic Disorders: Heart: Coronary Heart Disease (ischemic heart disease) including atherosclerosis, Congenital and Valvular Heart Disease. Respiratory System- Bronchial

Asthma, Emphysema, Bronchiectasis. Diseases of the Kidney - Diseases of other parts of the Urinary System, Reproductive system - Diseases of uterus, cervix, ovaries and testis.

Total: 60 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Describe the features of inflammation and cellular adaption, cell injury.

CO2: Identify and describe the features of hemodynamic disorders and deficiency Diseases.

CO3: Understand and describe the pathogenesis and pathology of various systemic Disorders.

CO4: Learn the different types of infections and diseases.

CO5: Understand the normal structure and functions of various organs.

Text Books:

1. Harsh Mohan, 2003, Textbook of Pathology,,3rd edition, Jaypee Brothers Medical Publishers.
2. Edward f. Goljan md, 2018, Rapid Review Pathology (sae) paperback, Elsevier India.

Reference Books:

1. Robbins and Cotran Pathologic Basis of Disease (Two Vol Set), 10e, South Asia Edition Paperback.by Vinay Kumar (Author), Abul K. Abbas, Jon C. Aster, Manoj K. Singh (Editor) Elsevier Health Science, 2020.
2. Muir's Textbook of Pathology scratch codes by C Simon Herrington, CRC Press, 2020

Web Sources:

1. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://application.wiley-vch.de/books/sample/3527335137_c01.pdf
2. https://www.jaypeedigital.com/eReader/chapter/9789386261182/ch1

24DBBC32 **CANCER BIOLOGY**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE

This curriculum is designed to provide students a broad understanding of the molecular, genetic, cell biological and pathobiological aspects of cancer. Students will also learn about the current state of clinical diagnosis, treatment of human cancers, and hurdles to overcome to realize its potential.

UNIT I INTRODUCTION (12)

Growth characteristics of cancers cells; neoplasia, anaplasia, metaplasia and hyperplasia, types of cancer benign, malignant, metastatic cancers. Carcinomas, sarcomas, adenomas, haemopoetic cancers. Characteristics of cancer cells, changes in cell membrane structure and functions.

UNIT II ONCOGENES (12)

Provirus, protovirus, oncogenes and proto-oncogenes. Mechanism of carcinogenic transformation by oncogenes, viral oncogenes. Tumor suppressor genes - properties, mechanism of tumor suppressor genes in cancer induction with special reference to P53 gene.

UNIT III CARCINOGENESIS (12)

Principles of carcinogenesis- chemical carcinogenesis, stages in chemical carcinogenesis -Initiation, promotion and progression. Physical carcinogenesis – X-ray radiation. Viral carcinogenesis. Free radicals and antioxidants in cancer.

UNIT IV TUMOR MARKERS (12)

Tumour markers- types of tumour markers. Apoptosis in cancer Cell death by apoptosis role of caspases. Death signaling pathways mitochondrial and death receptor pathways.

UNIT V DIAGNOSIS AND TREATMENT (12)

Cancer screening diagnosis and treatment. RIA and ELISA. Strategies of anticancer drug therapy chemotherapy, gene therapy, Immunotherapy and radiotherapy.

Total: 60 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Have better understanding of terminologies of 'Molecular Biology'. Have basic understanding of 'Genetics'.

CO2: Gain knowledge on cell cycle as well as apoptosis. Have knowledge about cancer, its development and types.

CO3: Have knowledge about genes with reference to cancer formation and mechanism. Have basic understanding of carcinogens and carcinogenesis

CO4: Have elementary knowledge about tumor markers. Know about the role of tumor suppressor genes.

CO5: Understand the signaling of cancerous cells. Have basic understanding of diagnostic tools for cancer and therapies available.

Text Books:

1. Vincent.T, Devita, Cancer-Principles & practice of oncology, 3rd edition, 2014.
2. Momna Hejmadi, Introduction to Cancer Biology. 2nd edition.

Reference Books:

1. Kinnell Parchment G. Mc. R. E, Perantoni. The Biological Basis of Cancer, Cambridge
2. University Press, 2nd Edition, 2006
3. Lauren Pecorino, Molecular Biology of Cancer: Mechanisms, Targets, and Therapeutics
4. Oxford University Press; 3 edition, 2012.

Web Sources:

1. 1.https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Biology_(Kimball)/12%3A_Cancer
2. 2.https://www.mlsu.ac.in/econtents/1466_Unit%203Study%20Notes%20on%20Cancer.pdf

24PBBC31 **HEMATOLOGY**

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVE

The course enables the students to impart knowledge and hands on training in hematological studies. It is also useful to learn the techniques of blood collection which is an important facet of clinical Biochemistry.

LIST OF EXPERIMENTS

1. Collection and preservation of blood
2. Preparation of blood smears
3. Blood Grouping
4. Total count of RBC
5. Total count of WBC
6. Clotting time
7. Bleeding time
8. Estimation of hemoglobin
9. Estimation of blood glucose
10. Determination of erythrocyte sedimentation rate
11. Photographic identification of the shapes of blood cells
12. Visit to a Hematology laboratory.

Course Outcome:

At the end of this course students will be able to,

CO1: Develop skill to withdraw blood from patients and recall the knowledge of biological samples and their collection procedures.

CO2: Distinguish serum, plasma and whole blood with emphasizing the role of anticoagulants

CO3: Identify the given solution as carbohydrate or amino acid/protein

CO4: Analyze blood glucose and interpret with clinical significance.

CO5: Differentiate different types of WBC and Perform estimation of hemoglobin by different methods.

Text Books:

1. Dacie & Lewis, 2011, Practical hematology, 11th edition, Elsevier, Amsterdam, Netherlands.
2. J. Jayaraman, Laboratory Manual in Biochemistry. New Age International Pvt Ltd Publishers.2011 (Paperback).

Reference Books:

1. Harold Varley, Practical Clinical Biochemistry, CBS. 6th edition, 2006.
2. Shirley Mitchell Lewis, Barbara J. Bain, Imelda Bates (2006) Dacie And Lewis Practical Hematology, 10th Edition, Churchill Livingstone/Elsevier.

Web Sources:

1. https://microbiologynotes.com/category/haematology/
2. https://paramedicsworld.com/category/hematology-practicals

24PBBC32 **CLINICAL BIOCHEMISTRY**

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVE

Apply various techniques for the analysis of body fluids, cells and tissues. Interpret the results in relation to health and disease. Analyze the biochemical parameters in urine and blood samples and indicate their clinical significance. Encompasses fundamental and applied research into the biochemical and physiological processes of human life

LIST OF EXPERIMENTS

1. Estimation of protein by Lowry method.
2. Estimation of blood glucose by Ortho-Toluidine method.
3. Estimation of blood glucose by Anthrone method.
4. Estimation of serum bilirubin by Malloy & Evelyn method.
5. Estimation of total protein and A: G ratio.
6. Estimation of blood urea by diacetyl monoxime method.
7. Estimation of serum creatinine by Jaffe's method
8. Estimation of Cholesterol by Zak's method
9. Hematological analysis-RBC, WBC-TC/DC,
10. Hemoglobin content and ESR
11. Analysis of normal and abnormal urine constituents
12. Estimation of Calcium

Course Outcome:

At the end of this course students will be able to,

CO1: Understand the different biological samples and their collection procedures. Perform biochemical laboratory analysis in blood samples

CO2: Analyze biochemicals in urine samples. Distinguish serum, plasma and whole blood emphasizing the role of anticoagulants

CO3: Assess presence and absence of normal and abnormal constituents in urine by performing qualitative urine analysis

CO4: Analyze glucose, urea protein, total protein and A/G ratio in blood

CO5: Determine analytes such as creatinine, urea, and cholesterol in serum. Evaluate and interpret the generated results after analysis in order to determine the likely diagnosis

Text Books:

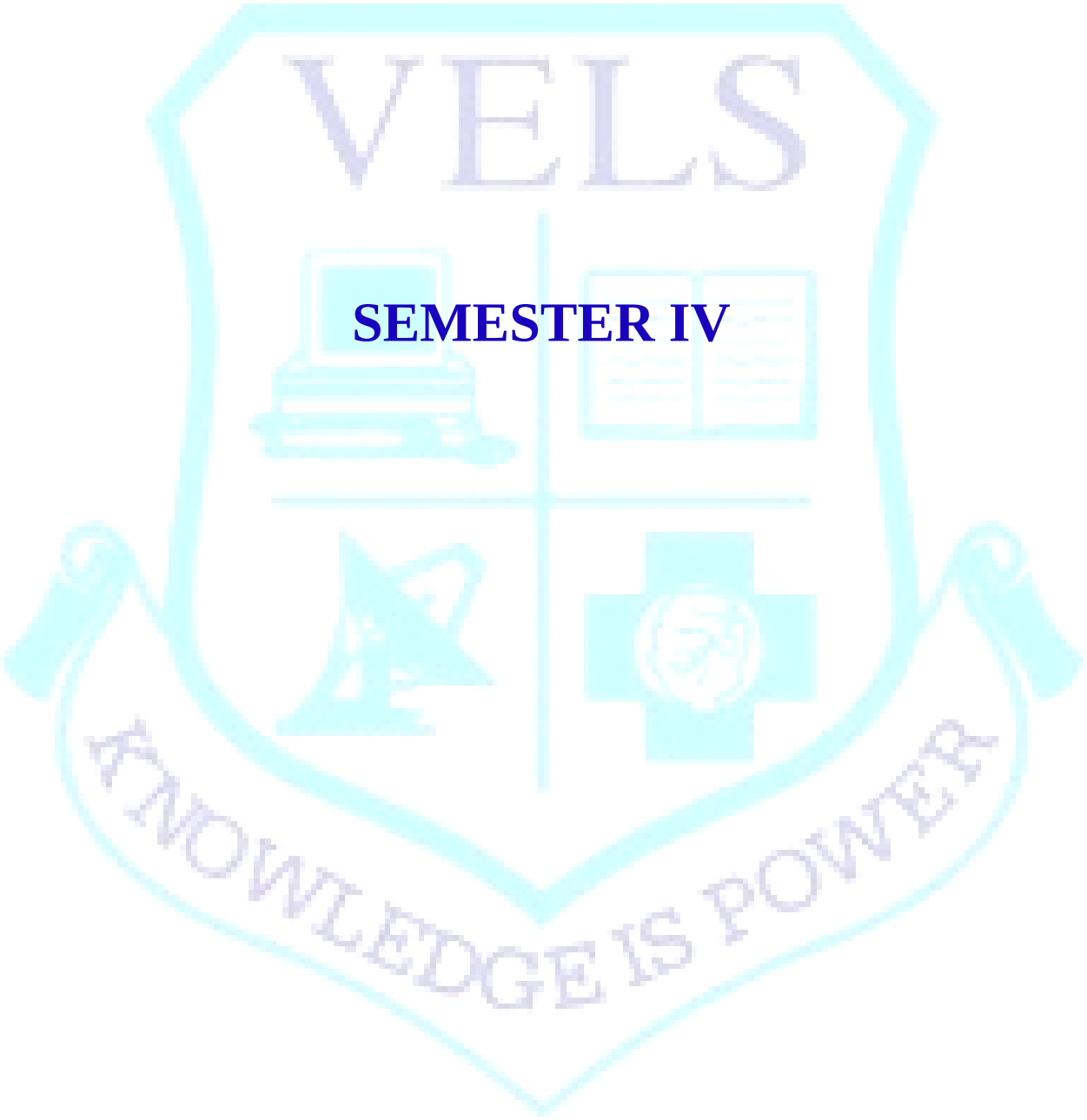
1. J. Jayaraman, Laboratory Manual in Biochemistry. New Age International Pvt Ltd Publishers. 2011 (Paperback).
2. S. K. Sawhney, Randhir Singh, Introductory Practical Biochemistry. Alpha Science International, Ltd. 2 edition, 2005

Reference Books:

1. Harold Varley, Practical Clinical Biochemistry, CBS. 6 edition, 2006.
2. Robert Eisenthal, Enzyme Assays: A Practical Approach (Practical Approach Series). Oxford University Press, U.S.A. 2 edition, 2002

Web Sources:

1. https://www.youtube.com/watch?v=Mse9wl1dfDE
2. https://www.youtube.com/watch?v=7xH-Ro1UdeI



SEMESTER IV

24CBBC41 **CELL BIOLOGY**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE:

Cell Biology typically revolve around understanding the fundamental principles, structures, and functions of cells, which are the basic units of life. It also integrates the descriptive, experimental and biochemical approaches into a conceptual framework for the analysis of development.

UNIT I OVERVIEW OF CELLS **9**

Historical background of cells. Cell theory. Classification of cells- Structure of prokaryotic and eukaryotic cells. Chemical composition of biological membranes. Fluid mosaic model of membrane. Extracellular structures. Cytosol. Transport across membranes- diffusion, active transport and passive transport.

UNIT II CELL ORGANELLES **9**

Nucleus, Nucleoplasm- structure and functions. Ribosomes- types, structure and functions, Endoplasmic reticulum- types, structure and functions. Golgi apparatus, Mitochondria, Lysosomes- structure and functions. Peroxisomes- morphology and functions. Chloroplasts- structure and functions. Cytoskeleton- types of filaments and functions. Microtubules- Chemistry and functions.

UNIT III STRUCTURE AND TYPES OF CHROMOSOMES **9**

Chromosomes- Introduction, structure. Molecular Genetics of chromosomes. Centromere. Secondary constriction. Telomeres. Prokaryotic and eukaryotic chromosomes. Functions and significance of chromosomes.

UNIT IV CELL CYCLE **9**

Cell cycle- Definition. Phases of cell cycle- G1, S, G2, M phase. Regulatory mechanism of cell cycle- cyclins, cyclin-dependent kinases. Check point proteins, tumour suppressors and growth factors. Meiotic cell division. Mitotic cell division.

UNIT V CELL COMMUNICATION 9

Cell- cell communication- Introduction. Importance of cell communication. Components of cell signalling. Types of signaling- autocrine, paracrine, endocrine, neuronal signalling. Cell recognition- intrinsic and extrinsic recognition. Cell adhesion- types and functions.

Total: 45 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Define clearly what is meant by life and living organisms and explain the mechanisms that underlies the evolution of life on earth.

CO2: Describe membrane physiology including transport mechanisms across membranes.

CO3: Identify the major cellular events that occur during cell division and cell cycle. Explain the concept of DNA as genetic material and its organization in the nucleus.

CO4: Know how fertilization and cleavage occur. Know about the process of differentiation to many different types of cells and tissues.

CO5: Understand the basic concepts of organogenesis, morphogenesis, regeneration, aging, gene expression and regulation.

Text Books:

1. Devasena.T, Cell Biology. Oxford University Press India; First edition (2012).
2. Rastogi. S.C, Cell Biology. Newage Publishers (2008).

Reference Books:

1. Karp G, Cell and Molecular Biology: Concepts and Experiments. John Wiley & Sons. Inc. 6th Edition.2010
2. De Robertis E.D.P & De Robertis E.M.F. Cell and Molecular Biology. Lippincott Williams & Wilkins, Philadelphia. 8th edition ,2006

Web Sources:

1. https://microbenotes.com/category/developmental-biology/
2. https://w2ww.le.ac.uk/biology/phh4/teaching/heslopharrisonlecture1introductory.pdf

24CBBC42 **IMMUNOLOGY**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE:

To Impart Knowledge about the types and the various determinants of immunity. To expose the students to different types of lymphoid organs and to the cellular basis of immunity. To appreciate clonal selection theory, mechanism of cell mediated and humoral mediated immune responses. To understand the diagnostic methods of immunology. To study the disorders associated with immunological processes.

Unit I TYPES OF IMMUNITY **9**

Infection – Types of infection, Immunity – Innate Immunity, Active, Passive, Natural and Artificial immunity, Factors affecting innate immunity – Physical, Mechanical, Biochemical, Cellular and Genetic factors. Inflammation, Mechanism of Phagocytosis.

UNIT II IMMUNE CELLS **9**

Cells involved in Immune response – T, B and Null cells, Structure and functions of lymphoid organs- Thymus, Bone Marrow, Spleen, Lymph nodes, Mucous Associated Lymphoid Tissue, Gut Associated Lymphoid Tissue.

UNIT-III ANTIGEN **9**

Antigen, Factors affecting Antigenicity, Epitope, Haptens, Adjuvants. Clonal Selection Theory, Antibody – Classes, Structure and Biological function. Humoral and Cell Mediated Immunity.

UNIT – IV ANTIGEN ANTIBODY INTERACTIONS **9**

Principles of Ag-Ab Interactions – Affinity, Avidity, Precipitation, Precipitation curve, Agglutination, Principle – ELISA, RIA, Immuno electrophoresis and Immunofluorescence. Monoclonal Ab production- Hybridoma technology.

UNIT– V HYPERSENSITIVITY **9**

Hypersensitivity. Immediate Type – I (Allergic Asthma), II (Erythroblastosis Foetalis), III & Delayed Type – IV (Contact Dermatitis). Autoimmune Diseases – Hashimotos Thyroiditis

and Rheumatic Arthritis.

Total: 45 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Apply and practice the methods to improve immunity.

CO2: Appreciate and analyze the integration of immune cells and organs

CO3: Apply the knowledge on the production of vaccines and immune kits.

CO4: Analyse and diagnose the various immune disorders.

CO5: Preventive measures for allergy and other hypersensitivity reactions.

Text Books:

1. Immunology- Peter, Alex and Micheal, 2nd edition, 2004
2. Fundamentals of Medical Immunology-Venugopal Jayapal,2007

Reference Books:

1. Immunology - Kuby , WH Freeman Publications.5th edition,2003.
2. Essential Immunology –Roitt, Wiley Blackwell Publishers, 10th edition 2008

Web Sources:

1. www.whfreemen.com/kuby
2. www.immunologylink.com

24DBBC41 **ENDOCRINOLOGY**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVE:

The course will enable students to understand and appreciate the delicate network and balance of hormones required for the healthy functioning of the human body. It will provide an understanding of the different endocrine factors that regulate metabolism, growth, ionic homeostasis, glucose homeostasis and reproductive function. It outlines the consequences of hormonal imbalances with special emphasis on human diseases.

UNIT I PITUITARY HORMONES 12

Hormones - Classification of hormones - Steroid, Amino acid derivatives, Peptide / Protein hormones, hormone secreted by various glands, tropic hormones of hypothalamus and Pituitary, Anterior and posterior pituitary hormones - biological action, feedback regulation and related disorders.

UNIT II THYROID HORMONES 12

Thyroid gland and its functions. Synthesis, secretion, regulation, transport, metabolic fate and biological actions and functions of thyroid hormones. Hypothyroidism – Goiter, Myxedema; hyperthyroidism- Exophthalmos, Natural goitrogens. Biological actions and functions of parathyroid hormones. Disorders - Rickets, Osteomalacia, Osteoporosis.

UNIT III ADRENAL HORMONES 12

Adrenal gland and its functions. Hormones of Adrenal cortex and adrenal medulla - synthesis, biological action, regulation, transport, and metabolism. Disorders of adrenal cortex - Cushing's syndrome, aldosteronism, congenital adrenal hyperplasia, Disorders of adrenal medulla – Phaeochromocytoma, Addison's disease.

UNIT IV PANCREATIC HORMONES 12

Pancreatic gland and its functions. Synthesis, biological action, regulation, transport and metabolism of glucagon, somatostatin and insulin. Disorders - Diabetes mellitus (Type I & II), Insulinoma. Functions of Gastro intestinal hormones – Gastrin, Cholecystokinin, Secretin, Ghrelin, Leptin, and Motilin.

UNIT V GONADAL HORMONES 12

Gonadal glands and its functions. Biosynthesis, biological actions, transport, metabolism, and regulation of Testosterone, Estrogen, Progesterone. Disorders - Hypogonadism in males, Poly Cystic Ovarian Syndrome (PCOS). Menstrual cycle. Role of hormones during parturition and lactation.

Total: 60 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Apply the knowledge in integration of body system by endocrines.

CO2: Analyze the integration of thyroid hormones with metabolism and parathyroid hormones with calcium metabolism.

CO3: Link the relationship between adrenal hormones with, neurotransmission, mineral and energy metabolism.

CO4: Discuss the link between pancreatic and gastro intestinal hormones with diseases.

CO5: Create awareness on gonadal systems and measures to prevent the reproductive disorders.

Text Books:

1. Prakash.S.Lohar, Endocrinology, MJP Publishers, 2005
2. R.Radheshyam, Textbook of Endocrinology, Neha Publishers, 2012.

Reference Books:

1. William's Text book of Endocrinology- Larsen, Kronenberg, Melmed & Polonsky, 10th Edition, Saunders Publishers, 2003.
2. Mark's Basic Medical Biochemistry- A Clinical Approach, Colleen Smith, Allan D.Marks, Michael Lieberman, 2nd Edition, Lippincott Williams & Willkins, 2005.

Web Sources:

1. https://www.youtube.com/watch?v=0GSRbmcNh3A
2. https://www.youtube.com/watch?v=eWHH9je2zG4

24DBBC42 **NEUROBIOLOGY**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVE

This paper provides a basic understanding of the nervous system, Structure and function relationship and integration of the nervous tissue networking and insights in to neurotransmission

UNIT I NEURON (12)

Neuron- Neurocellular anatomy, neural membrane, classification of neuron, nerve fibers, axonal transport, neural growth, neuroglia, nervous system, blood brain barrier, cerebrospinal fluid.

UNIT II NERVE POTENTIAL (12)

Neuronal signalling -Membrane potentials, ion channels, recording neuronal signals, ionic basis of resting potential and action potential, propagation of action potential.

UNIT III SYNAPSE (12)

Synaptic transmission- Synapse, Electrical synapse transmission, chemical synaptic transmission, Synaptic transmitter release, synaptic potentials, synaptic delay, synaptic plasticity, molecular mechanism of synaptic transmission, myoneural junction.

UNIT IV NEUROTRANSMITTERS (12)

Neurotransmitters- Chemistry, synthesis, storage, release, receptors and function- acetyl choline, catecholamines, serotonin, histamine, glutamate, aspartate, GABA, glycine, neuropeptides, nitric oxide.

UNIT V NEURO DISORDERS (12)

Neural processing and neurodegenerative disorders-Learning and memory, neurochemical basis of drug abuse, neurodegenerative disorders, Parkinson's disorder, Alzheimer's disorder, Amyotrophic Lateral Sclerosis, Senile Dementia.

Total: 60 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Understand the physiology of human nervous system

CO2: Understand the anatomy of the central nervous system and its integration with the peripheral nervous system

CO3: Explain the anatomy and physiology of neurons

CO4: Demonstrate on the structure and function of different types of cells of the nervous system

CO5: Understand neuronal signalling and synaptic transmission importance

Text Books:

1. Arthur C. Guyton and John E Hall, Text book of medical physiology 11th Edition; 2006
2. David Nelson and Michael Cox, Lehninger Principles of Biochemistry, 4th edition; 2005

Reference Books:

1. Bruce Alberts, Alexander Johnson, Juliana Lewis, Martin Raff, Keith Roberts and Peter Walter, Molecular biology of the cell, 4th Edition; 2004
2. Mark F Bear, Barry W Connors and Michael A Paradiso, Neuroscience: Exploring the brain, 4th Edition; 201

Web Sources:

1. https://ocw.mit.edu/courses/7-29j-cellular-neurobiology-spring-2012/pages/lecture-notes/
2. https://www.studocu.com/en-nz/document/victoria-university-of-wellington/biology-of-animals/neurobiology-lecture-notes/15801298

24PBBC41 **METHODS IN CELL BIOLOGY**

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVE

Cell biology practical is an understanding of cell biology as an asset in modern science. It provides knowledge about the composition, structure and function of organelles and other cellular components and their biological activities.

LIST OF EXPERIMENTS

1. Visualization of animal cell by methylene blue
2. Visualization of plant cell by methylene blue.
3. Identification of different stages of mitosis in onion root tip.
4. Identification of different stages of meiosis in grasshopper testis.
5. Micrographs of different cell components (dry lab).
6. Sub-cellular fractionation.
7. Visualization of nuclear fraction by acetocarmine stain.
8. Isolation of mitochondria from rat liver
9. Staining and visualization of mitochondria by Janus green stain.
10. Isolation of WBC
11. Isolation of Platelets
12. Osmotic Fragility Test

Course Outcome:

At the end of this course students will be able to,

CO1: Separate plant and animal cells and visualize them.

CO2: Visualize different stages of mitosis on onion root tip. Visualize different stages of meiosis.

CO3: Perform sub-cellular fractionation. Gain Knowledge about structure and function of different cell components.

CO4: Isolate WBC.

CO5: Understand about osmosis employing osmotic fragility test. Know about the structure and function of mitochondria and chloroplast.

Text Books:

1. Jayaraman, Laboratory Manual in Biochemistry. New Age International Pvt Ltd Publishers. 2011 (Paperback).
2. S. Sadasivam, A. Manickam, Biochemical Methods. New age publishers. 2009 (paperback).
3. S. K. Sawhney, Randhir Singh, Introductory Practical Biochemistry. Alpha Science International, Ltd. 2 edition, 2005.

Reference Books:

1. Harold Varley, Practical Clinical Biochemistry, CBS. 6 edition, 2006.
2. Hans Bisswanger, Practical Enzymology. Wiley VCH. 2nd Edition, 2011.

Web Sources:

1. https://www.rug.nl/infonet/studenten/umcg/celweb/manualworkshopscelbiology-eng.pdf
2. https://webstor.srmist.edu.in/web_assets/srm_mainsite/files/files/BT0213%20-%20CELL%20BIOLOGY%20PRACTICAL%20MANUAL.pdf

24PBBC42 **IMMUNOLOGY**

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVE

To understand and perform, the most important methods in immunology and to enhance the practical experience on techniques in immunological tests.

LIST OF EXPERIMENTS

1. Blood film preparation and identification of cells.
2. ABO Blood Grouping.
3. WIDAL test – Slide Agglutination Test
4. Single radial immunodiffusion
5. Ouchterlony double diffusion
6. Latex agglutination test.
7. Immuno electrophoresis - CCIE.
8. Rocket immuno electrophoresis.
9. Cross over immuno electrophoresis
10. Graber and Williams Immunoelectrophoresis
11. Enzyme linked immunosorbent assay ELISA (Indirect/Sandwich ELISA) - Demo
12. CLIA assay (Demo)

Course Outcome:

At the end of this course students will be able to,

CO1: Develop an understanding of the scope of immunology. Describe the principle involved in the immune responses.

CO2: Describe the various mechanisms involved in the immune response and their importance in the clinical diagnosis of infection and disease.

CO3: Interpret the basic types of serological reactions and significance of use in clinical laboratories

CO4: Compare and discuss the diseases relevant to the immune system.

CO5: Develop an understanding about the basic serological techniques in disease diagnosis and to recognize the importance of obtained laboratory data and correlation to disease processes.

Text Books:

1. Roitt I, Male, Brostoff, 2002, Immunology, Mosby Publication.
2. Kuby J, 2000, Immunology, WH Freeman & Co.,

3. Ashim K. Chakravarthy, 1998, Immunology, TataMcGraw-Hill.

Reference Books:

1. Jayaraman. J. (1992), Laboratory Manual in Biochemistry, 4th reprint, Wiley Eastern Ltd, New Delhi
2. Gupta. R.C and Bharghava. S. (1992), Practical Biochemistry, CBS Publishers and Distributors, New Delhi.

Web Sources:

1. https://webstor.srmist.edu.in/web_assets/srm_mainsite/files/files/BT0213%20-%20CELL%20BIOLOGY%20PRACTICAL%20MANUAL.pdf
2. https://www.urmc.rochester.edu/MediaLibraries/URMCMedia/labs/frelinger-lab/documents/Immunology-Lab-Manual.pdf

SEMESTER V

24CBBC51 **MOLECULAR BIOLOGY**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE:

To introduce the type of DNA sequences and chromosome structure. To instill the knowledge of the molecular basis of DNA synthesis. To understand the molecule basis of RNA synthesis and modified into different types of RNA. To discuss about the genetic code, molecular basis of protein synthesis & modification. To detail the mechanism of DNA mutation and Repair system.

Unit I INTRODUCTION- GENES **9**

Gene Organization - Genes, DNA sequences – Unique and repetitive sequences, coding, non-coding DNA, Satellite DNAs, Cot Curves, Chromosomes – Types, properties, Gene organization in Prokaryotes and Eukaryotes.

UNIT II REPLICATION **9**

DNA Replication - Chemistry of DNA synthesis, Modes of DNA replication, Semiconservative Replication - Meselson and Stahl experiment, Enzymes of DNA replication – DNA polymerases, Helicases, Primase, Ligases, Topoisomerases, Prokaryotic replication. Brief outline of eukaryotic replication.

UNIT-III TRANSCRIPTION **9**

Transcription - Chemistry of Transcription, RNA polymerases, Role of sigma factor, Closed and open promoter complexes, Prokaryotic Transcription, post transcriptional modifications of mRNA- capping, tailing, splicing.

UNIT – IV TRANSLATION **9**

Translation - Basic features and deciphering of the Genetic code, Genetic code dictionary, wobble hypothesis, Ribosomes, Protein synthesis in prokaryotes - Activation of amino acids, aminoacyl tRNA synthetases, tRNA as adaptor molecule, Prokaryotic translation, post translational modifications.

UNIT– V MUTATION AND DNA REPAIR **9**

Mutation and DNA Repair - Mutation – Types, Physical and chemical mutagens, DNA damages and mutations, DNA repair – Direct repair systems, Excision repair – Base and nucleotide excision repair, Mismatch repair.

Total: 45 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Gain knowledge about the organization of genes to chromosomes in prokaryotes and eukaryotes, types of DNA sequences, complexity of DNA sequences determined by renaturation kinetics.

CO2: Apply the concept gained in mechanism of replication in the field of molecular Biology.

CO3: Gain knowledge about different types of RNA and its synthesis leads to understanding protein synthesis and development.

CO4: Apply the knowledge of protein synthesis to create polypeptide for drug development against genetic disorders.

CO5: Familiar and able to link the concept with mutation and repair system.

Text Books:

1. Biochemistry - Voet Donald and Voet Judith: 2004. Wiley International Edition, 3rd Edition: John Wiley & Sons.
2. Lehninger Principles of Biochemistry – Nelson David and Cox Michael: 2004. W.H.Freeman & Co : New York

Reference Books:

1. Molecular cell biology – Lodish, Harvey, Berk, Arnold, Zipursky, Lawrence, Matsudaira, Paul, Baltimore: 2006, 4th Edition, W.H Freeman & Co.
2. Lewin's Genes X– Krebs Jocelyn, Lewis Benjamin, Goldstein, Eliottt, Kilpatrick, Stephen: 2009. Jones and Bartlett.

Web Sources:

1. https://youtu.be/3wTAEfjo20c
2. https://youtu.be/sGyZ2s3FOWg

24CBBC52 INTERMEDIARY METABOLISM

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE:

The course aims to provide a provide insights to give a broad overview of the various aspects of plant biochemistry in an efficient way. It imparts knowledge of different secondary metabolites used as therapeutics.

UNIT I CARBOHYDRATE METABOLISM 12

Basic metabolic pathways – anabolic, catabolic and amphibolic pathways. Carbohydrate metabolism - Glycolysis, TCA Cycle, and its regulation. Glycogenesis, Glycogenolysis, Gluconeogenesis, HMP shunt and Glyoxlate cycle. Hormonal regulation of glycogen metabolism (Glycogen synthase and glycogen phosphorylase).

UNIT II AMINO ACID METABOLISM 12

Transamination, Oxidative and Non - oxidative deamination, Decarboxylation. Amino acid metabolism – Urea cycle and its regulation. Degradation of glucogenic and ketogenic amino acids - Phenyl alanine, Threonine, Arginine, Tryptophan, Methionine. Biosynthesis of non-essential amino acids - Asparagine, Glutamine, Serine.

UNIT III LIPID METABOLISM 12

Biosynthesis of saturated fatty acids (Palmitic acid) and unsaturated fatty acids. Lipid metabolism- oxidation of fatty acids (saturated, odd, and even numbered) - β oxidation, α-oxidation, and ω-oxidization. Ketogenesis. Biosynthesis and Degradation of triglyceride. Biosynthesis of Cholesterol – Regulation. Degradation of Cholesterol.

UNIT IV NUCLEOTIDE METABOLISM 12

Biosynthesis of Purine and pyrimidine bases – denova synthesis & salvage pathway. Regulation of purine and pyrimidine biosynthesis. Degradation of purine and pyrimidine bases in the Uricotelic and Ureotelic systems.

UNIT V BIOLOGICAL OXIDATION 12

Electron transport chain- components and reactions of electron transport chain. Theories of

Oxidative phosphorylation - Redox loop and proton pump mechanism. Inhibitors of ETC and oxidative phosphorylation. High energy compounds and linkages. P/O ratio and uncouplers of oxidative phosphorylation.

Total: 60 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Gain knowledge about various types of metabolism and pathways of carbohydrates by which nutrient molecules are degraded and hence energy production.

CO2: Explain how cells survive and proliferate by synthesis and degradation of glycogen and serve as a buffer for glucose, HMP shunt for replenishing NADPH and ribose.

CO3: Gain insights in to the importance of amino acid biosynthesis and degradation of specific glucogenic and ketogenic amino acids.

CO4: Describe ketogenesis, fatty acid oxidation and synthesis. Compare and contrast the structure and function of cholesterol and cholesterol esters.

CO5: Apply the knowledge of nucleic acid metabolic pathway for Cancer research.

Text Books:

1. Lehninger, Nelson and Cox, 2004, Principles of Biochemistry 4th edition.
2. Voet &Voet, Biochemistry, 2013, IV edition.

Reference Books:

1. Jeremy M Berg, John L Tymoczko, and Lubert Stryer, (2006), Biochemistry, 6th Edition, Freeman Publications.
2. Geoffrey Zubay (1998),Biochemistry, 4th Edition, Wm.C. Brown Publishers.

Web Sources

1. https://www.youtube.com/watch?v=8v9elkbuIPc
2. https://www.youtube.com/watch?v=d9hffYCwfEA

24CBBC53 **PLANT BIOCHEMISTRY**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVE:

The course aims to provide a provide insights to give a broad overview of the various aspects of plant biochemistry in an efficient way. It imparts knowledge of different secondary metabolites used as therapeutics.

UNIT I INTRODUCTION TO PLANT CELL 9

Structure and function of extra cellular organelles. Transport mechanisms: Diffusion, osmosis and imbibition. Absorption and translocation of water – active absorption and passive absorption. Transpiration – Types, Mechanism of stomatal opening, factors affecting transpiration and guttation.

UNIT II PHOTOSYNTHESIS 9

Pigments and factors affecting photosynthesis, Photosynthetic apparatus, pigments of photosynthesis, Calvin cycle (C3 plants), Hatch slack (C4 plants) & CAM pathways of carbon reduction and its regulation. Photorespiration: photorespiration pathway and significance.

UNIT III NITROGEN METABOLISM 9

Role of nitrogen in plants, sources of nitrogen – molecular nitrogen, organic & inorganic nitrogen. Significance of nitrogen. Ammonification, nitrification, nitrate reduction, Physical and biological nitrogen fixation – symbiotic, non-symbiotic. Symbiotic nitrogen fixation in leguminous plants, denitrification and nitrogen cycle.

UNIT IV PLANT HORMONES 9

Characteristics and classification of plant hormones. Plant growth regulators: Auxins; gibberellins, cytokines, abscisic acid and ethylene – biosynthesis and their metabolic functions, synthetic growth hormones, inhibitors. Stress response in Plants. Factors affecting the growth of plants.

UNIT V PLANT SECONDARY METABOLITES 9

Definition and Classification of Primary and Secondary metabolites: Alkaloids, terpenoid,

flavonoids, phenolic and phenolic acids, steroids, tannins, cyanogenic glycosides, amines and non-protein amino acids, gums, mucilage, resins etc. Importance of secondary metabolites.

Total: 45 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Recall the understanding of plant cell organelles and their functions.

CO2: Describe the source of food for other organisms and their synthesis in plants.

CO3: Demonstrate the role of nitrogen in plant growth.

CO4: Analyze the role of plant growth substances in various stages of plant growth.

CO5: Explain the uses of secondary metabolites in pharmaceutics.

Text Books:

1. H.D Kumar and H.N Singh. (1980), Plant Metabolism, 1st Edition, Publisher. Macmillan, ISBN- 10:0333256387: ISBN-13:978-0333256381.

2. S. K. Verma and Mohit Verma, A textbook of plant physiology, biochemistry and biotechnology (2008), 2nd edition, S. Chand and Company Pvt. Ltd, New Delhi.

Reference Books:

1. P.M. Dey & J.B. Harborne (2000), Plant Biochemistry, Hart Court Asia Pte Ltd

2. Prof David T. Dennis, Prof David H. Turpin, Dr Daniel D. Lefebvre and Dr David B. Layzell (Editors), Plant Metabolism,(1997), 1st Ed, publisher: Longman; ISBN-10: 0582259061, ISBN-13:978-582259065.

Web Sources:

1. https://www.slideshare.net/Christa_belle/photosynthesis-43829124
2. https://www.slideshare.net/kayeenvadakkan/overview-of-nitrogen-metabolism

24DBBC51 **APPLIED MICROBIOLOGY**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVE:

To provide students with a conceptual background in microbiology. To provide students with an understanding of various microbiological techniques. To make the students to be familiar with the relationship between microbes and human beings.

UNIT I INTRODUCTION 12

Introduction to microbiology, Microscopy Bright field microscopy, fluorescent microscopy, electron microscopy-transmission electron microscopy, scanning electron microscopy. Culture techniques for isolation of bacteria-streak plate technique, pour plate technique. Staining- Simple staining, flagella staining, gram staining, acid-fast staining.

UNIT II PROKARYOTES 12

Prokaryotes: Morphology of bacteria, component parts, cell wall structure, growth curve, media composition. Eukaryotes: Morphology, characteristics and importance of algae and fungi.

UNIT III VIRUSES 12

Viruses: Cultivation of viruses using fertilized eggs and animal cell culture, structure of viruses, plaque assay. Bacteriophages–T4 phage, stages in lifecycle; Lambda phage-lifecycle; switch between lysogeny and lytic cycle. Oncogenic viruses–oncogenicDNAviruses-SV40; oncogenic RNA viruses- HIV.

UNIT IV MICROBIAL DISEASES 12

Microbial diseases: Normal human micro flora, host parasitic interaction, exo and endotoxins. Water borne diseases– Aetiology, pathogenesis and symptoms of cholera and dysentery. Air-borne diseases–Aetiology, causes, symptoms and prevention of TB and diphtheria. Direct contact disease–Aetiologyand symptoms of rabies*.

UNIT V WATER MICROBIOLOGY 12

Water microbiology: Microbes in water; bacteriological examination of water; purification of drinking water. Soil microbiology: Rhizosphere and mycorrhiza. Microbiology of food borne

diseases: Botulism, staphylococcal poisoning, salmonellosis and perfringens poisoning.

Total: 60 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Recall the characteristics of bacteria, algae, fungi and viruses.

CO2: Describe the role of microbes as normal flora and as disease causing agents.

CO3: Demonstrate the microscopic techniques, staining and culturing methods.

CO4: Recollect the microbial diseases and their symptoms and prevention.

CO5: Analyze the bacteriological examination and purification of drinking water.

Text Books:

1. Micheal J. Pelczar, E.C.S. Chanand Noel R.Krieg (2008), Microbiology 5th ed.,Tata McGraw -Hill Publishing Company Ltd, New Delhi.
2. R.C. Dubey and D.K.Maheshwari (2005), Text Book of Microbiology, S Chand and Company Ltd. New Delhi.

Reference Books:

1. Geetha Sumbali and R.S. Mehrotta (2009), Principles of Microbiology, Tata McGraw – Hill Education private limited, New Delhi.
2. Joanne Willey, LindaSherwood, Christopher J. Woolverton (2016), Prescott's Microbiology 10th ed. McGraw-Hill Education, Chennai, TamilNadu.

Web Sources:

1. https://microbenotes.com/
2. https://microbiologyinfo.com/

24DBBC52 SKILLS IN BIOCHEMISTRY

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVE:

To help students develop the ability to apply biochemistry concepts to solve practical problems, with an emphasis on their relevance to health, medicine, and industry.

UNIT I INTRODUCTION TO BIOCHEMISTRY 12

Overview of biochemistry and its significance in biological processes. Structure, function, and classification of proteins, lipids, carbohydrates, and nucleic acids laboratory safety, equipment, and common lab techniques (pH measurement, centrifugation, and homogenization.

UNIT II ENZYMES AND ENZYME KINETICS 12

Overview of enzyme types, enzyme classification, and mechanisms of enzyme action. Michaelis-Menten equation, enzyme-substrate interaction, factors affecting enzyme activity (temperature, pH, inhibitors). Use of enzymes in diagnostics (e.g., ALT, AST) and biotechnology (e.g., industrial enzymes).

UNIT III METABOLISM AND BIOENERGETICS 12

Overview of metabolic pathways, energy production and consumption in cells. Glycolysis, Krebs cycle, oxidative phosphorylation, and electron transport chain. Gluconeogenesis, fatty acid biosynthesis, and protein synthesis. Hormonal regulation (insulin, glucagon), allosteric regulation, feedback inhibition.

UNIT IV PROTEIN CHEMISTRY AND ANALYSIS 12

Primary, secondary, tertiary, and quaternary structure of proteins. Techniques like centrifugation, filtration, dialysis, and chromatography (ion-exchange, affinity). Electrophoresis (SDS-PAGE), protein quantification (Bradford assay, BCA assay), and Western blotting.

UNIT V ADVANCED BIOCHEMICAL TECHNIQUES 12

Techniques like Thin Layer Chromatography (TLC), High-Performance Liquid Chromatography (HPLC), and Gas Chromatography (GC) for separation and analysis of compounds. Principles of gel electrophoresis (Agarose, SDS-PAGE), use in nucleic acid and protein analysis.

Total: 60 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Recall the fundamental biochemical characteristics and functions of key biomolecules, including proteins, lipids, carbohydrates, and nucleic acids.
CO2: Describe the roles of enzymes, metabolic pathways, and biochemical processes in cellular functions and human health.
CO3: Demonstrate proficiency in essential biochemistry laboratory techniques, including spectrophotometry, chromatography, and electrophoresis.
CO4: Identify common biochemical disorders, their symptoms, and the biochemical basis for their prevention and treatment.
CO5: Apply biochemical analysis techniques to assess the quality of biological samples.

Text Books:

1. David L. Nelson & Michael M. Cox (2017), Lehninger Principles of Biochemistry (7th ed.), W.H. Freeman and Company.
2. Jeremy M. Berg, John L. Tymoczko, and Lubert Stryer (2015), Biochemistry (8th ed.), W.H. Freeman and Company.

Reference Books:

1. Reginald H. Garrett & Charles M. Grisham (2016), *Biochemistry* (7th ed.), Cengage Learning.
2. Donald Voet, Judith G. Voet, & Charlotte W. Pratt (2016), *Fundamentals of Biochemistry: Life at the Molecular Level* (5th ed.), Wiley.

Web Sources:

1. https://www.biochemistryonline.com/
2. https://www.biochemweb.com/

24PBBC51 **MOLECULAR BIOLOGY**

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVE

To understand and perform, the most recent and important methods in Molecular Biology. To understand the molecular approach used in research relevant for understanding the development and treatment of human diseases. Hands –on training of the latest molecular biology techniques. To understand the molecular aspects of biology.

LIST OF EXPERIMENTS

1. Separation of proteins by SDS PAGE.
2. Determination of molecular weight of serum proteins by SDS PAGE
3. Study of enzyme activity on Native PAGE.
4. Isolation of plasmid DNA
5. Isolation of genomic DNA from plant source.
6. Separation of DNA by Agarose gel electrophoresis.
7. Determination of size of DNA by agarose gel electrophoresis
8. RFLP.
9. Gene amplification by PCR.
10. RT-PCR (Demonstration)
11. Southern hybridization (Demonstration).
12. Western blotting (Demonstration).

Course Outcome:

At the end of this course students will be able to,

CO1: Determine and understand the basic principle involved in isolation of biomolecules from various biological sources

CO2: Isolate and purify DNA and RNA from various sources – viz plant, microbes and animals

CO3: Separate Proteins by SDS PAGE

CO4: Understanding the mobility differences of macromolecules in electrophoresis

CO5: Understand the optimal conditions essential for protein/nucleic acid separation and purification

Text Books:

1. Michael R. Green, Joseph Sambrook. Molecular Cloning: A Laboratory Manual, 4th Ed
2. S.K.Sawhney and Randhir Singh. Introductory practical biochemistry. 2005, 2nd edition.

Reference Books:

1. Roger L. Lundblad, Fiona Macdonald, (2010), Handbook of Biochemistry and Molecular Biology, 4th Edition. CRC Press.
2. Leland J. Cseke, AraKirakosyan, Peter B. Kaufman, Margaret V. Westfall, (2011), Handbook of Molecular and Cellular Methods in Biology and Medicine, 3rd Edition, CRC Press.
3. David. T. Plummer, (1995), An Introduction to Practical Biochemistry, Tata McGraw Hill Publishing Company Ltd, New Delhi.

Web Sources:

1. https://webstor.srmist.edu.in/web_assets/downloads/2021/20BTC502J-lab-manual.pdf
2. https://www.slideshare.net/slideshow/practical-manual-on-molecular-biology-and-genetic-engineeringrecombinant-dna-technology/109053921

24PBBC52 **PLANT BIOCHEMISTRY**

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVE

To learn the techniques of plant tissue culture. To get a hands-on-training on molecular techniques. To implement the applications of plant tissue culture, microbes, genetics and molecular techniques in research and industries

LIST OF EXPERIMENTS

1. Preparation of plant tissue culture media and sterilization
2. Estimation of chlorophyll
3. Estimation of flavonoids
4. Estimation of total phenols
5. Estimation of starch
6. Estimation of vitamin C
7. Estimation of glutathione
8. Estimation of vitamin E
9. Phytochemical screening of any one selected medicinal plant
10. Estimation of Tannins

Course Outcome:

At the end of this course students will be able to,

CO1: Correlate the principles of plant biochemistry, microbes, molecular biology and genetic techniques

CO2: Demonstrate the technical skills involved in plant tissue culture, counting cells, identification of gene and its expressions

CO3: Develop and apply the modern technology of plant biochemistry, microbial techniques, molecular biology and genetics in industries and research

CO4: Examine the results obtained using plant biochemistry, sterilization techniques, molecular biology and genetics

CO5: Be competent in handling the microbial cultures and plant samples.

Text Books:

1. Plant Metabolism by H.D Kumar and H.N Singh. Publisher. Macmillan, ISBN-

10:0333256387: ISBN-13:978-0333256381.1st Edition, 1980.

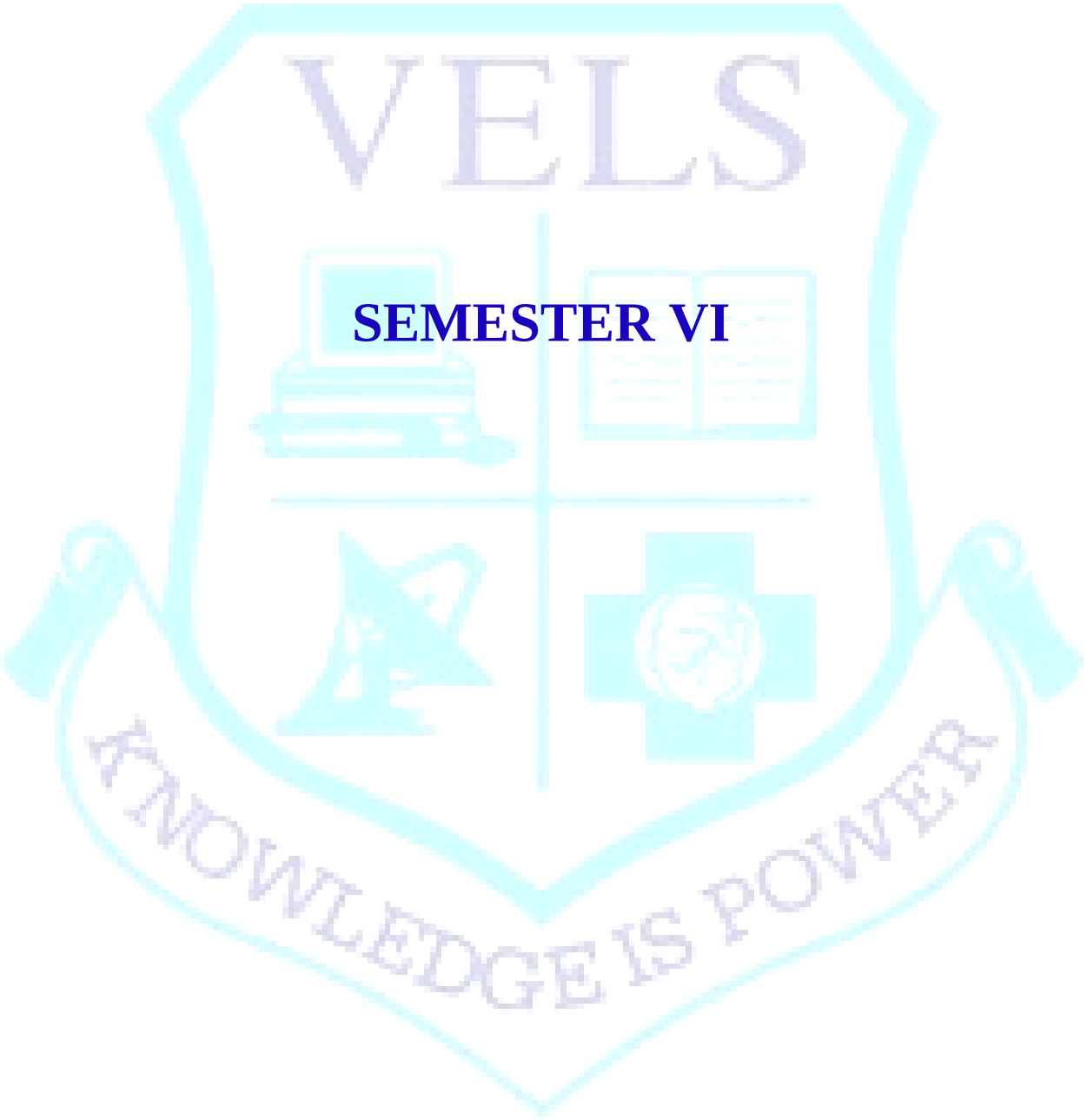
2. A textbook of plant physiology, biochemistry and biotechnology (2008). S. K. Verma and Mohit Verma. 2nd edition. S. Chand and Company Pvt. Ltd, New Delhi.

Reference Books:

1. Plant Biochemistry, P.M. Dey & J.B. Harborne (2000) Hart Court Asia Pte Ltd
2. Plant Metabolism: Prof David T. Dennis, Prof David H. Turpin, Dr Daniel D. Lefebvre and Dr David B. Layzell (Editors) publisher: Longman; ISBN-10: 0582259061, ISBN-13:978-582259065, 1st Ed, 1997

Web Sources:

1. https://www.slideshare.net/Christa_belle/photosynthesis-43829124
2. https://www.slideshare.net/kayeenvadakkan/overview-of-nitrogen-metabolism



SEMESTER VI

24CBBC61 **TISSUE CULTURE**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE:

The objectives of this course are to educate students about the fundamental concepts of plant, animal and microbial cell system, their differences, related applications, thus preparing them to meet the challenges of the new and emerging areas of biotechnology industry.

UNIT I PLANT TISSUE CULTURE 9

Introduction of plant tissue culture and cell suspension culture, physico - chemical conditions for propagation of plant cells and tissues, composition of media, nutrient, and hormone requirement; Types of culture – organ and explant, callus, cell suspension, embryo, and protoplast culture.

UNIT II PLANT REGENERATION PATHWAYS 9

Organogenesis and somatic embryogenesis. Applications of cell and tissue culture and somoclonal variation. Germplasm storage and cryo- preservation. Brief introduction to transgenic plants. Invitro pollination and fertilization; somatic embryogenesis and somoclonal variation. Conservation of germplasm.

UNIT III PLANT TISSUE CULTURE – GENETIC ENGINEERING 9

Transfer of nucleic acid to plant cells - Direct transformation by electroporation and particle gun bombardment; - Agrobacterium, Ti plasmid vector. Theory and techniques for the development of new genetic traits, conferring resistance to herbicide, pesticide, plant pathogens. To Visit a Tissue culture laboratory for hands on training.

UNIT IV ANIMAL CELL CULTURE 9

Development of primary culture, Development of cell line by enzymatic disaggregation, Culture media and growth conditions. Cell type and characterization, origin of animal cell line, maintenance and characterization of different cell lines, Marker gene characterization. Cryopreservation.

UNIT V ANIMAL BIOTECHNOLOGY **9**

Cell growth characteristics and kinetics, Micro-carrier attached growth, Cell culture in continuous, perfusion and hollow fibre reactor, Mass transfer in mammalian cell culture. Hybridoma technology, Organ culture technology. Medical Biotechnology - Production of Insulin, Interferon, tPA, Principles of Gene therapy.

Total: 45 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Develop a fundamental understanding of basic concepts of animal and plant tissue culture methods and their applications in the field of Biotechnology.

CO2: Develop a fundamental understanding of basic concepts of animal and plant tissue culture methods and their applications in the field of Biotechnology.

CO3: Correlate between different biological samples and understand the importance of different media in tissue culture.

CO4: Comprehend the applications of plant, animal and microbial cell culture in industry, healthcare, and environment.

CO5: Evaluate applications of various concepts & techniques of animal and plant tissue culture to facilitate biotechnological advancement and innovations.

Text Books:

1. Caroline Bowsher, Martin steer, Alyson Tobin (2008), Plant Biochemistry, Garland science ISBN 978-0-8153-4121-5

2. P.M Dey and J.B. Harborne (Editors) (1997) Plant Biochemistry Publisher: Academic Press.

Reference Books:

1. Introduction to Biotechnology, P.K.Gupta, Kalyani Publishers, second edition.

2. Introduction to plant Biotechnology, H.S.Chawala, second ed., PHI

Web Sources:

1. https://www.excedr.com/blog/tissue-culture
2. https://www.slideshare.net/slideshow/tissue-culture-244818552/244818552

24CBBC62 PHARMACEUTICAL BIOCHEMISTRY

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVE:

The course was designed in such a way to equip the students with Definition and classification of drugs, Basics of Pharmacokinetics of a drug, Basics of Pharmacodynamics in living system and Mechanism of action of drugs, Toxicity assessment and Drug abuse.

UNIT I INTRODUCTION TO DRUG BIOCHEMISTRY 12

Classification, routes of administration – factors influencing dosage and drug action, Absorption and distribution of drugs. Pharmacogenetics. Origin of a drug from plants and animals.

UNIT II DRUG METABOLISM 12

Drug Biotransformation pathways - phase I – oxidation, reduction and hydroxylation. Phase II- Conjugation, Elimination of drugs from the body system. Storage of drugs in adipose tissue. Mechanism of drug action, the combined effect of drugs. Factors modifying drug action, tolerance and dependence.

UNIT III PHARMACODYNAMICS 12

Pharmacodynamics - receptor concepts, theory, drug receptor interaction (DRI), Factors affecting DRI, Cholinergic and anticholinergic drugs, Adrenergic and adrenergic blockers, General anesthetics, Local anesthetics. Adverse reactions to drugs and common drug receptor interactions. A Visit to Pharmaceutical based IT industry / Pharmaceutical industry.

UNIT IV THERAPIES 12

Principles of therapeutics: Chemotherapy of microbial diseases, Chemotherapy of fungal infections, Chemotherapy of parasitic infections, rational use of antibiotics. Application for New Drug Discovery (NDD) according to Indian Control Authority and USFDA guidelines. Ethical considerations in utilizing human subjects for drug discovery process. Helsinki‟s declaration.

UNIT V TOXICOLOGY **12**

Toxicology: Principles of toxicology and treatment of poisoning. Heavy metals and antagonists. Non-metallic environmental toxicants. Methods involved in the development of new drugs. Preclinical toxicological studies: Calculation of LD50 and ED50.Acute, subacute and chronic toxicity studies; Irwin profile test, pre-clinical pharmacokinetic and dynamic studies. Lipinski's rule for drug like molecule, High throughput screening (in-vitro and in-vivo) for pre-clinical pharmacokinetic and pharmacodynamic studies.

Total: 60 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Elaborate on the classification of drugs.

CO2: Demonstrate the basics of Pharmacokinetics of a drug.

CO3: Interpret the basics of Pharmacodynamics in living system.

CO4: Describe the mechanism of action of drugs.

CO5: Summarize the toxicity assessment.

Text Books:

1. Satoskar, R.S and Bhandarkar, S.D. (2000) Pharmacology and Pharmacotherapeutics, 13th edition, Vol. I and II, Popular Prakeshan PVT Ltd, Mumbai.
2. Tripathi, K.D. (2013) Essentials of Medical Pharmacology, 7th edition, Jaypee brothers medical publishers, New Delhi.

Reference Books:

1. Rang, H.P., Dale, M.M., Ritter, J. and Flower, R.J. (2007) Pharmacology, 6th edition, Churchill Living Stone Elsevier.
2. Barar, F.S.K. (2013) Text Book of Pharmacology, 1st edition, S.Chand and Company Pvt. Ltd.

Web Sources:

1. https://www.carewellpharma.in/bpharmacy/notes/2nd-sem/biochemistry
2. https://www.scribd.com/document/352974635/Pharmaceutical-Biochemistry-Contents

24CBBC63 ECOLOGY AND ENVIRONMENTAL TOXICOLOGY

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVE:

To enable student to understand ecosystem structures and functions. To provide deep understanding of incredible diversity of life, interactions between different ecosystem services and impacts of natural disturbances on ecosystem. To impart knowledge on harmful effects and disposal of radioactive wastes. To enable student to understand inorganic and organic pollutants, their entry into the environment and transformation within the environment. To impart knowledge on various bioremediation methods.

UNIT I INTRODUCTION 12

Introduction to Ecology. Definition, Branches and relation of ecology with other disciplines- Significance of ecology for man. Structure of Ecosystem-Abiotic and biotic components. Examples of ecosystem, Productivity of ecosystem, food chain in ecosystem, ecological pyramids Adaptations-aquatic adaptation, Volant adaptation and desert adaptation.

UNIT II ECOSYSTEM 12

Ecosystem-fresh water communities- physiochemical nature, Lentic-biotic communities, distribution of oxygen and dissolved nutrients. Loti –characteristics of lotic and its inhabitants. Estuaries -Types of estuaries, physiochemical aspects of estuaries. Marine - physiochemical stratification, marine communities (biotic) coral reef as a specialized oceanic ecosystem. Terrestrial Ecosystems-Classification, wetland biomes and tropical savanna biomes.

UNIT III RADIOACTIVITY 12

Radioactive pollution- Radioactivity and kinds of radiation. Sources of radioactive pollution. Effect of radioactive pollution, protection and control from radiation, disposal of radioactive waste.

UNIT IV TOXICITY 12

Chemical toxicology-Toxic metals-toxic effects of Pb, Cd, Hg, Ar, Cr and Ni. Estimation of toxic metals. Toxicity of pesticides-toxic effects of organochlorines, halogenated hydrocarbons, carbonamates, heterocyclic compound, organophosphates, chlorinated phenoxy

substances and amides in urea.

UNIT V BIOREMEDIATION **12**

Bioremediation – *In-situ* engineered bioremediation, intrinsic bioremediation and natural attenuation and bio barriers. *Ex situ*-Bioremediation, phytoremediation, microbial degradation of xenobiotics

Total: 60 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Utilize the knowledge in understanding the ecosystem.

CO2: Discuss and explain the interaction between various ecosystem and impact of natural disturbances on ecosystem.

CO3: Discuss and explain the harmful effects of radioactive pollutants and their waste.

CO4: Apply the knowledge in executing preventive measures on understanding toxic metals, organic and inorganic pollutants into environment.

CO5: Apply the knowledge in the disposal ofwaste by various bioremediation methods.

Text Books:

1. Ecology-Verma and Agarwal S.(2004), Ecology, First Edition, Chand Publications.
2. B.K.Sharma, Krishna Prakashan (2014), Environmental Chemistry, Media Publisher.

Reference Books:

1. Walker, C.H. et al. 1996. Principles of Ecotoxicology. Taylor & Francis. Inc. 321 pp. ISBN 0748402217.
2. Shaw, I. and J. Chadwick. 1998. Principles of Environmental Toxicology. Taylor & Francis. Inc. 216 pp. ISBN 0748403557.

Web Sources:

1. https://youtu.be/I8Uj4yD0g6M.
2. https://www.conserve-energy-future.com › radioactive-pollution-causes-effects-solution

24CBBC64 **FORENSIC SCIENCE**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVE:

This course aims to provide overview of recent developments and emerging trends in forensic science. The course also gives insight on scope of forensic biochemistry and learn about concepts of forensic biology and its techniques.

UNIT I INTRODUCTION TO FORENSIC SCIENCE 12

Historical aspects of forensic science. Concepts and Scope of forensic science. Tools and Techniques in Forensic Science. Organizational set up of Forensic Science Laboratories in India - Central and State Forensic Science Laboratories, Fingerprint Bureaus, National Crime Records Bureau, Police & Detective Training Schools, Bureau of Police Research & Development. Services of crime laboratories.

UNIT II FORENSIC PSYCHOLOGY 12

Basics of Forensic Psychology - Definition and fundamental concepts of forensic psychology and forensic psychiatry. Ethical issues in forensic psychology. Psychology and Criminal Behavior - Personality disorder and its types. Psychological assessment and its importance.

UNIT III TECHNIQUES IN FORENSIC SCIENCE 12

Detection of Deception - Tools for detection, Polygraphy and Narco analysis and brain electrical oscillation signatures. Forensic applications of microscopy. Forensic photography - Basic principles and applications of photography in forensic science, Crime scene and laboratory photography. Documentation of crime scene by photography, sketching and field notes. Simulation of a crime scene for training.

UNIT IV FORENSIC BIOLOGY 12

Biological Evidence - Nature and importance of biological evidence. Morphology and biochemistry of human hair, Comparison of human and animal hair. Identification of wood, leaves, pollens and juices as botanical evidence. Forensic Entomology - Basics of forensic entomology. Insects of forensic importance. Collection of entomological evidence during death investigations.

UNIT V FORENSIC TOXICOLOGY 12

Basics of Toxicology - Post-mortem Toxicology. Dose-response relationship - Lethal dose 50 and effective dose 50. Poisons - Classification of poisons. Physio-chemical characteristics and mode of action of poisons. Accidental, suicidal and homicidal poisonings. Drugs - Broad classification: Narcotics, stimulants, depressants and hallucinogens.

Total: 45 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Demonstrate an understanding of how forensic scientists operate and use scientific evidence in a legal context.

CO2: Describe the working of the forensic establishments in India and abroad.

CO3: Summarize an understanding of the elements of criminal justice system and the consequences of crime in society.

CO4: Illustrate the skills involving the tools and techniques required for detection of deception and the critical assessment of advanced forensic techniques.

CO5: Recall the skills in using various tools and techniques for analysis of different types of crime scene evidence.

Text Books:

1. Narayanareddy K. S., (2007), The Essentials of Forensic Medicine & Toxicology, 26th Edition, Published by K. Sugana Devi, Hyderabad.

2. Basu, R. (2009), Fundamentals of forensic medicine and toxicology,. 2nd Edition, Books and Allied(P) Ltd. Kolkata.

Reference Books:

1. Pillay V.V., Text book of Forensic Medicine,2009, Paras Publication. Hyderabad.

2. JB Mukherjee's (2007) Forensic Medicine and Toxicology – Volume I and II (combined)- edited by Karmakar, III Edition.

Web Sources:

1. https://www.slideshare.net/drbhargava5745/introduction-to-forensic-science-labs-in-india

2.https://www.slideshare.net/JayantTiple/classification-of-poisons-and-types-of poisoningpptx-252803879

24DBBC61 **BIOINFORMATICS**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE:

To impart knowledge about the basics of Internet communication. To expose the students to the principles and applications of Bioinformatics & data bases. To understand the concept of Sequence alignment & gene prediction. To enable students, understand protein structural organization, prediction and visualization. To understand the basics of Phylogenetics analysis and Drug designing.

UNIT I INTRODUCTION 12

Introduction to Internet – IP address, URL; networks - LAN, WAN; Communication protocols – TCP, IP, FTP, HTTP; www, web browsers, Search Engines. Types of Databases - Flat files, Relational, Object oriented databases.

UNIT II COMPUTERS AND BIOLOGY 12

Bioinformatics- Definition and Comparison between Computers and Biology; Principles, Applications of Bioinformatics and Challenges, NCBI, Biological databases. INSDC, GenBank, Protein sequence databases: Uniprot, PDB; Literature database – PubMed; Data retrieval systems – Entrez.

UNIT III SEQUENCE ALIGNMENT 12

Introduction to Sequence, Alignments, Type of Alignments and their Significance, Dot plot, Pairwise alignment –BLAST and Multiple Sequence Alignment - Clustal W algorithm. Gene prediction, Human Genome Project and its significance, OMIM.

UNIT IV PROTEIN STRUCTURE 12

Protein Structure: Primary, Secondary, Super Secondary, Tertiary, Quaternary, Peptide bond, phi, psi and chi torsion angles, Significance of Ramachandran plot; Motif and Domain. 3D Protein structure prediction (Homology Modelling) and Structure Visualization.

UNIT V PHYLOGENETIC ANALYSIS 12

Basics of Phylogenetic analysis - Definitions of Homologs, Orthologs, Paralogs and Xenologs; Definitions for Genomics, Metagenomics, Transcriptomics, Proteomics, Lipidomics, Interactomics, Pharmacogenomics, Metabolomics, Chemoinformatics. Basic

Steps in drug development- Stages, Clinical Trials, Structure based drug designing.

Total: 60 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Explain the basics of Internet communication.

CO2: Discuss about the use of Bioinformatics and Database.

CO3: Align sequences, utilize sequence aligning tools, predict genes.

CO4: Discuss about protein structural organization, predict protein Structure and utilize structure prediction & visualization tools.

CO5: Explain about Phylogenetics analysis and discuss about Drug designing..

Text Books:

1. Essential Bioinformatics by Jin Xiong
2. Text book of Bioinformatics-Sharma, Munjal and Shankar, 2008.

Reference Books:

1. Bioinformatics: Sequence and Genome Analysis by Mount D., Cold Spring Harbor Laboratory Press, New York. 2004
2. Bioinformatics- a Practical Guide to the Analysis of Genes and Proteins by Baxevanis, A.D. and Francis Ouellellette, B.F., Wiley India Pvt Ltd. 2009

Web Sources:

1. https://www.ks.uiuc.edu/Training/Tutorials/science/bioinformatics-tutorial/bioinformatics.pdf
2. https://zhanglab.ccmb.med.umich.edu/papers/2009_8.pdf

24DBBC62 **DRUG DESIGNING**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE:

To provide students with an understanding of the principles and processes involved in drug design. To equip students with knowledge of modern computational methods in drug discovery. To familiarize students with the relationship between drug structure and its biological activity, as well as the techniques used in lead compound identification and optimization.

UNIT I INTRODUCTION TO DRUG DESIGN 12

Definition and scope of drug designing, historical development, and importance in pharmaceutical sciences. Pharmacokinetics, pharmacodynamics, drug-receptor interaction, and structure-activity relationship (SAR). From target identification to drug approval, stages of drug development, and regulatory aspects.

UNIT II MOLECULAR MODELLING AND SIMULATION 12

Introduction to docking simulations, receptor-ligand interactions, and docking software tools (AutoDock, Glide, etc.). Regression models, pharmacophore modeling, and molecular descriptors. Principles of MD simulations, understanding protein-ligand interactions, and the use of MD software tools.

UNIT III DRUG TARGET IDENTIFICATION AND VALIDATION 12

Methods for identifying drug targets (e.g., receptors, enzymes, ion channels). Techniques for validating drug targets, including genetic knockouts, RNA interference, and CRISPR technology. High-throughput screening (HTS) and virtual screening in drug discovery.

UNIT IV LEAD COMPOUND IDENTIFICATION AND OPTIMIZATION 12

Techniques like fragment-based drug discovery (FBDD), high-throughput screening, and virtual screening. Strategies for improving drug properties (e.g., potency, selectivity, pharmacokinetics, toxicity). Lipinski's Rule of Five, ADMET (Absorption, Distribution, Metabolism, Excretion, Toxicity) profiling

UNIT V BIOINFORMATICS AND DRUG DESIGNING TOOLS 12

Use of bioinformatics tools to predict protein structures, sequence alignments, and interactions. Introduction to tools like PyMOL, Chimera, MOE, and others for 3D molecular visualization, ligand-binding prediction, and structure-based drug design.

Total: 60 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Understand the basic concepts of drug design and the drug development process.

CO2: Apply molecular modeling techniques such as docking, QSAR, and molecular dynamics to drug design.

CO3: Identify and validate drug targets using modern biotechnology techniques.

CO4: Understand the strategies used in the identification and optimization of lead compounds for drug development.

CO5: Use bioinformatics tools to predict drug efficacy and drug-target interactions.

Text Books:

1. J. Richard Dixon & Norman J. Woolfson (2012), *Drug Design: Structure- and Ligand-Based Approaches*, CRC Press.

2. M. M. Gokhale & P. N. Padhye (2019), *Computer-Aided Drug Design*, Elsevier.

Reference Books:

1. Geetha Sumbali and R.S. Mehrotta (2009), Principles of Microbiology, Tata McGraw – Hill Education private limited, New Delhi.
2. Joanne Willey, LindaSherwood, Christopher J. Woolverton (2016), Prescott's Microbiology 10th ed. McGraw-Hill Education, Chennai, TamilNadu.

Web Sources:

1. https://www.bioinformatics.org/
2. https://www.chemspider.com/

24PBBC61 **CELL CULTURE TECHNIQUES**

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVE

The course enables the students to learn the techniques of plant tissue culture and provide a hands-on-training on tissue culture techniques. The course provides students to acquire knowledge on practical aspects of gene transfer methods and various types of tissue culture.

LIST OF EXPERIMENTS

1. Requirements for Plant Tissue Culture Laboratory
2. Sterilization techniques in plant tissue culture
3. Preparation of Tissue Culture Media
4. Callus Induction
5. Shoot tip culture
6. Anther culture
7. Embryo culture
8. Isolation of Protoplasts
9. Preparation of Synthetic Seed
10. Isolation of genomic DNA from plant
11. Demonstration of Gene transfer techniques (direct methods)
12. Demonstration of Gene transfer techniques (indirect methods)

Course Outcome:

At the end of this course students will be able to,

CO1: Develop skills to work in the tissue culture industry

CO2: Demonstrate skills of callus culture through hands on experience.

CO3: Illustrate the biotransformation technique

CO4: Evaluate the different techniques used in Plant Tissue Culture

CO5: Develop a critical knowledge on sterilization techniques related to plant tissue culture

Text Books:

1. Rushikesh Tahakik, Practical Manual- Plant Tissue Culture, MGM College of Agricultural Biotechnology, 2023.

2. Handbook of Plant Cell Culture Techniques and breeding. Ed. Evans, Sharp, Ammirato and

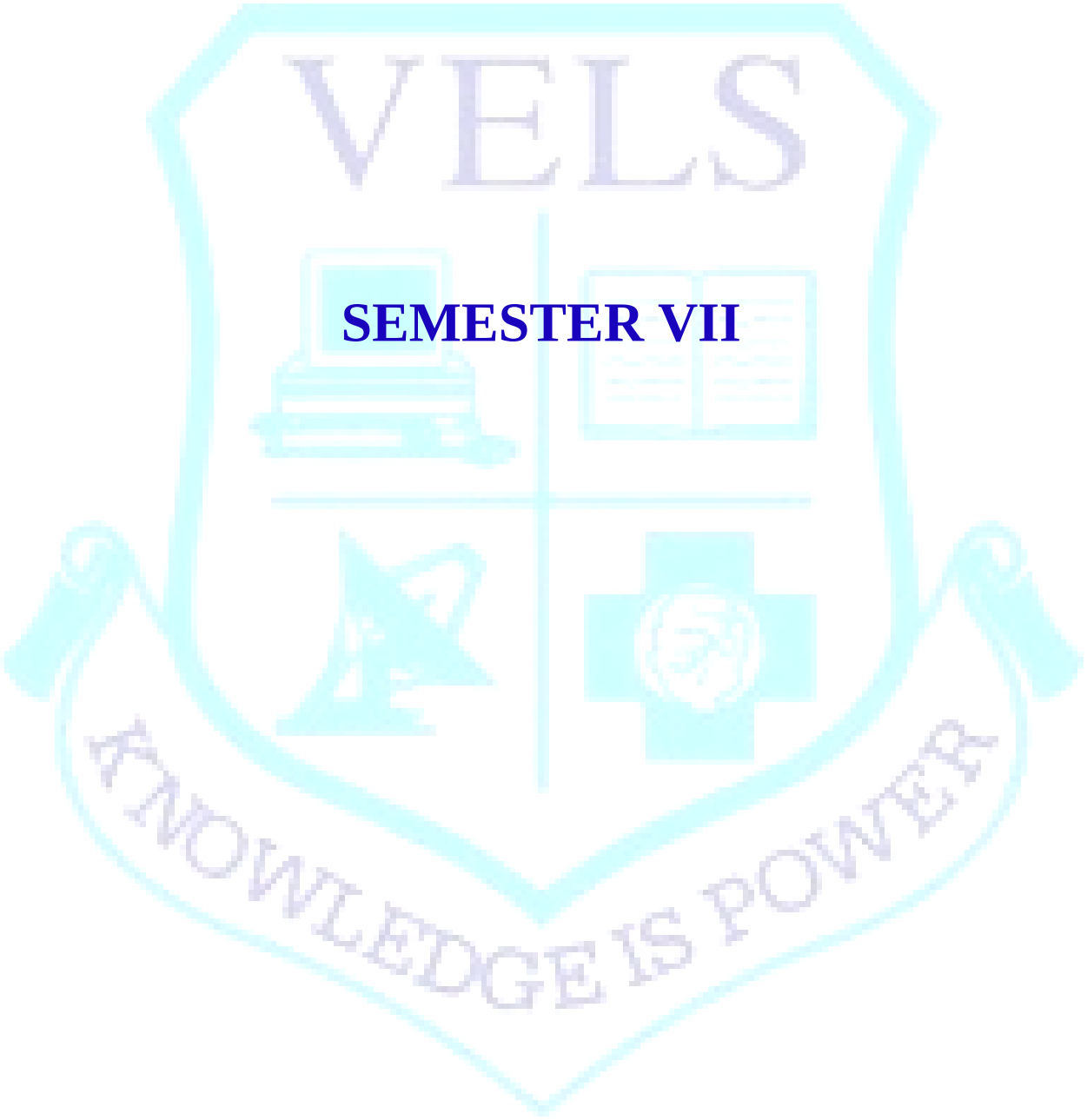
Yamada. Macmillan, New York, 1983

Reference Books:

1. Gupta. R.C and Bharghava. S. (1992), Practical Biochemistry, CBS Publishers and Distributors, New Delhi
2. Plant Tissue Culture: Methods and Application in Agriculture. Ed. Travor A. Thorpe. Academic Press, 1981.

Web Sources:

1. https://www.youtube.com/watch?v=TORRxwbz7aY
2. https://www.youtube.com/watch?v=dENVTq7l0uQ



SEMESTER VII

24CBBC71 **GENETICS**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE:

This course presents the way characters get transferred through generations and methods to analyze and modify them. To make the student to understood the concept of genes and their behavior. Basic genetics and their role.

UNIT I HISTORY 9

History of Genetics - Mendelian Principles, Segregation, Independent Assortment, Dominance. Multiple alleles, Incomplete dominance, over dominance and co dominance.

UNIT II LINKAGE AND CROSSING OVER 9

Epistasis, lethal genes. Sex determination and sex linkage in diploids, linkage and crossing over, gene mapping. Chromosomal theory of inheritance, maternal effects.

UNIT III CHROMOSOMAL VARIATION 9

Chromosomal variation in number, Changes in Chromosomal structure, Genetics of Heamoglobin, Transposable elements in prokaryotes and eukaryotes.

UNIT IV CHROMOSOME STRUCTURE 9

Structure of chromosome, fine structure of Gene, cistron, recon, Structure of Eukaryotic gene, Experimental evidence for DNA as the genetic material, cytoplasmic genetic systems-mitochondria and chloroplast DNA.

UNIT V POPULATION GENETICS 9

Genetic control of Development in Drosophila. Population genetics, calculating gene frequency, factors affecting gene frequency. Pedigree analysis and genetic counselling.

Total: 45 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Understanding of Mendelian Genetics: Students should be able to explain and apply the principles of Mendelian inheritance, including concepts such as dominant and recessive

alleles, Punnett squares, and genetic ratios.

CO2: Knowledge of Genetic Variation: Students should understand the sources and mechanisms of genetic variation, including mutation, recombination, and gene flow, and how these processes contribute to genetic diversity within populations.

CO3: Comprehension of Molecular Genetics: Students should have a grasp of the molecular mechanisms underlying gene expression, regulation, and replication, including DNA structure, transcription, translation, and epigenetics.

CO4: Application of Genetic Tools and Techniques: Students should be able to apply various genetic techniques and tools such as polymerase chain reaction (PCR), gel electrophoresis, DNA sequencing, and genetic engineering to analyse and manipulate genetic material.

CO5: Understanding of Population Genetics: Students should understand the principles of population genetics, including Hardy-Weinberg equilibrium, genetic drift, gene flow, and natural selection, and how these processes shape the genetic composition of populations over time.

Text Books:

1. D.L.Hartl, 1991, Basic genetics, Jones and Bartett public.
2. Friedfelder 1987, Microbial genetics, Jones and Bartett public.

Reference Books:

1. Watson et.,al, 1987, Molecular Biology of the genes 4th Ed. the Benjamin /Cummings coins.
2. Molecular by cell biology, 1994.Lodish, Baltimore scientific American books,Inc.

Web Sources:

1. https://www.cliffsnotes.com/study-guides/biology/biology/classical-mendelian-genetics/introduction-to-genetics
2. https://unacademy.com/content/neet-ug/study-material/biology/genetics/

24CBBC72 MOLECULAR DEVELOPMENTAL BIOLOGY

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVE:

The course integrates the descriptive, experimental and biochemical approaches into a conceptual framework for the analysis of development. The course deals with key steps in the transformation of the single-celled zygote into the complex, multicellular, adult organisms and links genetics with embryology.

UNIT I EVOLUTION AND FERTILIZATION 12

Introduction, history and evolution – an overview. Development among unicellular eukaryotes Acetabularis, Naegleria. The origins of sexual reproduction. Fertilization: structure of gametes, recognition of sperm and egg –action at distance and contact of gametes. Cleavage: Patterns of embryonic cleavage, radial holoblastic cleavage, spiral holoblastic cleavage, mechanisms of cleavage –regulation of cleavage cycles.

UNIT II MODEL ORGANISMS 12

Major model organisms. Availability culture and cost; access and micromanipulation. Examples: Drosophila, zebrafish, Caenorhabditis elegans, chicks.

UNIT III EMBRYONIC DEVELOPMENT IN ANIMALS 12

Early Embryonic Development, morphogenesis and organogenesis in animals: Blastula formation, Types of Cleavage, Gastrulation and formation of germ layers in animals. Cell aggregation and differentiation in Dictyostelium. Organogenesis-vulva formation in Caenorhabditis elegans; eye lens induction, limb development in vertebrates, neuron differentiation, larval formation, metamorphosis.

UNIT IV EARLY EMBRYONIC DEVELOPMENT IN PLANTS 12

Early Embryonic Development in plants: Gametogenesis, Fertilization, Embryo sac development and double fertilization in plants.

UNIT V REGENERATION AND APOPTOSIS 12

Cell death and regeneration. Concept of regeneration; cell cycle, programmed cell death; aging and senescence. Basics of cancer development.

Total: 60 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Develop knowledge and understand the biological process increases by using a historical approach to science.

CO2: Explain the molecular mechanisms that underlie animal development.

CO3: Explain underlying developmental biology processes during tissue development and organogenesis.

CO4: Develop an understanding about the basic concepts of developmental biology.

CO5: Compare and contrast the different process of differentiation to many different types of cells and tissues.

Text Books:

1. T. Subramoniam, (2011),Molecular developmental biology. 2nd Edition.
2. Manju Yadav (2008), Molecular Developmental Biology. Discovery Publishing Pvt.Ltd.

Reference Books:

1. Scott F. Gilbert, Susan Singer, (2006), Developmental Biology. Sinauer Associates Inc.; 8th edition.
2. Jonathan M. W. Slack,(2012), Essential Developmental Biology. Wiley-Blackwell. 3rd Edition,

Web Sources:

1.https://plato.stanford.edu/entries/biology-developmental/

2. https://www.geeksforgeeks.org/developmental-biology/

24CBBC73 BIOCHEMISTRY OF CELL SIGNALLING

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVE:

The course was designed in such a way to the impart knowledge of signaling mechanisms taking place at cellular level and to assess the mechanism of signaling molecules in transduction process.

UNIT I MEMBRANE TRANSPORT 12

Membrane assembly – importins and exportins. Membrane transport: Diffusion (passive and facilitated). Active transport – symport, antiport, Na+ K+ ATPase. Ion gradients, ion selective channels, group translocations. Endocytosis and exocytosis.

UNIT II CELL SIGNALING I 12

Fundamental concepts and definitions of signal, ligands, and receptors, Endocrine, paracrine and autocrine signaling. Receptors and signaling pathways – cell surface receptors, ion channels, G – protein coupled receptors, receptor kinases (tyr, ser/thr).

UNIT III CELL SIGNALING II 12

Signal transduction through cytoplasmic and nuclear receptors. The Ras, raf, MAP kinase cascade. Second messengers -cyclic nucleotides, lipids and calcium ions. Crosstalk in signaling pathways.

UNIT IV CELL CYCLE 12

Cell Cycle: - Overview of cell cycle. Cell cycle Control in mammalian cells, Checkpoints in cell-cycle regulation.

UNIT V CANCER 12

Cell cycle and cancer: - Apoptosis (Programmed cell death) -- Pathways, regulators & effectors in apoptosis. Cancer: Properties of tumor cells & Genetic basis and onset of cancer. Tumor suppressor genes and functions of their products. Carcinogenic effect of chemicals and radiation. Molecular diagnosis of cancer.

Total: 60 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Understand the basics of "Cell Biology". Comprehend the historical and current understanding of cell membrane structure and function.

CO2: Demonstrate membrane structure and functions. Demonstrate the types of transport mechanisms on membranes.

CO3: Encompass the basic concepts of co-ordination and integration in multicellular organisms with respect to metabolic events.

CO4: Encompass the fundamentals of ligand and receptor interactions. Understand the basics and different types of signalling pathways.

CO5: Gain knowledge on signal transduction andGain knowledge on the role of second messengers. Understand Basics of cell cycle as well as apoptosis. Know about cancer, its development and types.

Text Books:

1. Lodish et al.(2003), Molecular Cell Biology. Scientific 5th ed. Freeman.
2. Twyman. (1998), Advanced Molecular Biology. 2nd ed. Viva books.

Reference Books:

1. De Robertis and De Robertis.(2006) Cell and Molecular Biology, 8th ed. Lea and Febiger.
2. Karp G. (2002),Cell and Molecular Biology. 3rd ed. John Wiley and Sons.
3. Murray et al. (2003), Harper's Biochemistry. 26th ed. McGraw Hill (for Unit–II).

Web Sources:

1.https://www.khanacademy.org/science/ap-biology/cell-communication-and-cell-cycle/cell-communication/a/introduction-to-cell-signaling

2. http://dosequis.colorado.edu/Courses/MCDB3145/Docs/Karp-617-660.pdf

24DBBC71 **RESEARCH METHODOLOGY**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

The main objective of this course is to introduce the basic concepts in research methodology in science. This course addresses the issues inherent in selecting a research problem. Discuss the techniques and tools to be employed in completing a research project. Enable the students to prepare report writing and framing Research proposal.

UNIT I INTRODUCTION TO RESEARCH (12)

Introduction to Research: The concept of research, characteristics of good research, Application of Research, Meaning and sources of Research problem, characteristics of good Research problem, Research process, outcomes, application of Research, Meaning and types of Research hypothesis, Importance of Review of Literature, Organizing the Review of Literature.

UNIT II RESEARCH DESIGN (12)

Research Design: Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses, Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables.

UNIT III SAMPLING (12)

Sampling, Data Collection and analysis: Types and sources of data – Primary and secondary, Methods of collecting data, Concept of sampling and sampling methods – sampling frame, sample, characteristics of good sample, simple random sampling, purposive sampling, convenience sampling, snowball sampling, classification and tabulation of data, graphical representation of data, graphs and charts. Statistical Methods and its Applications of in Research.

UNIT IV RESEARCH REPORT (12)

Research Report: Research report and its structure, journal articles – Components of journal article. Explanation of various components. Structure of an abstract and keywords. Thesis and dissertations. components of thesis and dissertations. Referencing styles and bibliography.

UNIT V SOFTWARE (12)

Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases. Use of tools / techniques for Research: methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism

Total: 60 Hours

Course Outcome:

At the end of this course students will be able to,

CO -1	Students who complete this course will be able to understand and comprehend the basics in research methodology and applying them in research/ project work.
CO -2	This course will help them to select an appropriate research design
CO -3	The course will also enable them to collect the data, edit it properly and analyse it accordingly. It will facilitate students' prosperity in higher education
CO -4	The students will develop skills in qualitative and quantitative data analysis and presentation.
CO -5	Students will be able to demonstrate the ability to choose methods appropriate + to research objectives.

Text books:

1. Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition,2006.
2. Uma Sekaran (2010). Research Methods for Business, 4th edition, Wiley.

Reference Books

1. Ranjit Kumar (2009) Research Methodology, 2nd edition, Pearson Education.
2. Donald Cooper and PS Schindler (2009) Business Research Methods, 9th edition, Tata McGraw Hill.

Web sources

1. https://www.studocu.com/in/document/sant-gadge-baba-amravati-university/zoology/unit-1-rm-this-notes-for-phd-course-work/35922604
2. Chromeextension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.drnishikantjha.com/papersCollection/Research%20Methodology%20.pdf

24DBBC72 **CLINICAL RESEARCH**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVE:

To provide students with a comprehensive understanding of clinical research, including its principles, methodologies, and ethical considerations. To equip students with knowledge on clinical trial design, data analysis, and regulatory requirements. To prepare students to conduct, manage, and evaluate clinical research studies in the pharmaceutical and healthcare industries.

UNIT I INTRODUCTION TO CLINICAL RESEARCH 12

Overview of clinical research, its importance, and role in drug development. Phases of clinical trials (Phase I-IV), including the design, goals, and evaluation criteria for each phase. Steps in the clinical research process, from study concept to publication. Basic principles of GCP, the importance of ethics, safety, and quality in clinical research.

UNIT II STUDY DESIGN AND METHODOLOGY 12

Types of clinical study designs (observational, interventional, case-control, cohort, randomized controlled trials). Methods of randomization, types of blinding, and their importance in minimizing bias. Key statistical concepts in clinical research, including hypothesis testing, sample size calculation, and data analysis.

UNIT III ETHICS IN CLINICAL RESEARCH 12

Informed consent, patient confidentiality, and protecting vulnerable populations. Role and functions of IRBs in approving and overseeing clinical trials. Ethics in drug approval, including the role of regulatory bodies (FDA, EMA, ICH) and international guidelines (Declaration of Helsinki, ICH-GCP).

UNIT IV CLINICAL TRIAL MANAGEMENT AND MONITORING 12

Writing and developing clinical trial protocols, including inclusion/exclusion criteria, endpoints, and outcomes. Methods of monitoring clinical trials, including site visits, data review, and ensuring protocol adherence. Strategies for recruiting and retaining patients in clinical trials.

UNIT V REGULATORY FRAMEWORK AND DATA ANALYSIS 12

Understanding the role of regulatory bodies (FDA, EMA, ICH) in approving clinical trials and drugs. Phase IV clinical trials, pharmacovigilance, and monitoring the long-term safety and efficacy of drugs. **Total: 60 Hours**

Course Outcome:

At the end of this course students will be able to,

CO1: Understand the principles and processes involved in clinical research and the phases of clinical trials.

CO2: Design and manage clinical trials, including study design, data collection, and statistical analysis.

CO3: Address ethical issues and ensure compliance with Good Clinical Practice (GCP) and regulatory requirements.

CO4: Monitor and manage clinical trials, including recruitment, data collection, and quality control.

CO5: Interpret and analyze clinical trial data and report findings.

Text Books:

1. John I. Gallin, Frederick P. Ognibene (2012), *Principles and Practice of Clinical Research* (3rd ed.), Elsevier.
2. Mitchell D. Weiner (2016), *Fundamentals of Clinical Trials* (5th ed.), Springer.

Reference Books:

1. Harvey J. Motulsky (2017), Intuitive Biostatistics: A Nonmathematical Guide to Statistical Thinking (4th ed.), Oxford University Press.
2. Iain M. Calvert, Steven M. S. (2016), Clinical Trials: A Practical Guide to Design, Analysis, and Reporting (2nd ed.), Wiley-Blackwell.

Web Sources:

1. https://www.clinicaltrials.gov/
2. https://www.who.int/ictrp/en/

24PBBC71 **GENETICS**

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVE

To get hands on experience on basic microscopy and its principles and functioning. To impart knowledge about various cell organelles and cell division

LIST OF EXPERIMENTS

1. Identification of given plant cell (Allium cepa)
2. Identification of given animal cells (Muscle cell, Sperm Cell)
3. Identification of given bacterial cells (E.Coli) by microscopy
4. Leishman staining, Giemsa staining, Gram's staining
5. Staining for different stages of mitosis in Allium cepa
6. Staining for different stages of meiosis in flower Buds of Allium cepa
7. Buccal smear preparation
8. Isolation of chromosomal DNA from plants
9. Isolation of chromosomal DNA from bacterial cells
10. Agarose gel electrophoresis of DNA.
11. Isolation of Chloroplasts.
12. Karyotyping.

Course Outcome:

At the end of this course students will be able to,

CO1: Determine and understand the basic principle involved in isolation of biomolecules from various biological sources

CO2: Isolate and purify DNA and RNA from various sources – viz plant, microbes and animals

CO3: Separate Proteins by SDS PAGE

CO4: Understanding the mobility differences of macromolecules in electrophoresis

CO5: Understand the optimal conditions essential for protein/nucleic acid n and purification

Text Books:

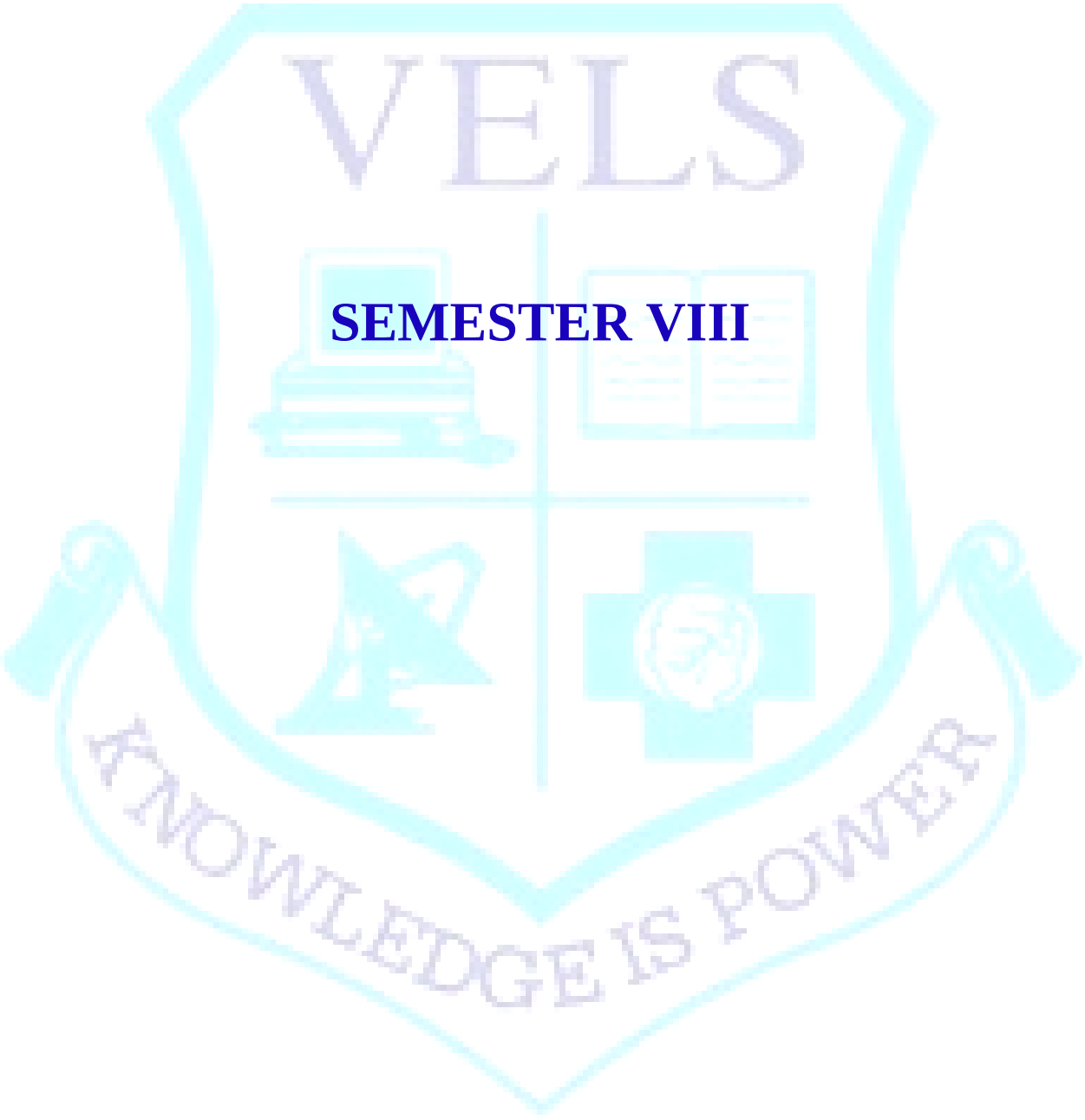
1. 1 Michael R. Green, Joseph Sambrook. Molecular Cloning: A Laboratory Manual, 4th Ed.
2. S.K.Sawhney and Randhir Singh. Introductory practical biochemistry. 2nd edition.2005.

Reference Books:

1. Roger L. Lundblad, Fiona Macdonald. Handbook of Biochemistry and Molecular Biology, 4th Edition. CRC Press, 2010
2. Leland J. Cseke, Ara Kirakosyan, Peter B. Kaufman, Margaret V. Westfall. Handbook of Molecular and Cellular Methods in Biology and Medicine, 3rd Edition, CRC Press, 2011

Web Sources:

1. https://www.youtube.com/watch?v=GXW5EY7GKI0
2. https://www.youtube.com/watch?v=kXgtLmJvU_s



SEMESTER VIII

24CBBC81 MOLECULAR BASIS OF INFECTIOUS DISEASES

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE:

To learn the diversity of microorganisms and learn the abundance, distribution and significance of microorganism in the environment such as bioremediation and Plant microbe interactions understand various biogeochemical cycles - microbes involved in various diseases etc.

UNIT I CLASSIFICATION OF INFECTIOUS AGENTS 9

Bacteria, Viruses, protozoa and fungi. Past and present emerging and re-emerging infectious diseases and pathogens. Source, reservoir and transmission of pathogens, Antigenic shift and antigenic drift. Host parasite relationship, types of infections associated with parasitic organisms. Overview of viral and bacterial pathogenesis. Infection and evasion.

UNIT II OVERVIEW OF DISEASES CAUSED BY BACTERIA 9

Detailed study of tuberculosis: History, causative agent, molecular basis of host specificity, infection and pathogenicity, Diagnostics, Therapeutics, inhibitors and vaccines. Drug resistance and implications on public health. Other bacterial diseases including Typhoid, Diphtheria, Pertussis, Tetanus, Typhoid and Pneumonia.

UNIT III OVERVIEW OF DISEASES CAUSED BY VIRUSES 9

Detailed study of AIDS, history, causative agent, pathogenesis, Diagnostics, Drugs and inhibitors. Other viral diseases including hepatitis, influenza, rabies, chikungunya and polio.

UNIT IV OVERVIEW OF DISEASES CAUSED BY PARASITES 9

Detailed study of Malaria, history, causative agents, Vectors, life cycle, Host parasite interactions, Diagnostics, Drugs and Inhibitors, Resistance, Vaccine development. Other diseases including leishmaniasis, amoebiasis.

UNIT V OVERVIEW OF DISEASES CAUSED BY OTHER ORGANISMS 9

Fungal diseases, General characteristics. Medical importance of major groups, pathogenesis, treatment.

Total: 45 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Deliberate in depth infectious agents.

CO2: Learn the detail of bacterial diseases.

CO3: Understand the detail of viral diseases.

CO4: Learn the characteristics of diseases caused by parasites.

CO5: Learn the characteristics of fungal diseases.

Text Books:

1. Prescott, Harley, Klein's, Willey, J.M., Sherwood, L.M., Woolverton, C.J. (2008) Microbiology 7th Ed Mc Graw Hill International Edition (New York) ISBN: 978-007-126727.

2. Mandell, Douglas and Bennett.S, Principles and practices of Infectious diseases, 7th edition, Volume, 2. Churchill Livingstone Elsevier.

Reference Books:

1. Sherris Medical Microbiology: An Introduction to Infectious Diseases by Kenneth J.Ryan, C. George Ray, Publisher: McGraw-Hill.

2. Medical Microbiology by Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller, Elsevier Health Sciences

Web Sources:

1. https://microbenotes.com/
2. https://microbiologyinfo.com/

24CBBC82 **OMICS TECHNOLOGY**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE:

The syllabus enhances the principles and technologies underlying various omics disciplines. It also explores the applications of omics technologies in biological and biomedical research. Develops the critical thinking and problem-solving skills in omics data analysis and interpretation.

UNIT I GENOMICS 9

Genomics- Introduction. Historical development and current trends in omics research. Categories of genomics. Genome mapping- Physical mapping and genetic mapping. Genome sequencing. Genome sequence assembly. Genome annotation. Variant calling. Applications of genomics in Genetics, medicine and agriculture.

UNIT II TRANSCRIPTOMICS 9

Transcription factor binding sites- common tools and database. Microarrays. RNA-Seq. Regulatory RNAs: large or small, Computational prediction of microRNA target genes. RNA dark matter. Applications of transcriptomics in gene regulation, developmental Biology and disease research.

UNIT III PROTEOMICS 9

Fundamental concepts for protein separation and analysis. Tools of proteomics- 2D PAGE, SDS PAGE, mass spectrometry (MALDI and ESI), liquid chromatography. Peptide mass fingerprinting in protein identification. Applications of functional proteomics, biomarker discovery and drug development.

UNIT IV METABOLOMICS 9

Basic concepts for metabolomics. Tools of metabolomics- gas chromatography, capillary electrophoresis, electrochemical detectors. Metabolic fingerprinting. Applications of metabolism, nutrition and disease biomarkers.

UNIT V LIPIDOMICS **9**

Basic concepts of lipidomics. Data acquisition strategies in lipidomics. Data processing and analysis pipelines. Applications of lipidomics in metabolic diseases, neurodegenerative diseases and cancer research.

Total: 45 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Demonstrate the various omics technologies, including genomics, transcriptomics, proteomics, metabolomics, and lipidomics.

CO2: Apply appropriate techniques for data acquisition in omics experiments.

CO3: Infer proficiency in bioinformatics tools and computational methods for analyzing omics data.

CO4: Demonstrate skills in experimental design and planning for omics studies.

CO5: Analyze and explore the applications of omics technologies in biomedical research.

Text Books:

1. Bioinformatics for omics data: methods and protocols (2011), Mayer, B., New York: Humana Press.

2. Barh D., Zambare V., Azevedo V. (2013). Omics: Applications in Biomedical, Agricultural, and Environmental Sciences CRC Press. Taylor and Francis Group

Reference Books:

1. Applications of Advances Omics Technologies: from Genes to Metabolites (2014), Wilson and Wilsons. Elsevier.

2. Bagchi D., Swaroop A., Bagchi M. Wiley Blackwell. (2015) Genomics, Proteomics and Metabolomics in Nutraceuticals and Functional Foods.

Web Sources:

1. https://nursing.wayne.edu/ohr/j_pierce_introduction_to_omics_092220-opt.pdf
2. https://cs.nyu.edu/~mishra/COURSES/05.COBIO/lec11%5bCB-F05%5d.pdf

24CBBC83 **APPLIED BIOTECHNOLOGY**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVE:

To introduce the tools of genetic engineering. To instill the knowledge about the strategies of gene cloning method. To enable students, understand plant Biotechnology in crop improvement and disease resistance. To impart knowledge on types of cell cultures and their application in medical field. To utilize the knowledge in understanding the application of biotechnology in various industries.

UNIT I INTRODUCTION 12

Introduction to Biotechnology- Scope and Importance, Tools of R-DNA technology; Enzymes, Linkers, Adaptors, Vectors - Plasmid, Phages, Cosmid, Viral, Shuttle and Expression vectors. Automated Gene Machine, Gene amplification-PCR and Application, DNA sequencing-Sanger's method.

UNIT II GENE TRANSFER METHODS 12

Strategies of r-DNA Technology; Isolation and Identification of Gene of interest- Gene Library. Gene transfer methods – Electroporation, Liposome mediated transfer, Gene Gun method, Selection of recombinants - Marker gene and Reporter genes for Animal and Plant cells, Colony Hybridization Methods. Blue white selection method, Insertional inactivation method and Immunological method. Blotting- Southern, Northern, and Western.

UNIT III PLANT BIOTECHNOLOGY 12

Plant Biotechnology: Plant tissue culture-Requirements for plant tissue culture, Types of culture, Applications of plant tissue culture. Applications of Transgenic plants- Herbicide resistant crops and Insect resistant crops.

UNIT IV ANIMAL BIOTECHNOLOGY 12

Animal Biotechnology: Requirement for animal tissue culture, Mammalian cell culture, Stem cell culture, Cell lines and its maintenance. Applications of animal cell culture. Transgenic animals and its applications. Medical Biotechnology: Production of Insulin, Interferon, tPA, Principles of Gene therapy.

UNIT V INDUSTRIAL BIOTECHNOLOGY 12

Industrial Biotechnology: Fermentation, Fermenter and Fermentation process-types. Downstream processing- Production of Vinegar, Single Cell Protein-Algae. Enzyme Biotechnology: Immobilization of enzymes, methods of immobilization. Industrial application of enzymes- Food industry, Textile industry, pharmaceutical industry, Paper and Pulp industry.

Total: 60 Hours

Course Outcome:

At the end of this course students will be able to,

CO1: Outline the fundamental steps in genetic engineering procedures and discuss the various tools of recombinant DNA Technology.

CO2: Discuss the technique used to isolate specific gene of interest, explain various gene transfer method and selection procedure for identifying transformants.

CO3: Identify various natural and artificial ways to propagate plants to increase genetic variety and genetic composition.

CO4: Outline the fundamentals of various types of animal cell cultures. Discuss the role of biotechnology in the health care sector.

CO5: Explain and discuss the various steps involved in large scale production and harvesting of genetically engineered protein. Discuss the role of biotechnology in various industrial sectors.

Text Books:

1. U.Sathyanarayana (2013) Biotechnology ,8th reprint.
2. R.C.Dubey- Textbook of Biotechnology.

Reference Books:

1. Bernard R Glick and Jack J Pasternak, Molecular Biotechnology Principles and Applications of Recombinant DNA,(2003),3rd edition.
2. Essentials of Biotechnology-Michael Crichton.

Web Sources:

1. www.niscair.res.in
2. www.gate2biotech.com/instantnotes-

24DBBC81 TISSUE ENGINEERING AND REGENERATIVE MEDICINE

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

The syllabus helps to understand the basic principles and methodologies of tissue engineering. Explore the components of tissue engineering, including cells, scaffolds, and signaling molecules. Applications of tissue engineering in regenerative medicine, drug discovery, and biomedical research are also studied.

UNIT I BASIC CONCEPTS OF TISSUE ENGINEERING (12)

Tissue Engineering- Definition and scope. Basic concepts of tissue Engineering. Growth factors, cytokines, bioactive molecules. Historical overview in tissue Engineering. Extracellular matrix- structure and its functions. Applications of tissue Engineering. Cells used in tissue Engineering. Mechanical stimuli on cells- cell adhesion and cell migration.

UNIT II TECHNOLOGIES IN TISSUE ENGINEERING (12)

Tissue Engineering scaffolds- Introduction, characteristics and applications. Biomimetic scaffolds tissue Engineering. Bioreactors- cell culture environment, mechanical stimulation, scaffold seeding, mass transfer. Bioprinting, electrospinning and decellularization techniques. Regulatory challenges in tissue Engineering.

UNIT III APPLICATIONS OF TISSUE ENGINEERING (12)

Applications of tissue Engineering- nerve tissue Engineering, human skin replacement, bone tissue Engineering, musculoskeletal tissue Engineering, cartilage tissue Engineering, vascular graft tissue Engineering, renal tissue Engineering, dental tissue Engineering, tracheal tissue Engineering, cardiovascular tissue Engineering and hepatic tissue Engineering.

UNIT IV OVERVIEW OF REGENERATIVE MEDICINE (12)

Regenerative medicine- Overview, historical perspective, basic concepts and approaches. Stem cells- embryonic stem cells, induced pluripotent stem cells. Stem cell therapies, mesenchymal stem cell therapies. Gene therapy- viral vectors, gene editing technologies. Biomaterials. Drug delivery.

UNIT V TECHNOLOGIES IN REGENERATIVE MEDICINE (12)

Emerging technologies and future directions in regenerative medicine- introduction, organ on a chip system- microfluidic architecture, tissue models, dynamic microenvironment, disease modelling and drug screening. Challenges and opportunities in regenerative medicine- scalability, long term safety.

Potential impact of regenerative medicine on healthcare. Regulation and ethics.

Total: 60 Hours

COURSE OUTCOMES:

At the end of this course students will be able to,

CO 1	Recall the fundamental principles underlying tissue engineering and regenerative medicine, including cell biology, biomaterials science, and tissue physiology.
CO 2	Demonstrate the various techniques used in tissue engineering, such as scaffold fabrication, cell culture methods, and bioreactor design.
CO 3	Apply appropriate biomaterials for specific tissue engineering applications based on their properties, biocompatibility, and degradation kinetics.
CO 4	Interpret on cell behaviour, including proliferation, differentiation, and signalling pathways, and how these processes can be manipulated in tissue engineering
CO 5	Design different regenerative medicine strategies, including cell-based therapies, growth factor delivery, and tissue grafting techniques.

Text Books

1. Anthony Atala, Robert Lanza, Tony Mikos, Robert Nerem. Principles of Tissue Engineering. Academic press, 3rd edition. 2018.
2. Anthony Atala, Robert Lanza, James A Thomson, Robert Nerem. Principles of regenerative medicine. Academic press, 2nd edition. 2011.

Reference Books

1. John P Fisher, Antonios G Mikos, Joseph D Bronzino, Donald R Peterson. Tissue Engineering-Principles and Practices. CRC press, 1st edition.2013.
2. Ravi Birla. Introduction to Tissue Engineering: Applications and Challenges. Wiley IEEE press. 2014

Web sources

1. 1.https://archive.nptel.ac.in/content/storage2/courses/102106036/Module%201/Lecture%201/Lecture%201.pdf
2. https://ec.europa.eu/futurium/en/system/files/ged/house_of_lords.pdf

24DBBC82 ENTREPRENEURSHIP DEVELOPMENT IN BIOCHEMISTRY

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVE:

To provide students with an understanding of entrepreneurship in the field of biochemistry. To enable students to recognize business opportunities in biochemistry-related sectors such as pharmaceuticals, biotechnology, and healthcare. To impart the skills and knowledge necessary to start and manage a biochemistry-based enterprise, covering aspects such as business planning, marketing, finance, and regulations.

UNIT I INTRODUCTION TO ENTREPRENEURSHIP IN BIOCHEMISTRY 12

Definition, characteristics, and types of entrepreneurship. Scope and significance of entrepreneurship in biochemistry-related industries like biotechnology, pharmaceuticals, and healthcare. Opportunities for biochemists to venture into business, such as starting a lab, manufacturing diagnostic kits, or developing biochemical products.

UNIT II BUSINESS PLANNING AND STRATEGY DEVELOPMENT 12

Components of a business plan, market research, and feasibility analysis. Overview of different business models—service-oriented, product-based, and research-based businesses. Identifying the mission, vision, and goals for a biochemistry-related startup. Competitive analysis and developing a business strategy.

UNIT III FINANCIAL MANAGEMENT FOR ENTREPRENEURS 12

Introduction to key financial concepts such as budgeting, financial forecasting, and cash flow management. Venture capital, angel investors, government grants, crowdfunding, and loans for biochemistry-based startups. Understanding balance sheets, profit and loss accounts, and cash flow statements in the context of a biochemistry business.

UNIT IV MARKETING AND SALES IN BIOCHEMICAL ENTREPRENEURSHIP 12

Market segmentation, targeting, and positioning in the biochemistry and biotechnology sectors.Translating research into marketable products in the biochemistry field, including diagnostic kits, biopharmaceuticals, and laboratory services.

UNIT V LEGAL AND ETHICAL ASPECTS 12

Overview of regulations governing biochemistry-related businesses, such as the Food and Drug Administration (FDA), European Medicines Agency (EMA), and Good Manufacturing Practices (GMP). **Total: 60 Hours**

Course Outcome:

At the end of this course students will be able to,

CO1: Understand the basics of entrepreneurship and its application in the biochemistry industry.

CO2: Develop a business plan, define business models, and strategize for a successful biochemistry venture.

CO3: Manage finances, identify funding sources, and understand costing and pricing strategies in a biochemistry startup.

CO4: Apply marketing strategies to launch and promote biochemistry-based products and services.

CO5: Navigate legal, ethical, and regulatory issues in biochemistry entrepreneurship.

Text Books:

1. Hisrich, R. D., Peters, M. P., & Shepherd, D. A. (2017), Entrepreneurship (10th ed.), McGraw-Hill Education.
2. Bessant, J., & Tidd, J. (2015), Innovation and Entrepreneurship (3rd ed.), Wiley.

Reference Books:

1. Zimmerer, T. W., & Scarborough, N. M. (2018), *Essentials of Entrepreneurship and Small Business Management* (9th ed.), Pearson.
2. Cunningham, J. B., & Lischeron, J. (2016), *Entrepreneurship: A Practice-Based Approach*, Routledge.

Web Sources:

1. https://www.biotechstartups.org/
2. https://www.biochemistryentrepreneur.com/

24PBBC81 **INFECTIOUS BIOLOGY**

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVE

The students will gain hands-on knowledge and acquire adequate skill required to sterilize media and to prepare, inoculate observe and distinguish the growth patterns in different media.

LIST OF EXPERIMENTS

1. Cleaning and Sterilization of Glassware
2. Preparation and growth of Bacteria in Basal Media– Nutrient Broth, Peptone Water, Nutrient Agar
3. Simple staining– positive and negative staining
4. Gram staining of Bacteria
5. Acid fast staining
6. WIDAL test
7. Endospore staining
8. MIC determination using Kirby Bauer assay
9. Isolation of bacteria from soil
10. Permanent slides of pathogens-*Mycobacterium tuberculosis, Leishmania, Plasmodium falciparum*
11. Demonstration of bacterial transformation and transduction
12. Photographic demonstration of infectious diseases

Course Outcome:

At the end of this course students will be able to,

CO1: Develop skills to observe microbes using microscopes.

CO2: Competently prepare and cultivate bacteria in different types of media.

CO3: Judge the accuracy of sterilization

CO4: Analyze different staining techniques.

CO5: Evaluate the sensitivity and resistance of bacteria to antimicrobials.

Text Books:

1. Prescott, Harley, Klein's Microbiology (2008) 7th Ed., Willey, J.M., Sherwood, L.M., Woolverton, C.J. Mc Graw Hill International Edition (New York) ISBN: 978007-126727.
2. Mandell, Douglas and Bennett.S, Principles and practices of Infectious diseases, 7th edition, Volume, 2. Churchill Livingstone Elsevier

Reference Books:

1. Sherris Medical Microbiology: An Introduction to Infectious Diseases by Kenneth J.Ryan, C. George Ray. Publisher: McGraw-Hill.
2. Medical Microbiology by Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller, Elsevier Health Sciences

Web Sources:

1. https://www.youtube.com/watch?v=AZS2wb7pMo4
2. https://www.youtube.com/watch?v=0ckzxblxU3k

24PBBC82 **BIOINFORMATICS**

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVE

To impart hands-on training on:

- Sequence retrieval from NCBI database
- Searching Protein and DNA structure from PDB
- Different molecular file formats for saving a protein/DNA sequence
- Different sequence alignment databases.
- Applying the statistical approaches and models for phylogenetic analysis and tree reconstruction.
- Different protein structure prediction databases

LIST OF EXPERIMENTS

1. Biological databases and data retrieval

Sequence retrieval (protein and gene) from NCBI.

Structure download (protein and DNA) from PDB.

Molecular file formats - FASTA, GenBank, Genpept, GCG, CLUSTAL, Swiss-Prot, FIR.

Molecular viewer by visualization software.

2. Sequence alignment

BLAST suite of tools for pairwise alignment.

Multiple sequence alignment using CLUSTALW.

3. Phylogenetic analysis

Generating a phylogenetic tree using PHYLIP.

4. Protein structure prediction and analysis

Primary sequence analyses (Protparam).

Secondary structure prediction (GOR, nnPredict, SOPMA).

Tertiary structure prediction (SWISSMODEL).

Protein structure evaluation - Ramachandran map (PROCHECK).

5. Gene structure prediction and analysis

Gene prediction using GENSCAN and GLIMMER.

6. Data analysis:

Mean, Median, standard deviation (MS excel)

SOFTWARE REQUIRED

1. SEESAR
2. 2.Online free software

Course Outcome:

At the end of this course students will be able to,

CO1: Be able to retrieve a sequence from NCBI database
Be able to search a protein from PDB

CO2: Understand the different molecular file formats for saving a protein/DNA sequence.

CO3: Apply different sequence alignment databases such as BLAST and CLUSTALW.

CO4: Apply the statistical approaches and models for phylogenetic analysis and tree Reconstruction.

CO5: Analyze and predict the protein structure using structure prediction databases

Text Books:

1. Mount, D.W., (2001). Bioinformatics: Sequence and Genome Analysis 1st ed., Cold Spring Harbor Laborator Press (New York), ISBN: 0-87969-608-7.
2. Pevsner, J., (2003). Bioinformatics and Functional Genomics 1st ed., John Wiley & Sons, Inc. (New Jersey), ISBN: 0-47121004-8.

Reference Books:

1. Baxevanis, A.D., and Ouellette, B.F., (2005). Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins 3rd ed., John Wiley & Sons, Inc. (New Jersey), ISBN: 0-47147878-4.
2. Ghosh, Z., and Mallick, B., (2008). Bioinformatics – Principles and Applications st ed. Oxford University Press (India), ISBN: 9780205692303.

Web Sources:

1. https://www.youtube.com/watch?v=8XaA_NtPt2o
2. https://www.youtube.com/watch?v=N6SqWokdyJQ