PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST)

Declared as DEEMED-TO-BE-UNIVERSITY
U/s 3 of UGC Act, 1956

SCHOOL OF ARTS AND SCIENCE

B.SC., BIOCHEMISTRY

SYLLABUS

REGULATION 2023

FROM THE ACADEMIC YEAR: 2023 - 2024

1. Preamble

Biochemistry is the cross over scientific discipline that integrates the living world and chemistry. It involves the study of the structure of biomolecules and explores the biological processes at molecular level in the living organisms. It is the laboratory science that has several domains like cell biology, molecular biology, clinical biology, enzymology, immunology, physiology, pharmacology etc., It has enlightened many aspects of health and diseases and paved the way for many interdisciplinary technological innovations like metabolomics, genomics and proteomics. There is a continuous demand for biochemists in public and private health care sectors, agriculture, medical and forensic departments. Almost all food, pharmaceuticals, health and beauty care etc required quality control and safety checks for which experts in the field of Biochemistry are always in need. The syllabi for the three-year B.Sc., degree programme in Biochemistry was framed in such a way that at the end of the course they could apply the knowledge and expertise in industries, diagnostic laboratories and various research fields

The programme endeavours to provide students a broad-based training in biochemistry with a solid background of basic concepts as well as exposing them to the exciting advancements in the field. In addition to theoretical knowledge, significant emphasis has been given to provide hands on experience to the students in the forefront areas of experimental biochemistry. A multidisciplinary approach has been employed to provide the best leverage to students to enable them to move into frontier areas of biological research in the future.

The course defines clearly the objectives and the learning outcomes, enabling students to choose the elective subjects for broadening their skills. The course also offers skills to pursue research in the field of Biological Chemistry and thus would produce best minds to meet the demands of society.

Biochemistry, today is considered as an application oriented integrated basic science. It's an interdisciplinary science that has emerged by the confluence of principles of Chemistry, Physics and Mathematics to Biology. Advances in Biochemistry have immense positive implications on the understanding of biochemical interactions, cellular communications, hormonal mechanisms and the cross talks between them. The research in Biochemistry has been translational and there is a shift from hypothesis driven research to data dependent research that promises translational, product oriented research. Much of the advancement in Biochemistry is in the advancement of Biotechnology, as a basic science discipline Biochemistry lead to Biotechnological advancement. Considering its pivotal role in biological sciences, it is imperative to strengthen the fundamental concepts of Biochemistry.

B.Sc., Graduate Attributes

- **Research, inquiry and analytical thinking abilities.**
- **Capability and motivation for intellectual development.**

- **Ethical, social and professional understanding.**
- **Communication in intra and inter disciplinary**
- **Teamwork, collaborative and management skills in scientific research**
- **Information literacy in respective discipline**

Programme Outcomes:

PO1: Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study

PO2: Communication Skills: Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.

PO3: Critical thinking: Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.

PO4: Problem solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.

PO5: Analytical reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.

PO6: Research-related skills: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation

PO7: Cooperation/Team work: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team

PO8: Scientific reasoning: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.

PO9: Reflective thinking: Critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society.

PO10 Information/digital literacy: Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.

PO 11 Self-directed learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.

PO 12 Multicultural competence: Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

PO 13: Moral and ethical awareness/reasoning: Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.

PO 14: Leadership readiness/qualities: Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.

PO 15: Lifelong learning: Ability to acquire knowledge and skills, including „learning how to learn", that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.

Programme Specific Outcomes:

PSO1 – Placement:

To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, and beliefs and apply diverse frames of reference to decisions and actions.

PSO 2 - Entrepreneur:

To create effective entrepreneurs by enhancing their critical thinking, problem solving,

decision making and leadership skill that will facilitate startups and high potential organizations

PSO3 – Research and Development:

Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.

PSO4 – Contribution to Business World:

To produce employable, ethical and innovative professionals to sustain in the dynamic business world.

PSO 5 – Contribution to the Society:

To contribute to the development of the society by collaborating with stakeholders for mutual benefit

Eligibility for admission

Candidate for admission to the first year of B.Sc. Degree Course in Bio-Chemistry shall be required to have passed the Higher Secondary Examination with Chemistry and Biology or Chemistry, Botany and Zoology or Biochemistry and Chemistry.

3. Highlights of the Revamped Curriculum

- The curriculum is created to improve the relationship between business and academia
- Every semester, practicals based on the course taken that semester will aid students in applying what they have learned
- Students will benefit from the introduction of skill based elective courses including Bioinformatics, Nanobiotechnology, Therapeutic nutrition, and Medical Laboratory technology as they keep up with technological advancements in their fields of study
- The fourth semester internship will give students a chance to apply what they have learned in class to a real-world working experiment
- Skill enhancement courses help students venture new platforms in career.
- Equip students with employability skills, generate self-employment and small scale entrepreneurs.

Mapping of PEOs and PO

B.SC BIOCHEMISTRY

C1 - Nutritional Biochemistry

C2 - Chemistry - I

C3 - Nutritional Biochemistry Lab

C4 - Chemistry - I Lab

C5 - Cell Biology

C6 - Chemistry - II

C7 - Chemistry - II lab

C8 - Cell Biology lab

C9 - Medicinal Diet

C10 - Indian Constitution

C11 - Lifestyle Diseases (Non Major Elective)

C12 - First Aid

C13 - Communication Skills

C14 - Biomolecules

C15 - Microbiology-I

C16 - Biomolecules Lab

C17 - Microbiology-I lab

C18 - Basics of Forensic science

C19 - Medical Laboratory technology

C20 – Research Methodology

C21 - Biochemical Techniques

C22 - Microbiology-II

C23 - Biochemical Techniques Lab

C24 – Microbiology-II lab

C25- Participation in Bounded Research

C26 - Environmental Studies

C27 – Enzymes

C28 – Intermediary Metabolism

C29 – Clinical Biochemistry

C30- Clinical Biochemistry Lab

C31- Enzyme and Immunology Lab

C32- Professional Skills

C33- Value Education

C34- Molecular Biology

C35- Human Physiology

C36- Project

C37- Professional Competency Skill-

B. Sc., Curriculum Mapping

Programme Educational Objectives vs Programme Outcome

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
PEO I	*	*		*		*	*		*		*	*		*	
PEO II	*		*	*		*		*	*		*		*	*	
PEO III			*	*	*			*	*	*			*	*	*
PEO IV		*	*	*			*	*	*			*	*	*	
PEO V	*			*	*	*			*	*	*			*	*

B. Sc., Curriculum Mapping

Programme Outcome vs Course Outcome

Programme Outcome-PO Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
C1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
C2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
C3	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
C4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
C5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
C6	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
C7				*	*				*	*				*	*
C8	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

C9				*	*				*	*				*	*
C10	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
C11			*	*	*			*	*	*			*	*	*
C12	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
C13	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
C14	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
C15	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
C16			*	*	*			*	*	*			*	*	*
C17	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
C18	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
C19			*	*	*			*	*	*			*	*	*
C20	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
C21	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
C22	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
C23		*		*	*		*		*	*		*		*	*
C24	*	*	*			*	*	*			*	*	*		
C25		*	*	*	*		*	*	*	*		*	*	*	*
C26	*	*	*	*		*	*	*	*		*	*	*	*	
C27		*		*	*		*		*	*		*		*	*
C28		*	*	*	*		*	*	*	*		*	*	*	*
C29		*		*	*		*		*	*		*		*	*
C30	*	*	*			*	*	*			*	*	*		

DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY- REGULATION 2023

COURSE STRUCTURE

SEMESTER – I

SEMESTER – I					
Course Code	**Course Title**	**L**	**T**	**P**	**C**
THEORY					
23110AEC11/ 23111AEC11/ 23132AEC11/ 23135AEC11	Tami – I/Advanced English-I/Hindi-I/ French - I	3	1	0	3
23111AEC12	English-I	3	1	0	3
23115AEC13	Nutritional Biochemistry	4	1	0	3
23114GEC14	Chemistry –I	4	1	0	3
PRACTICAL					
23115SEC15L	Nutritional Biochemistry Lab	0	0	3	3
23114SEC16L	Chemistry Lab–I	0	0	3	3
Skill Enhancement Course					
23115SEC17	Medicinal Diet	2	0	0	2
23115SEC18	Foundation Course (FC)	2	0	0	2
Ability Enhancement Compulsory course					
231AECCINC	Indian Constitution	2	0	0	2
AUDIT COURSE					
231LSCUV	Universal Human Values	-	-	-	1
	Total	**20**	**4**	**6**	**25**
SEMESTER – II					
Course Code	**Course Title**	**L**	**T**	**P**	**C**
THEORY					
23110AEC21/ 23111AEC21/ 23132AEC21/ 23135AEC21	Tami – II/Advanced English-II/Hindi-II/ French - II	3	1	0	3
23111AEC22	English-II	3	1	0	3

23115AEC23	Cell Biology	4	1	0	3
23114GEC24	Chemistry –II	4	1	0	3
PRACTICAL					
23115SEC25L	Cell Biology Lab	0	0	3	3
23114SEC26L	Chemistry Lab–II	0	0	3	3
Skill Enhancement Course					
23115SEC27	Lifestyle Diseases	2	0	0	2
23115SEC28	First Aid	2	0	0	2
Ability Enhancement Compulsory course					
231AECCCMS	Communication Skills	2	0	0	2
AUDIT COURSE					
231SSCBE	Basic Behavioural Etiquette	-	-	-	1
	Total	**20**	**4**	**6**	**25**
SECOND YEAR					
SEMESTER – III					
23110AEC31/ 23132AEC31/ 23111AEC31/ 23135AEC31	Tamil – III/Hindi-III/Advanced English-III/ French – III	3	1	0	3
23111AEC32	English-III	3	1	0	3
23115AEC33	Biomolecules	4	1	0	3
23116GEC34	Microbiology-I	4	1	0	3
	PRACTICAL				
23115SEC35L	Biomolecules Lab	0	0	3	3
23116SEC36L	Microbiology Lab-I	0	0	3	3
Skill Enhancement Course					
23115SEC37	Basics of Forensic science	2	0	0	1
23115SEC38	Medical Laboratory technology	2	0	0	2
Ability Enhancement Compulsory course					
23115RMC39	Research Methodology	2	0	0	2
AUDIT COURSE					
231ACLSOAN	Office Automation	-	-	-	1
	Total	**20**	4	**6**	**24**
SEMESTER – IV					

23110AEC41/ 23111AEC41/ 23132AEC41/ 23135AEC41	Tamil-IV/Advanced English-IV /Hindi-IV/ French – IV	3	0	0	3
23111AEC42	English-IV	3	0	0	3
23115AEC43	Biochemical Techniques	4	1	0	3
23116GEC44	Microbiology II	4	1	0	3
PRACTICAL					
23115SEC45L	Biochemical Techniques Lab	0	0	3	3
23116SEC46L	Microbiology Lab-II	0	0	3	3
Skill Enhancement Course					
23115SEC47_	A. Biomedical Instrumentation Or B. Tissue Culture	2	0	0	2
23115SEC48_	A. Medical Coding Or B. Microbial techniques	2	0	0	2
Ability Enhancement Compulsory course					
23115BRC49	Participation in Bounded Research	2	0	0	2
231AECCEVS	Environmental Studies	2	0	0	2
AUDIT COURSE					
231LSCLS	Leadership and Management Skills	0	0	0	1
	Total	**22**	**2**	**6**	**27**
SEMESTER – V					
23115AEC51	Enzymes	5	1	0	4
23115AEC52	Intermediary Metabolism	5	1	0	4
23115AEC53	Clinical Biochemistry	5	1	0	4
23115DSC54__	Discipline Specific Elective –I	4	0	0	3
Skill Enhancement Course					
23115SEC55L	Clinical Biochemistry Lab	0	0	3	3
23115SEC56L	Enzyme and Immunology Lab	0	0	3	3
23115SEC57	Internship/Industrial Visit/Field Visit	**0**	**0**	**0**	**2**
AUDIT COURSE					
231ACLSPSL	Professional Skills	-	-	-	1
231AECCVED	Value Education	2	0	0	2

	Total	**21**	**3**	**6**	**26**
Third year					
SEMESTER – VI					
23115AEC61	Molecular Biology	5	0	0	4
23115AEC62	Human Physiology	5	0	0	4
23115DSC63__	Discipline Specific Elective –II	5	0	0	3
23115PRW64	Project	0	0	13	4
23115SEC65	General awareness for competitive examination	2	0	0	2
231EXACT	Extension activity	-	-	-	1
AUDIT COURSE					
231ACSIKWS	Indian Knowledge System	-	-	-	2
	Total	**17**	**0**	**13**	**20**
Total Credits -Programme					**140**
Total Credits - Audit Courses					**07**
Total Credits					**147**

Discipline Specific Electives

Semester	Discipline Specific Elective Courses-I
V	a) 23115DSC54A – Immunology b) 23115DSC54B – Biochemical Pharmacology c) 23115DSC54C- Disaster Management
	Discipline Specific Elective Courses-II
VI	a) 23115DSC63A- Biotechnology b) 23115DSC63B – Bioinformatics c) 23115DSC63C- Bioentrepreneurship d) 23115DSC63D- Plant Biochemistry and plant Therapeutics

Credit Distribution

Sem	AEC	SEC	GEC	DSC	AECC	Research	Others	Total
I	9	10	3	-	2	-	-	24
II	9	10	3	-	2	-	-	24
III	9	9	3	-	-	2	-	23
IV	12	10	-	-	2	2	-	26
V	12	8	-	3	2	-	-	25
VI	8	2	-	3	-	4	1	18
Total	**59**	**49**	**9**	**6**	**8**	**8**	**1**	**140**

AUDIT COURSE CREDIT DISTRIBUTION

Sem	Audit
I	1
II	1
III	1
IV	1
V	1
VI	2
Total	**7**

SEMSTER I

Course Code	Course Name	L	T	P	C
23110AEC 11	இக்கால இலக்கியம்	3	1	0	3

இக்கால இலக்கியம்

23110AEC 11

முதல் பருவம்

பாடநோக்கங்கள்

1. இக்கால தமிழ் இலக்கிய வகைகளின் மாதிரிகளை கற்பித்தல்.
2. தமிழின் இனிமையை உணரச் செய்தல்
3. தமிழின் ஈடுபாட்டையும் சுவைக்கும் திறனையும் ஏற்படுத்துதல்.
4. கவிதை எழுதும் திறனை உருவாக்குதல்
5. படைப்பாளர்களாக உருவாக்கும் திறனை ஏற்படுத்துதல்.

பயன்கள்

- மொழி ஆளுமைத் திறன் பெறுதல்.
- சமூக சிந்தனையை வளர்த்துக் கொள்ளுதல்.
- படைப்பாளர்களாக உருவாகும் திறனைப் பெறுதல்.
- இலக்கியங்களின் அறிவை மேம்படுத்துதல்.
- கவிதை எழுதும் முறையை புரிந்துக்கொள்ளுதல்

அலகு **-1** மரபுக்கவிதை

1. பாரதியார்--விடுதலை, வந்தே மாதரம் ,காற்று

2.பாரதிதாசன் - அழகின் சிரிப்பு ,தமிழனுக்கு வீழ்ச்சி இல்லை

3.கவிமணி தேசியவிநாயகம் பிள்ளை-- தொழிலாளியின் முறையீடு

4.நாமக்கல் கவிஞர்-- தருணம் இதுவே ,

5.கண்ணதாசன்-- அனுபவம்

அலகு **-2** புதுக்கவிதைகள்

1.அப்துல் ரகுமான் -வெற்றி

2.அறிவுமதி-நட்புக் காலம்

3.வைரமுத்து- ருசி, சிற்பி- ஓடு ஓடு சங்கிலி

4.மு.மேத்தா- வெளிச்சம் வெளியே இல்லை

அலகு **-3** நாட்டுப்புறவியல்

1.பழமொழிகள்

2. விடுகதைகள்

3. தொழில் பாடல்

அலகு**- 4** சிறுகதை

1. தடயம்- மா. ஜெயபிரகாசம்

2. எதார்த்தம் - சு. தமிழ்ச்செல்வி

3.நீதி-- பூமணி

அலகு**- 5** இலக்கியவரலாறு

1. கவிதை

2. சிறுகதை

3. நாட்டுப்புறவியல்

பொதுக்கட்டுரை **–** மனித நேயம், வாழ்வியல் அறங்கள்

மனப்பாடப் பகுதி **:** பாரதியார் கவிதை- வேண்டும்,பாரதிதாசன் கவிதை-செந்தாமரை

பார்வை நூல்கள் **:**

1. பாரதியார் கவிதைகள் - மணிவாசகர் பதிப்பகம் சென்னை

2.பாரதிதாசன் கவிதைகள் **-** பாரி நிலையம்**,** சென்னை

3. தமிழ் இலக்கிய வரலாறு - மு வரதராஜன் சாகித்திய அகாதெமி,சென்னை

4. நாட்டுப்புறவியல் - முனைவர். ஆறு. ராமநாதன் ,மணிவாசகர் பதிப்பகம், சென்னை

5. தமிழ் சிறுகதையும் தோற்றம் வளர்ச்சி **-** தமிழ் புத்தக நிலையம்**,** சென்னை

இணையதளம் -www.tamilvu.org

www.noolulagam.com

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CLO1	3	2	3	3	3	2	2	2	3	2	3	2
CLO2	3	3	2	2	2	3	2	3	3	2	2	2
CLO3	3	2	3	3	2	2	2	3	2	3	3	2
CLO4	3	3	3	2	2	2	3	2	3	2	3	3
CLO5	3	3	2	2	2	2	3	2	2	2	3	3

English I

Course Code	Course Name	L	T	P	C
231114AEC12	**English I**	3	1	0	3

Learning Objectives

LO1: To enable learners to acquire the linguistic competence necessarily required in various life situations.

LO2: To help them understand the written text and able to use skimming, scanning skills

LO3: To assist them in creative thinking abilities

LO4: To enable them become better readers and writers

LO5: To assist them in developing correct reading habits, silently, extensively and intensively

Unit No.	Unit Title & Text	No. of Periods for the Unit
I	**Poetry** 1.1 A Patch of Land - Subramania Bharati 1.3 A Nation's Strength – Ralph Waldo Emerson 1.4 Love Cycle - Chinua Achebe	20
II	**Prose** 2.1 JRD - Harish Bhat 2.2 Us and Them - David Sedaris From Dress Your Family in Corduroy andDenim	20
III	**Short Stories** 3.1 The Faltering Pendulum- Bhabani Bhattacharya 3.2 How I Taught my Grandmother to Read- Sudha Murthy 3.3 The Gold Frame- R.K. Laxman	20
IV	**Language Competency** 4.1 Vocabulary: Synonyms, Antonyms, Word Formation 4.2 Appropriate use of Articles and Parts of Speech 4.3 Error correction	15

V	**English for Workplace** 5.1 Self - introduction, Greetings 5.2 Introducing others 5.3 Listening for General and Specific Information 5.4 Listening to and Giving Instructions / Directions	15

Course Outcomes

Course Outcomes	On completion of this course, students will;	
CO1	Develop and integrate the use of the four language skills i.e. Reading, Listening, Speaking and Writing	PO1
CO2	Understand the total content and underlying meaning in the context.	PO1,PO2
CO3	Form the habit of reading for pleasure and for information	PO4, PO6
CO4	Comprehend material other than the prescribed text	PO4, PO5, PO6
CO5	Develop the linguistic competence that enables them, in the future, to present the culture and civilization of their nation.	PO3, PO8

Text books (Latest Editions)

1. Steel Hawk and other stories by Bhattacharya, Bhabani, New Delhi: Sahitya Akademi, 1967
2. How I taught my Grandmother to Read and other Stories, Murthy, Sudha,Penguin Books, India, 2004

Reference Books

(Latest Editions, and the style given must be strictly adhered to)

1. English in use - A textbook for College Students (English, Paper back, - T.Vijay Kumar, K Durga Bhavani, YL Srinivas
2. Practical English Usage - 4th Edition By Michael Swan

3. The Art of Civilized Conversation: A Guide to Expressing Yourself with Style and Grace -Margaret Shepherd, Penny Carter, (Illustrator), Sharon Hogan, 2005.

Web Resources

1. A patch of land by Subramania Bharati translated by Usha Rajagoplan:

   https://books.google.co.in/books?id=iSHvOmXuvLMC&printsec=frontcover&dq=subramania+bharati+poems&hl=en&newbks=1&newbks_redir=0&source=gb_mobile_search&sa=X&redir_esc=y#v=onepage&q=subramania%20bharati%20poems&f=false

2. The Sparrow by Paul Laurence Dunbar https://poets.org/poem/sparrow-0
3. A Nation's Strength by Emerson

   https://poets.org/poem/nations-strength

4. Love cycle by Chinua Achebe: https://www.best-poems.net/chinua-achebe/love-cycle.html
5. JRD by Harish Bhat

   https://www.tata.com/newsroom/heritage/coffee-tea-jrd-tata-stories

6. Us and Them by David Sedaris

   From Dress Your Family in Corduroy and Denim

   https://legacy.npr.org/programs/morning/features/2004/jun/sedaris/usandthem.html

7. Uncle Podger Hangs a Picture: http://rosyhunt.blogspot.com/2013/01/uncle-podger-hangs-picture.html
8. The Gold Frame: https://fybaenglish.blogspot.com/2018/12/the-gold-frame-r-k-laxman.html

Mapping with Programme outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3

Mapping with Programme Specific Outcomes:

CO /PO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**

CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 - Strong, 2 – Medium, 1 – Low

NUTRITIONAL BIOCHEMISTRY

Course Code	Course Name	L	T	P	C
23115AEC13	**Nutritional Biochemistry**	4	1	0	

Course Oobjectives

The objectives of this course are to

- Create awareness about the role of nutrients in maintaining proper health
- Understand the nutritional significance of carbohydrates, lipids and proteins.
- Understand the importance of a balanced diet.
- Study the effect of additives, emulsifiers, flavour enhancing substances in food.
- Study the significance of nutraceuticals.

Unit I: Concepts of food and nutrition. 12 Hrs

Basic food groups-energy yielding, body building and functional foods. Modules of energy. Calorific and nutritive value of foods. Measurement of Calories by bomb calorimeter. Basal metabolic rate (BMR)- definition, determination of BMR and factors affecting BMR. Respiratory quotient (RQ) of nutrients and factors affecting the RQ. SDA-definition and determination- Anthropometric measurement and indices – Height, Weight, chest and waist circumference BMI.

Unit II: 12 Hrs

Physiological role and nutritional significance of carbohydrates, lipids and protein. Evaluation of proteins by nitrogen balance method- Biological value of proteins- Digestibility coefficient, Protein Energy Ratio and Net Protein Utilization. Protein energy malnutrition – Kwashiorkar and Marasmus, Obesity-Types and preventive measures.

Unit III: 12 Hrs

Balanced diet, example of low and high-cost balanced diet- for infants, children, adolescents, adults and elderly people. ICMR classification of five food groups and its significance food pyramid. Junk foods- definition and its adverse effects.

Unit IV: **Food additives:** 12 Hrs

Structure, chemistry, function and application of preservatives, emulsifying agents, buffering agents, stabilizing agents, natural and artificial sweeteners, bleaching, starch modifiers, antimicrobials, food emulsions, fat replacers, viscosity agents, gelling agents and maturing agents. Food colors, flavors, anti-caking agent, antioxidants. Safety assessment of food additives.

Unit V: **Nutraceuticals and Functional Foods:** 12 Hrs

Definition, properties and function of Nutraceuticals, food Supplements, dietary supplements prebiotics and probiotics, and functional Foods. Food as medicine. Natural pigments from plants– carotenoids, anthocyanins and its benefits.

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Cognizance of basic food groups viz. Carbohydrates, proteins and lipids and their nutritional aspects as well as calorific value	PO1, PO5
CO2	Identify and explain nutrients in foods and the specific functions in maintaining health.	PO1
CO3	Classify the food groups and its significance	PO1, PO2
CO4	Understand the effect of food additives	PO1, PO2
CO5	Describe the importance of nutraceuticals and pigments	PO1, PO5, PO6

Text books

1. Gaile Moe, Danita Kelley, Jacqueline Berning and Carol Byrd-Bredbenner. 2013. Wardlaw's Perspectives in Nutrition: A Functional Approach. McGraw-Hill, Inc., NY, USA.
2. M. Swaminadhan (1995) Principles of Nutrition and Dietics. Bappco.
3. Tom Brody (1998). Nutritional Biochemistry (2^{nd} ed), Academic press, USA
4. Garrow, JS, James WPT and Ralph A (2000). Human nutrition and dietetics(10thed)
5. Churchill Livingstone.
6. Andreas M.Papas (1998). Antioxidant Status, Diet, Nutrition, and Health (1sted) CRC

Reference Books

1. Branen, A.L., Davidson PM &Salminen S. 2001. Food Additives.2nd Ed. Marcel Dekker.
2. Gerorge, A.B. 1996. Encyclopaedia of Food and Color Additives. Vol. III. CRC Press.
3. Advances in food biochemistry, Fatih Yildiz (Editor), CRC Press, Boca Raton, USA, 2010
4. Food biochemistry & food processing, Y.H. Hui (Editor), Blackwell Publishing, Oxford, UK, 2006.
5. Geoffrey Campbell-Platt. 2009. Food Science and Technology. Wiley-Blackwell, UK.

Web resources

1. http://old.noise.ac.in/SecHmscicour/english/LESSON O3.pdf
2. https://study.com/academy/lesson/energy-yielding-nutrients-carbohydratesfat-protein.html.
3. https://www.nhsinform.scot/healthy-living/food-and-nutrition/eatingwell/vitamins-and-minerals

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	3				2		3	3	3	3
CO 2	3						3	3		3
CO 3	3	2					3	1		3
CO 4	3	2					3	3		3
CO5	3				2	2	3	3		3

S-Strong (3) **M-Medium (2)** **L-Low (1)**

CHEMISTRY 1

Course Code	Course Name	L	T	P	C
23114AEC12	Chemistry 1	4	1	0	3

Course Objectives:

- To understand the various theories of coordination chemistry.
- To study the various concepts of resonance and halogen compounds.
- To study the properties of aromatic compounds and organic reactions.
- To learn the concepts of solid-state chemistry.

Course Outcomes:

Upon successful completion of this course the students would be able:

- To describe structure and functions of biologically important coordination compounds.
- To apply eletromeric and resonance effect to predict reactivity and stability of organic compounds
- To classify the drugs based on their mode of actions.
- To predict conditions for spontaneous and non-spontaneous reactions.
- To calculate Gibb's free energy, work function and entropy of a reaction

UNIT I: COORDINATION CHEMISTRY AND INDUSTRIAL CHEMISTRY:

1.1 Coordination Chemistry: Nomenclature-Werner's, sidgwick and Pauling's theories. Chelation-industrial importance of EDTA, Biological role of hemoglobin and Chlorophyll

1.2 Industrial Chemistry: Fuelgases – Watergas, producer gas, LPG gas, Gobar gas and natural gas. Fertilizers - NPK and mixed Fertilizers- soaps and detergents.

UNIT II: ELECTRON DISPLACEMENT EFFECTS AND HALOGEN COMPOUNDS:

2.1 Polar effects: Inductive effect - Relative Strength of Aliphatic monocarboxylic acid and aliphatic amines. Resonance - Condition for resonance. Consequences of resonance - resonance of energy. Basic property of aniline and acidic property of phenol. Hyper conjugation – Heat of hydrogenation – Bond length and dipole moment. Steric effect.

2.2 Halogen containing compounds: Important chloro-hydrocarbons use dissolvent. Pesticides–Dichloromethane, chloroform, carbon tetrachloride, DDT and BHC Types of solvents: -Polar, Non-polar.

UNIT – III AROMATIC COMPOUNDS AND ORGANIC REACTIONS:

3.1 Aromatic compounds: Structure, stability resonance and aromaticity of benzene. Substitution reaction: Nitration, Halogenations, Alkylation. Naphthalene – Isolation, properties and uses.

3.2 Organic reaction: Biuret, Decarboxylation, Benzoin, Perkin, Cannizaro, Claisen and Halo form reactions

3.3 Chemotherapy: Explanation with two examples each for analgesics, antibacterial, anti - inflammatory, antibiotics, antiseptic and disinfectant, anesthetics local and general (Structures not necessary).

UNIT – IV SOLIDSTATE, ENERGETICS AND PHASERULE:

4.1 Solidstate: Typical crystal lattices - unit cell, elements of symmetry, Bragg's equation, Weiss Indices, Miller indices, simple body centered and face centered lattices

4.2 Energetics: First law of thermodynamics – state and path function – need for the second law – carnotscycle and thermo- dynamic scale of temperature, spontaneous and Non–spontaneous processes–entropy – Gibbs free energy.

4.3 Phase rule: Phase, component, degree of Freedom, phase rule definitions – one component system–water system.

UNIT – V CHEMICALEQUILIBRIUMANDCHEMICALKINETICS:

5.1 Chemical equilibrium: Criteria of homo generous and heterogeneous equilibria, - decomposition of HI, N_2O_4, $CaCO_3$+Pd_5.

5.2 Chemical Kinetics: Order of reaction and their determinations-activation energy, effects of temperature on reaction rate.

REFERENCES:

1. Gopalan R, Text Book of Inorganic Chemistry, 2nd Edition, Hyderabad, Universities Press, (India), 2012.
2. Morrison R.T. and Boyd R.N., Bhattacharjee S.K. Organic Chemistry (7^{th} edition), Pearson India, (2011).
3. Puri B.R., Sharma L.R. and Pathania M.S. (2013), Principles of Physical Chemistry, (35^{th}edition), New Delhi: Shoban Lal Nagin Chandand Co.
4. https://gascnagercoil.in/wp-content/uploads/2020/12/allied-chemistry-book.pdf

NUTRITIONAL BIOCHEMISTRY LAB

Course Code	Course Name	L	T	P	C
23115AEC15L	**Nutritional Biochemistry Lab**	0	0	3	3

Course objectives

The objectives of this course are to

- Impart hands-on training in the estimation of various constituents by titrimetric method
- Prepare Biochemical preparations
- Determine the ash content and extraction of lipid

TITRIMETRY **20hrs**

1. Estimation of ascorbic acid in a citrus fruit.

2. Estimation of calcium in milk.

3. Estimation of glucose by Benedict's method in honey.

4. Estimation of phosphorous (Plant source)

BIOCHEMICAL PREPARATIONS **15 Hrs**

Preparation of the following substances and its qualitative tests

5. Lecithin from egg yolk.

6. Starch from potato.

7. Casein and Lactalbumin from milk.

GROUP EXPERIMENT **10Hrs**

8. Determination of ash content and moisture content in food sample

9. Extraction of lipid by Soxhlet's method.

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Estimate the important biochemical constituents in the food samples.	PO1, PO3
CO2	Prepare the macronutrients from the rich sources.	PO1, PO3
CO3	Determine the ash and moisturecontent of the food samples	PO1, PO3

CO4	Extract oil from its sources	PO1, PO3, PO6

Text books

1. Laboratory manual in Biochemistry, J. Jayaraman, 2nd edition, NewAge International Publishers, 2011,
2. An Introduction to Practical Biochemistry, David T. Plummer, 3 rd edition, Tata McGraw-Hill Publishing Company Limited, 2001.

Reference books

1. Biochemical Methods, Sadasivam S and Manickam A, 4h edition, NewAge International Publishers, 2016
2. Essentials of Food and Nutrition, Vol. I & II, M.S. Swaminathan.
3. Bowman and Robert M. 2006. Present Knowledge in Nutrition.9th edition, International Life Sciences Publishers.
4. Indrani TK. 2003. Nursing Manual of Nutrition and Therapeutic Diet, 1st edition Jaypee Brothers medical publishers.
5. Martha H. and Marie A. 2012. Biochemical, Physiological, and Molecular Aspects of Human Nutrition.3rd edition. Chand Publishers.

Mapping with Program Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	3		3				3	3	3	3
CO 2	3		3				3	3	3	3
CO 3	3		3				3	3	3	3
CO 4	3		3			3	3	3	3	3

S- Strong (3) M-Medium (2) L-Low (1)

ALLIED CHEMISTRY PRACTICAL - I

Course Code	Course Title	L	T	P	C
23114SEC16L	Allied Chemistry Practical - I	0	0	3	2

Course Objectives:

1. To learn the techniques of titrimetric analyses.
2. To know the estimation of several cations and anions.
3. To learn the techniques of qualitative analysis of organic compounds

Volumetric Analysis:

1. Acidimetry and alkalimetry:
   - (a) Strong acid VS strong base
   - (b) Weak acid VS strong base
   - (c) Determination of hardness of water.
2. Permanganometry:
   - (a) Estimation off ferrous sulphate
   - (b) Estimation of oxalic acid
3. Iodometry:
   - (a) Estimation of potassium dichromate
   - (b) Estimation of potassium permanganate

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

1. To understand the use of volumetric pipette, burette and analytical balance.
2. To explain the principles of volumetric analysis.

MEDICINAL DIET (NON-MAJOR ELECTIVE)

Course Code	Course Title	L	T	P	C
23115SEC17	Medicinal Diet (Non-Major Elective)	2	0	0	2

Learning Objectives

The main objectives of this course are to

- Provide basic knowledge about diet
- Understand of diet modification for GI diseases
- Plan a diet for liver diseases
- Prepare diet chart for Infectious diseases
- Plan a diet for Diabetes, Renal and Cardio-vascular diseases

Unit I: Principles of Therapeutic Diet: Definitions of Normal diet, Therapeutic diet, soft Diet and Liquid diet. Objectives of Diet Therapy. Advantages of using normal diet as the basis for Therapeutic diet. Normal Diet-therapeutic modification of normal diet. 6 Hrs

Unit II: Diet modification in Gastrointestinal diseases: Peptic ulcer, Diarrhea, Lactose intolerance, Constipation and Malabsorption syndrome 6 Hrs

Unit III: Diet Modification in liver and gall bladder in diseases: Etiology, symptoms and dietary treatment in jaundice, hepatitis, cirrhosis of liver and hepatic coma. 6 Hrs

Unit IV: Diet Modification in Infectious Diseases: Fevers, Typhoid, Tuberculosis and Viral Hepatitis. Dietary modifications in Tuberculosis. 6 Hrs

Unit V: Diet Modification in Diabetes, Renal and Cardio-vascular Diseases-Diabetes, acute & chronic glomerulonephritis, nephrosis, renal failure, kidney stone and Hypertension.6 Hrs

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Possess basic knowledge about diet	PO1
CO2	Sketch diet plan for GI diseases	PO1, PO4, PO5, PO6
CO3	Sketch diet plan for liver diseases	PO1, PO4, PO5, PO6
CO4	Sketch a diet plan for Infectious diseases	PO1, PO4, PO5, PO6
CO5	Prepare diet chart for Diabetes Renal and Cardio-vascular	PO1, PO4,

	diseases	PO5, PO6

Text Books

1. M. Raheena Begum, A Text Book of Foods, Nutrition and Dietetics, Sterling Publishers Pvt. Ltd.
2. M.V. Raja Gopal, Sumati. R., Mudambi, Fundamentals of foods and Nutrition, Wiley Eastern Limited, Year-1990.
3. William S.R Nutrition and Diet Therapy, 1985, 5thedition, Mosly Co. St. Louis.

Reference books

1. Rodwell Williams Nutrition and Diet Therapy, 1985, the C.V Mosly St. Louis.
2. M.V. Krause & M.A. Mohan, Food Nutrition and Diet Therapy, 1992 by W.B Saunders Company, Philadelphia, London.
3. Davidson and Passmore, Human Methods and Diabetics, 1976 the English Language Book Society and Churchill.

Mapping with Program Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	2						3	3		3
CO 2	2			2	3	2	3	3		3
CO 3	2			2	3	2	3	3		3
CO 4	2			2	3	2	3	3		3
CO 5	2			2	3	2	3	3		3

S-Strong (3) M-Medium (2) L-Low (1)

INDIAN CONSTITUTION

Course Code	Course Title	L	T	P	C
231AECCICN	Indian Constitution	2	-	-	**2**

Aim:

The aim of the constitution is mentioned in the *preamble that is to constitute* India into a sovereign, socialist, democratic republic and it's the provision of the rights of citizens.it's primary objective is to provide economic, social & political justice.

Course Objectives:

- To make the students understand about the democratic rule and parliamentarian administration
- To appreciate the salient features of the Indian constitution
- To know the fundamental rights and constitutional remedies
- To make familiar with powers and positions of the union executive,union parliament and the supreme court
- To exercise the adult franchise of voting and appreciate the electoral system of Indian democracy.

Course outcome:

1. Democratic values and citizenship training are gained
2. Awareness on fundamental rights is established
3. The function of union government and state government are learnt
4. The power and functions of the judiciary are learnt thoroughly
5. Appreciation of democratic parliamentary rule is learnt

Unit I: The making of Indian constitution

The constitution assembly organization - character -work salient features of the constitution- written and detailed constitution -socialism - secularism-democracy and republic.

Unit II: Fundamental rights and fundamental duties of the citizens

Right of equality -right of freedom- right against exploitation -right to freedom of religion- cultural and educational rights -right to constitutional remedies -fundamental duties.

Unit III: Directive principles of state policy

Socialistic Principles-Gandhi a principles-liberal and general principles -differences between fundamental rights and directive principles

Unit IV: The union executive, union parliament and Supreme Court

Powers and positions of the president - qualification - method of election of president and vice president -prime minister -Rajya Sabah -Lok Sabah. The supreme court -high court - functions and position of supreme court and high court

Unit V: State council -election system and parliamentary democracy in India

State council of ministers -chief minister -election system in India-main features election commission-features of Indian democracy.

References:

1) Palekar. S.A. Indian constitution government and politics, ABD publications, India
2) Aiyer, Alladi Krishnaswami, Constitution and fundamental rights 1955.
3) Markandan. K.C. Directive Principles in the Indian constitution 1966.
4) Kashyap. Subash C, Our parliament, National book trust, New Delhi 1989

UNIVERSAL HUMAN VALUES

Course Code	Course Title	L	T	P	C
231LSCUV	**Universal Human Values**	-	-	-	1

Aim:

This course aims at making learners conscious about universal human values in an integral manner, without ignoring other aspects that are needed for learner's personality development.

Course Objectives:

- The present course deals with meaning, purpose and relevance of universal human values and how to inculcate and practice them consciously to be a good human being and realize one's potentials.

Course Outcomes:

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

- Know about universal human values and understand the importance of values in individual, social circles, career path, and national life.
- Learn from case studies of lives of great and successful people who followed and practiced human values and achieved self-actualization.
- Become conscious practitioners of human values.
- Realize their potential as human beings and conduct themselves properly in the ways of the world.

Unit I: Introduction - What is love? Forms of love for self, parents, family, friend, spouse, community, nation, humanity and other beings, both for living and non-living Love and compassion and inter-relatedness Love, compassion, empathy, sympathy and non-violence Individuals who are remembered in history for practicing compassion and love. Narratives and anecdotes from history, literature including local folklore Practicing love and compassion: What will learners learn gain if they practice love and compassion? What will learners lose if they don't practice love and compassion? Sharing learner's individual and/or group experience(s). Simulated Situations. Case studies

Unit II: Introduction - What is truth? Universal truth, truth as value, truth as fact (veracity, sincerity, honesty among others). Individuals who are remembered in history for practicing this value. Narratives and anecdotes from history, literature including local folklore. Practicing Truth: What will learners learn/gain if they practice truth? What will learners lose if they don't practice it?. Learners' individual and/or group experience(s). Simulated situations Case studies

Unit III: Introduction - What is non-violence? Its need. Love, compassion, empathy, sympathy for others as pre-requisites for non-violence. Ahimsa as non-violence and non-

killing. Individuals and organisations that are known for their commitment to non-violence. Narratives and anecdotes about non-violence from history, and literature including local folklore. Practicing non-violence: What will learners learn/gain if they practice non-violence? What will learners lose if they don't practice it? Sharing learner's individual and/or group experience(s) about non-violence. Simulated situations. Case studies

Unit IV: Introduction - What is righteousness? Righteousness and *dharma*, Righteousness and Propriety. Individuals who are remembered in history for practicing righteousness - Narratives and anecdotes from history, literature including local folklore. Practicing righteousness: What will learners learn/gain if they practice righteousness? What will learners lose if they don't practice it? Sharing learners' individual and/or group experience(s). Simulated situations. Case studies

Unit V: Introduction - What is peace? Its need, relation with harmony and balance. Individuals and organisations that are known for their commitment to peace. Narratives and Anecdotes about peace from history, and literature including local folklore. Practicing peace: What will learners learn/gain if they practice peace? What will learners lose if they don't practice it? Sharing learner's individual and/or group experience(s) about peace. Simulated situations. Case studies

TAMIL – II

Course Code	Course Title	L	T	P	C
23110AEC21	Tami – II	3	1	0	3

பக்தி இலக்கியம் - 23110AEC21
இரண்டாம் பருவம்

பாடநோக்கங்கள்

- காலந்தோறும் பக்தி இலக்கியம் வளர்ந்துள்ள தன்மையைக் கற்பித்தல்.
- நாயன்மார்கள், ஆழ்வார்களின் பக்திச் சிறப்பை அறிய செய்தல்.
- ஆழ்வார்களின் பக்தி உணர்வை ஊட்டுதல்
- பாடல்களில் இசை இன்பம், ஓசை நயம் ஆகியவற்றை உணரச்செய்தல்
- குழந்தைப் பருவத்தின் தன்மையை உணர்த்துதல்

பயன்கள்

- நாயன்மார்கள் பக்திச் சிறப்பை அறிதல்.
- ஆழ்வார்களின் பக்தி நெறியை உணர்தல்.
- பக்தி இலக்கியம் காலம் தோறும் வளர்ந்ததை அறிதல்.
- பாடல்களில் இசை இன்பம், ஓசை நயம் அறிதல்.
- குழந்தைப் பருவத்தின் தன்மையை உணர்தல்.

அலகு- 1 பன்னிரு திருமுறைகள்
1. திருஞானசம்பந்தர்– திருத்தில்லைப் பதிகம்
2. திருநாவுக்கரசர் - திருநீற்றுப் பதிகம்
3. சுந்தரர் - திருவெண்ணைநல்லூர்
4. திருமூலர்- திருமந்திரம்(இளமை நிலையாமை)

அலகு- 2 பன்னிரு ஆழ்வார்கள்
1. ஆண்டாள் - திருப்பாவை
2. பெரியாழ்வார்- மூன்றாம் திருமுறை(பத்து பாடல்கள்)
3. மதுரகவியாழ்வார் - கண்ணின் நுண் சிறு தாம்பு

அலகு- 3 சிற்றிலக்கியங்கள்
1. மீனாட்சியம்மைப் பிள்ளைத்தமிழ்– செங்கீரை பருவம், அம்புலி பருவம்
2. நந்திக்கலம்பகம்
3. குற்றால குறவஞ்சி- குறத்தி நகர்வளம் கூறுதல்
4. காளமேகப்புலவர் பாடல்கள்

அலகு- 4 புதினம
1. நா .பார்த்தசாரதியின்- குறிஞ்சி மலர்

அலகு-5 தமிழ் இலக்கிய வரலாறு
1. பக்தி இலக்கியங்கள்
2. சைவமும் தமிழும்
3. வைணவ சமயம் போற்றி வளர்த்த தமிழ்
4. சிற்றிலக்கியங்கள்
5. நாவல் இலக்கியம்

பார்வை நூல்கள் :
1. தேவாரம் - மணிவாசகர் பதிப்பகம் சென்னை
2. நாலாயிர திவ்ய பிரபந்தம் - வர்த்தமான பதிப்பகம் சென்னை
3. தமிழ் இலக்கிய வரலாறு - முனைவர் ச சுபாஷ் சந்திர போஸ், இயல் வெளியீடு ,தஞ்சாவூர
4. தமிழ் நாவல் இலக்கியம் -கா கைலாசபதி- தமிழ் புத்தக,நிலையம், சென்னை

இணையதளம் -www.tamilvu.org , www.noolulagam.com

Mapping with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CLO1	3	2	3	3	3	2	2	2	3	2	3	2

CLO2	3	3	2	2	2	3	2	3	3	2	2	2
CLO3	3	2	3	3	2	2	2	3	2	3	3	2
CLO4	3	3	3	2	2	2	3	2	3	2	3	3
CLO5	3	3	2	2	2	2	3	2	2	2	3	3

ENGLISH-II

Course Code	Course Title	L	T	P	C
23111AEC22	English-II	3	1	0	3

Learning Objectives		
LO1	To introduce learners to the essential skills of communication in English	
LO2	To enable them use these skills effectively in academic and non-academic contexts	
LO3	To help them identify and eliminate common mistakes in writing and speaking	
LO4	To enable them use various business communication strategies and to use advanced vocabulary	
LO5	To familiarize them in writing descriptive essays and respond to arguments orally and in writing	
Unit No.	**Unit Title & Text**	**No. of Periods for the Unit**
I	**Poetry** 1.1Very Indian Poem in Indian English - Nissim Ezekiel 1.2 Still I Rise - Maya Angelou 1.3 On Killing a Tree - Gieven Patel	20
II	**Prose** 2.1 If You Are Wrong Admit it- Dale Carnegie 2.2 Kindly Adjust Please - Shashi Tharoor 2.3 The Spoon-fed Age- W.R. Inge	20
III	**Fiction** Alchemist - Paulo Coelho	20
IV	**Language Competency** 4.1 Homonyms, Homophones, Homographs Portmanteau words 4.2 Subject Verb Agreement	15
V	**English in the Workplace** 5.1 Reading for General and Specific information [charts, tables, schedules, graphs etc] 5.2 Reading news and weather reports 5.3 Writing paragraphs 5.4 Taking and making notes	15

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Learn to introduce themselves and talk about everyday activities confidently	PO1
CO2	Be able to write short paragraphs on people, places and events	PO1, PO2
CO3	Identify the purpose of using various tenses and effectively employ them in speaking and writing	PO4, PO6
CO4	Gain knowledge to write subjective and objective descriptions	PO4, PO5, PO6
CO5	Identify and use their skills effectively in formal contexts.	PO3, PO8

Text Books (Latest Editions)	
1	The Alchemist - Paulo Coelho Harper - 2005
References Books **(Latest editions, and the style as given below must be strictly adhered to)**	
1	Advanced English Grammar. Martin Hewings. Cambridge University Press, 2000
2	Descriptive English. SP Bakshi, Richa Sharma · 2019, Arihant Publications (India) Ltd.
3	The Reading Book: A Complete Guide to Teaching Reading. Sheena Cameron, Louise Dempsey, S & L. Publishing, 2019.
4	Skimming and Scanning Techniques, Barbara Sherman, Liberty University Press, 2014
5	Brilliant Speed Reading: Whatever you need to read, however. Phil Chambers, Pearson, 2013.
6	The Archer, Paulo Coelho. Penguin Viking, 2020.
WebResources	
1	Very Indian poem by Nissim Ezekiel http://econtent.in/pacc.in/admin/contents/40_%20_2020103001102714.pdf
2	Still I Rise by Maya Angelou https://www.poetryfoundation.org/poems/46446/still-i-rise
3	The Flower by Tennyson: https://www.poemhunter.com/poem/the-flower-2/
4	On Killing a tree by Gieve Patel: https://www.poemhunter.com/poem/on-killing-a-tree/
5	If you are wrong, admit it: https://www.tbr.fun/if-youre-wrong-admit-it/
6	Kindly Adjust please - Shashi Tharoor https://www.theweek.in/columns/shashi-tharoor/2018/05/25/kindly-adjust-to-our-english.html?fbclid=IwAR3IhtdXqvuV4ySECn9S7SA6HmCEYISyd1QHd3BlwKgiNKKwdke

	Sg3qWp-U/
7	The Spoon Fed Age: https://www.nrkacademy.com/2016/04/spoon-feeding-by-wringe .html
8	The Alchemist: https://www.youtube.com/watch?v=lxBYpmxjeDU

Mapping with Programme Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3

3 - Strong, 2 - Medium, 1 - Low

CELL BIOLOGY

Course Code	Course Title	L	T	P	C
23115AEC23	Cell Biology	4	1	0	3

Learning Objectives

The main objectives of this course are to

- Provide basic understanding of architecture of cells and its organelles.
- Understand the organization of prokaryotic and eukaryotic genome.
- Educate on the structural organization of bio membrane and transport mechanism
- Impart knowledge on cell cycle, cell division and basics of cells
- Familiarize the concept of mechanism of cell-cell interactions.

Unit I: Architecture of cells- Structural organization of prokaryotic and eukaryotic cells microbial, plant and animal cells. The ultrastructure of nucleus, mitochondria, RER, SER, golgi apparatus, lysosome, peroxisome and their functions 12 Hrs

Unit II: Cytoskeleton- microfilament, microtubules and intermediary filament- structure, composition and functions. Organization of Genome -prokaryotic, and eukaryotic genome. Organization of chromatin - histones, nucleosome concept, formation of chromatin structure. Special types of chromosomes - lamp brush chromosomes, polytene chromosomes. 12 Hrs

Unit III: Bio membranes - Structural organization of bilipid layer model and basic functions - transport across cell membranes- uniport, symport and antiport. Passive and active transport. 12Hrs

Unit IV: Cell cycle - Definition and Phases of Cell cycle - Cell division - Mitosis and Meiosis and its significance, Cancer cells- definition, types and characteristics of cancer cells. 12 Hrs

Unit V: Extracellular matrix – Collagen, laminin, fibronectin and proteoglycans- structure and biological role. Structure and role of cadherin, selectins, integrins, Cell -cell interactions- Types-gap junctions, tight junctions and Desmosomes. 12 Hrs

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Explain the structure and functions of basic components of prokaryotic and eukaryotic cells, especially the organelles.	PO1
CO2	Familiarize the cytoskeleton and chromatin	PO1, PO2

CO3	Illustrate the structure, composition and functions of cell membrane related to membrane transport	PO1, PO2
CO4	Elaborate the phases of cell cycle and cell division-mitosis and meiosis and characteristics of cancer cells.	PO1, PO2
CO5	Relate the structure and biological role of extra cellular matrix in cellular interactions	PO1, PO2

Text books

1. Arumugam. N, Cell biology. Saras publication (10ed, paperback), 2019
2. Devasena. T. Cell Biology. Oxford University Press India-ISBN: 9780198075516, 0198075510, 2012**.**
3. Bruce Alberts and Dennis Bray. 2013, Essential Cell Biology. (4th ed). Garland Science.

Reference books

1. S.C.R. Cell Biology. Newage Publishers -ISBN-10: 8122416888/ISBN-13: 978-8122416886, 2008
2. Cooper. G.A. The Cell: A Molecular Approach. Sinauer Associates, Inc -ISBN10: 0878931066 / ISBN 13: 9780878931064, 2013
3. E.M.F. D.R. Cell and Molecular Biology. Lippincott Williams & Wilkins Philadelphia - ISBN: 0781734932 9780781734936, 2006.
4. LodishH. A, Berk C.A, Kaiser M, Krieger M.P, Scott A, Bretscher H, Ploegh and Matsudaira. 2007. Molecular Cell Biology, 6th Edition, WH. Freeman Publishers, New York, USA.

Web resources

1. https://nicholls.edu/biol-ds/bio1155/Lectures/Cell%20Biology.pdf
2. https://www.medicalnewstoday.com/article/320878.php
3. https://biologydictionary.net /cell

Mapping with Program Outcome

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	3						3			3
CO 2	3	3					3			3
CO 3	3	3					3			3
CO 4	3	3					3	3		3
CO5	3	3					3			3

S-Strong (3) M-Medium (2) L-Low (1)

ALLIED CHEMISTRY - II

Course Code	Course Title	L	T	P	C
23114GEC24	Allied Chemistry - II	4	1	0	3

Course Objectives:

1. To learn the basics of nuclear chemistry and metallic bond.

2. To understand the properties and applications of carbohydrates, amino acids and proteins.

3. To study the basic concepts of polymers, heterocyclic compounds and stereoisomerism.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

1. To explain theory of nuclear chemistry and chemical bonding.

2. To classify carbohydrates and proteins.

3. To synthesise polymers and hetero cyclic compounds.

4. To apply conductivity measurements to determine degree of dissociation of weak electrolyte and pH of buffer solution.

5. To explain preparation and applications of emulsion and gels in chromatography.

UNIT I: Nuclear Chemistry and Metallic bond:

1.1 Nuclear Chemistry: Fundamental particles of nucleus- isotopes, isobars, isotones and isomers – differences between chemical reactions and nuclear reactions, nuclear fusion and fission- radioactive series.

1.2 Metallic bond: Electron gas, Pauling and band theories, semiconductors – intrinsic, extrinsic – type and p – type semiconductors.

1.3 Compounds of sulphur and sodiumthiosulphate

UNIT II: Carbohydrates, Amino Acids and Proteins:

2.1 Carbohydrates: classification –glucose and fructose–preparation and properties – structure of glucose –Fischer and Haworth cyclic structures.

2.2 Amino acids and proteins: Amino acids – Classification based on structure. Essential and non – essentials amino acids – preparation, properties and uses – peptides (elementary treatment only) – proteins – Classification based on physical properties and biological functions. Structure of proteins–primary and secondary (elementary treatment).

UNIT III: Polymers, Heterocyclic Compound and Stereoisomerism:

3.1 Synthetic polymers: preparation, properties and uses of Teflon, epoxy resins, polyester resin.

3.2 Heterocyclic compounds: Furan, pyrrole and pyridine –preparation, properties and uses – basic properties of pyridine and pyrrole.

3.3 Stereoisomerism: Optical isomerism – Lactic and tartaric acid – racemic mixture and resolution. Geometrical isomerism–maleic and fumaricacids.

Unit IV: Surface and photochemistry:

4.1 Surface Chemistry: Emulsions, gels–preparation, properties - Electrophoresis and applications, chromatography – Column, paper and thin layer Chromatography.

4.2 Photochemistry: Laws of photochemistry and applications.

Unit V: Electrochemistry, pH and Buffer

5.1 Electrochemistry: Specific and equivalent conductivity–their determination – effect of dilution on conductivity. Ostwald's Dilution law, Kohlrausch law, conductivity measurements, and conduct metric titrations.

5.2 pH and buffer: Importance of Ph and buffers –pH determination by colorimetric and electrometric methods.

REFERENCES:

1. B.R. Puri, L.R. Sharma, K.C. Kalia, 'Principles of Inorganic Chemistry', 21st edition, Vallabh Publications, 2004-2005.
2. Bahl, B.S. and Bahl, A., Organic Chemistry, (12thedition), New Delhi, Sultan Chand & Co., (2010).
3. Puri B.R., Sharma L.R. and Pathania M.S. (2013), Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin Chand and Co.
4. https://oms.bdu.ac.in/ec/browse.php?type=UG

CELL BIOLOGY LAB

Course Code	Course Title	L	T	P	C
23115SEC25L	Cell Biology Lab	0	0	3	3

Learning Objectives

The aim objectives of this course are to

- Learn the parts of microscope
- Investigate the cells under microscope.
- Image the cells using different stains
- Identify the cells, organelles and stages of cell division
- Identify the spotters

I MICROSCOPYANDSTAININGTECHNIQUES

1. Study the parts of light and compound microscope
2. Preparation of Slides and Micrometry
3. Examination of prokaryotic and eukaryotic cell
4. Visualization of animal and plant cell by methylene blue
5. Visualization of nuclear fraction by acetocarmine stain
6. Staining and visualization of mitochondria by Janus green stain

II GROUP EXPERIMENT

1. Identification of different stages of mitosis in onion root tip
2. Identification of different stages of meiosis in onion bulb

III SPOTTERS

9. a) **Cells**: Nerve, plant and Animal cell

   b) **Organelles**: Mitochondria, Chloroplast, Endoplasmic reticulum,

   c) **Mitosis stages** – Prophase, Anaphase, Metaphase, Telophase

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Identify the parts of microscope.	PO1, PO2
CO2	Preparation of Slides	PO1, PO2
CO3	Identify the stages of mitosis & meiosis	PO1, PO2

CO4	Visualize nucleus and mitochondria by staining methods	PO1, PO2
CO5	Identify the spotters of cells, organelles and stages ofc ell division	PO1, PO2

Text books

1. Rickwood, Dand J.R. Harris cell Biology: Essential Techniques, Johnwikey 1996.
3. Davis, J.M. Basic Cell culture: A practical approach, IRL 1994.
4. Ganesh M.K. and Shivashankara A.R. 2012. Laboratory Manual for Practical Biochemistry Jaypee publications, 2nd edition.

Reference books

1. Essential practical handbook of Cell biology, Genetics and Microbiology - A Practical manual - Debarati Das Academic publishers
2. Cell biology Practical, Dr. Venugupta. Prestige publisher
3. Cell and Molecular biology, DeRobertis, 8th edition, 1st June, 1987

Mapping with Program Outcomes:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	2	3					3	3	3	3
CO 2	2	3					3	3	3	3
CO 3	2	3					3	3	3	3
CO 4	2	3					3	3	3	3

S-Strong (3) M-Medium (2) L-Low (1)

CHEMISTRY LAB–II

Course Code	Course Title	L	T	P	C
23114GEC26L	Chemistry Lab - II	0	0	3	3

COURSE OBJECTIVES:

1. To learn the techniques of titrimetric analyses.
2. To know the estimation of several cations and anions.
3. To learn the techniques of qualitative analysis of organic compounds

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

1. To understand the use of volumetric pipette, burette and analytical balance.
2. To explain the principles of volumetric analysis,

Organic Analysis:

Analyse the following organic Compounds.

1. Carbohydrate
2. Amide
3. Aldehyde
4. Ketone
5. Acid
6. Amine

The students may be trained to perform the specific reactions like tests for aliphatic or aromatic, saturated or unsaturated and functional group present and record their observations.

REFERENCES:

1. R. Gopalan, Elements of analytical chemistry, S. Chand, New Delhi, 2000.
2. N.S. Gnanapragasam and G. Ramamurthy, Organic Chemistry lab manual, S. Viswanathan and Co. Pvt. Ltd. Chennai-1998

LIFESTYLE DISEASES (NON-MAJOR ELECTIVE)

Skill Enhancement Course

Course Code	Course Title	L	T	P	C
23115SEC27	Lifestyle Diseases (Non-Major Elective)	2	0	0	2

Learning Objectives

- The objectives of this course are to
- Create awareness on life style diseases among adolescents.
- List out the lifestyle diseases.
- Explain the common lifestyle diseases and their prevention.
- Acquaint the disorders associated with women's health.
- Impart life skills so as to prevent lifestyle diseases.

Unit I: Lifestyle diseases: Definition, Factors contributing to lifestyle diseases - Physical in activity, Poor food habits, disturbed biological clock, sleep deprivation. 6Hrs

Unit II: Top lifestyle diseases, Impact of Lifestyle diseases on family, society and economy of country. **6** Hrs

Unit III: Causes, symptoms**,** types, preventive measures and treatment of Obesity, cardiovascular diseases, diabetes and cancer. 6 hrs

Unit IV: Women's lifestyle diseases: Polycystic Ovarian Disease, Infertility, Breast and cervical cancer and Osteoporosis. 6 hrs

Unit V: Prevention of lifestyle diseases: Balanced diet, sufficient intake of water, physical activity, sleep-wake cycle, stress management and meditation. 6Hrs

Course outcomes

CO	On completion of the course the students will be able to	Program Outcomes
CO1	Define Life style diseases and describe the contributing factors	PO1
CO2	Enumerate the top lifestyle diseases and its impact on life.	PO1, PO4, PO5
CO3	Elaborate the treatment and prevention measures of common lifestyle diseases.	PO1, PO4, PO5
CO4	Highlight the lifestyle diseases that affects the	PO1, PO4, PO5

	women's health	
CO5	Illustrate the various measures for prevention of lifestyle diseases	PO1, PO4, PO5

Textbooks

1. JamesM R, Lifestyle Medicine, 2nd Edition, CRC Press, 2013
2. Akira Miyazaki, New Frontiers in Lifestyle-Related Disease, Springer, 2008

Reference books

1. Steyn K, Life style and related risk factors for chronic diseases
2. Willett WC, Prevention of chronic disease by means of diet and lifestyle.
3. Kumar M & R. Kumar, Guide to prevention of lifestyle diseases. Deep & Deep publications

Web resources

1. https://youtu.be/jDdL2bMQXfE
2. https://youtu.be/7WnpSB14nDM
3. https://youtu.be/ollz9MqtW-U

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	2						3	3		3
CO 2	2			2	3		3	3		3
CO 3	2			2	3		3	3		3
CO 4	2			2	3		3	3		3
CO 5	2			2	3		3	3		3

S-Strong (3) M-Medium (2) L-Low (1)

FIRST AID

Course Code	Course Title	L	T	P	C
23115SEC28	First Aid	2	0	0	2

Learning Objectives

The main objectives of this course are to:

- Provide knowledge on the basics of first aid.
- Perform first aid during various respiratory issues.
- Demonstrate the first aid to treat injuries.
- Learn the first aid techniques to be given during emergency.
- Familiarize the first aid during poisoning.

Unit I: Aims and important rules of first aid, dealing with emergency, types and content of a first aid kit. First aid technique – Dressing and Bandages, fast evacuation technique, transport techniques.6 Hrs

Unit II: Basics of Respiration – CPR, first aid during difficult breathing, drowning, choking, strangulation and hanging, swelling within the throat, suffocation by smoke or gases and asthma. 6 Hrs

Unit III: Common medical aid - first aid for wounds, cuts, head, chest, abdominal injuries, shocks, burns, amputations, fractures, dislocation of bones. 6Hrs

Unit IV: First aid related to unconsciousness, stroke, fits, convulsions - seizures, epilepsy. 6Hrs

Unit V: First aid in poisonous bites (Insects and snakes), honey bee stings, animal bites, disinfectant, acid and alkali poisoning. 6Hrs

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Discuss on the rules of first aid, dealing during emergency and first aid techniques	PO1, PO4, PO5
CO2	Understand the first aid techniques to be given during different types of respiratory problems	PO1, PO4, PO5
CO3	Provide first aid for injuries, shocks and bone injury	PO1, PO4, PO5

CO4	Detail on the first aid to be given for unconsciousness, stroke, fits and convulsions	PO1. PO4, PO5
CO5	Gain expertise in giving first aid for insect bites and chemical poisoning	PO1. PO4, PO5

Text books

1) First aid and health Dr. Gauri Goel, Dr. Kumkum Rajput, Dr. Manjul Mungali, ISBN 978-93-92208-19-5
2) Indian First Aid Mannual-https://www.indianredcross.org/publications/FA-manual.pdf
3) Red Cross First Aid/CPR/AED Instructor Manual

Web resources

1. https://www.redcross.org/take-a-class/first-aid/first-aid-training/first-aid-online
2. https://www.firstaidforfree.com/

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	2						3	3	3	3
CO 2	2			3	3		3	3	3	3
CO 3	2			3	3		3	3	3	3
CO 4	2			3	3		3	3	3	3
CO5	2			3	3		3	3	3	3

S-Strong (3) M-Medium (2) L-Low (1)

COMMUNICATION SKILLS

Course Code	Course Title	L	T	P	C
231AECCCMS	Communication Skills	2	0	0	2

Aim: The aim to develop communication skills

Course Objectives:

This course has been developed with the following objectives:

- Identify common communication problems that may be holding learners back
- Identify what their non-verbal messages are communicating to others
- Understand role of communication in teaching-learning process
- Learning to communicate through the digital media
- Understand the importance of empathetic listening
- Explore communication beyond language.

Course Outcome:

- By the end of this program, participants should have a clear understanding of what good communication skills are and what they can do to improve their abilities.

Unit I: Techniques of effective listening, Listening and comprehension, Probing questions, Barriers to listening, Pronunciation, Enunciation, Vocabulary, Fluency, Common Errors.

Unit II: Techniques of effective reading, gathering ideas and information from a given text, Identify the main claim of the text, Identify the purpose of the text, Identify the context of the text, Identify the concepts mentioned. Evaluating these ideas and information - Identify the arguments employed in the text, Identify the theories employed or assumed in the text. Interpret the text - To understand what a text says, to understand what a text does, To understand what a text means

Unit III: Clearly state the claims, Avoid ambiguity, vagueness, unwanted generalizations and over simplification of issues, Provide background information, Effectively argue the claim, Provide evidence for the claims, Use examples to explain concepts, Follow convention, Be properly sequenced, Use proper signposting techniques, Be well structured. Well-knit logical sequence - Narrative sequence, Category groupings, Different modes of Writing - E-mails, Proposal writing for Higher Studies, Recording the proceedings of meetings, Any other mode of writing relevant for learners

Unit IV: Role of Digital literacy in professional life, Trends and opportunities in using digital technology in the workplace, Internet Basics, Introduction to MS Office tools: Paint, Office, Excel, Power point. Introduction to social media websites, Advantages of social media, Ethics and etiquettes of social media, How to use Google search better, Effective ways of using Social Media, Introduction to l Marketing

Unit V: Meaning of non-verbal communication, Introduction to modes of non-verbal communication, Breaking the misbeliefs, Open and Closed Body language, Eye Contact and Facial Expression, Hand Gestures, Do's and Don'ts, Learning from experts, Activities-Based Learning

Reference:

1. Sen Madhu Chanda (2010), An Introduction to Critical Thinking, Pearson, Delhi
2. Silvia P. J. (2007), How to Read a Lot, American Psychological Association, Washington DC

AUDIT COURSE

Course Code	Course Title	L	T	P	C	
231SSCBE	Basic Behavioural Etiquette	-	-	-	1	

Objectives:

Training is mainly focused on discipline, grooming, career planning and building personality. As it is the first year of the university, students are given awareness about the job market right from the start so that they prepare accordingly at their own pace and potential.

Eliminating negative thought, developing enriching habits, unlocking individual potentials and well-versed communication is the aim of this program. The module consists of

a) Communication Skills

b) Goal Setting

c) Career Planning

d) Reaching your Potential

e) Time Management

f) Stress Management

g) Grooming and Discipline

h) Learning skills

i) Listening Skills

j) Team Building

Reference Book

1 Barbara Pachter, Marjorie Brody. Complete Business Etiquette Handbook. Prentice Hall, 2015.

2 Dhanavel, S.P. English and Soft Skills. Hyderabad: Orient BlackSwan, 2021.

3 Koneru, Aruna. Professional Communication. Delhi: McGraw, 2008.

4 Mahanand, Anand. English for Academic and Professional Skills. Delhi: McGraw, 2013. Print.

5 Nancy Mitchell. Etiquette Rules : A Field Guide to Modern Manners. Wellfleet Press, 2015.

6 Rani, D Sudha, TVS Reddy, D Ravi, and AS Jyotsna. A Workbook on English Grammar and Composition. Delhi: McGraw, 2016.

SECOND YEAR: SEMESTER III

Course Code	Course Title	L	T	P	C
23110AEC31	**Tamil – III**	3	1	0	3

காப்பிய இலக்கியம் - **23110AEC31**
மூன்றாம் பருவம்

பாடநோக்கங்கள்

- தமிழ்க் காப்பியங்களை அறிமுகப்படுத்துதல்.
- காப்பியங்கள் கூறும் வாழ்வியல் அறங்களை உணர்த்துதல்.
- காப்பிய இலக்கியங்களில் இலக்கியச் சுவையை பயிற்றுவித்தல்.
- நாடக இலக்கியத்தின் தனித்துவத்தைக் கற்பித்தல்.
- புராணச் செய்திகளை மேம்படுத்திக் கொள்ளச்செய்நல்

பயன்கள்

- இலக்கியங்களின் சிறப்புகளை அறிவர்
- காப்பியக் கதைகள் வழி அறச் சிந்தனை பெறுவர்
- பல்வேறு காப்பிய வடிவங்களை பற்றிய அறிவு பெறுவர்.
- நாடக படைப்பாக்கத்திற்கான தூண்டுதலைப் பெறுவர்
- புராணச் செய்திகள் வழி தமிழ் கலாச்சாரத்தை அறிவர்.

அலகு-**1** காப்பியங்கள்

1.சிலப்பதிகாரம் - மதுரை காண்டம் (வழக்குரை காதை)]
2.மணிமேகலை - விழாவறை காதை
3.சீவக சிந்தாமணி - குணமாலையார் இலம்பகம்

அலகு-**2** காவியங்கள்

1.கம்பராமாயணம்- மந்தரை சூழ்ச்சி படலம்
2.மகாபாரதம் - ஆரண்ய பருவம்

அலகு-**3** புராணங்கள்

1. பெரியபுராணம்- இளையான்குடி மாற நாயனார் புராணம்
2. சீறாப்புராணம் - ஈத்தங்குழை வரவழைத்தப் படலம்
3.தேம்பாவணி- பிரிந்த மகனை காண்படலம்

அலகு-**4** நாடகம் - சாபம்? விமோசனம்

அலகு-**5** இலக்கிய வரலாறு

1. காப்பியங்கள்
2. இரட்டைக் காப்பியங்கள்
3. நாடக இலக்கியம்

பார்வை நூல்கள் :

1. காப்பியத்திறன்- மணிவாசகர் நூலகம், சிதம்பரம்.
2 . தமிழ் காப்பியங்கள் - கி. வா .ஜெகன் ஜெகநாதன் , அமுத நிலையம், சென்னை .
3 .நவீன நாடக உருவாக்கம் - கோ பழனி , தமிழ் பல்கலைக்கழகம், தஞ்சாவூர்.
4. இணையதளம் -www.tamilvu.org , www.noolulagam.com
5. சாபம்? விமோசனம்
மு.இராமசுவாமி,
செண்பகம் இராமசுவாமி,
பாவை பதிப்பகம்,ஜானிஜான் சாலை,
சென்னை - 14

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CLO1	3	2	3	3	3	2	2	2	3	2	3	2
CLO2	3	3	2	2	2	3	2	3	3	2	2	2
CLO3	3	2	3	3	2	2	2	3	2	3	3	2
CLO4	3	3	3	2	2	2	3	2	3	2	3	3
CLO5	3	3	2	2	2	2	3	2	2	2	3	3

English-III

Course Code	Course Title	L	T	P	C
23111AEC32	English-III	3	1	0	3

Learning Objectives	
LO1	To enhance the level of literary and aesthetic experience of students and to help them respond creatively.
LO2	To sensitize them to the major issues in the society and the world.
LO3	To provide them with an ability to build and enrich their communication skills
LO4	To equip them to utilize the digital knowledge resources effectively for their chosen fields of study
LO5	To help them think and write imaginatively and critically.

Unit No.	Unit Title & Text	No. of Periods for the Unit
I	**Poetry:** 1.1 The Voice of the Mountains - Mamang Dai 1.2 A Song of Hope - Oodgeroo Noonuccal 1.3 In an Artist's Studio - Christina Rossetti	20
II	**Scenes From Shakespeare:** 2.1 Romeo & Juliet -The Balcony Scene 2.2 Macbeth-Banquet Scene 2.3 Julius Caesar - Murder Scene	20
III	**Speeches of Famous personalities** 3.1 Yes, We Can-Barack Obama 3.2 You've Got to Find What You Love-Steve Jobs	20
IV	**Language Competency** 4.1 Writing letters and emails 4.2 Writing and messaging in social media platforms [blogs, twitter, instagram.facebook] 4.3 Learning netiquette, email etiquette	15
V	**English for Workplace** 5.1 Data Interpretation and Reporting 5.2 Data Presentation and analysis 5.3 Meeting Etiquettes - language, dress code, voice modulation. Online Meetings - Terms and expressions used 5.4 Conducting and participating in a meeting	15

Course Outcomes

Course Outcomes	On completion of this course, students will;	
CO1	Broaden their outlook and sensibility and be acquainted with cultural diversity and divergence in perspectives.	PO1
CO2	Be updated with basic informatics skills and attitudes relevant to the emerging knowledge society	PO1,PO2
CO3	Produce grammatically and idiomatically correct language.	PO4,PO6
CO4	Gain knowledge in writing techniques to meet academic and professional needs.	PO4,PO5,PO6
CO5	Be equipped with sufficient practice in Vocabulary, Grammar, Comprehension and Remedial English from the perspective of career-oriented tests.	PO3,PO8

Text Books (Latest Editions)	
1	Arden Shakespeare Complete works by Shakespeare (Author), William (Author), Bloomsbury, 2011)
References Books **(Latest Editions, and the style as given below must be strictly adhered to)**	
1	The Shakespeare Book: Big Ideas Simply Explained, Stanley Wells et al. DK Publishing, 2015
3	Famous Speeches by Mahatma Gandhi, CreateSpace Independent Publishing Platform, 2016
4	**How to Build a Professional Digital Profile Kindle Edition** by Jeanne Kelly Bernish, Bernish Communications Associates, LLC; 1st edition (May 29, 2012)
5	Keys to Teaching Grammar to English Language Learners, Second Ed.: A Practical Handbook by Keith S Folse, Michigan Teacher Training, 2016.
6	Role Play-Theory and Practice.Krysia M Yardley-Matwiejczuk, SAGE publications ltd, 1997

BIOMOLECULES

Course Code	Course Title	L	T	P	C
23115AEC33	**Biomolecules**	4	1	0	3

Learning objectives

- The main objectives of this course are to:
- Introduce the structure, properties and biological significance of carbohydrates
- Comprehend the classification, functions and acid base properties of amino acids
- Elucidate the various levels of organization of Proteins.
- Impart knowledge on the classification, properties and characterization of lipids.
- Acquaint with the classification, structure, properties and functions of nucleic acids

Unit I: Carbohydrates-Classification and biological significance, physical properties - stereo isomerism, optical isomerism, anomers, epimers and mutarotation. Monosaccharides: Occurrence, linear and cyclic structure, Reactions of monosaccharides due to the presence of hydroxyl, aldehyde and keto groups. Disaccharides: Structure and properties of reducing disaccharides (lactose and mannose), non-reducing disaccharide(sucrose). Polysaccharides: Homopolysaccharides - Occurrence, structure and biological significance of starch, glycogen and cellulose. Heteropolysaccharides - Structure and biological significance of mucopolysaccharides - hyaluronic acid, chondroitin sulphate and heparin. (Structural elucidation not needed). 12 hrs

Unit II: Amino acids -Classification based on composition of side chain and nutritional significance. General structure of amino acids. 3 - and 1- letter abbreviations. Modified amino acids in protein non - protein amino acids. Physical properties of amino acids, isoelectric point, titration curve (alanine, lysine, glutamic acid), optical activity. Chemical reactions due to carboxyl group, amino group and side chains. Colour reactions of amino acids. 12Hrs

Unit III: Proteins-Classification based on shape, composition, solubility and functions. Properties of proteins - Ampholytes, isoelectricpoint, salting in and salting out, denaturation and renaturation, UV absorption. Levels of Organization of protein structure- Primary structure, Formation and characteristics of peptide bond, phi and psi angle, Secondary structure-α helix (egg albumin), β- pleated sheath (keratin), triple helix (collagen). Tertiary structure - with reference to myoglobin. Quaternary structure with reference to haemoglobin. 12 Hrs

Unit IV: Lipids- Lipids: Bloor's classification, chemical nature and biological functions. Fatty acids: classification, nomenclature, structure and properties of fatty acids. Simple and

mixed triglycerides: structure and general properties, Characterization of fats- iodine value, saponification value, acid number, acetyl number, polensky number, Reichert-Meissl number along with their significance. Compound lipids-Structure and functions of phospholipids and glycolipids. Derived lipids-Structure and functions of cholesterol, bile acids and bile salts. 12Hrs

Unit V: Nucleic Acids-Structure of purine and pyrimidine bases, nucleosides and nucleotides and their biological importance. Types of DNA: A, B, C, Z DNA, structure and biological significance, super helicity. Types of RNA: mRNA, tRNA, rRNA, hnRNA, snRNA, Secondary and tertiary structure of tRNA. Properties of DNA-Hypochromic and hyperchromic effect, melting temperature, viscosity. Denaturation and annealing. 12Hrs

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Classify, illustrate the structure and explain the physical and chemical properties of carbohydrates.	PO1
CO2	Indicate the classification, structure, properties and biological functions of amino acids.	PO1
CO3	Explain the classification and elucidate the different levels of structural organization of proteins.	PO1
CO4	Elaborate on classification, structure, properties, functions and characterization of lipids	PO1, PO4
CO5	Describe the structure, properties and functions of different types of nucleic acids	PO1

Textbooks

1. Biochemistry, U. Sathyanarayana & U. Chakrapani, 2013, 5th edition Elsevier India Pvt. Ltd., Books & Allied Pvt. Ltd.
2. Fundamentals of Biochemistry, J.L. Jain, Sunjay Jain, Nitin Jain, 2013, 7th edition S. Chand & Company Ltd.
3. Text book of Medical Biochemistry, M.N. Chatterjea, Rana Shinde, 2002, 8th edition, Jaypee Brothers.

Reference books

1. David L. Nelson, Michael M. Cox, 2005, Principles of Biochemistry, 4th edition W.H. Freeman and Company.
2. Voet. D, Voet. J.G. and Pratt, C.W, 2004, Principles of Biochemistry, 4th edition John

Wiley & Sons, Inc.

3. Zubay G.L, *et.al*., 1995, Principles of Biochemistry, 1st edition, WmC. Brown Publishers.

Web resources

1. https://www.britannica.com/science/biomolecule
2. https://en.wikipedia.org/wiki/Biomoleculehttps://www.khanacademy.org/science/biology/macromolecules

Mapping with Program Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	3						3			3
CO 2	3						3			3
CO 3	3						3			3
CO 4	3			2			3	2		3
CO5	3						3			3

S-Strong (3) M-Medium (2) L-Low

MICROBIOLOGY-I

Course Code	Course Title	L	T	P	C
23116GEC34	**Microbiology-I**	4	1	0	3

Aim:

Students should have knowledge about the history and development of Microbiology

Objectives:

The contents of this course will help students understand history, biology of microorganisms, growth and control of microbes. Thus the beginners are rightly exposed to foundation of Microbiology which would lead them towards progressive advancement of the subject

Outcomes:

On the successful completion of the course, student will be able to:

1. Understand the history of microbiology
2. Analyze the types of microscopes
3. Understand the general characteristics of microbes
4. Evaluate the success of understanding the characterization and cultivation of microbes.

Unit I: History of microbiology - Historical development of Microbiology- Theories of spontaneous generation - The scope of Microbiology - prokaryotic and eukaryotic microorganisms. General principles and nomenclature - Haeckel's three kingdom concept, Whittaker's five kingdom concept- Carl Woese three domain classification.

Unit II: **Microscopy -** Microscopy: Principles and applications of bright field, dark field, phase contrast, fluorescent SEM and TEM. Principles and types of staining - Simple, differential (Gram, Spore, AFB) Capsule staining (Negative), Sterilization: Principles and methods – physical moist heat, dry heat, filtration (Membrane and HEPA).

Unit III: General characteristics of microbes - General characteristics and nature of Archaebacteria, Cyanobacteria, Mycoplasma, Rickettsiae, Chlamydia, Spirochaetes, Actinobacteria, Protozoa, Algae, Fungi and Viruses. Basic understanding of classification of viruses, algae, fungi and protozoa.

Unit IV: Classification of bacteria - Outline classification for bacteria as per the Bergey's Manual of Systematic Bacteriology - Structural organization of bacteria - Size, shape and arrangement of bacterial cells -Ultrastructure of a bacterial cell - cell wall, cell membrane,

ribosomes, nucleoid, slime, capsule, flagella, fimbriae, spores, cysts, plasmid, mesosomes and cytoplasmic inclusions.

Unit V: Cultivation of microbes - Cultivation of microbes- Types of culture media with specific examples for each type. Aerobic and Anaerobic culture techniques-Pure culture techniques (Tube dilution, Pour plate, Spread plate and Streak plate).

REFERENCES

1. Alcamo IE. Fundamentals of Microbiology, sixth edition, Addison wesley Longman, Inc. California. 2001.
2. Alexopoulos CJ, Mims CW and Blackwell M. Introductory Mycology. Fifth edition John Wiley and Sons. Chichester. 2000.
3. Atlas RA and Bartha R. Microbial Ecology. Fundamentals and Application, Benjamin Cummings, New York. 2000.
4. Black JG. Microbiology-principles and explorations, 6th edition. John Wiley and Sons, Inc. New York. 2005.
5. Cappuccino and Sherman. Microbiology – A Laboratory Manual. 7th edition, Dorling Kindersley (India) Pvt. Ltd., New Delhi. 2012.

Text Book

1. Dubey RC and Maheswari DK. A Text Book of Microbiology. S Chand, New Delhi. 2010 7. Johri RM, Snehlatha, Sandhya Shrama. A Textbook of Algae. Wisdom Press, New Delhi. 2010.
2. Kanika Sharma. Textbook of Microbiology – Tools and Techniques. 1st edition, Ane Books Pvt. Ltd., New Delhi. 2011.
3. Madigan MT, Martinko JM, and Parker J. Biology of Microorganisms, 12th Edition, MacMillan Press, England. 2009.
4. Moselio Schaechter and Joshua Leaderberg. The Desk encyclopedia of Microbiology. Elseiver Academic press, California. 2004.
5. Pelczar MJ, Chan ECS and Kreig NR. Microbiology, fifth edition. McGrawHill. Book Co. Singapore. 2009.
6. Prescott LM, Harley JP, and Klein DA. Microbiology (7th edition) McGraw Hill, Newyork. 2008.
7. Schlegel HG. General Microbiology, Cambridge University Press, U.K. 2008.
8. Tortora GJ, Funke BR and Case CL. Microbiology: An Introduction. 9th Edition, Pearson Education, Singapore. 2009.
9. Rajan S and Selvi Christy R. Essentials of Microbiology, Anjanaa Book House, Chennai, 2015.

BIOMOLECULES LAB

Course Code	Course Title	L	T	P	C
23115SEC35L	**Biomolecules Lab**	0	0	3	3

Learning Objectives

The main objectives of this course are to

- Identify the biomolecules carbohydrates and amino acids by qualitative test
- Determine the quality of Lipids by titrimetric methods
- Isolate nucleic acids from plant and animal source

I) Qualitative test for 15 Hrs

1) Carbohydrates

a) Glucose b) Fructose c) Arabinose d) Maltose e) Sucrose f) Lactose g) Starch

2) Amino acids

a) Arginine b) Cysteine c) Histidine d) Proline e) Tryptophan f) Tyrosine g) Methionine

II Titrimetric methods 15 Hrs

1) Determination of Saponification value of an edible oil

2) Determination of Iodine number of an edible oil

3) Determination of Acid number of an edible oil

III. Group Experiments 15 hrs

1) Isolation of DNA from plant/animal source.

2) Isolation of RNA from rich source.

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Qualitatively analyze the carbohydrates and report the type of carbohydrate based on specific tests	PO1, PO2, PO3
CO2	Qualitatively analyze amino acids and report the type of amino acids based on specific tests	PO1, PO2, PO3
CO3	Determine the Saponification, Iodine and acid number of	PO1, PO3,

	edible oil	PO4
CO4	Isolate the nucleic acid from biological sources	PO1, PO3

Text books

1. David T Plummer, An Introduction to Practical Biochemistry, 3rd edition, Tata McGraw-Hill Edition
2. J. Jayaraman Laboratory Manual in Biochemistry New Age International (P) Limited Fifth edition 2015
3. S. Sadasivam A. Manickam Biochemical Methods New Age International Pvt Ltd publisher's third edition 2018

Reference books

1. Rageeb, Kiran Patil, M. Bakshi Rahman, Sufiyan Ahmad Raees. A Practical book on Biochemistry, Everest publishing house1stEdition, 2019
2. Introductory practical Biochemistry - S.K. Sawhney, Randhir Singh, 2nd ed, 2005.
3. Biochemical Tests - Principles and Protocols. Anil Kumar, Sarika Garg and Neha Garg. Vinod Vasishtha Viva Books Pvt Ltd, 2012.
4. Harold Varley, Practical Clinical Biochemistry, CBS. 6thedition, 2006.
5. Keith Wilson and John Walker. Principles and Techniques of Practical Biochemistry, 4th edition, Cambridge University press, Britain, 1995.

Web resources

1. https://www.pdfdrive.com/instant-notes-analytical-chemistry-e912659.html 14
2. https://www.pdfdrive.com/analytical-biochemistry-e46164604.html
3. https://www.pdfdrive.com/biochemistry-books.html

Mapping with Program Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	2	3	3				3	3	3	3
3CO 2	2	3	3				3	3	3	3
CO 3	2		3	2			3	3	3	3
CO 4	2		3				3	3	3	3

S-Strong (3) M-Medium (2) L-Low (1)

MICROBIOLOGY LAB-I

Course Code	Course Title	L	T	P	C
23116SEC36L	**Microbiology Lab-I**	0	0	3	3

1. Safety practices in Microbiological laboratory
2. Microscope and its operation
3. Principles and operations - Autoclave, Hot Air Oven, Filtration, Laminar Air Flow, Incubators, colony counter, Centrifuge, pH meter, Colorimeter and Spectrophotometer
4. Preparation of culture media, cleaning of glassware and sterilization methods
5. Demonstration of ubiquitous nature of microorganisms.
6. Measurement of size of microbes – micrometry.
7. Observation of permanent slides to study the structural characteristics of algae (Anabena, Nostoc, Spirulina, Oscillotoria), fungi (Pythium, Rhizopus, Saccharomyces, Penicillium, Aspergillus, Agaricus) and protozoa (Entamoeba histolytica and Plasmodium spp.).
8. Enumeration of bacterial numbers by Viable count (Plate count) and Total count (Haemo cytometer count)
9. Pure culture techniques - Streak plate, Pour plate and Spread plate.
10. Test for motility of bacteria - Hanging drop method.
11. Staining techniques - Simple staining, Gram’s staining, Spore-staining, Capsular staining.
12. Isolation of bacteria, actinobacteria, fungi and cyanobacteria.

BASICS OF FORENSIC SCIENCE

Skill Enhancement Course

Course Code	Course Title	L	T	P	C
23115SEC37	Basics of Forensic science	2	0	0	1

Learning Objectives

The main objectives of this course are to

C1 Gain knowledge on the basic practices of forensic analysis.

C 2 Perform investigation using fresh blood.

C 3 Carry out the analysis using body fluids

C 4 Investigate the presence of forms of drugs and poisons in body fluids.

C5 Execute the identification test on multiple samples.

Unit I: Forensic Science: Definition, History and Development. Crime scene management and investigation; collection, preservation, packing and forwarding of physical and trace evidences for analysis. 6Hrs

Unit II: Blood – grouping and typing of fresh blood samples including enzyme. Cases of disputed paternity and maternity problems, DNA profiling. 6Hrs

Unit III: Analysis of body fluids- Analysis of illicit liquor including methyl and ethyl alcohol in body fluids and breathe. Chemical examination, physiology and pharmacology of Insecticides and pesticides. 6Hrs

Unit IV: Psychotropic drugs -Sedatives, stimulants, opiates and drugs of abuse. Identification of poisons from viscera, tissues and body fluids. 6Hrs

Unit V: Identification tests- Identification of hair, determination of species origin, sex, site and individual identification from hair. Classification and identification of fibers. Examination and identification of saliva, milk, urine and faecal matter 6Hrs

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Gain knowledge on basics of forensic science and method for collection and preservation of samples	PO1, PO2, PO6
6CO2	Assess the paternity, maternity problems and DNA profiling	PO1, PO2
CO3	Identify the presence of alcohol, insecticides and pesticides in	PO1, PO2

	body fluids	
CO4	Detail on the test performed to identify the presence of drugs and poisons in body fluids	PO1, PO2
CO5	Identify species and sex from the available body fluids	PO1, PO2

Reference books

1. An Introduction to Forensic DNA Analysis by Norah Rudin & Keith Inman USA, Second edition.
2. Forensic Science Handbook, Volume 2 & 3 by Saferstein, Richard E.
3. Forensics by Embar-Seddon, Ayn and Pass. Allan D.
4. Forensic Medicine by Adelman, Howard C & Kobilinsky, Lawrence Page 24 of 63

Mapping with Program Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	2	3					3		3	3
CO 2	2	3					3		3	3
CO 3	2	3					3		3	3
CO 4	2	3					3		3	3
CO5	2	3					3		3	3

S-Strong (3) M-Medium (2) L-Low (1)

MEDICAL LABORATORY TECHNOLOGY

Course Code	Course Title	L	T	P	C
23115SEC38	Medical Laboratory technology	2	0	0	2

Learning Objectives

The main objectives of this course are to

- Impart knowledge on specimen collection and disposal of waste.
- Acquaint knowledge on collection, preservation and transfusion of blood.
- Quantify the biomolecules in biological sample
- Understand the significance of various tests and their interpretation in diseased conditions
- Acquaint knowledge on enzymes, hormones and Immunoglobulins as markers for diagnosis.

Unit I: Collection, transport, analysis of specimen – blood, routine urine, feces, sputum, semen, CSF Documentation of samples & results. Disposal of laboratory/ hospital waste- Noninfectious waste, biomedical waste, infected sharp waste disposal, infected non sharp disposal - color coding as per guidelines. 6 Hrs

Unit II: Determination of Blood group and Rh factor -Basic blood banking procedures- cross matching, screening test. Blood transfusion and hazards. 6 Hrs

Unit III: Estimation of blood sugar - Enzymatic method, HbA1C, Qualitative and quantitative analysis of urine sample- NPN-urea, uric acid, creatinine. Mineral, vitamin and CSF analysis. 6 Hrs

Unit IV: Immuno diagnostics - Widal test, VDRL test, ASO, RA, CRP and Complement fixation Test. RIA, ELISA, Skin test - Montaux and Lepramin test. 6 Hrs

Unit V: Assay of clinically important enzymes- Estimation of clinically important hormones - Insulin, Thyroid and Reproductive hormones and its clinical significance. 6 Hrs

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Collect & preserve of biological samples.	PO1, PO2
CO2	Estimate the various constituents in biological sample	PO1, PO2, PO6
CO3	Perform the routine procedures adopted in blood bank	PO1, PO2,

		PO6
CO4	Analyze and interpret the values for both normal and disease conditions.	PO1, PO2, PO6
CO5	Assay the enzymes and hormones &interpret clinical implications	PO1, PO2, PO6

Text Books

1. Kanai L Mukherjee and Anuradha Chakravarthy Medical Laboratory Technology IVth edition, Vol I, 2022
2. Ramnik Sood, Text Book of Medical Laboratory Technology, Jaypee Publishers, 2006
3. Tietz, N. (2018) Fundamentals of Clinical Chemistry and Molecular Diagnostics 8th edition, W.B. Saunders Company

Web Resources

1. https://www.youtube.com/watch?v=QNYlX5Ne9lQ
2. https://www.slideshare.net/doctorrao/agglutination-tests-and-immunoassys
3. https://microbenotes.com/introduction-to-precipitation-reaction/

Mapping with Program Outcome

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	2	3					3	3	3	3
CO 2	2	3				2	3	3	3	3
CO 3	2	3				2	3	3	3	3
CO 4	2	3				2	3	3	3	3
CO5	2	3				2	3	3	3	3

S - Strong (3) M - Medium (2) L -Low (1)

RESEARCH METHODOLOGY

Ability Enhancement Compulsory course

Course Code	Course Title	L	T	P	C
23115RMC39	Research Methodology	2	0	0	2

Aim:

To create a basic appreciation towards research process and awareness of various research publication

Course objectives:

- To understand the steps in research process and the suitable methods.
- To identify various research communications and their salient features
- To carry out basic literature survey using the common data-bases
- To give exposure to MATLAB platform for effective computational and graphic works required for quality research

Course outcome:

Ability to carry out independent literature survey corresponding to the specific publication type and assess basic computational frameworks used in mathematical researches.

Unit I: Introduction to Research Methodology

Meaning of research – Objectives of research – Types of research – Significance of research – Research approaches

Unit II: Research Methods

Research methods versus methodology - Research and scientific method - Criteria of good research - Problems encountered by researchers in India.

Unit III: Literature Survey

Articles - Thesis - Journals - Patents - Primary sources of journals and patents - Secondary sources - Listing of titles - Abstracts - Reviews - General treatises - Monographs.

Unit IV: Database Survey

Database search - NIST - MSDS - PubMed - Scopus - Science citation index - Information about a specific search.

Unit V: Basic Principles of Laboratory Life Sciences Laboratory

Introduction - Access to Laboratory and Emergency Exits - Basic Biostatistics, Mean, Median, Mode and its Application - Fundamental of Biosafety, Bioethics, Replication –

Advantages and Disadvantages, Standard division, Standard Error, Preparation of Chemicals – Percentage, Molarlity and Normality, Ratio Solution, PPM Solution etc. Ethical Issue in Animal Handling, Basic of DMRT, ANOVA etc.

Reference Book

1. John W. Creswell, Research Design: Qualitative, Quantitative, and Mixed Methods, Approaches, 4th Edition SAGE
2. Sharan B. Merriam & Elizabeth J. Tisdell, Qualitative Research: A Guide to Design and Implementation, 4th Edition, John Wiley & Sons
3. Introductory Statistics. Fifth Edition. (2004) Prem S. Mann. John Wiley and Sons, (ASIA) Pvt. Ltd.
4. Research Methodology Methods and Statistical Techniques - Santosh Gupta
5. Biostatistical analysis. J.H. Zar, 4th edition. Pearson Education, Inc. India.
6. Braun, R.P. Introduction to instrumental analysis, McGraw Hill.
7. Wilson & Walker, Principles and Techniques of Biochemistry and Molecular Biology. 6th Edn, Cambridge Univ. Press.

AUDIT COURSE

Course Code	Course Title	L	T	P	C
231ACLSOAN	Office Automation	-	-	-	1

Course Objectives:

To provide an in-depth training in the use of office automation, internet and internet tools. The course also helps the candidates to get acquainted with IT.

Course Outcomes:

After completion of the course, students would be able to documents, spreadsheets, make small presentations and would be acquainted with the internet.

Unit I: Knowing the basics of Computers

Unit II: Word Processing (MS word)

Unit III: Spread Sheet (MS XL)

Unit IV: Presentation (MS Power Point)

Unit V: Communicating with Internet

Reference:

1. Fundamentals of computers - V. Rajaraman - Prentice- Hall of India
2. Microsoft Office 2007 Bible - John Walkenbach, Herb Tyson, Faithe Wempen, cary N. Prague, Michael R Groh, Peter G. Aitken, and Lisa a. Bucki -Wiley India pvt. ltd.
3. Introduction to Information Technology - Alexis Leon, Mathews Leon, and Leena Leon, Vijay Nicole Imprints Pvt. Ltd., 2013.
4. Computer Fundamentals - P. K. Sinha Publisher: BPB Publications

Web Reference

1. https://en.wikipedia.org
2. https://wiki.openoffice.org/wiki/Documentation
3. http://windows.microsoft.com/en-in/windows/windows-basics-all-topics

SEMESTER – IV - TAMIL-IV

Course Code	Course Title	L	T	P	C
23110AEC41	Tamil-IV	3	0	0	3

சங்க இலக்கியம் **- 23110AEC41**

நான்காம் பருவம்

பாடநோக்கங்கள்

- இலக்கியங்கள் வாயிலாக சமுதாயக் கருத்தக்களை
- பழந்தமிழ் இலக்கிய வளத்தை உணர்த்துதல்.
- சங்க அக, புற பாடல் மரபுகளைப் பயிற்றுவித்தல்
- வாழ்வியல் அறங்கள் மற்றும் வரலாற்றுச் செய்திகளை . பயிற்றுவித்தல்
- புற இலக்கியங்கள் காட்டும் வாழ்வியல் அறங்களை எடுத்துக் கூறுதல்

பயன்கள்

- பழந்தமிழ் இலக்கிய மரபை அறிவர்.
- சங்க இலக்கியங்களில் உள்ள அழகியல் கூறுகளை உணர்வர்.
- வாழ்வியல் அறங்கள் மற்றும் வரலாற்றுச் செய்திகளை அறிவர்.
- சங்க அக, புற பாடல் மரபுகளை புரிந்துக்கொள்வர்.
- புற இலக்கியங்கள் காட்டும் வாழ்வியல் அறங்களை உணர்வர்.

அலகு**-1**

1. குறுந்தொகை– பாடல் எண்: 28,38
2. நற்றிணை– பாடல் எண்: 1,27,28,167,168
3. ஐங்குறுநூறு– பாடல் எண்: இளவேனில் பத்து

அலகு**-2**

1. கலித்தொகை– பாடல் எண்: 3,7
2. அகநானூறு– பாடல் எண்:5,42,100
3. புறநானூறு– பாடல் எண்: 182,204,41,121

அலகு**-3**

1 சிறுபாணாற்றுப்படை முழுவதும்

அலகு**-4**

1. திருக்குறள்– செய்நன்றி அறிதல், கூடா நட்பு ,நலம்புனைந்துரைத்தல்
2. நாலடியார் – பாடல் எண்: 1,172,215,253

அலகு**-5**

இலக்கிய வரலாறு

1. சங்க இலக்கியம்
2. எட்டுத்தொகை, பத்துப்பாட்டு
3. பதினெண் கீழ்க்கணக்கு நூல்கள்

பார்வை நூல்கள்

1. குறுந்தொகை - கழக வெளியீடு ,சென்னை
2. நற்றிணை - கழக வெளியீடு ,சென்னை
3. ஐங்குறுநூறு - கழக வெளியீடு ,சென்னை
4. கலித்தொகை - கழக வெளியீடு ,சென்னை
5. அகநானூறு - கழக வெளியீடு ,சென்னை
6. புறநானூறு - கழக வெளியீடு ,சென்னை
7. திருக்குறள் - பரிமேலழகர் உரை ,கழக வெளியீடு ,சென்னை
8. இணையதளம் -www.tamilvu.org , www.noolulagam.com

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CLO1	3	2	3	3	3	2	2	2	3	2	3	2
CLO2	3	3	2	2	2	3	2	3	3	2	2	2
CLO3	3	2	3	3	2	2	2	3	2	3	3	2
CLO4	3	3	3	2	2	2	3	2	3	2	3	3
CLO5	3	3	2	2	2	2	3	2	2	2	3	3

ENGLISH-IV

Course Code	Course Title	L	T	P	C
23111AEC42	English-IV	3	0	0	3

Learning Objectives	
LO1	To help learners imbibe the rules of language unconsciously and tune to deduce language structure and usage.
LO2	To enable them use receptive skills through reading and listening to acquire good exposure to language and literature.
LO3	To help them develop style in speech and writing and manipulate the tools of language for effective communication.
LO4	To provide exposure to plays, autobiographies and expose them to value based ideas.
LO5	To enhance their language skills especially in the areas of grammar and pronunciation.

Unit No.	Unit Title & Text	No. of Periods for the Unit
I	**Life Writing** 1.1 I am Malala-Malala Yousafzai - Chapter 1 1.2 My Inventions - Nikola Tesla - Chapter 2	20
II	**One Act Plays** 2.1The Zoo Story- Edward Albee 2.2 The Proposal- Anton Chekhov	20
III	**Interviews** 3.1 Nelson Mandela's Interview with Larry King. 3.2 Rakesh Sharma's Interview with Indira Gandhi from Space 3.3 Lionel Messi with Sid Lowe (Print)	20
IV	**Language Competency** 4.1 Refuting, Arguing & Debating 4.2 Making Suggestions & Responding to Suggestions, Asking for and Giving Advice or Help4.3 Interviews (face to face, telephone and video conferencing)	15

V	**English for Workplace** 5.1 Job Applications: Covering letters, CV and Resume 5.2 Creating a digital profile - Linkedin 5.3 Filling Forms (Online & Manual): creation of account, railway reservation, ATM,Credit/debit card 5.4. Body Language -Practical Skills for Interviews	15

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Learn to communicate effectively and appropriately in real life situation.	PO1
CO2	Use English effectively for study purpose across the curriculum	PO1, PO2
CO3	Develop interest in and appreciation of Literature	PO4, PO6
CO4	Develop and integrate the use of the four language skills	PO4, PO5, PO6
CO5	Enhance their language skills especially in the areas of grammar and pronunciation.	PO3, PO8

Text Books (Latest Editions)	
1	I Am Malala The Girl Who Stood Up for Education and Was Shot by the Taliban by Malala Yousafzai, Christina Lamb , Little Brown, 2013.
2	My Inventions by Nikola Tesla Ingram Short title, 2011 Edition
References Books **(Latest editions, And the style as given below must be strictly adhered to)**	
1	Writing Your Life: A Guide to Writing Auto biographies, Mary Borg, Taylor & Francis, 2021
2	One-act Plays for Acting Students: An Anthology of Short Norman A. Bert · 1987 ·
3	The One-Act Play Companion: A Guide to plays, playwrights ... Colin Dolley, Rex Walford · 2015

4	How to Build a Professional Digital Profile Kindle Edition by Jeanne Kelly Bernish, Bernish Communications Associates, LLC; 1st edition (May 29, 2012)
5	Role Play-Theory and Practice. Krysia M Yardley-Matwiejczuk, SAGE publications ltd, 1997

Web Resources	
1	For Readers' Theatre: https://www.youtube.com/watch?v=JaLQJt8orSw&t=469s(the link to the performance; refer scripts by Aaron Sheperd)
2	http://BBC learn English.com
3	http://onestopenglish.com
4	http://hearn-english-today.com
5	http://talkenglish.com
6	The Zoo Story: http://www.lem.seed.pr.gov.br/arquivos/File/livrosliteraturaingles/zoostory.pdf

BIOCHEMICAL TECHNIQUES

Course Code	Course Title	L	T	P	C
23115AEC43	Biochemical Techniques	4	1	0	3

Learning objectives

The objectives of this course are to

- Introduce the basic principles, types and applications of various sedimentation technique.
- Provide an understanding of the underlying principles of chromatographic techniques
- Demonstrate experimental skills in various electrophoretic techniques.
- Appraise the use of colorimetric and spectroscopic techniques in biology
- Impart knowledge about the measurement of radioactivity and safety aspects of radioactive isotopes.

Unit I: Centrifugation - Basic principles, RCF**,** Sedimentation coefficient, Svedberg constant. Types of rotors. Preparative centrifugation- differential and density gradient centrifugation, Rate zonal and Isopycnic techniques, construction, working and applications of analytical ultracentrifuge-Determination of molecular weight (Derivation excluded) 9 Hrs

Unit II: Chromatography - adsorption, partition. Principle, instrumentation and applications of paper chromatography, thin layer chromatography, ion-exchange chromatography, gel permeation chromatography and affinity chromatography. 9 Hrs

Unit III: Electrophoresis -General principles, factors affecting electrophoretic mobility. Tiselius moving boundary electrophoresis. Electrophoresis with paper and starch. Principle, instrumentationandapplicationsofagarosegelelectrophoresisandSDS-PAGE. 9Hrs

Unit IV: Basics of Electromagnetic radiations- Energy, wavelength, wavenumber and frequency. Absorption and emission spectra, Lambert - Beer Law, Light absorption and transmittance. Colorimetry-Principle, instrumentation and applications. Visible and UV spectrophotometry – Principle, instrumentation and applications - enzyme assay, structural studies of proteins and nucleic acids. 9 hrs

Unit V: Radioactivity - Types of Radioactive decay, half-life, units of radioactivity, Detection and measurement of radioactivity - Methods based upon ionization -Geiger Muller Counter. Methods based upon excitation - Solid &Liquid scintillation counters. Autoradiography. Biological applications and safety aspects of radioisotopes. 9 Hrs

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Describe types of rotors and identify the centrifugation technique for the separation of biomolecules.	PO1, PO2, PO6
CO2	Demonstrate the principles, operational procedure and applications of planar and column chromatography.	PO1, PO2, PO6
CO3	Specify the factors and explain the separation of DNA and protein using electrophoretic technique.	PO1, PO2, PO6
CO4	State Beer's Law and illustrate the instrumentation and uses of colorimeter and spectrophotometer.	PO1, PO2, PO6
CO5	Enumerate various methods of measurement of radioactivity and safety aspects of radioactive isotopes.	PO1, PO2, PO6

Textbooks

1. Avinash Upadhyay, Kakoli Upadhyay & Nirmalendu Nath, 2002, Biophysical Chemistry, Principles and Techniques, 3rd edition, Himalaya Publishing House.
2. L. Veerakumari, 2009, Bioinstrumentation, 1st edition, MJP Publishers.
3. Keith Wilson & John Walker, 2000, Practical Biochemistry-Principles and techniques, Cambridge University Press, 4th edition.

Reference books

1. Terrance G. Cooper The tools of Biochemistry, 1977, John Wiley & Sons, Singapore.
2. Gurumani, Research Methodology for Biological Sciences, 2011, 1st edition, MJP Publishers.
3. Saroj Dua, Neera Garg, Biochemical Methods of Analysis, 2010, 1st edition, Narosa Publishing house.

Web Resources

1. 1.https://www.britannica.com/science/chromatography
2. 2.https://www.youtube.com/watch?v=xgxFBQZYXlE
3. 3.https://www.youtube.com/watch?v=7onjVBsQwQ8

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	2	3				2	3	3	3	3
CO 2	2	3				2	3	3	3	3
CO 3	2	3				2	3	3	3	3
CO 4	2	3				2	3	3	3	3
CO 5	2	3				2	3	3	3	3

S-Strong (3) M-Medium (2) L-Low (1)

MICROBIOLOGY – II

Course Code	Course Title	L	T	P	C
23116AEC44	MICROBIOLOGY – II	0	0	3	3

Aim:

Students should have knowledge about the microbes and their metabolism

Objectives:

- To equip the students with the real knowledge of working with different types of Microbes.
- To understand the variety of microorganisms and to analyse their true potential.

Outcomes:

On the successful completion of the course, student will be able to:

1. Understand the different types of microbial associations.
2. Analyze the nutritional types of microorganisms
3. Apply the knowledge to enumerate the microorganisms from natural environment.
4. Evaluate the success of understanding the metabolism of microbes.

Unit I: Microbes and its associations: Microbes in Extreme Environment – thermophilic, methanogenic and halophilic. Archaea - live in extreme conditions. Beneficial aspects of microorganisms. Physiology and biochemistry of microbes- Photo-autotrophs, Chemo-autotrophs, Parasitism, Saprophytism, Mutualism and Symbiosis, Commensalisms, endozoic microbes.

Unit II: Nutrition and growth of microorganisms: Nutritional types of microorganisms, nutritional requirements. Factors influencing the growth of microorganisms – temperature, pH, Osmotic pressure, moisture, radiations and different chemicals, Physiology of growth – Significance of various phases of growth. Growth measurements – batch, continuous and synchronous.

Unit III: Microbial enzymes and their Reproduction: Bacterial enzymes – classification, properties, kinetics of enzyme action – Michaelis Menton equation for simple enzymes - coenzymes and cofactors, isozymes. A detailed account of General structure, growth and reproduction of Bacteria, fungi and Virus. Economic and industrial importance of yeast and moulds

Unit IV: Microbial metabolism: Metabolism of carbohydrates: Anabolism – phototsynthesis – oxygenic – an oxygenic, synthesis of carbohydrate – catabolism of glucose – Embden Mayer – Hoff – Parnas pathway – Pentose pathway, Kreb's cycle (TCA) – electron

transport system and ATP production. Metabolism of protein – synthesis and degradation of amino acids – glycine tyrosine, cysteine, serine, glutamine, synthesis of peptides and proteins – urea cycle.

Unit V: Microbes and their Respiration: Anaerobic Respiration – Nitrate, sulphate and Methane respiration – Fermentations – alcohol, mixed acid, lactic acid fermentation – Metabolism of lipids – biosynthesis of fatty acids and cholesterol – oxidation of fatty acids.

Text Book(s)

1. Pelczar, JR. M. J. (1993). Microbiology: Concepts and Applications. McGraw-Hill. Inc.
2. Prescott, L.M., Harley, J.P and Klein, D. A. Brown (2019). Microbiology. 11th edition, Mc Graw publishers.
3. Stanier, R. Y., Ingraham, J. I., Wheelis, M. I. and Painter, P. R. (2005). General Microbiology. Macmillan Press Ltd. Hampshire.

Reference Books

1. Madigan, M. T., Bender, K. S., Buckley, D. H., Sattley, W. M. and Stahl, D. A. (2017). Brock Biology of Microorganisms. 15th edition. Pearson.
2. Tortora, G. J., Funke, B. R. and Case, C. L. (2016). Microbiology: An introduction. 12th Edition, Pearson.

BIOCHEMICAL TECHNIQUES LAB

Course Code	Course Title	L	T	P	C
23115SEC45L	Biochemical Techniques Lab	0	0	3	3

Learning objectives

The objectives of this course are to:

- Acquaint the students with colorimetric estimations of biomolecules.
- Equip skills on various separation techniques.
- Impart knowledge about the estimation of minerals and vitamins.

I Colorimetry

1. Estimation of amino acid by Ninhydrin method.
2. Estimation of protein by Biuret method.
3. Estimation of DNA by Diphenylamine method.
4. Estimation of RNA by Orcinol method.
5. Estimation of Phosphorus by Fiske and Subbarow method.

II Chromatography

6. Separation and identification of sugars and amino acids by paper chromatography.
7. Separation and identification of amino acids and lipids by thin layer chromatography.

III Demonstration

1. Separation of serum and plasma from blood by centrifugation.
2. Separation of serum proteins by SDS-PAGE.

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Estimate the amount of biomolecules by Colorimetric method.	PO1, PO3, PO6
CO2	Quantify the amount of minerals by Colorimetric method	PO1, PO3, PO6
CO3	Separate and identify sugars, lipids and amino acids by chromatography	PO1, PO3
CO4	Operate centrifuge for the separation of serum and plasma	PO1, PO3, PO6

CO5	Demonstrate the separation of proteins electrophoretically	PO1, PO3, PO6

Text books

1. J. Jayaraman, Laboratory Manual in Biochemistry New Age International (P) Limited Fifth edition 2015.
2. Sadasivam A. Manickam Biochemical Methods New Age International Pvt Ltd publishers third edition 2018.
3. Keith Wilson and John Walker Principles and techniques of Practical Biochemistry Cambridge University Press, 2010, Seventh edition.

Reference books

1. S. K. Sawhney and Randhir Singh, Introductory Practical Biochemistry. Alpha Science International, Ltd 2nd edition, 2005.
2. David T. Plummer, 2001, An Introduction to Practical Biochemistry, 3rd edition, Tata McGraw- Hill publishing company limited.
3. Varley's Practical Clinical Biochemistry by Alan H Gowenlock, published by CBS Publishers and distributors, India Sixth Edition,1988.

MICROBIOLOGY LAB-II

Course Code	Course Title	L	T	P	C
23116SEC46L	Microbiology Lab-II	0	0	3	3

Learning objectives

- 1.Aquire knowledge on bacterial growth
- Gain knowledge on carbohydrates fermentation for bacteria.
- Learn the biochemical identification of the bacteria

Experiments

1. Bacterial growth curve: Cell count/viable count/absorbance (total count)
2. Carbohydrate fermentation tests: Glucose, Lactose, Sucrose and Mannitol.
3. Biochemical test for identification of bacteria: IMViC tests - TSI agar test Urease-Catalase- Oxidase.

Course Outcome

- Describe the bacteria growth
- Explain the carbohydrate test for bacteria characteristics.
- Elaborate on the biochemical test for bacterial identification

BIOMEDICAL INSTRUMENTATION

Course Code	Course Title	L	T	P	C
23115SEC47A	Biomedical Instrumentation	2	0	0	2

Learning Objectives

- The objectives of this course are to
- Provide insights about the blood pressure and its measurement.
- Elaborate the mechanism of instruments related to respiration.
- Highlight the importance of imaging techniques.
- Acquaint students about the basics of medical assisting devices.
- Familiarize about the life saving therapeutic equipment's.

Unit I: Measurement of blood pressure - sphygmomanometer. Cardiac output - Cardiac rate - Heart sound - Stethoscope, ECG - EEG - EMG - ERG. 6 Hrs

Unit II: Monitoring of inspired/expired anaesthetic gases, manograph, inhalators, nebulizers, aspirators, infant respirator, Plethysmography.6 Hrs

Unit III: Medical imaging: X-ray machine - Radio graphic and fluoroscopic techniques – Computed tomography - MRI - PET, Ultrasonography - Endoscopy - Thermography.6 Hrs

Unit IV: Assisting equipment's: Pacemakers - Defibrillators - Ventilators6 Hrs

Unit V: Therapeutic equipment's: Nerve and muscle stimulators - Diathermy - Heart - Lung machine - Audio meters - Dialyzers. 6 Hrs

Course Outcomes

CO	On completion of this course, students will be able to	Programme outcome
CO1	Illustrate the functions of instruments used for measuring blood pressure.	PO1, PO2, PO5
CO2	Elaborate the devices required for monitoring of respiratory gases.	PO1, PO2, PO5
CO3	Understand the operation of the imaging and sonographic instruments.	PO1, PO2, PO5

CO4	Differentiate between the action of pacemakers, defibrillators and ventilators.	PO1, PO2, PO5
CO5	Demonstrate the function of therapeutic equipment's	PO1, PO2, PO5

Text books

1. M. Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies.
2. L.A. Geddes and L.E. Baker, 'Principles of Applied Bio-Medical Instrumentation', John Wiley & Sons.
3. J. Webster, 'Medical Instrumentation', John Wiley & Sons.
4. C. Rajarao and S.K. Guha, 'Principles of Medical Electronics and Biomedical instrumentation', Universities (India) Ltd, Orient Longman Ltd.

Reference books

1. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, 'Bio-Medical Instrumentation and Measurements', II Edition, Pearson Education, 2002.
2. R.S. Khandpur, 'Handbook of Bio-Medical instrumentation', Tata McGraw HillPublishing Co Ltd.,

Web Resources

1. https://youtu.be/GkUCmb0cKwo?list=PLCZ9KmODEcu138IlVeHClJ4nskArYr1Dg

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	2	3			3		3	3	3	3
CO 2	2	3			3		3	3	3	3
CO 3	2	3			3		3	3	3	3
CO 4	2	3			3		3	3	3	3
CO 5	2	3			3		3	3	3	3

S-Strong (3) M-Medium (2) L-Low

TISSUE CULTURE

Course Code	Course Title	L	T	P	C
23115SEC47B	Tissue Culture	2	0	0	2

Learning Oobjectives

The objectives of this course are to

- Introduce the tools and techniques used in tissue culture technique.
- Acquire knowledge on preparation of growth medium for culture techniques.
- Impart knowledge on procedures involved gene transfer.
- Acquaint with the process of tissue culture technique.
- Understand the importance of plant and animal tissue culture for the production and evaluation of bioactive compounds

Unit l: Introduction to Tissue culture, Types- seed, embryo, Callus, Organ, Protoplast culture, Advantages and importance of tissue culture, Tools and techniques 6 Hrs

Unit II: Media and Culture Preparation - pH, temperature, solidifying agents. Role of Micro and macro nutrients. Maintenance of cultures.6 Hrs

Unit III: Methods of gene transfer in plants and animals - direct and indirect gene transfer methods.6 Hrs

Unit IV: Cell culture technique - Explants selection, sterilization and inoculation. 6 Hrs

Unit V: Transgenic plants for crop improvement. Transgenic plants for molecular farming. Animal Cloning - an Overview-Applications of animal cell culture 6 Hrs

Course outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Introduction to plant tissue culture	PO1, PO2, PO3
CO2	Brief knowledge on preparation of tissue culture media	PO1, PO2
CO3	Understanding on different methods of gene transfer	PO1, PO2, PO3
CO4	Gain knowledge on plant and animal cell culture techniques	PO1, PO2, PO3

CO5	Study of applications of genetically modified plants and animals.	PO1,PO2,PO3

Text books

1. Trivedi, P.C.2000. Applied Biotechnology: Recent Advances. PANIMA Publishing corporation.
2. Ignacimuthu. 1996. Applied Plant Biotechnology. Tata McGraw – Hill.
3. Lycett, G.W. and Grierson, D. (ed). 1990. Genetic Engineering of crop plants.
4. Grierson and Covey, S.N.1988. Plant Molecular biology. Blackie.
5. Chawla, H.S., "Introduction to Plant Biotechnology", 3rd Edition, Science Publishers, 2009.

Reference books

1. Gamburg OL, Philips GC, Plant Tissue & Organ Culture fundamental Methods, arias Publications. 1995.
2. Stewart Jr., C.N., "Plant Biotechnology and Genetics: Principles, Techniques and Applications" Wiley-Interscience, 2008.
3. Freshney, R. I. (2010). Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications. Wiley-Blackwell, 2010. 6th Edition.
4. Davis, J. M. (2008). Basic Cell Culture. Oxford University Press. New Delhi.
5. Davis, J. M. (2011). Animal Cell Culture. John Willy and Sons Ltd. USA.6Freshmen R. I. (2005). Culture of Animal Cells. John Willy and Sons Ltd. USA.
6. Butler, M. (2004). Animal Cell Culture and Technology. Taylor and Francis. Keywork USA.
7. Verma, A. S. and Singh, A. (2014). Animal Biotechnology. Academic Press, ELSEVIER, USA

Web Resources

1. https://www.britannica.com/science/tissue-culture
2. https://en.wikipedia.org/wiki/Plant_tissue_culture
3. https://microbeonline.com/animal-cell-culture-introduction-types-methods-applications/

Mapping with Program Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	2	3	3				3	3	3	3
CO 2	2	3					3	3	3	3
CO 3	2	3	3				3	3	3	3
CO 4	2	3	3				3	3	3	3
CO5	2	3	3				3	3	3	3

S - Strong (3) M - Medium (2) L -Low (1)

MEDICAL CODING

Course Code	Course Title	L	T	P	C
23115SEC48A	Medical Coding	2	0	0	2

Course objectives

The objectives of this course are to

- Understand the basic concept of medical coding
- Familiarize the student about medical terminology
- Understand about the classification of diseases based on WHO/AHA
- Understand about the CPT code used for diseases as per American Medical Association (AMA)

Unit I: Introduction to Medical coding, coding theory, Healthcare Common Procedure Coding, First Aid and CPR 6Hrs

Unit II: Introduction to Medical Terminology, specialization I & II, Diagnostic coding, factors affecting diagnostic coding 6Hrs

Unit III: Documenting medical records- Importance of Documentation, Types of dictation formats. 6Hrs

Unit IV: Introduction to Human Anatomy and Coding, ICD-10- CM classification system. 6Hrs

Unit - V: Introduction to CPT coding, types of CPT coding Medical Law and Ethics. 6hrs

Course Outcome

CO	On completion of this course, students will be able to	Program Outcomes
CO1	Explaining the basic concept of coding and its application. Possess the knowledge about the First aid and CPR	PO1, PO2, PO6
CO2	Possess the knowledge about medical terminology used in medical coding industry	PO1, PO2, PO6
CO3	Possess the knowledge about the ICD-10 CM international classification of diseases based on WHO	PO1, PO2, PO6
CO4	Possess the knowledge about the CPT codes used for diseases as per American Medical Association (AMA)	PO1, PO2, PO6
CO5	Understand CPT coding and its types	PO1, PO2, PO6

Text books

1. Understanding Medical Coding, A comprehensive guide Sandra L Johnson Robin Linker**.**

2. Buck's Step – by – step Medical Coding Elsevier reference

Reference books

1. Terry Tropin M Shai, RHIA, CCS-P, AHIMAICD-10-CMcoding guidelines made easy 2017.
2. Besty J Shiland - Medical terminology and anatomy for ICD-10.

Mapping with Program Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	2	3				3	3		2	3
CO 2	2	3				3	3		2	3
CO 3	2	3				3	3		2	3
CO 4	2	3				3	3		2	3
CO5	2	2				2	3		2	3

S - Strong (3) M - Medium (2) L -Low (1)

MICROBIAL TECHNIQUES

Course Code	Course Title	L	T	P	C
23115SEC48B	Microbial techniques	2	0	0	2

Learning objectives

The objectives of this course are to

- Study the growth of bacteria
- Know the parts & uses of microscope
- Learn staining methods to identify microbes
- Learn different types of culture methods
- Study food preservation methods

Unit I: Growth of bacteria- Definition, growth phases, factors affecting growth (pH, temperature, and oxygen), cell count (hemocytometer, Bacterial cell- Bacillus subtilis), fungal cell (Saccharomyces) and human blood cell. 6 Hrs

Unit II: Microscopy- Principle, types - Compound microscope, electron microscope - TEM, SEM, use of oil immersion objective. 6 Hrs

Unit III: Stains and staining- Principles of staining, simple staining, negative staining, Differential staining, Gram and acid-fast staining, flagella staining, capsule and endospore Staining. Staining of yeast (methylene blue), lactophenol cotton blue, staining of mold (Penicillium, Aspergillus), Agaricus. 6 Hrs

Unit IV: Cultivation of bacteria - Types of growth media (natural, synthetic, complex, enriched, selective- definition with example), culture methods (streak plate, spread plate, pour plate, stab culture, slant culture, liquid shake culture, anaerobiosis) - aerobic and Anaerobic bacteria. 6 Hrs

Unit V: Food microbiology- Microbiological examination of food: microscopic examination and culture, phosphatase test of Pasteurized milk. Preservation of food- High temperature (boiling, pasteurization, appreciation), low temperature (freezing), dehydration, osmotic pressure, chemical preservations, radiation. Microorganisms as food SCP. 6 Hrs

Course Outcome

CO	On completion of this course, students will be able to	Program Outcomes
CO1	Understand the growth of bacteria and to perform cell count	PO1, PO2
CO2	Acquire knowledge of microscope and its uses	PO1, PO2

CO3	Identify the microbes by staining methods	PO1, PO2, PO6
CO4	Culture microbes by various methods	PO1, PO2, PO6
CO5	Preserve foods at high and low temperature	PO, PO2, PO6

Text books

1. Sherris Medical Microbiology, 7th Edition by Authors: Kenneth Ryan, C. George Ray, Nafees Ahmad, W. Lawrence Drew, Michael Lagunoff, Paul Pottinger, L. Barth Reller and Charles R. Sterling
2. Food Microbiology: Fundamentals and Frontiers, 5th Edition by Editor(s): Michael P. Doyle, Francisco Diez-Gonzalez, Colin Hill
3. Text book of microbiology by Ananthanarayan and Panicker's
4. Textbook of microbiology by P.C. Trivedi Sonali Pandey Seema Bhadauria.
5. Prescott's Microbiology, 10th Edition by Authors: Joanne Willey, Linda Sherwood and Christopher J. Woolverton

Reference books

1. Bailey & Scott's Diagnostic Microbiology, 14th Edition by Author: Patricia Title
2. Medical Microbiology, 7th Edition Authors: Patrick R. Murray, Ken S. Rosenthal and Michael A. Pfaller
3. Microbiology: Laboratory Theory and Application, 3rd Edition Authors: Michael J. Leboffe and Burton E. Pierce

Mapping with Program Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	2	3					3	3	3	3
CO 2	2	3					3	3	3	3
CO 3	2	3				2	3	3	3	3
CO 4	2	3				2	3	3	3	3
CO5	2	3				2	3	3	3	3

S - Strong (3) M - Medium (2) L -Low (1)

Ability Enhancement Compulsory course

ENVIRONMENTAL STUDIES

Course Code	Course Title	L	T	P	C
231AECCEVS	Environmental Studies	2	0	0	2

Aim

Creating awareness about the environmental problems among people. Imparting basic knowledge about the environment and its allied problems

Course Objectives:

- Creating the awareness about environmental problems among people.
- Imparting basic knowledge about the environment and its allied problems.
- Developing an attitude of concern for the environment.
- Motivating public to participate in environment protection and environment improvement.
- Acquiring skills to help the concerned individuals in identifying and solving environmental problems.
- Striving to attain harmony with Nature.

Course Outcomes:

Students who graduate with a major in environmental science will be able to:

CO1: Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale;

CO2: Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment;

CO3: Demonstrate ecology knowledge of a complex relationship between predators, prey, and the plant community;

CO4: Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues; and

CO5: Understand how politics and management have ecological consequences.

Unit I: Nature of Environmental Studies - Definition, scope and importance. Multidisciplinary nature of environmental studies. Need for public awareness.

Unit II: Natural Resources and Associated Problems. Forest resources: Use and over - exploitation, deforestation, dams and their effects on forests and tribal people. Water resources: Use and over - utilization of surface and ground water, floods, drought, conflicts

over water, dams benefits and problems. Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources. Food resources: World food problem, changes caused by agriculture effect of modern agriculture, fertilizer - pesticide problems. Energy resources: Growing energy needs, renewable and non - renewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy. Land resources: Solar energy, Biomass energy, Nuclear energy, Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individuals in conservation of natural resources.

Unit III: Ecosystems. Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristics features, structure and function of the following ecosystem: a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit VI: Biodiversity and its conservation

Introduction - Definition: genetic, species and ecosystem diversity. Bio - geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega - diversity nation. Western Ghat as a biodiversity region. Hot - spot of biodiversity. Threats to biodiversity habitat loss, poaching of wildlife, man - wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In - situ and Ex - situ conservation of biodiversity.

Unit V: Environmental Pollution. Definition: Causes, effects and control measures of: Air pollution, Water pollution, soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of a individual in prevention of pollution. **Social Issues and the Environment.** Disaster management: floods, earthquake, cyclone, tsunami and landslides. Urban problems related to energy Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issue and possible solutions. Global waming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation. Consumerism and waste products.

Field Work

Visit to a local area to document environmental assets - River / Forest / Grassland / Hill / Mountain.

or

Visit to a local polluted site - Urban / Rural *I* lad Listrial / Agricultural.

or

Study of common plants, insects, birds.

or

Study of simple ecosystems - ponds, river, hill slopes, etc.

References:

1. Agarwal, K.C,200l, Environmental Biology, Nidi Pub. Ltd., Bikaner.
2. Bharucha Erach, The l3iodiversity of India, Mapin Publishing Pvt, Ltd., Ahmedabad 380013, India, Email: rn4pin@icenet.net (R)
3. Brunner R.C., 1989, 1-lazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clank R.S., Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H. Gorhani, E. & Hepworth, M.T.2001, Environmental Encyclopedia, Jaico Pub. Mumbai, Il96p
6. De A.K., Environmental Chemistry, Wiley Wastern Ltd.
7. Down to Earth, Centre for Science and Environment, New Delhi. (R)
8. Gleick, H., 1993, Water in crisis, Pacific Institute for studies in Dcv., Environment & Security. Stockholm Env Institute. Oxford Univ. Press 473p
9. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bompay (R)
10. Heywood, V.K. & Watson, R.T.1995, Global Biodiversity Assessment, Crnbridge Univ. Press 1140 p.
11. Jadhav, H. and Bhosale, VJvI. 1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi 284p.
12. Mickinney, M.L. and School. R.M. 1196, Environmental Science Systems and Solutions, Web enhanced edition, 639p.
13. Miller T.G. Jr. Environmental Science. Wadsworth Publications Co. (TB).
14. Odum, E.P. 1971, Fundamentals of Ecology, W.B. Saunders Co. USA,574zp.
15. Rao M.N. and Dana, A.K. 1987, Waste Water Treatment, Wxford &IBH Publ. Co. Pvt. Ltd., 345p
16. Sharma B.K., 2001, Environmental Chemistry, Gokel PubI. Hkouse, Meerut
17. Survey of the Environment, The Hindu (M)
18. Townsend C., Harper, J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)

AUDIT COURSE

Course Code	Course Title	L	T	P	C
231LCSCLS	Leadership and Management Skills	0	0	0	1

Aim:

The aim of the course cultivating and nurturing the innate leadership skills of the youth so that they may trans form these challenges into opportunities and become torch bearers of the future by developing creative solutions.

Course Objective:

The Module is designed to**:**

Help students to develop essential skills to influence and motivate others

- Inculcate emotional and social intelligence, and integrative thinking for effective leadership
- Create and maintain an effective and motivated team to work for the society
- Nurture a creative and entrepreneurial mindset
- Make students understand the personal values and apply ethical principles in professional and social contexts.

Course Outcomes:

Upon completion of the course, students will be able to:

- Examine various leadership models and understand/assess their skills, strengths and abilities that affect their own leadership style and can create their leadership vision
- Learn and demonstrate a set of practical skills such as time management, self-management, handling conflicts, team leadership, etc.
- Understand the basics of entrepreneurship and develop business plans
- Apply the design thinking approach to leadership
- Appreciate the importance of ethics and moral values for making of a balanced personality.

Unit I: Leadership Skills: Understanding Leadership and its Importance - What is leadership? - Why Leader ship required? - Whom do you consider as an ideal leader? - Traits and Models of Leadership - Are leaders born or made? - Key characteristics of an effective leader - Leadership styles - Perspectives of different leaders - Basic Leadership Skills – Motivation – Teamwork Negotiation – Networking.

Unit I: Managerial Skills: Basic Managerial Skills - Planning for effective management - How to organize teams? - Recruiting and retaining talent - Delegation of tasks - Learn to coordinate – Conflict management - Self-Management Skills - Understanding self-concept – Developing self – awareness - Self-examination - Self-regulation

Unit III: Entrepreneurial Skills: Basics of Entrepreneurship - Meaning of entrepreneurship - Classification and types of entrepreneurships - Traits and competencies of entrepreneur - Creating Business Plan - Problem identification and idea generation - Idea validation – Pitch making

Unit IV: Innovative Leadership and Design Thinking: Innovative Leadership - Concept of emotional and social intelligence - Synthesis of human and artificial intelligence - Why does culture matter for today's global leaders – Design Thinking - What is design thinking? - Key elements of design thinking: Discovery – Interpretation - Ideation - Experimentation - Evolution. How to transform challenges in to opportunities? - How to develop human-centric solutions for creating social good?

Unit V: Ethics and Integrity - Learning through Biographies - What makes an individual great? - Understanding the persona of a leader for deriving holistic inspiration - Drawing insights for leadership - How leaders sail through difficult situations? - Ethics and Conduct - Importance of ethics - Ethical decision making - Personal and professional moral codes of conduct - Creating a harmonious life

Book

- Ashokan, M. S. (2015). Karmayogi: A Biography of E. Sreedharan. Penguin, UK.
- Brown, T. (2012). Change by Design. Harper Business
- Elkington, J., & Hartigan, P. (2008). The Power of Unreasonable People: How Social Entrepreneurs Create Markets that Change the World. Harvard Business Press.
- Goleman D. (1995). Emotional Intelligence. Bloomsbury Publishing India Private Limited
- Kalam A. A. (2003). Ignited Minds: Unleashing the Power within India. Penguin Books India
- Kelly T., Kelly D. (2014). Creative Confidence: Unleashing the Creative Potential WithinUsAll. William Collins

E-Resources

- HowtoBuildYourCreativeConfidence,TedTalkbyDavidKelly
- India’s Hidden Hot Beds of Invention Ted Talk by Anil Gupta - https://www.ted.com/talks/anil_gupta_india_s_hidden_hotbeds_of_invention
- Knowledge@Wharton Interviews Former Indian President APJ Abdul Kalam - . "A Leader Should Know How to Manage Failure" https://www.youtube.com/watch?v=laGZaS4sdeU
- Martin, R. (2007). How Successful Leaders Think. Harvard Business Review, 85(6):60.

SEMESTER V

Course Code	Course Title	L	T	P	C
23115AEC51	Enzymes	5	1	0	4

Course objectives

The main objectives of this course are to

- Provide fundamental knowledge on enzymes and their properties.
- Understand the mechanism of action of enzymes and the role of coenzymes in catalysis.
- Introduce the kinetics of enzymes and determine the Km and Vmax.
- Explain the effect of inhibitors on enzyme activity
- Understand the role of enzymes in clinical diagnosis and industries.

Course outcome

- To explain basic properties and basic functions of enzymes
- To explain working principle of enzymes and the relationship between enzyme and substrate
- To explain the properties of enzyme-catalysed reactions, Michaelis-Menten kinetics and the Lineweaver-Burke graphic
- To define the mechanisms of enzyme activity regulation, allosteric regulation
- To explain the Industrial applications of enzymes

Unit I: Introduction to enzymes: Nomenclature and Classification based on IUB with examples, enzyme as catalyst-Activation energy, Enzyme specificity-absolute, Group, linkage and stereo specificities. Concept of Active site, Lock and key hypothesis and induced fit theory, Enzyme expression Units-IU, turnover number, katal and specific activity.12 Hrs

Unit II: Mechanism of enzyme catalysis - Acid Base catalysis, covalent catalysis, electrostatic catalysis, metal ion catalysis, proximity and orientation effect. Coenzymes - Definition, types, co-enzymatic forms of vitamins- NAD/NADP, FAD, FMN, Coenzyme A TPP, PLP, lipoic acid and biotin. Multienzyme complexes - Pyruvate dehydrogenase complex. Isoenzyme with reference to LDH and CK.12 Hrs

Unit III: Enzyme kinetics - Definition of kinetics, Factors affecting enzyme activity - temperature, pH, substrate and enzyme concentration, activators-cofactors, Derivation of Michaelis-Menton equation for unisubstrate reactions, Lineweaver - Burk plot, Eadie - Hofstee plot Significance of Km and V max and their determination using the plots. 12 Hrs

Unit IV: Enzyme inhibition - Reversible and irreversible inhibition-types of reversible

inhibitors, competitive, non-competitive, un-competitive inhibitors. Graphical representation by L-B plot, (Kinetic derivations not required), Determination of Km and Vmax in the presence and absence of inhibitors. Allosteric enzymes - Sigmoidal curve, positive and negative modulators. 12 Hrs

Unit V: Applications of enzymes -Immobilized enzymes - methods of immobilization-adsorption, covalent bonding, crosslinking, encapsulation, entrapment and applications of immobilized enzymes. Biosensors – e.g. Glucose sensors. Industrial applications of enzymes - Food, textile and pharmaceutical industries.12Hrs

Course Outcomes

CO	**On completion of this course, students will be able to**	**Programme outcome**
CO1	Identify the major classes of enzymes, differentiate between a chemical catalyst and a biocatalyst and define the units of enzymes.	PO1
CO2	Explain the mechanism of enzyme catalysis and the role of coenzymes in enzyme action.	PO1, PO2
CO3	Illustrate the steady state kinetics, interpret MM plot and LB plot based on kinetics data, and determine Km and Vmax.	PO1, PO3
CO4	Distinguish the types of inhibition along with its importance in biochemical reactions.	PO1, PO3
CO5	Comprehend the various methods for production of immobilized enzymes and discuss the application of enzymes in clinical diagnosis and various industries.	PO1, PO2, PO6

Textbooks

1. U. Sathyanarayana & U. Chakrapani, 2013, Biochemistry, 4th edition, Elsevier India Pvt. Ltd., Books & Allied Pvt. Ltd.
2. Dr. G.R Agarwal, Dr. Kiran Agarwal & O.P. Agarwal, 2015, Textbook of Biochemistry (Physiological chemistry), 18th edition, Goel Publishing House,
3. T. Devasena, 2010, Enzymology, 1st edition, Oxford University Press.

Reference books

1. Trevor Palmer, 2008, Enzymes: Biochemistry, Biotechnology, Clinical Chemistry, 2nd edition, East West Press Pvt. Ltd.
2. David L. Nelson, Michael M. Cox, 2005, Principles of Biochemistry, 4th edition W.H. Freeman and Company,
3. Voet. D, Voet. J.G. and Pratt, C.W, 2004, Principles of Biochemistry, 4th edition John Wiley & Sons, Inc.

4. Zubay G.L, et. al., 1995, Principles of Biochemistry, 1st edition, WmC. Brown Publishers.

Web resources

1. www.biologydiscussion.com/notes/enzymes-notes

Mapping with Program Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	3						3			3
CO 2	3	2					3			3
CO 3	3		2				3			3
CO 4	3		2				3			3
CO 5	3	2				2	3	3	3	3

S-Strong(3) M-Medium (2) L-Low (1)

INTERMEDIARY METABOLISM

Course Code	Course Title	L	T	P	C
23115AEC52	Intermediary Metabolism	5	1	0	4

The main objectives of this course are to

- Review the basic concepts of free energy transformation and describe biological oxidation.
- Illustrate the pathways of carbohydrate metabolism.
- Explain the pathways of oxidation and biosynthesis of lipids.
- Detail the catabolism of amino acids and synthesis of specialized products from amino acids.
- Acquaint the metabolism of nucleic acids and its regulation

Unit I: Bioenergetics-High energy compounds: Role of high energy compounds, free energy hydrolysis of ATP and other organophosphates, ATP-ADP cycle.

Biological Oxidation: Electron transport chain -its organization and function. Inhibitors of ETC. Oxidative phosphorylation, P/O ratio, Peter Mitchell's chemiosmotic hypothesis. Mechanism of ATP synthesis, uncouplers of oxidative phosphorylation, substrate level phosphorylation with examples. 15 Hrs

Unit II: Metabolism of carbohydrates - Glycolysis, TCA Cycle, Amphibolic nature and integrating role of TCA cycle. Anaplerosis, Pentose Phosphate Pathway (HMP shunt), Gluconeogenesis, Glycogenesis, Glycogenolysis and its regulation, glyoxylate cycle, Entner-Doudoroff pathway and Coricycle.15 Hrs

Unit III: Metabolism of lipids - Oxidation of fatty acids - α, β and ω -oxidation of saturated fatty acids, Oxidation of fatty acids with odd number of carbon atoms and unsaturated fatty acids, Ketogenesis, Biosynthesis of saturated fatty acids and unsaturated fatty acids, Biosynthesis and degradation of triglycerides, phospholipids and cholesterol.15 Hrs

Unit IV: Metabolism of amino acid- Metabolic nitrogen pool, Catabolism of amino acid: Oxidative deamination, non-oxidative deamination, transamination and decarboxylation, Biogenic amines, Urea cycle and its regulation.15 Hrs

Unit V: Metabolism of nucleotides - Biosynthesis of purines and pyrimidines, - de novo synthesis and salvage pathways, Degradation of purines and pyrimidines, Conversion of ribonucleotide to deoxyribonucleotide. 15 Hrs

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes

CO1	State the concepts of bioenergetics and illustrate the mechanism off law of electrons and the production of ATP.	PO1, PO2
CO2	Elaborate the biochemical reactions and integration of pathways of carbohydrate metabolism.	PO1,
CO3	Sketch the oxidation and biosynthesis of fatty acids, phospholipids, triglycerides and cholesterol with suitable examples	PO1
CO4	Explain catabolism of amino acids, synthesis of non-essential amino acids and specialized products from amino acids.	PO1
CO5	Describe the metabolism of nucleic acids with necessary illustrations and its regulation.	PO1

Textbooks

1. U. Sathyanarayana & U. Chakrapani, 2015, Biochemistry, 4th Elsevier India Pvt. Ltd.,
2. M.N. Chatterjea and Rana Shinde, 2002, Textbook of Medical Biochemistry, 5th edition Jaypee Brothers Medical Publishers Pvt. Ltd.

Reference books

1. Lehninger Principles of Biochemistry, David L. Nelson, Michael M. Cox, 2008, 5th edition, W.H. Freeman and Company.
2. Robert K. Murray, Daryl K. Granner, Victor W. Rodwell, 2006, Harper's Illustrated Biochemistry, 27th edition, McGraw Hill Publishers.
3. Principles of Biochemistry. Voet. D. Voet, J.G. Voet and Pratt C.W. 2010, Fourth edition, John Wiley & Sons, Inc,.
4. Principles of Biochemistry, Geoffrey L. Zubay, William W. Parson, Dennis E. Vance, 1995, 2nd Edition, Wm.C. Brown Publishers.
5. Biochemistry, Garret, R.H. and Grisham, C.M. 2005, 3rd Edition. Thomson Learning INC.

Web resources

1. https://nptel.ac.in/courses/104/105/104105102/
2. http://www.nptelvideos.in/2012/11/biochemistry-i.html
3. https://www.saddleback.edu/faculty/jzoval/mypptlectures/ch15_metabolism/lecture_notes_ ch15_metabolism_current-v2.0.pdf

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	3	2					3			3
CO 2	3						3			3
CO 3	3						3			3
CO 4	3						3			3
CO 5	3						3			3

S-Strong (3) M-Medium (2) L-Low (1)

CLINICAL BIOCHEMISTRY

Course Code	Course Title	L	T	P	C
23115AEC53	Clinical Biochemistry	5	1	0	4

Learning objectives

The main objectives of this course are to

- Comprehend the basic concepts and disorders of carbohydrate metabolism
- Explain the disorders of lipid metabolism.
- Elucidate the liver function test and kidney function test.
- Designate the gastric function test.
- Familiarize the clinical enzymology.

Unit I: Disorders of carbohydrate metabolism: Maintenance of blood glucose by hormone with special reference to insulin and glucagon. Abnormalities in glucose metabolism: Diabetes mellitus; types, causes, biochemical manifestations, diagnosis and treatment, glycated hemoglobin. Inborn errors of carbohydrate metabolism, glycosuria, Fructosuria, Pentosuria, Galactosemia and Glycogen storage diseases. 15 hrs

Unit II: Disorders of Lipid Metabolism: Lipid Profile, Atherosclerosis, Fatty liver and hyperlipidemia. Hyper cholesterolemia, Lipidosis and Xanthomatosis, Tay-Sach`s disease, Niemann-Pick disease, lipotropic agents. 15 Hrs

Unit III: Liver Function Tests: Bilirubin metabolism and jaundice, Estimation of conjugated and total bilirubin in serum (Diazo method). Detection of bilirubin and bile salts in urine (Fouchet's test and Hay's Sulphur test). Thymol turbidity test, prothrombin time, serum enzymes in liver disease serum transaminases (SGPT & SGOT) and lactate dehydrogenase (LDH). 15 Hrs

Kidney Function Tests: Measurement of urine pH, volume, specific gravity, osmolality, sediments in urine, inulin, urea and creatinine clearance tests. Concentration and dilution tests. Phenol red test. Levels of plasma protein and its significance related to kidney function. Proteinuria. 15Hrs

Unit VI: Gastric Function test: Composition of gastric juice, collection of gastric contents, examination of gastric residuum, fractional test meal (FTM), stimulation test-alcohol and histamine stimulation, Tubeless gastric analysis1.5 Hrs

Unit V: Clinical enzymology: Enzymes of diagnostic importance- LDH, creatine kinase, transaminases, phosphatases, Isoenzymes of lactate dehydrogenase.15 Hrs

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Explain the concepts of hormones and their importance to maintain glucose and types of Diabetes, diagnosis and treatment.	PO1, PO3, PO6
CO2	Analyze the lipid profile and different deficiency state.	PO1, PO3, PO6
CO3	Describe the liver and kidney functions and specific diagnostic methods used for biological sample.	PO1, PO3, PO6
CO4	Detail about the composition of gastric juice and special test for diagnosis.	PO1, PO3, PO6
CO5	Elaborate the enzyme markers used for diagnostic studies.	PO1, PO3, PO6

Text books

1. M.N. Chatterjee and Rana Shinde, Text Book of Medical Biochemistry, Jaypee Brothers Medical Publishers (P) LTD, New Delhi, 8th Edition, 2012
2. Ambika Shanmugam's Biochemistry for medical students, 8th edition, published by Wolters Kluwer India Pvt. Ltd.

Reference books

1. Philip. D. Mayne, Clinical Chemistry in diagnosis and treatment. ELBS Publication, 6th edition, 1994.
2. Thomas M. Devlin (2014) Text book of Biochemistry with clinical correlations (7th ed). John Wiley and sons.
3. Tietz Fundamentals of clinical chemistry and molecular Diagnostics (2014) (7th ed) Saunders.

Web Resources

1. https://www.britannica.com/science/metabolic-disease/Disorders-of-carbohydrate-metabolism
2. https://www.slideshare.net/MohitAdhikary/gastric-and-pancreatic-function-tests
3. https://onlinecourses.nptel.ac.in/noc20_ge13/preview

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	3		3			2	3	2	2	3
CO 2	3		3			2	3	2		3
CO 3	3		3			2	3	3	2	3
O 4	3		3			2	3	3	2	3
CO 5	3		3			2	3	3	2	3

S-Strong (3) M-Medium (2) L-Low (1)

IMMUNOLOGY

Course Code	Course Title	L	T	P	C
23115DSC54__	Immunology	4	0	0	3

Learning Objectives

The objective of this course are to

- Introduce the structure and functions of lymphoid organs and cells of the immune system
- Illustrate the structure and classification of antibodies and adaptive immune response
- Impart knowledge on the types of immunity and uses of vaccines
- Provide an understanding of immune related diseases and transplantation
- Study the Ag-Ab interaction and immunological techniques to identify antigens and antibodies

Unit I: Structure and function of primary lymphoid organs (thymus, bone marrow), secondary lymphoid organs (spleen, lymph node), Cells involved in immune system-Functions-Phagocytosis -Inflammation 15 Hrs

Unit II: Antigens - Nature, Immunogens, haptens, cross reactions - Immunoglobulin- types-structure and function. Cells involved in antibody formation, Clonal selection theory, Co-operation of T-cell with B-cell. Differentiation of T and B lymphocyte - Humoral and cell mediated immunity. Monoclonal antibody – Production and application in biology. 15Hrs

Unit III- Immunity and its types-Innate, Acquired, active and passive. - Natural and Artificial - Commonly used toxoid vaccines, killed vaccines, live attenuated vaccines, rDNA Vaccines, DNA and subunit vaccines 15Hrs

Unit IV: Hypersensitivity – Immediate (Type 1) and Delayed (Type IV), Auto- immune diseases with examples. Organ specific and systemic autoimmunity. SLE, RA. Transplantation – Types of Grafts, structure& functions of MHC, graft Vs host reaction, immunosuppressive Agents. 15Hrs

Unit V: Antigen-antibody reactions, General features of Antigen Antibody reactions. Precipitation, Immuno diffusion, SID and DID - Oudin Procedure, Oakley Fulthrope Procedure, Radio immune diffusion, Ouchterlony double diffusion, CIE, Rocket electrophoresis, Agglutination-Coomb's test Complement Fixation test-Wasserman's reaction, RIA, ELISA. 15Hr

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Associate structure and function of the organs involved in our	PO1

	body's natural Defence	
CO2	Classify antigens and antibodies and the role of lymphocytes in defending the host	PO1, PO2
CO3	Describe the types of immunity and the uses of vaccines	PO1, PO4
CO4	Understand the immune related diseases and mechanism of transplantation	PO1, PO2
CO5	Examine the immunological tests and relate it to the immune status of an Individual	PO1, PO3

Text Books

1. Kuby, J. (2018). Immunology (5th ed). W.H. Freeman - ISBN-10 : 1319114709 / ISBN-13 : 978-1319114701
2. Rao, C. V. (2017). Immunology (3rd ed). Chennai: Alpha Science Int. Ltd - ISBN-10 : 1842652559/ ISBN 13:978-1842652558
3. Tizard (1995). An Introduction to Immunology. Harcourt Brace College Publications

References Books

1. Kenneth M. Murphy, Paul Travers, Mark Walport - (2007), Janeway's Immunobiology, 7thedition, Garland Science.
2. Abul K. Abbas, Andrew H. Lichtman, Jordan S. Pober - (1994), Cellular and molecular immunology, 2ndedition, B. Saunders Company.
3. Basic Immunology Functions and Disorders of the Immune System, 6th Edition - January 25, 2019 Authors: Abul Abbas, Andrew Lichtman, Shiv Pillai, ISBN: 9780323549431eBook ISBN: 9780323639095
4. Peter Delves, Seamus Martin, Dennis Burton, Ivan Roitt - (2006), Roitt's Essential Immunology, 11th edition, Wiley-Blackwell

Web resources

1. https://onlinecourses.nptel.ac.in/noc22_bt40/preview
2. https://onlinecourses.swayam2.ac.in/cec20_bt05/preview
3. https://youtu.be/8uahFPl6ny8

Mapping with Program Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	3						3			3
CO 2	3		2				3			3
CO 3	3			2			3	3		3
CO 4	3	2					3	1		3
CO 5	3		3				3	3	3	3

S-Strong (3) M-Medium (2) L-Low (1)

BIOCHEMICAL PHARMACOLOGY

Course Code	Course Title	L	T	P	C
23115DSC54__	Biochemical Pharmacology	4	0	0	3

Learning Objectives

The objectives of this course are to

- Introduce the basic concepts of pharmacology.
- Explain the metabolism of drugs and factors responsible for metabolism.
- Acquaint the adverse response and side effects of drugs.
- Familiarize important drugs used for common metabolic disorders.
- Provide an understanding about the action of antibiotics.

Unit I: Drugs – classification based on sources, routes of drug administration - Oral/Enteral, Parenteral and Local application. Absorption of drugs, factors influencing drug absorption, distribution and excretion of drugs. 15 Hrs

Unit II: Drug metabolism - Phase I and Phase II reactions, role of cytochrome P_{450}, non-microsomal reactions of drug metabolism. Factors influencing drug metabolism. Therapeutic index. 15 Hrs

Unit III: Drug allergy, Drug tolerance - IC 50, LD50 of a drug, Drug intolerance, Drug addiction, Drug abuses and their biological effects. Drug resistance - biochemical mechanism. 15 Hrs

Unit IV: Therapeutic Drugs - Analgesics and Non-steroidal anti-inflammatory drugs (NSAIDs) - Aspirin and Acetaminophen. Insulin, Oral antidiabetic drugs - Sulfonylureas, Biguanides. Antihypertensive drugs - ACE inhibitors, Calcium channel blockers. Anti-cancer agents - Antimetabolites. 15 Hrs

Unit V: Antibiotics - Definition, Examples and Biochemical mode of action of penicillin, streptomycin, tetracyclines and chloramphenicol. 15 Hrs

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Classify the different routes of drug administration, describe the absorption, distribution, metabolism and excretion of drugs.	PO1

CO2	Illustrate the metabolism of drugs, classify the microsomal and non-microsomal reactions and explain the role of cytochromes.	PO1
CO3	List out the various adverse response and side effects of drugs.	PO1, PO2, PO4
CO4	Justify the use of synthetic drugs and elucidate its pharmacological actions and its adverse effects for different disease.	PO1, PO4
CO5	Highlight the importance and explain the mode of action of important antibiotics.	PO1, PO4

Text Books

1. N. Murugesh, A concise text book of Pharmacology - Sathya Publishers.
2. Jayashree Ghosh, A Textbook of Pharmaceutical chemistry –S. Chand & Company Ltd.
3. S.C. Metha, Ashutosh Kar, Pharmaceutical Pharmacology - New Age International (P) Limited, Publishers.

References Books

1. Lippincott's illustrated Reviews- Pharmacology by Mary J. Mycek, Richard A. Harvey,
2. Pamela C. Champe, Lippincott – Raven publishers, New Delhi.
3. David. E. Golan, Principles of Pharmacology, Wolters Kluwer (India) Pvt. Ltd.
4. R.S. Satoskar, S. B. Elsevier Pharmacology and pharmacotherapy. - ISBN-10: 9788131248867 / ISBN-13: 978-8131248867, 2017.
5. Tripathi, K. Essentials of Medical Pharmacology. Jaypee Publishers- ISBN-10: 9350259370 / ISBN-13: 978-9350259375, 2018.

Web Resources

1. https://slideplayer.com/slide/3728296/64/video/What+is+bioremediation%3F.mp4

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	3						3			3
CO 2	3						3			3
CO 3	3	2		2			3	2		3
CO 4	3			2			3	2		3
CO 5	3			2			3	2		3

S-Strong (3) M-Medium (2) L-Low (1)

DISASTER MANAGEMENT

Course Code	Course Title	L	T	P	C
23115DSC54__	Disaster Management	4	0	0	3

Course Objectives:

- To provide students an understanding the need for studying the disaster management
- Develop an understanding about the various types of disasters.
- To expose students to the risk and vulnerability analysis
- To create awareness about disaster prevention and risk reduction
- To establish relationship between disasters and developments.
- To understand Rehabilitation, Reconstruction and Recovery in the event of Disaster
- To gain knowledge on Climate Change Adaptation and IPCC Scenario and Scenarios in the context of India.

Course Outcomes:

CO1: Understand the need and significance of studying disaster management

CO2: Understand the different types of disasters and causes for disasters.

CO3: Gain knowledge on the impacts Disasters on environment and society

CO4: Study and assess vulnerability of a geographical area.

CO5: Students will be equipped with various methods of risk reduction measures and risk mitigation.

CO6: Understand the role of Information Technology in Disaster Management

CO7: Understand Geographical Information System applications in Disaster Management

Content of Course

Unit I: Introduction to Disasters

Chapter No.1: Disaster: Concept, Meaning, and Definition
Chapter No.2: History of Major Disaster Events in India
ChapterNo.3: Types of Disasters - Natural Disasters: Famine, Drought, Flood, Cyclone, Tsunami, Earthquake

Unit II: Disaster Mitigation and Disaster Management

Chapter No.4: Man-made Disasters: Riots, Blasts, Industrial, Militancy
Chapter No.5: Profile, Forms and Reduction of Vulnerability
Chapter No. 6: Disaster Mitigation: Concept and Principles

Unit III: Impact of Disaster

Chapter No.7: Disaster Management: Concept and Principles

Chapter No.8: Pre-disaster-Prevention and Preparedness

Chapter No.9: Physical, Economic, Social, Psycho-socio Aspects, Environmental Impacts

Unit IV: Disaster Process and Intervention

Chapter No.10: During Disaster – Rescue and Relief

Chapter No.11: Post-disaster – Rehabilitation and Reconstruction
Chapter No.12: Victims of Disaster-Children, Elderly, and Women
Chapter No.13: Displacement-Causes, Effects and Impact

Unit V: Disaster Intervention

Chapter No.14: Major Issues and Dynamics in the Administration of Rescue, Relief, Reconstruction and Rehabilitation
Chapter No.15: Components of Rescue, Relief, Reconstruction; Rehabilitation
Chapter No.16: Disaster Policy in India; Disaster Management Authority-NDMA, SDMA, DDMA; Disaster Management Act, 2005

References:

1. Anil Sinha (2001), Disaster Management-Lessons Drawn and Strategies for Future. New Delhi, Jain Publications.
2. Backer, C.W. and Chapman, W. (ed.). (1969), Man and Society in Disasters, New Delhi,
3. Clarke, J.I., Peter Curson, et.al. (ed.) (1991), Population and Disaster, Oxford, Basil Blackwell Ltd.
4. Cuny, Frederick (1984), Disasters and Development, Oxford, Oxford University Press. Disaster Management Act 2005
5. Garb, S. and Eng.E (1969), Disasters Hand Book, New York, Springer.
6. Gupta, M.C, L.C. Gupta, B. K. Tamini and Vinod K. Sharma (2000), Manual on Natural Disaster Management in India, New Delhi, National Institute of Disaster Management. Hoff, A (1978), People in Crisis-Understanding and Helping, California, Addison Wesley.
7. Maskrey Andrew (1989), Disaster Mitigation: A Community Based Approach, Oxford, Oxfarm.
8. Narayan, Sachindra (ed.) (2000), Anthropology of Disaster Management, New Delhi, Gyan Publishing House.
9. Nidhi G Dhawan (2014), Disaster Management and Preparedness, New Delhi, Jain Publications.
10. Parasuraman, S. and Unnikrishnan, P.V. (2000), India Disasters Report: Towards Policy Initiative, New Delhi, Oxford University Press.

CLINICAL BIOCHEMISTRY LAB

Course Code	Course Title	L	T	P	C
23115SEC55L	Clinical Biochemistry Lab	0	0	3	3

Course Objectives:

The objectives of this course are to

- Introduce the methods of sample collection (blood & urine) for analytical purpose.
- Impart practical knowledge on the assay of activity of various diagnostically important enzymes
- Understand the estimation procedure for various important biomolecules.
- Help students learn the routine qualitative analysis of urine sample for diagnostic purpose.
- Train students on various hematological tests and its significance.

EXPERIMENTS **80 Hrs**

1. Collection and preservation of blood and urine samples.
2. Estimation of creatinine by Jaffe's method (serum & urine)
3. Estimation of urea by diacetyl monoxime method (serum & urine)
4. Estimation of uric acid (serum & urine)
5. Estimation of cholesterol by Zak's method
6. Estimation of Glucose by Ortho Toluidine method
7. Estimation of Protein by Lowry's method
8. Estimation of Hemoglobin by Shali's/Drabkins method
9. Assay of SGPT and SGOT

Qualitative analysis of normal constituents of urine

Urea, Creatinine, Phosphorus, Calcium

Abnormal constituents

Calcium

Sugar (Glucose, fructose, pentose)

Protein

Amino acids (Tyrosine, Histidine, Tryptophan)

Ketone bodies

Bile pigments with clinical significance.

DEMONSTRATION EXPERIMENTS (10 Hrs)

HEMATOLOGY

a) RBC Counting

b) Total and differential count of white blood cells

c) Packed cell volume

d) Erythrocyte sedimentation rate

e) Blood clotting time

f) Blood grouping

Course Outcomes

CO	On completion of this course, students will be able to	Programme outcome
CO1	Acquaint knowledge on collection of biological samples (urine, blood) and their preparation for diagnostic purpose.	PO1, PO2
CO2	Assay the activity of various clinically important enzymes and relate their clinical importance.	PO1, PO2
CO3	Estimate the important biomolecules in biological samples and relate their clinical significance	PO1, PO2, PO3, PO6
CO4	Qualitatively analyze urine sample for normal and abnormal constituents in urine and interpret the results	PO1, PO2, PO3
CO5	Perform the routine haematological tests.	PO1, PO2, PO3, PO6

Text Books

1. Manickam. S.S. (2018). Biochemical Methods (3rd ed.). Newage International Pvt Ltd publishers.
2. Plummer. D.T. An Introduction to Practical Biochemistry. Tata McGraw Hill.
3. Alan H Gowenlock. 1998. Varley's Practical Clinical Biochemistry, 6th edition, CBS Publishers, India.
4. Godkar, B. 2020. Textbook of Medical Laboratory Technology Vol 1 & 2 Paperback, 3rd edition, Bhalani Publishers.
5. Kanai L Mukerjee. 1996. Medical Lab Technology, Vol I& II, 1st edition, Tata Mcgraw Hill, Pennsylvania.

6. Ranjna Chawla. 2014. Practical Clinical Biochemistry Methods and interpretations 58 (Paperback). 4th edition, Jaypee Brothers Medical Publishers, New York.

Reference books

1. Singh, S.K. (2005). Introductory Practical Biochemistry (2nd ed.). Alpha Science International, Ltd
2. Ashwood, B. a. (2001). Tietz Fundamentals of Clinical chemistry. WB Saunders Company, Oxford Science Publications USA

Web resources

1. https://www.elsevier.com/journals/clinical-biochemistry/0009-9120/guide-for-authors
2. http://rajswasthya.nic.in/RHSDP%20Training%20Modules/Lab.%20Tech/Biochemistry/ Dr.%20Jagarti%20Jha/Techniques%20In%20Biochemistry%20Lab.pdf
3. https://dspace.cuni.cz/bitstream/handle/20.500.11956/111493/Clinical_biochemistrypdf.pdf?sequence=1&isAllowed=y
4. https://dspace.cuni.cz/bitstream/handle/20.500.11956/111493/Clinical_biochemistrypdf.pdf?sequence=1&isAllowed=y

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	3	3					3	3	3	3
CO 2	3	3					3	3	3	3
CO 3	3	3	3			3	3	3	3	3
CO 4	3	3	2				3	3	3	3
CO 5	3	3	3			3	3	3	3	3

S-Strong (3) M-Medium (2) L-Low (1)

ENZYME AND IMMUNOLOGY LAB

Course Code	Course Title	L	T	P	C
23115SEC55L	Enzyme and Immunology Lab	0	0	3	3

Course Objective

Upon successful completion students will -

- To promote critical thinking among students;
- To provide students with a foundation in immunological processes;
- To provide students with knowledge on how the immune system works building on their previous knowledge from biochemistry, genetics, cell biology and microbiology;

Course Outcome

- Study the principle and applications of various immuno techniques ranging from precipitation and agglutination reactions to ELISA, Radio immunoassay
- Besides, students will get an opportunity to learn diffusion and electrophoresis.
- To estimate the mineral content in food
- To know the sources of enzymes and study the extraction and partial purification of enzyme acid phosphatase
- To standardize the optimum pH, optimum substrate concentration required for the maximum activity of acid phosphatase
- To analyse the inhibition pattern by various competitive inhibitors for the enzyme acid phosphatase purified from germinated mung bean
- To assay the activity of Lactate dehydrogenase and glucose-6-phosphate dehydrogenase enzymes

EXPERIMENTS

ENZYMES

1. Determination of Alkaline Phosphatase Activity.
    a. Effect of PH
    b. Effect of Temperature.
    c. Specific Activity
    d. Km (Saturation Method).
2. Determination of Salivary Amylase Activity.

a. Effect of PH

b. Effect of Temperature.

c. Specific Activity

d. Km (Saturation Method).

IMMUNOLOGY

1. Double Immunodiffusion
2. Single Radial Immuno diffusion
3. Rocket Immunoelectrophoresis
4. Direct ELISA
5. Hemagglutination tests for identification of human blood groups
6. Detection by viral fever by slide agglutination tests.
7. Dialysis.

REFERENCES:

1. Manuals in Biochemistry - Dr.J.Jayaraman.
2. Practical Biochemistry - Plummer.
3. Manuals in Biochemistry - Dr.S.Ramakrishnan.
4. Klemir and others: Practical Biological Chemistry.
5. Practical Biochemistry – Koch and Hank Dunn and Drell
6. Practical Biochemistry – Sawhney (2000)
7. Varley's Practical Clinical Biochemistry – Ed. Alan W. Gowenlock (Heinemann Medical Books, London,1988).

AUDIT COURSE

PROFESSIONAL SKILLS

Course Code	Course Title	L	T	P	C
231ACLSPSL	Professional Skills	-	-	-	1

Course Objectives:

The Objectives of the course are to help students/candidates:

- Acquire career skills and fully pursue to partake in a successful career path
- Prepare a good resume, prepare for interviews and groupdiscussions
- Explore desired career opportunities in the employment market in consideration ofan individual SWOT.

Course Outcomes:

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

- Prepare their resume in an appropriate template without grammatical and other errors and using proper syntax
- Participate in a simulated interview
- Actively participate in group discussions towards gainful employment
- Capture a self - interview simulation video regarding the job role concerned
- Enlist the common errors generally made by candidates in an interview
- Perform appropriately and effectively in group discussions
- Explore sources (online/offline) of career opportunities
- Identify career opportunities in consideration of their own potential and aspirations
- Use the necessary components required to prepare for a career in an identified occupation (as a case study).

Unit I: Resume Skills: Preparation and Presentation, Introduction of resume and its importance, Difference between a CV, Resume and Biodata, Essential components of a good resume, Resume skills: common errors, Common errors people generally make in preparing their resume, prepare a good resume of her/his considering all essential components

Unit II: Interview Skills: Preparation and Presentation, Meaning and types of interviews (F2F, telephonic, video, etc.). Dress Code, Background Research, Do's and Don'ts, Situation, Task, Approach and Response (STAR Approach) for facing an interview. Interview procedure (opening, listening skills, closure, etc.). Important questions generally asked in job interview (open and closed ended questions).

Unit III: Interview Skills: Simulation Observation of exemplary interviews Comment critically on simulated interviews, Interview Skills: Common Errors: Discuss the common errors generally candidates make in interview Demonstrate an ideal interview

Unit IV: Group Discussion Skills: Meaning and methods of Group Discussion, Procedure of Group Discussion, Group Discussion-Simulation, Group Discussion - Common Errors.

Unit V: Exploring Career Opportunities: Knowing yourself - personal characteristics, Knowledge about the world of work, requirements of jobs including self-employment. Sources of career information, preparing for a career based on their potentials and availability of opportunities,

VALUE EDUCATION

Course Code	Course Title	L	T	P	C
231AECCVED	Value Education	2	0	0	2

Course Objectives

- Provide insights into the central dogma of molecular biology and explain the mechanism of DNA replication.
- Elaborate the mechanism of transcription and reverse transcription.
- Highlight the characteristics of genetic code and describe the process of protein synthesis.
- Introduce the concept of regulation of gene expression in prokaryotes
- Familiarize the different types of mutations and explain the mechanism of DNA repair.

Course Content:

UNIT I: Central Dogma of molecular Biology, DNA as the unit of inheritance. Experimental evidences by Griffith's transforming principle, Avery, McLeod and McCarthy's experiment, and Hershey and Chase Experiment. Replication in prokaryotes: Modes of replication, Meselson and Stahl's experimental proof for semiconservative replication. Mechanism of Replication – Initiation, events at Ori C, Elongation – replication fork, semi discontinuous replication, Okazaki fragments, and termination. Bidirectional replication, Inhibitors of replication. Models of replication-theta, rolling circle and D loop model.

UNIT II: Transcription - Mechanism of transcription: DNA dependent RNA polymerase(s), recognition, binding and initiation sites, TATA/ Pribnow box, elongation and termination. Post-transcriptional modifications; inhibitors of transcription. RNA splicing and processing of mRNA, tRNA and rRNA. Reverse transcription.

UNIT III: Genetic Code and its characteristics, Wobble hypothesis. Translation: Adaptor role of tRNA, Activation of amino acids, Initiation, elongation and termination of protein synthesis, post-translational modifications and inhibitors of protein synthesis

UNIT IV: Regulation of Gene Expression In Prokaryotes - Principles of gene regulation, negative and positive regulation, concept of operons, regulatory proteins, activators, repressors, regulation of lac operon and trp operon.

UNIT V: Mutation: Types-Nutritional, Lethal, Conditional mutants. Missense mutation and other point mutations. Spontaneous mutations; chemical and radiation – induced mutations. DNA repair: Direct repair, Photo reactivation, Excision repair, Mismatch repair, Recombination repair and SOS repair.

Course Outcomes

- Illustrate the Central Dogma of molecular biology, explain the multiplication of DNA in the cell and describe the types and modes of replication.

- Elaborate the mechanism of transcribing DNA into RNA, discuss the formation of different types of RNA.
- Decipher the genetic code and summarize the process of translation.
- Comprehend the principles of gene expression and explain the concept of operon in prokaryotes.
- Distinguish the types of mutations and explain the various mechanisms of DNA repair.

Text Books (Latest Editions)

1. Veer Bala Rastogi, 2008, Fundamentals of Molecular Biology, 1st edition, Anebooks India.
2. David Friefelder,1987, Molecular Biology, 2nd edition, Narosa Publishing House.
3. Dr. P.S. Verma and Dr. V.K. Agarwal, 2013, Cell biology, Genetics, Molecular Biology, Evolution and Ecology,1st edition, S. Chand & Company Pvt. Ltd.

References Books

1. Karp, G., 2010, Cell and Molecular Biology: Concepts and Experiments, 6th edition, John Wiley & Sons. Inc.
2. DeRobertis, E.D.P. and De Robertis, E.M.F., 2010, Cell and Molecular Biology, 8th edition, Lippincott Williams and Wilkins, Philadelphia.
3. James. D. Watson, 2013, Molecular Biology of the Gene 7th edition, Benjamin Cummings.

SEMESTER: VI
MOLECULAR BIOLOGY

Course Code	Course Title	L	T	P	C
23115AEC61	Molecular Biology	5	0	0	4

Learning Objectives

- The objectives of this course are to
- Provide insights in to the central dogma of molecular biology and explain the mechanism of DNA replication.
- Elaborate the mechanism of transcription and reverse transcription.
- Highlight the characteristics of genetic code and describe the process of protein synthesis.
- Introduce the concept of regulation of gene expression in prokaryotes
- Familiarize the different types of mutations and explain the mechanism of DNA repair.

Unit I: Central Dogma of molecular Biology, DNA as the unit of inheritance. Experimental evidences by Griffith's transforming principle, Avery, McLeod and McCarthy's experiment, and Hershey and Chase Experiment. Replication in prokaryotes: Modes of replication, Meselson and Stahl's experimental proof for semiconservative replication. Mechanism of Replication – Initiation, events at Ori C, Elongation – replication fork, semi discontinuous replication, Okazaki fragments, and termination. Bidirectional replication, Inhibitors of replication. Models of replication-the rolling circle and D loop model. 15 Hrs

Unit II: Transcription - Mechanism of transcription: DNA dependent RNA polymerase(s), recognition, binding and initiation sites, TATA/ Pribnow box, elongation and termination. Post-transcriptional modifications; inhibitors of transcription. RNA splicing and processing of mRNA, tRNA and rRNA. Reverse transcription. 15 Hrs

Unit III: Genetic Code and its characteristics, Wobble hypothesis. Translation: Adaptor role of tRNA, Activation of amino acids, Initiation, elongation and termination of protein synthesis, post-translational modifications and inhibitors of protein synthesis. 15 Hrs

Unit IV: Regulation of Gene Expression In Prokaryotes–Principles of gene regulation, negative and positive regulation, concept of operons, regulatory proteins, activators, repressors, regulation of lac operon and trp operon.15 Hrs

Unit V: Mutation: Types-Nutritional, Lethal, Conditional mutants. Missense mutation and other point mutations. Spontaneous mutations; chemical and radiation – induced mutations.

DNA repair: Direct repair, Photo reactivation, Excision repair, Mismatch repair, Recombination repair and SOS repair. 15 Hrs

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Illustrate the Central Dogma of molecular biology, explain the multiplication of DNA in the cell and describe the types and modes of replication.	PO1
CO2	Elaborate the mechanism of transcribing DNA into RNA, discuss the formation of different types of RNA.	PO1
CO3	Decipher the genetic code and summarize the process of translation.	PO1
CO4	Comprehend the principles of gene expression and explain the concept of operon in prokaryotes.	PO1, PO2
CO5	Distinguish the types of mutations and explain the various mechanisms of DNA repair.	PO1, PO2

Textbooks

1. Veer Bala Rastogi, 2008, Fundamentals of Molecular Biology, 1st edition, Anebooks India.
2. David Friefelder, 1987. Molecular Biology, 2nd edition, Narosa Publishing House.
3. Dr.P.S.Verma and Dr.V.K.Agarwal, 2013, Cell biology, Genetics, Molecular Biology Evolution and Ecology, 1stedition, S.Chand & Company Pvt .Ltd.

Reference books

1. Karp, G., 2010, Cell and Molecular Biology: Concepts and Experiments, 6th edition, John Wiley & Sons. Inc.
2. DeRobertis, E.D.P. and DeRobertis, E.M.F., 2010, Cell and Molecular Biology, 8th edition, Lippincott Williams and Wilkins, Philadelphia.
3. James. D. Watson, 2013, Molecular Biology of the Gene 7th edition, Benjamin Cummings.
4. George M. Malacinski, 1992, Freifelder's Essentials of Molecular Biology, 4th edition, Narosa publishing House.

Web resources

1. www.mednotes.net/notes/biology
2. https://www.onlinebiologynotes.com/repair-mechanism-of mutation/

3. https://teachmephysiology.com/biochemistry/protein-synthesis/dna-translation/

Mapping with Program Outcomes:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	3						3			3
CO 2	3						3			3
CO 3	3						3			3
CO 4	3	2					3			3
CO 5	3	2					3	1		3

S-Strong (3) M-Medium (2) L-Low (1)

HUMAN PHYSIOLOGY

Course Code	Course Title	L	T	P	C
23115AEC62	Human Physiology	5	0	0	4

Learning Objectives

The main objectives of this course are to

- Aid in understanding the physiology of respiratory and circulatory systems
- Explain the structure and physiology of the nervous and muscular system
- Explicate the functions of digestive and excretory system of the body.
- Impart knowledge about the process of reproduction.
- Emphasize the importance of various endocrine factors that regulate metabolism, growth, homeostasis and reproduction.

Unit I: Respiratory System – Overview of respiratory system, Types of respiration, Transport of respiratory gases, Exchange of respiratory gases in lungs and tissues –Chloride Shift & Bohr's effect, Lung surfactant. Circulatory System-Structure and functions of the Heart. Arterial and venous system, Cardiac cycle, Pace maker, Blood pressure and Factors affecting blood pressure. 15Hrs

Unit II: Nervous system- Structure of neuron, synaptic transmission, reflex action, neurotransmission- Resting membrane and Action potential. Neuro transmitters- acetyl choline, Noradrenaline, Dopamine, Serotonin, Histamine, GABA, Substance P.Muscular system-structure and types of muscles - skeletal, smooth and cardiac muscles, muscle proteins- types and functions, mechanism of muscle contraction. 15Hrs

Unit III: Digestive system- composition, functions of saliva, gastric pancreatic intestine and bile secretions, structure of digestive system, Digestion, absorption of carbohydrates, lipids, proteins. Excretory system- Structure of nephron, mechanism of urine formation, Concentration and acidification of Urine. Role of kidneys in the maintenance of acid base balance. 15Hrs

Unit IV: Reproductive system: Oogenesis, spermatogenesis, capacitation and transport of sperm, blood-testis barrier. Fertilization, early development, Implantation, Placentation and Parturition. 15Hrs

Unit V: Endocrinology- Classification of hormones, endocrine glands and their secretions, structure and functions of Insulin, thyroxine. Steroid hormones - Corticosteroids, Sex

hormones - testosterone and estrogen, menstrual cycle. 15Hrs

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Explain the exchange of gases, design of blood vessels and cardiac cycle.	PO1
CO2	Summarize the events in transmission of nerve impulses and mechanism of muscle contraction.	PO1
CO3	Elaborate the structure and functions of digestive system, structure of nephron and mechanism of urine formation and role of kidney in maintenance of pH.	PO1
CO4	Describe the process of Oogenesis, Spermatogenesis, Fertilization, and Parturition.	PO1, PO2
CO5	Understand the role of different hormones that regulate metabolism, growth, glucose homeostasis and reproductive function.	PO1, PO2

Textbooks

1. K. Sembulingam & Prema Sembulingam, 2016, Essentials of Medical Physiology, 7th edition, Jaypee Brothers Medical Publishers (P) Ltd.
2. Chatterjee. C.C., 1988, Human Physiology-Vol I & II, 1st edition, Medical Allied Agency.
3. Animal Physiology-Mariakuttikan and Arumugam, Saras publication, 2017.

Reference books

1. Text book of medical biochemistry physiology- MN. Chatterjee and Rana shinde, 7th edition, Jaypee brothers- medical publishers, 2007.
2. Meyer, Meyer & Meij, 2002, Human Physiology, 3rd edition, A.I.T.B.S Publishers.
3. Guytonand Hall, 2011, Text book of Medical Physiology, 12th edition, W.B. Saunders Company.
4. Test book of Medical Physiology–Guyton & Hall, 12th edition, Saunders Publishers, 2010
5. Human anatomy and physiology-Elaine N. Marieb, 3rd edition, Benjamin/Cummings (a Pearson education company), 1995.

Web resources

1. https://www.youtube.com/watch?v=6qnSsV2syUE
2. https://www.youtube.com/watch?v=9_h0ZXx1lFw
3. https://slideplayer.com/slide/9431799/

BIOTECHNOLOGY

Course Code	Course Title	L	T	P	C
23115DSC63__	Biotechnology	5	0	0	3

Course objectives

The main objectives of this course are to

- Impart knowledge on gene manipulation and gene transfer technologies
- Make the students understand the procedures involved in plant tissue culture.
- Acquire knowledge on animal cell culture and stem cell technology.
- Improve the employability skills of students by providing knowledge in recent techniques such as PCR, blotting, ELISA etc.
- Understand the application of fermentation technology.

Unit I: Recombinant DNA technology

Recombinant DNA technology - Principles of gene cloning: restriction endonucleases and other enzymes used in manipulating DNA molecules. Ligation of DNA molecules, DNA ligase, linkers and adapters, homopolymer tailing. end labeling and construction maps of PBR322, λ bacteriophage. 15 Hrs

Unit II: Plant Tissue culture

Plant tissue culture- basic requirements for culture, M S medium, callus culture, protoplast culture. Vectors – Ti plasmid (cointegration vector and binary vector), Viral vectors- TMV, CaMV and their applications. Transgenic plants – pest resistant, herbicide resistant and stress tolerant plants**.** 15 Hrs

Unit III: Animal Tissue culture

Animal cell lines and organ culture - culture methods and applications. Transgenic animals: transgenic mice- Production and its applications. Stem cell technology: definition, types, and applications. 15 Hrs

Unit IV: Molecular Techniques

PCR – Principle, types and its application in clinical diagnosis and forensic science. Southern blotting, Northern blotting and DNA finger printing Technique-principle and their applications. 15 Hrs

Unit V: Fermentation technology

Fermentation technology – Fermentors - general design, fermentation processes - Media used, downstream processing. Production and applications of ethanol, Streptomycin and Proteases. Production of edible vaccines. 15 Hrs

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Acquire knowledge on rDNA technology, DNA manipulation, and use of restriction endonuclease	PO1, PO3
CO2	Get acquainted with the use of cloning and vectors in plant tissue culture.	PO1, PO2, PO3
CO3	Understand the methods for production of proteins using recombinant DNA technology and their applications, basics of tissue culture, transgenesis, stem cell technology, risks, and safety aspects and patenting in biotechnology	PO1, PO3
CO4	Gain knowledge about the importance of gene and gene manipulation technologies	PO1, PO3
CO5	Know the concept fermentation technology and its applications.	PO1, PO3

Text Books

1. James D. Watson, Amy A. Caudy, Richard M. Myers, Jan Witkowski (2006) Recombinant DNA: Genes and Genomes - a Short Course (3rd ed), W.H. Freeman & Co
2. Satyanarayana U (2008), Biotechnology, Books & Allied (P) Ltd.
3. Cassida L (2007) Industrial Microbiology, New Age International

Reference books

1. Reed G (2004) Prescott and Dunn's Industrial Microbiology, CBS Publishers & Distributors
2. Biotechnology: applying the genetic revolution- David P. Clark, Pazdernik N. J, Elsevier (2009).
3. Click B.R. and Pasternark J.J (2010). Molecular Biotechnology: Principles and Applications of Recombinant DNA. (4th ed) American Society for Microbiology

Web Sources

1. NPTEL Certification course - Gene Therapy by Sachin Kumar https://nptel.ac.in/courses/102/103/102103041/
2. Coursera Certification course –Vaccines

3. https://futureoflife.org/background/benefits-risks-biotechnology/
4. https://www.sciencedirect.com/topics/neuroscience/genetic-engineering
5. http://www.biologydiscussion.cm/biotechnology/techniques-biotechnology/important-techniques-of-biotechnology-3-techniques/15683
6. https://iopscience.iop.org/book/978-0-7503-1347-6/chapter/bk978-0-7503-1347-6ch1
7. https://www.slideshare.net/zeal_eagle/fermentation-technology
8. https://www.slideshare.net/zeal_eagle/fermentation-technology
9. https://www.slideshare.net/Chepkitwai/blotting-techniques-6129300

BIOINFORMATICS

Course Code	Course Title	L	T	P	C
23115DSC63__	Bioinformatics	5	0	0	3

The objective of this course are to

- Impart knowledge on bioinformatics and applications
- Learn about biological databases
- Understand the local and global sequence alignment
- Provide insights on BLAST and Microarray
- Familiarize about structural genomics and visualization tools

Unit I: Introduction to Bioinformatics - Bioinformatics and its applications. - Genome, Metabolome - Definition and its applications. Metabolome - Metabolome Database - E. coli metabolome database, Human Metabolome database. Transcriptome - Definition and applications. 15 Hrs

Unit II : Biological Databases - definition, types and examples –, Nucleotide sequence database (NCBI, EMBL, Gene bank, DDBJ) Protein sequence database- SwissProt, TrEMBL, Structural Database - PDB, Metabolic database-KEGG 15 Hrs

Unit III: Sequence Alignment-Local and Global alignment-Dot matrix analysis, PAM, BLOSUM. Dynamic Programming, Needleman- Wunch algorithm, Smith waterman algorithm. Heuristic methods of sequence alignment. 15 Hrs

Unit IV: BLAST - features, types (BLASTP, BLASTN, BLASTX), PSI BLAST, result format. DNA Microarray - Procedure and applications. 15 Hrs

Unit V: Structural Genomics-Whole genome sequencing (Shotgun approach), Comparative genomics-tools for genome comparison, VISTA servers and precomputed tools. Molecular visualization tools. RASMOL, Swiss PDB viewer. Nutrigenomics - Definition and applications 15 Hrs

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Introduce the fundamentals of Bioinformatics and its applications Genome, metabalome & Transcriptome.	PO1

CO2	Classify biological database and to correlate the different file formats used by nucleic acid, protein database, structural and metabolic database.	PO1, PO2, PO3
CO3	Develop algorithms for interpreting biological data.	PO1, PO2
CO4	Discuss the concepts of sequence alignment and its types. Understand the tool used to detect the expression of genes	PO1, PO2, PO3
CO5	Apply the various tools employed in genomic study and protein visualization. Analyse the entire genome by shot gun method.	PO1, PO2

Text books

1. Basic of Bioinformatics by Rui Jiang Xuegong Zhang and Michael Q. Zhang Editors
2. Bioinformatics for Beginners Genes, Genomes, Molecular Evolution, Databases and Analytical Tools By: Supratim Choudhuri (Author)
3. Bioinformatics by Saras publication
4. Introduction to Bioinformatics by Arthur Lesk

Reference books

1. Computation in Bioinformatics Multidisciplinary Applications S Balamurugan, Anand T. Krishnan, Dinesh Goyal, Balakumar Chandrasekaran
2. Chemoinformatics and Bioinformatics in the Pharmaceutical Sciences
3. Navneet Sharma PhD Pharmaceutics, Himanshu Ojha, Pawan Raghav, Ramesh K. Goyal

Web resources

1. https://nptel.ac.in/courses/102/106/102106065/
2. http://www.digimat.in/nptel/courses/video/102106065/L65.html
3. https://www.slideshare.net/sardar1109/bioinformatics-lecture-notes

BIO ENTREPRENEURSHIP

Course Code	Course Title	L	T	P	C
23115DSC63__	Bio entrepreneurship	5	0	0	3

Learning Objectives

The objective of this course are to

- Impart knowledge on bio entrepreneurship and the types of industries
- Learn about business plan, proposal and funding agencies
- Understand the market strategy and the role of information technology in expansion of business
- Provide insights on legal requirement and accounting to establish as Bio entrepreneurship
- Familiarize about business bio incubators centres

Unit I: Introduction to Bio entrepreneurship; Types of industries – Biopharma, Bio agriculture and CRO; Introduction to Trademarks, Copyrights and patents. 15 Hrs

Unit II: Business Plan, Budgeting and Funding Idea or opportunity; Business proposal preparation; funds/support from Government agencies like MSME/banks, DBT, BIRAC, Start-up and make in India Initiative; dispute resolution skills; external environment changes; avoiding/managing crisis; Decision making ability. 15 Hrs

Unit III: Market Strategy- Basics of market forecast for the industry; distribution channels – franchising, policies, promotion, advertising, branding and market; Introduction to information technology for business administration and Expansion. 15 Hrs

Unit IV: Legal Requirements, Finance and Accounting; Registration of company in India; Ministry of Corporate Affairs (MCA); basics in accounting: introduction to concepts of balance sheet, profit and loss statement, double entry, bookkeeping; finance and break-even analysis; difficulties of entrepreneurship in India. 15 Hrs

Unit V: Role of knowledge centres such as universities, innovation centres, research institutions (public & private) and business incubators in Entrepreneurship development; quality control and quality assurance; Definition, role and importance of CDSCO, NBA, GLP, GCP, GMP. 15 Hrs

Course Outcomes

After completion of the course the students will be able to

CO	On completion of this course, students will be able to	Program outcomes
CO1	Understand the concept and scope for entrepreneurship	PO1
CO2	Identify various operations involved in a venture creation	PO1, PO5, PO6
CO3	Gather funding and launching a winning business	PO1, PO5, PO6
CO4	Nurture the organization and harvest the rewards	PO1, PO5, PO6
CO5	Illustrate about the Business incubator centres and Bio entrepreneurship	PO1, PO5, PO6

Text books

1. Adams, D. J. (2008). Enterprise for life scientists: Developing innovation and entrepreneurship in the biosciences. Bloxham: Scion - ISBN 10: 1904842364 / ISBN 13: 9781904842361
2. Shimasaki, C. (2014). Biotechnology Entrepreneurship: Starting, managing, and Leading Biotech Companies. Academic London Press - ISBN 10: 0124047300 / ISBN 13: 9780124047303
3. Onetti, A. &. (2015). Business modeling for life science and biotech companies: Creating value and competitive advantage with the milestone bridge. Routledge - ISBN 10: 1138616907 / ISBN 13: 9781138616905
4. Kapeleris, D. H. (2006). Innovation and entrepreneurship in biotechnology: Concepts, theories & cases - ISBN-13: 978-1482210125, ISBN-10: 1482210126

Reference books

1. Desai, V. (2009). The Dynamics of Entrepreneurial Development and Management New Himalaya. New Himalaya House Delhi:pub - ISBN : 9789350440810 9350440814
2. Ono, R. D. (1991). The Business of Biotechnology, From the Bench of the Street. Butterworth-Heinemann - ISBN 10: 1138616907 / ISBN 13: 9781138616905

3. Jordan, J. F. (2014). Innovation, Commercialization, and Start-Ups in Life Sciences. London: CRC Press - ISBN-10 : 812243049X ,ISBN-13 : 978-8122430493

Web sources

1. http://www.simplynotes.in/e-notes/mbabba/entrepreneurship-development/
2. https://openpress.usask.ca/entrepreneurshipandinnovationtoolkit/chapter/chapter-1-introductionto-entrepreneurship/

PLANT BIOCHEMISTRY AND PLANT THERAPEUTICS

Course Code	Course Title	L	T	P	C
23115DSC63__	Plant Biochemistry and plant Therapeutics	5	0	0	3

Learning Objectives

The main objective of this course are to

- Convey the knowledge of photosynthesis.
- Detail the structure and types of secondary metabolites.
- Impart the idea on various plant hormones.
- Emphasize the effects of free radicals and the importance of antioxidants
- Understand the role of medicinal plants in treating diseases.

Unit I: Photosynthesis - Photosynthesis apparatus, pigments of photosynthesis, photo chemical reaction, photosynthetic electron transport chain, and path of carbon in photosynthesis - Calvin cycle, Hatch - lack pathway (4 ways) CAM path way, significance of photosynthesis. 15Hrs

Unit II: Secondary metabolites: Structure, Types, Sources, Biosynthesis and function of phenolics, tannins, lignins, terpenes and alkaloids. Medicinal properties of secondary metabolite. 15Hrs

Unit III: Plant hormones Structure and function of plant hormones such as ethylene, cytokinins, auxins, Absicic acid, Florigin and Gibberlins. 15Hrs

Unit IV: Free radicals, types, production, free radical induced damages, lipid peroxidation, reactive oxygen species, antioxidant defense system, enzymatic and non-enzymatic antioxidants, role of antioxidants in prevention of disease, phytochemicals as antioxidants. 15Hrs.

Unit V: Plant therapeutics: Bioactive principles in herbs, plants with antidiabetic, anticancer, antibacterial, antiviral, anti-malaria and anti-inflammatory properties. 15Hrs

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes

CO1	Gain knowledge on photosynthetic apparatus, pigments present, pathways, and significance of photosynthesis	PO1
CO2	Learn in detail about the structure, types, sources, biosynthesis and functions of secondary metabolites.	PO1,PO3
CO3	Understand the structure and functions of plant hormones.	PO1
CO4	Discuss about free radicals, types and its harmful effects. Role of enzymatic and non-enzymatic antioxidant in defence mechanism, prevention in disease.	PO1,PO2.PO3
CO5	Identify the plants with antidiabetic, anticancer, antibacterial, antiviral, anti-malaria and anti-inflammatory properties.	PO1, PO2,PO3

Text books

1. Singh M.P and Panda. H 2005. Medicinal Herbs with their formulations, Daya publishing house, Delhi
2. Plant Physiology – Devlin N. Robert and Francis H. Witham, CBS Publications
3. Molecular activities of plant cell – An Introduction to Plant Biochemistry. John. W.
4. Anderson and John Brardall, Black well Scientific Publications, 1994.

Reference books

1. Khan, I. A and Khanum. A 2004. Role of biotechnology in medicinal and aromatic plants, Vol.1 and Vol.10, Ukka2 publications, Hyderabad.
2. Plant Biochemistry and Molecular Biology - Hans Walter Heldt, Oxford University, 4th Edition, 2010
3. Plant biochemistry (2008), Caroline bowsher, Martin steer, Alyson Tobin, garland science.
4. Plant physiology and development (sixth edition) by Lincoln Taiz, Eduardo Zeiger , Ian Max Moller and Angus Murphy publisher ; Oxford university press

Web resources

1. https://www.intechopen.com/books/secondary-metabolites-sources-and-applications/anintroductory- chapter-secondary-metabolites
2. https://www.toppr.com/guides/biology/plant-growth-and development/plantgrowth

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	3						3			3
CO 2	3		2				3	3		3
CO 3	3						3			3
CO 4	3	3	3				3	3		3
CO5	3	3	3				3	3		3

S-Strong (3) M-Medium (2) L-Low (1)

AUDIT COURSE
INDIAN KNOWLEDGE SYSTEM

Course Code	Course Title	L	T	P	C
231ACSIKWS	Indian Knowledge System	-	-	-	2

Course Objectives:

The course design seeks to address the following issues:

- To introduce to the students the overall organization of IKS
- To develop an appreciation among the students the role and importance of Veda, Vedāṅgas, Upa Vedas and Purāṇas
- To show case the multi-dimensional nature of IKS and their importance in the contemporary society
- To motivate the students to take up a detailed study of some of these topics and explore their application potential

Course Outcomes:

CO1: Explain the historicity of Indian Knowledge System and the broad classification of Indian philosophical systems

CO2: Explain the potential of Sanskrit in natural language processing

CO3: Explain the features of Indian numeral system and its role in science & technology advancement

CO4: Illustrate the basic elements of the Indian calendar and the components of Indian Panchanga

CO5: Outline the science, engineering & technology heritage of ancient and medieval India

Syllabus

Unit I: Introduction to Indian Knowledge System (IKS), Definition, Concept and Scope of IKS (4).

Definition, Concept and Scope of IKS. IKS based approaches on Knowledge Paradigms. IKS in ancient India and in modern India

Unit II: IKS and Indian Scholars, Indian Literature (8)

Philosophy and Literature (Maharishi Vyas, Manu, Kanad, Pingala, Parasar, Banabhatta, Nagarjuna and Panini). Mathematics and Astronomy (Aryabhatta, Mahaviracharya, Bodhayan, Bhashkaracharya, Varahamihira and Brahmgupta). Medicineand Yoga (Charak, Susruta, Maharishi Patanjali and Dhanwantri). Sahitya (Vedas, Upvedas, Upavedas (Ayurveda, Dhanurveda, Gandharvaveda). Puran and Upnishad and shaddarshan (Vedanta,

Nyaya. Vaisheshik, Sankhya, Mimamsa, Yoga, Adhyatma and Meditation). Shastra (Nyaya, vyakarana, Krishi, Shilp, Vastu, Natya and Sangeet).

Unit III: Indian Traditional/tribal/ethnic communities, their livelihood and local wisdom (6).

Geophysical aspects, Resources and Vulnerability. Resource availability, utilization pattern and limitations. Socio-Cultural linkages with Traditional Knowledge System. Tangible and intangible cultural heritage.

Unit IV: Unique Traditional Practices and Applied Traditional Knowledge (8)

Myths, Rituals, Spirituals, Taboos and Belief System, Folk Stories, Songs, Proverbs, Dance, Play, Acts and Traditional Narratives. Agriculture, animal husbandry, Forest, Sacred Groves, Water Mills, Sacred Water Bodies, Land, water and Soil Conservation and management Practices. Indigenous Bio-resource Conservation, Utilization Practices and Food Preservation Methods, Handicrafts, Wood Processing and Carving, - Fiber Extraction and Costumes. Vaidya (traditional health care system), Tantra-Mantra, Amchi Medicine System. Knowledge of dyeing, chemistry of dyes, pigments and chemicals

Unit V: Protection, preservation, conservation and Management of Indian Knowledge System (4)

Documentation and Preservation of IKS. Approaches for conservation and Management of nature and bio-resources. Approaches and strategies to protection and conservation of IKS.