

# **MOHAN BABU UNIVERSITY**

Sree Sainath Nagar, Tirupati – 517 102



**MBU**  
**MOHAN BABU**  
**UNIVERSITY**

DREAM. BELIEVE. ACHIEVE

## **SCHOOL OF LIBERAL ARTS AND SCIENCES**

**B.Sc. – Bioinformatics**

**CURRICULUM AND SYLLABUS**  
*(For 2022-23 Admitted Students)*

**FULLY FLEXIBLE CHOICE BASED CREDIT SYSTEM (FFCBCS)**



# **MOHAN BABU UNIVERSITY**

## **Vision**

To be a globally respected institution with an innovative and entrepreneurial culture that offers transformative education to advance sustainability and societal good.

## **Mission**

- ❖ Develop industry-focused professionals with a global perspective.
- ❖ Offer academic programs that provide transformative learning experience founded on the spirit of curiosity, innovation, and integrity.
- ❖ Create confluence of research, innovation, and ideation to bring about sustainable and socially relevant enterprises.
- ❖ Uphold high standards of professional ethics leading to harmonious relationship with environment and society.

## **SCHOOL OF LIBERAL ARTS AND SCIENCES**

### **Vision**

To be the ideal culmination for the edification of liberal arts and sciences recognized for excellence, innovation, entrepreneurship, environment and social consciousness.

### **Mission**

- ❖ Infuse the essential knowledge of liberal arts and sciences, skills and an inquisitive attitude to conceive creative and appropriate solutions to serve industry and community.
- ❖ Proffer a know-how par excellence with the state-of-the-art research, innovation, and incubation ecosystem to realise the learners' fullest entrepreneurial potential.
- ❖ Endow continued education and research support to working professionals in liberal arts and sciences to augment their domain expertise in the latest technologies
- ❖ Entice the true spirit of environment and societal consciousness in citizens of tomorrow in solving challenges in liberal arts and sciences.

## **DEPARTMENT OF BIOLOGICAL AND CHEMICAL SCIENCES**

### **Vision**

To become a leading center of excellence in the Biological and Chemical Sciences through adapting advanced methods in teaching and research.

### **Mission**

- ❖ Inspire science students of tomorrow to take on the challenges in the scientific field and build sustaining society that is free from Biological and Chemical science apprehensions.
- ❖ Provide students with an education that combines academics with diligent practical training in a dynamic, research-oriented environment to serve Industry and Societal needs.
- ❖ Encourage faculty and staff to achieve bigger goals in their respective fields and exhibit the best of their abilities via continuing education and research.

## B.Sc. – Bioinformatics

### PROGRAM EDUCATIONAL OBJECTIVES

After few years of graduation, the graduates of B.Sc. Bioinformatics will:

- PEO1.** Pursue higher education in their core or allied areas of specialization.
- PEO2.** Employed as a productive and valued professional in industry/teaching/research.
- PEO3.** Engaged in innovation and deployment as a successful entrepreneur.
- PEO4.** Adapt evolving technologies in the core or allied areas by participating in continuing education programs for lifelong learning

### PROGRAM OUTCOMES

On successful completion of the Program, the graduates of B.Sc. Bioinformatics will be able to:

- PO1. Knowledge:** To study as well as apply concepts, theories, and practices across the disciplines to gain the foundational knowledge.
- PO2. Problem Analysis:** To identify, analyze and evaluate various experiences and perspectives using foundational disciplinary knowledge for substantiated conclusions.
- PO3. Design/Development of solutions:** To design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO4. Modern tool usage:** To create, select, and apply appropriate techniques, resources and modern tools with an understanding of the limitations.
- PO5. Environment and Sustainability:** Understand the issues of environmental contexts and demonstrate the knowledge for sustainable development.
- PO6. Ethics and Society:** Apply the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities under moral dimensions.
- PO7. Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, to manage projects and finance in multidisciplinary settings.
- PO8. Effective Communication:** To develop proficiency and efficiency in communicating by connecting people, ideas, books, media, and technology.
- PO9. Life-long learning:** Recognize the need for and acquire the ability to engage in independent and life-long learning in the broadest context of socio-technological changes.

## **PROGRAM SPECIFIC OUTCOMES**

On successful completion of the Program, the graduates of B.Sc. Bioinformatics will be able to:

- PSO1** Gain knowledge in fundamentals of bioinformatics, latest tools, software's used in the area of Bioinformatics and recognize different biological database resources and software packages for analysis and interpretation of biological data related to analysis of Genome, proteome and drug design.
- PSO2** Analyze various cellular and extracellular components through their theoretical and practical Biochemistry knowledge for understanding the health and disease condition of Plants and Animals.
- PSO3** Study and analyze the nature of chemicals and design the reaction mechanism for the synthesis and development of eco-friendly chemicals by applying modern methods for the benefit of public and industrial sector

## B.Sc. – Bioinformatics

### Basket Wise - Credit Distribution

S. No.	Basket	Credits (Min.- Max.)
1	SCHOOL CORE	28-34
2	PROGRAM CORE	54-72
3	PROGRAM ELECTIVE	27-45
4	UNIVERSITY ELECTIVE	9-12
<b>TOTAL CREDITS</b>		<b>Min. 120</b>

## School Core (28-34 Credits)

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
		L	T	P	S	C	
<b>School Main Basket (Min. 20 Credits to be earned)</b>							
	Indian Literature and Culture	2	-	-	-	2	-
	Linguistic Proficiency	-	1	2	-	2	-
	Science of Living	-	1	-	4	2	-
	Philosophy, Aesthetics and Ethics	2	-	-	-	2	-
	Media and Communications	1	-	-	4	2	-
22BS101401	Environmental Studies	2	-	-	-	2	-
	Quantitative Reasoning	-	1	-	4	2	-
	Literature and the World	2	-	-	-	2	-
22BS101036	Mind and Behaviour	3	-	-	-	3	-
	Social and Political Formations	2	-	-	-	2	-
	Introduction to Critical Thinking	2	-	-	-	2	-
22LG101401	Personality Development	2	-	-	-	2	-
	Fundamentals of Computer	-	1	2	-	2	-
22BS101002	Introduction to Biology	3	-	-	-	3	-
22BS101003	Biodiversity monitoring and management	3	-	-	-	3	-
22BS101004	Molecular taxonomy	3	-	-	-	3	-
	Biostatistics	3	-	-	-	3	-
	Internship	-	-	-	-	4	-
	Capstone Project	-	-	-	-	10	-

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
		L	T	P	S	C	
<b>Language Basket (Min. 8 Credits to be earned)</b>							
22LG102405	General English	2	-	2	-	3	-
	English language Skills	2	-	2	-	3	-
	English for Professional Development	-	1	2	4	3	-
	Advanced English Grammar and usage	3	-	2	-	4	English for Professional Development
	German Language	2	-	-	-	2	-
	French Language	2	-	-	-	2	-
22LG101402	Telugu	2	-	-	-	2	-
22LG101403	Hindi	2	-	-	-	2	-
22LG101404	Sanskrit	2	-	-	-	2	-
<b>Mandatory Non-Credit Courses (Min. 6 Credits to be earned Earned Credits will not be considered for CGPA)</b>							
	Introduction to Soft Skills	2	-	-	-	2	-
22LG107601	Professional Ethics and Human Values	2	-	-	-	2	-
	Indian Heritage and culture	2	-	-	-	2	-
	Disaster Mitigation and Management	2	-	-	-	2	-
	Essential Life Skills for Holistic Development	2	-	-	-	2	-
	NCC/NSS Activities	-	-	-	-	2	-
	Innovation, Incubation and Entrepreneurship	2	-	-	-	2	-
	Intellectual Property Rights	2	-	-	-	2	-
	Basic Research Methodology	2	-	-	-	2	-



## **PROGRAM CORE(54–72Credits)**

**(Min. 18 Credits from each Major)**

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project-based Learning	Credits	Pre-requisite
		L	T	P	S	C	
<b>Major 1 –Bioinformatics (18-24 Credits)</b>							
22BS102001	Introduction to Bioinformatics	3	-	3	-	4.5	-
22BS101005	Molecular Genetics	3	-	-	-	3	-
22BS102002	Biological Databases and DBMS	3	-	3	-	4.5	Introduction to Bioinformatics
22BS102003	Introduction to Genome Projects	3	-	3	-	4.5	Introduction to Bioinformatics
22BS102004	Computational biology	3	-	3	-	4.5	Introduction to Bioinformatics
22BS101006	Genomics and Proteomics	3	-	-	-	3	Introduction to Bioinformatics
22BS102005	Structural Analysis	3	-	3	-	4.5	Introduction to Bioinformatics
22BS101007	Building and Interpreting Multiple Sequence Alignment	3	-	-	-	3	Introduction to Bioinformatics
<b>Major 2 -Biochemistry (18-24 Credits)</b>							
22BS102006	Biomolecules	3	-	3	-	4.5	-
22BS102007	Biophysical techniques	3	-	3	-	4.5	Biomolecules
22BS102008	Human Physiology and Nutrition	3	-	3	-	4.5	-
22BS102009	Basics of Immunology and Clinical Biochemistry	3	-	3	-	4.5	Human Physiology and Nutrition
22BS101008	Endocrinology	3	-	-	-	3	Human Physiology and Nutrition
22BS101009	Cell Biology	3	-	-	-	3	Biochemistry
22BS101010	Introduction to Metabolism	3	-	-	-	3	Biochemistry

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project-based Learning	Credits	Pre-requisite
		L	T	P	S	C	
22BS102010	Enzymology and Bioenergetics	3	-	3	-	4.5	Biochemistry
22BS102011	Molecular biology	3	-	3	-	4.5	Biochemistry
22BS102012	Immunology	3	-	3	-	4.5	-
<b>Major 3 – Chemistry (18-24 Credits)</b>							
22BS101011	General Chemistry	3	-	-	-	3	-
22BS102013	Inorganic and Physical Chemistry	3	-	3	-	4.5	-
22BS102014	Basic Organic Chemistry	3	-	3	-	4.5	-
22BS102015	Advanced Chemistry-1	3	-	3	-	4.5	-
22BS102016	Advanced Chemistry-2	3	-	3	-	4.5	Advanced Chemistry-1
22BS101012	Chemistry of Advanced Materials	3	-	-	-	3	-
22BS101013	Natural products -1	3	-	-	-	3	Basics of Chemistry-1
22BS101014	Natural products -2	3	-	-	-	3	Natural products -1
22BS101015	Chemistry for Biology	3	-	-	-	3	-

## PROGRAM ELECTIVE (27 – 45 Credits)

**(Min. 9 Credits from each Major)**

Course code	Title of the Course	Lecture	Tutorial	Practical	Project-based Learning	Credits	Pre-requisite
		L	T	P	S	C	
<b>Major 1 – Bioinformatics(9-15 Credits)</b>							
22BS101016	Working with a Single DNA Sequence	3	-	-	-	3	Introduction to Bioinformatics
22BS101017	Sequence Alignment and Sequence Analysis	3	-	-	-	3	Introduction to Bioinformatics
22BS102017	Analytical Bioinformatics	3	-	3	-	4.5	Introduction to Bioinformatics
22BS106001	Bio-perl	-	-	1	4	1.5	Biological Databases and DBMS
22BS101018	Drug Design	3	-	-	-	3	Structural Analysis
22BS101019	Genetics	3	-	-	-	3	-
22BS101020	Evolution	3	-	-	-	3	-
22BS103001	Ecosystem Management	2	-	-	4	3	-
22BS101021	Basics of computational molecular biology	3	-	-	-	3	-
<b>Major 2 – Biochemistry (9-15 Credits)</b>							
22BS101022	Food and Nutrition	3	-	-	-	3	-
22BS102018	Biochemical Correlations in Disease	3	-	3	-	4.5	Immunology and Clinical Biochemistry
22BS102019	Molecular basis of Infectious diseases	3	-	3	-	4.5	Immunology and Clinical Biochemistry
22BS102020	Fundamentals of Bioinformatics and Proteomics	3	-	3	-	4.5	-
22BS101023	Genomics	3	-	-	-	3	-
22BS101024	Embryology	3	-	-	-	3	Human Physiology
22BS102021	Endocrinology	3	-	3	-	4.5	Human Physiology
22BS102022	Neurobiology	3	-	3	-	4.5	Human Physiology

Course code	Title of the Course	Lecture	Tutorial	Practical	Project-based Learning	Credits	Pre-requisite
		L	T	P	S	C	
22BS111002	Sericulture	-	1	-	4	2	Biology of Non-Chordates
22BS111003	Apiculture	-	1	-	4	2	Biology of Non-Chordates
22BS111004	Ethology	-	1	-	4	2	Wild Life Conservation and Management
<b>Major 3 - Chemistry (9-15 Credits)</b>							
22BS101025	Basic Reagents and Reaction Mechanism	3	-	-	-	3	-
22BS102023	Basics of organic Spectroscopy	3	-	3	-	4.5	Basics of Chemistry-2
22BS101026	Basics of Molecular Spectroscopy	2	-	-	-	2	Basics of Chemistry-2
22BS101027	Basic Clinical and Pharmaceutical Chemistry	2	-	-	-	2	General Chemistry
22BS101028	Heterocyclic Chemistry	3	-	-	-	3	Basics of Chemistry-1
22BS101029	Bio-organic Chemistry	3	-	-	-	2	-
22BS101030	Bio-inorganic Chemistry	3	-	-	-	2	-
22BS101031	Nuclear Chemistry	2	-	-	-	2	-
22BS101031	Food Chemistry and Technology	2	-	-	-	2	-
22BS102024	Fundamentals of Analytical Chemistry	3	-	3	-	4.5	-

## University Elective (9-12 Credits)

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
		L	T	P	S	C	
	Managing Innovation and Entrepreneurship	3	-	-	-	3	-
	Management Science	3	-	-	-	3	-
	Human Resource Management	3	-	-	-	3	-
	Business Communication and Career Skills	3	-	-	-	3	-
	Entrepreneurship for Micro, Small and Medium Enterprises	3	-	-	-	3	-
	Indian History	3	-	-	-	3	-
	Women Empowerment	3	-	-	-	3	-
	Planning for Sustainable Development	3	-	-	-	3	-
	Banking and Insurance	3	-	-	-	3	-
	Cost Accounting and Financial Management	3	-	-	-	3	-
	Gender and Environment	3	-	-	-	3	-
	Indian Economy	3	-	-	-	3	-
	Essential Life Skills for Holistic Development	3	-	-	-	3	-
	Indian Tradition and Culture	3	-	-	-	3	-
	Constitution of India	3	-	-	-	3	-
22CE201701	Disaster Management	3	-	-	-	3	-
	Global Strategy and Technology	3	-	-	-	3	-
	Green Technologies	3	-	-	-	3	-
	Stress Management and Well Being	3	-	-	-	3	-

**Note:**

1. If any student has chosen a course or equivalent course from the above list in their regular curriculum then, he/she is not eligible to opt the same course/s under University Elective.
2. The student can choose courses from other disciplines offered across the schools of MBU satisfying the pre-requisite other than the above list.

## SCHOOL CORE

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>
<b>22LG102405</b>	<b>GENERAL ENGLISH</b>	2	-	2	-	3
<b>Pre-Requisite</b>	-					
<b>Anti-Requisite</b>	-					
<b>Co-Requisite</b>	-					

**COURSE DESCRIPTION:** This course deals with selected literary works of eminent writers, exercises on speaking, reading comprehensions for skimming and scanning, vocabulary, grammar, pronunciation, and conversation practice.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

- CO1.** Demonstrate knowledge of literary works of various pieces of eminent writers.
- CO2.** Adapt general and technical vocabulary in communication.
- CO3.** Apply grammatically correct English in writing.
- CO4.** Analyse texts using reading techniques.
- CO5.** Apply different communication styles in various situations.

### CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
<b>CO1</b>	3	-	-	-	-	-	-	2	2
<b>CO2</b>	3	2	-	-	-	-	-	2	2
<b>CO3</b>	2	3	-	-	-	-	-	2	2
<b>CO4</b>	2	3	-	2	-	-	-	2	2
<b>CO5</b>	2	2	-	3	-	-	-	2	2
<b>Course Correlation Mapping</b>	<b>2</b>	<b>3</b>	<b>-</b>	<b>3</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2</b>	<b>2</b>

*Correlation Levels: 3: High; 2: Medium; 1: Low*

## COURSE CONTENT

**Module 1: 'A snake in the Grass' short story by R.K. Narayan. (06 Periods)**  
A Snake in the Grass – A Short Story, Reading Comprehension, Grammar, Vocabulary, Pronunciation, and Conversation Practice.

**Module 2: 'On saying Please 'short essay by A. G. Gardiner (06 Periods)**  
On Saying Please – A Short Essay, Reading Comprehension, Grammar Vocabulary, Pronunciation, and Conversation Practice.

**Module 3: 'If You Forget Me 'poem by Pablo Neruda (06 Periods)**  
If you Forget Me - A Poem, Reading Comprehension, Grammar, Pronunciation, and Conversation Practice.

**Module 4: 'After the Sunset' short story by Bhoopal (06 Periods)**  
After the Sunset – A Short Story, Reading Comprehension, Grammar, Pronunciation, and Conversation Practice.

**Module 5: 'Man's Peril 'essay by Bertrand Russel (06 Periods)**  
Man's Peril - An Essay, Reading Comprehension, Vocabulary, Grammar, Pronunciation, and Conversation Practice.

**Total Periods: 30**

## EXPERIENTIAL LEARNING

### List of Exercises

1. In rainy seasons a lot of snakes are found crawling around. Prepare a write-up on the reactions of people when they found snakes.
2. India is now for entrepreneurs and the government announced a lot of startup programmes for that. Prepare a presentation on recent entrepreneurs.
3. Small courtesies play a major role in creating an impression on other people. List out a few examples.
4. Prepare a PowerPoint presentation on the present scenario in higher education and jobs in India.
5. Being a shopkeeper and persuading a customer to buy a product which is introduced newly in the market. Prepare a conversation.
6. The English language has a rich vocabulary. List out the homophones and homonyms and write down the pronunciation and meaning of those words.
7. Describe a situation in your college where teamwork is needed and explain the strategies to manage the team effectively.
8. India is a country of unity in diversity. List out the existence of different racial and religious people and bring out reasons for the harmonious relationship among the people.
9. Forget and forgive are the most important quality of any human being. Prepare a write-up on any two experiences which come across in your life where you forgive or forget to maintain good relationships with friends or relatives.
10. Make a case study on the problems of second language learners of English and suggest solutions to overcome them.
11. How do you feel that the role of science and technology in nation-building?

*Above all will be detailed in CHO.*

## RESOURCES

### TEXTBOOKS:

1. G. Damodar "*English Language for Undergraduate Students*", Cambridge University-2019.

### REFERENCE BOOKS:

1. <https://www.researchgate.net/publication/331773456> RK Narayan's *A Snake in the Grass* and Stephen Leacock's *With the Photographer - A Comparative Study*
2. <https://smartenglishnotes.com/2020/07/17/on-saying-please-summary-analysis-and-questions-and-answers/>

### VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=WnOOK00CdaM>
2. <https://www.youtube.com/watch?v=H6Nlz8qmcFc>
3. <https://www.youtube.com/watch?v=-lTliZO85YM>
4. <https://www.youtube.com/watch?v=048YjXwgHWE>
5. <https://www.youtube.com/watch?v=XLLQm7Grmcc>

### WEB RESOURCES:

1. <https://www.researchgate.net/publication/331773456> RK Narayan's *A Snake in the Grass* and Stephen Leacock's *With the Photographer - A Comparative Study*
2. <https://smartenglishnotes.com/2020/07/17/on-saying-please-summary-analysis-and-questions-and-answers/>
3. [http://www.emcp.com/product\\_catalog/school/litLink/Grade09/U09-04forgetme/](http://www.emcp.com/product_catalog/school/litLink/Grade09/U09-04forgetme/)
4. <https://englishlanguage-lit.blogspot.com/2021/05/after-sunset-short-story-by-bhoopal.html>
5. <https://www.taylorfrancis.com/chapters/mono/10.4324/9781003090359-31/man-peril-bertrand-russell?context=ubx&refId=1d767e2d-ceb1-4537-9de5-6417eab47d1e>



## SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22LG101402	తెలుగు	2	-	-	-	2
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

**COURSE DESCRIPTION:** తుమ్మల సీతారామమూర్తి-ఎక్కట్ల, తిక్కన-నాడీజంఘోషాఖ్యానం, పోతన-ఘోషాఖ్యానం, దువ్వూరి రామిరెడ్డి - కృషీ వలుడు, మరియు తెలుగు వ్యాకరణం మీద అవగాహన.

**COURSE OUTCOMES:** కోర్సువిజయవంతంగా పూర్తిచేసిన తర్వాత, విద్యార్థులు వీటిని చేయగలరు:

- C01.** విద్యార్థులలో మానవీయ విలువలు పెరిగి నైతిక వలువలతో జీవించడం
- C02.** సమాజంలో మనకు చేతనైన సాయం చెయ్యడం ప్రతి మనిషి బాధ్యత అనే సందేశం
- C03.** త్రికరణ శుద్ధితో కృషి చేస్తే ఏదైనా సాధించ వచ్చు అనే సందేశం
- C04.** వ్యవసాయ రంగం గూర్చి విద్యార్థులలో అవగాహన కలగడం
- C05.** తెలుగు వ్యాకరణం

### CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
C01	3	-	-	-	-	-	-	-	-
C02	3	-	-	-	-	-	-	-	-
C03	3	-	-	-	-	-	-	-	-
C04	3	-	-	-	-	-	-	-	-
C05	3	-	-	-	-	-	-	-	-
<b>Course Correlation Mapping</b>	<b>3</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

Correlation Levels: 3: High; 2: Medium; 1: Low

## పాఠ్య ప్రణాళిక

**Module 1: ఎక్కట్లు – తుమ్మల సీతారామమూర్తి** (06 Periods)

సత్యవర్తన, సచ్చీలత, సన్మార్గం, సమసమానత్వం గూర్చి వివరించడం.

**Module 2: నాడీజంఘాపాఖ్యానం – తిక్కన** (06 Periods)

సహాయం చేసినవారిని మరచి పోరాదు. చేసిన మేలు మరచిన వారి జీవితం ఎంత హీనంగా ఉంటుందో తెలియజేయడం.

**Module 3: ధ్రువోపాఖ్యానం – పోతన** (06 Periods)

ఎటువంటి కష్టాలకు సమస్యలకు కుంగి పోకుండా దీక్షతో పట్టుదలతో కృషితో అనుకున్నది సాధించాలని తెలియజేయడం.

**Module 4: కృషీ వలుడు – దువ్వూరి రామిరెడ్డి** (06 Periods)

సమాజానికి వెన్నెముక అయిన రైతు యొక్క కష్టాలను త్యాగాలను వివరించడం.

**Module 5: సంధులు, సమాసాలు, అలంకారాలు.** (06 Periods)

తెలుగు భాష యొక్క మూలాలను తెలుసుకోవడం.

**Total Periods: 30**

## RESOURCES

### TEXT BOOKS:

1. ఎక్కట్లు – కవి తుమ్మల సీతారామమూర్తి చొదరి.
2. నాడీజంఘాపాఖ్యానం – కవి తిక్కన. (మహాభారతం – శాంతి పర్వం – తృతీయా శ్వాసం – 472 నుండి 511 పద్యాల వరకు).
3. ధ్రువోపాఖ్యానం – కవి పోతన (ఆంధ్ర మాహాభాగవతం – చతుర్థ స్కంధం – 216 నుండి 277 పద్యాల వరకు)
4. కృషీ వలుడు – కవి దువ్వూరి రామిరెడ్డి

**VIDEO LECTURES:**

1. <https://www.youtube.com/watch?v=5jX20h6HWzg>
2. <https://www.youtube.com/watch?v=FFtPSPByBmk>
3. [https://www.youtube.com/watch?v=nQHF\\_pgTfL8](https://www.youtube.com/watch?v=nQHF_pgTfL8)
4. <https://www.youtube.com/watch?v=IEERKL3Q2Cs>

**Web Resources:**

1. [http://teluguvignanamvinodam1.blogspot.com/2021/06/maha-bharatam-in-telugu-pdf-free-download\\_25.html](http://teluguvignanamvinodam1.blogspot.com/2021/06/maha-bharatam-in-telugu-pdf-free-download_25.html)
2. <https://www.freegurukul.org/blog/ramayanam-pdf/>

**EXPERIENTIAL LEARNING**

The experiential learning components will be detailed in CHO.

## SCHOOL CORE

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>
<b>22LG101404</b>	<b>SANSKRIT</b>	2	-	-	-	2
<b>Pre-Requisite</b>	-					
<b>Anti-Requisite</b>	-					
<b>Co-Requisite</b>	-					

**COURSE DESCRIPTION:** अस्मिन् पाठ्यक्रमे संस्कृत गद्य, पद्य, व्याकरणेन सह महाभारतम् अपि च रामायणस्य कान्धन खण्डानां मेलनं भवति । अयं पाठ्यक्रमः छात्राणां कृते विभिन्न संस्कृत ग्रन्थानां अपि च साहित्यस्य समालोचनात्मक विश्लेषण करणमपि शिक्षयति । संपूर्ण पाठ्यक्रमे अस्मिन्, छात्राः देवनागरी लिपेः लिखनं अधिगच्छति, संस्कृतस्य शब्दानां उच्चारणं तथा हृदिस्थं करिष्यति, अपि च प्राथमिक व्याकरण पठिष्यति तेन ते संस्कृते सरल वाक्यानां निर्माणं कर्तुं प्रभवन्ति ।

**COURSE OUTCOMES:** पाठ्यक्रमस्य सफलसमाप्तेः अनन्तरं छात्राः

- C01** कर्तव्यपरक शैक्षणिक वृत्तिपरक तथा शोधकर्तृणां निर्माणार्थं छात्राणां संज्ञानात्मक, प्रभावशाली तथा व्यवहारिक क्षमतानां आकार प्रदानार्थं सहायतां करोति।
- C02** सामाजिक परिवर्तने भागग्रहणार्थं सक्षमाः भवितुं छात्रेषु सेवायाः धारणा संचारः करोति।
- C03** समकालीन समस्या-समाधान स्थितिषु प्राचीन भारतीय ज्ञानस्य अनुप्रयोगस्य ज्ञानप्राप्तिः। सामान्य रूपेण तथा विशेष रूपेण अभ्यसने तथा तस्य मूल्यांकनस्य संदर्भं च नैतिक उपयुक्ततायाः एकः दृढतर भावनायाः विकासार्थम्।
- C04** प्राचीन साहित्यतः प्राथमिक जीवनं तथा अवधारणानां ज्ञानप्रदानं यत् कालातीतः जातः तथापि इदानीमपि समाजाय अनुवर्तते।  
आवेदनस्य प्रमुख क्षेत्रेषु प्राथमिक कौशलस्य अधिग्रहणे सुगमकरणम् उदा- नेतृत्वे, संचारे, अनुसंधान योग्यतायां, व्यवहार संशोधने इत्यादि।
- C05** सामाजिक विविधतायाः कृते सम्मान-विकसितं करनं तथा सामाजिक अपि च सांस्कृतिक प्रासंगिकतायाः अध्ययने अभिवृद्धि करनम्।

### CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
<b>C01</b>	3	-	-	-	-	-	-	-	-
<b>C02</b>	3	-	-	-	-	-	-	-	-
<b>C03</b>	3	-	-	-	-	-	-	-	-
<b>C04</b>	3	-	-	-	-	-	-	-	-
<b>C05</b>	3	-	-	-	-	-	-	-	-
<b>Course Correlation Mapping</b>	<b>3</b>	-	-	-	-	-	-	-	-

*Correlation Levels: 3: High; 2: Medium; 1: Low*

## COURSE CONTENT

### Module-1: प्राचीन पद्यसाहित्यम्

(06 Periods)

1. आर्य पादुका पट्टाभिषेकः - वल्मीकिः - श्रीमद्रामायणम्
2. यक्षप्रश्नाः - वेदव्यासः - महाभारतम्

### Module-2: चम्पूकाव्यम् & आधुनिक पद्यकाव्यम्

(06 Periods)

3. गङ्गावतरणम् - भोजराजः - चम्पूरामायणम्
4. मोहापनोदः - श्री पमिडिपाटि पट्टाभिरामारावः - मूलकथा-‘धर्मसौहृदम्’ इति संस्कृत पद्यकाव्यम्

### Module-3: गद्यसाहित्यम्

(06 Periods)

5. अत्युत्कटैः पापपुण्यैः इहैव फलमश्नुते - नारायणपण्डितः - हितोपदेशः
6. शूद्रकवीरवरकथा - हितोपदेशः

### Module-4: शब्दाः

(6 Periods)

देव, कवि, भानु, पितृ, धातृ, गो, रमा, मति

### Module 5: महाकवि, शास्त्रकाराः

(6 Periods)

1. पाणिनिः 2. कौटिल्यः 3. भरतमुनिः 4. भारविः 5. माघः 6. भवभूतिः
7. शङ्कराचार्यः 8. दण्डी

**Total Periods: 30**

## RESOURCES

### TEXT BOOKS:

1. विश्वभारती
2. संस्कृत भारती
3. अमृतवाणी

### REFERENCE BOOKS:

1. रामायणम्
2. महाभारतम्
3. अष्टाध्यायी
4. अमरकोशः

### VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=bh-14xfMeYk>
2. <https://www.youtube.com/watch?v=6xFkoOpzsvs>

### Web Resources:

1. <https://www.forum.universityupdates.in/threads/ou-sanskrit-2nd-semester-study-material.33659/>
2. [https://cbpbu.ac.in/study\\_mat\\_sanskrit.php](https://cbpbu.ac.in/study_mat_sanskrit.php)

## **EXPERIENTIAL LEARNING**

The experiential learning components will be detailed in CHO.

## SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
<b>22BS101002</b>	<b>INTRODUCTION TO BIOLOGY</b>	3	-	-	-	3
<b>Pre-Requisite</b>	-					
<b>Anti-Requisite</b>	-					
<b>Co-Requisite</b>	-					

**COURSE DESCRIPTION:** This course provides a detailed discussion on Introduction to living organisms, plant and animal biology, basics of molecular biology, human biology and photosynthesis.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to

- CO1.** Identify difference between cells, Cellular components and their functions.
- CO2.** Understand taxonomy, nomenclature and diseases resulting from parasites.
- CO3.** Identify Central dogma of Molecular biology and process of Recombinant DNA technology.
- CO4.** Understand different organ systems and their functions.
- CO5.** Understand basics and Mechanism of Photosynthesis.

### CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	-	-	-	-	-	-	-	-	3	-
<b>CO2</b>	3	2	-	-	-	-	-	-	-	-	3	-
<b>CO3</b>	3	3	-	-	-	-	-	-	-	-	3	-
<b>CO4</b>	3	2	-	-	-	-	-	-	-	3	3	-
<b>CO5</b>	3	2	-	-	-	-	-	-	-	3	3	-
<b>Course Correlation Mapping</b>	<b>3</b>	<b>2</b>	-	-	-	-	-	-	-	<b>3</b>	<b>3</b>	-

Correlation Levels: 3: High; 2: Medium; 1: Low

### COURSE CONTENT

#### **Module 1: INTRODUCTION TO LIVING ORGANISMS (09 Periods)**

Differences between Living and Non Living systems. Cell biology and cell structure, Sub cellular Structures, Difference between Prokaryotes and Eukaryotes, Comparison between Plant and Animal Cells.

#### **Module 2: PLANT AND ANIMAL BIOLOGY (10 periods)**

Classification of Plant Kingdom. Concepts of Growth, Economic Importance of Plants, Classification of Animal Kingdom, Functions, morphology, growth and Reproduction, Protozoan Parasites – two important forms in man (*Plasmodium*, *Entamoeba histolytica*), Helminthes ( *Fasciolopsis buski*, *Taenia solium*, *Ascaris*, *Wucharia bancrafti*)

**Module 3 BASIC MOLECULAR BIOLOGY (11 Periods)**

DNA as genetic material, Structure of DNA, Central dogma of Molecular Biology, DNA replication, Transcription, Translation, Gene expression and regulation, Recombinant DNA technology.

**Module 4 HUMAN BIOLOGY (08 Periods)**

Introduction of body as a whole, Physiology of Blood. Digestive system, Respiratory system and Endocrine system. Biological axons and neurons, Neuromuscular and synaptic junctions.

**Module 5 PHOTOSYNTHESIS (07 Periods)**

Bacterial & Plant photosynthesis; oxygenic and anoxygenic photosynthesis; chlorophyll as trapper of solar energy, photosynthetic reaction centres, Hill reaction, PS I & PS II, Photophosphorylation - cyclic & noncyclic; Dark reaction & CO<sub>2</sub> fixation.

**Total Periods: 45**

**EXPERIENTIAL LEARNING**

**LIST OF EXERCISES:**

1. Student will be asked to identify the Cell and Cellular organelle spotters and should write the functions of spotters identified
2. Students will be asked to prepare a table of disease causing Protozoans.
3. Students will be asked to prepare assignments for Central dogma of Molecular biology
4. Students have to identify different organs in the organ system diagrams.
5. Students will be given assignments on the topic of photosynthesis.

**RESOURCES**

**TEXT BOOKS:**

1. C. Ratledge and B. Kristiansen, Basic Biotechnology, 3rd edition, Cambridge University press, 2006.
2. A. Waugh, Ross and Wilson's Anatomy and Physiology in Health and Illness, 13th edition, Elsevier, 2018.

**REFERENCE BOOKS:**

1. F. B. Salisbury and C.W. Ross, Plant Physiology, 3rd Edition, CBS publisher, 2006.
2. C. C Chatterjee, Human Physiology, Vol 1 & 2, 13<sup>th</sup> Edition, CBS publisher, 2020

**VIDEO LECTURES:**

1. <https://www.youtube.com/watch?v=N0Y386SVGN8>
2. <https://www.youtube.com/watch?v=nqG9zsvd1Rk>
3. <https://www.youtube.com/watch?v=zBkN-rRleho>

**Web Resources:**

1. <https://www.biologydiscussion.com/plant-taxonomy/quick-notes-on-plant-taxonomy/47582>
2. <https://www.toppr.com/guides/biology/diversity-in-living-organisms/animal-kingdom/>
3. <https://www.youtube.com/watch?v=X3TAR0otFfM>
4. [https://www.youtube.com/watch?v=ZW9zPdb\\_Bs0](https://www.youtube.com/watch?v=ZW9zPdb_Bs0)



## SCHOOL CORE

<b>Course Code</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>
<b>22LG101401</b>	<b>PERSONALITY DEVELOPMENT</b>	2	-	-	-	2
<b>Pre-Requisite</b>	-					
<b>Anti-Requisite</b>	-					
<b>Co-Requisite</b>	-					

**COURSE DESCRIPTION:** This course gives awareness to students about the various dynamics of personality developments.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

- CO1.** Demonstrate knowledge of leadership qualities by examining and applying personality traits through Positive self esteem, Open Communication and Self-Righteousness.
- CO2.** Analyze the limitations of Attitudes by applying and demonstrating communication traits through decision Making, Ethics and Self Actualization.
- CO3.** Apply appropriate Analyzing techniques for comprehending different personalities by examining Positive and Negative Characteristic Traits and demonstrating through Leadership Styles, Mentoring and Behaviour Modification.
- CO4.** Apply appropriate techniques in Solving Problems by examining and demonstrating Time Management, Stress Management and Anger Management.

### CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
<b>CO1</b>	2	1	-	3		-	-	1	-
<b>CO2</b>	2	3	-	3		-	-	1	-
<b>CO3</b>	2	2	-	3		-	-	2	-
<b>CO4</b>	3	1	-	2		-	-	3	-
Course Correlation Mapping	2	2	-	3		-	-	2	-

*Correlation Levels:      3: High;      2: Medium;      1: Low*

## COURSE CONTENT

### **Module 1: PERSONALITIES AND LEADERSHIP QUALITIES (06 Periods)**

Introduction: Different Personalities - Personality Analysis - Freudian Analysis – Vedantic Concept: Swamy Vivekananda - Personality Begets - Types- Leadership Qualities - Decision Making - Case Studies: Personalities, - Exercises.

### **Module 2: SELF ESTEEM AND SELF DEVELOPMENT (06 Periods)**

**Know Yourself:** Self Image - Positive Self Esteem -Turn Failure into Success - Be Sensitive to Feedback - Build Self Confidence – Self Actualization - Set Goals - Action Plans - Accountability – Behavior Modification – Mentoring - Learning- Counseling – Challenge yourself with Aptitude Tests and Internships, - Exercises.

### **Module 3 ATTITUDE (06 Periods)**

Importance – Difference between Behavior and Attitude - Changing Negative Attitude- Impact of Attitudes on others - Unproductive Attitudes –Assess your Behaviour - Exercises.

### **Module 4 COMMUNICATION RELATIONSHIP (06 Periods)**

Introduction – Positive and Negative Characteristic Traits - Grapevine Communication – Open Communication; Team Player - Leadership styles – Performance Expectations - Electronic Communication; Text Messaging – Voicemail – e-Mail, - Exercises.

### **Module 5 CRITICAL WORK SKILLS AND ETHICS (06 Periods)**

Time Management - Balancing Life and Work - Stress Management - Anger Management - Making Decisions and Solving Problems - Developing Creativity - Ethics and Self-Righteousness – Being Judgemental in the Real World - Striving for Integrity, - Exercises.

**Total Periods: 30**

## EXPERIENTIAL LEARNING

1. List out the positive traits in you on the charts and explain in detail.
2. Discuss different famous personalities and their leadership styles.
3. What do you know about values and beliefs discuss elaborately.
4. Illustrate the morals that you follow in your that you practice in your life.
5. Interpret the role of different personalities in *Bhagavad Gita*.

## RESOURCES

### TEXTBOOK:

- 1 Harold R. Wallace and L. Ann Masters, *Personal Development for Life and Work*, Cengage Learning, Delhi, 10<sup>th</sup> edition Indian Reprint, 2011. (6<sup>th</sup> Indian Reprint 2015)
- 2 Barun K. Mitra, *Personality Development and Soft Skills*, Oxford University Press, 2011.

### REFERENCE BOOKS:

1. K. Alex, *Soft Skills*, S. Chand & Company Ltd, New Delhi, 2<sup>nd</sup> Revised Edition, 2011.
2. Stephen P. Robbins and Timothy A. Judge, *Organizational Behaviour*, Prentice Hall, Delhi, 16<sup>th</sup> edition, 2014

**VIDEO LECTURES:**

1. <https://www.youtube.com/watch?v=6Y5VWBLi1es>
2. <https://www.youtube.com/watch?v=H9qA3inVMrA>

**Web Resources:**

1. <https://www.universalclass.com/.../the-process-of-perso...>
2. <https://www.ncbi.nlm.nih.gov/pubmed/25545842>
3. <https://www.youtube.com/watch?v=Tuw8hxrFBH8>

## SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
<b>22BS101401</b>	<b>ENVIRONMENTAL STUDIES</b>	2	-	-	-	2
<b>Pre-Requisite</b>	-					
<b>Anti-Requisite</b>	-					
<b>Co-Requisite</b>	-					

**COURSE DESCRIPTION:** This course provides a detailed discussion on multidisciplinary nature of environmental studies, scope and importance of environmental education, ecosystems, ecology, renewable and non-renewable energy resources. Biodiversity and its conservation. Environmental pollution and its control measures, global environmental issues and Acts. Green Chemistry and its tools.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

- CO1** Understand the natural environment, and to realize the importance of the renewable energy sources.
- CO2** Acquire knowledge of various sources of water pollution and the management of municipal and Industrial wastewater.
- CO3** Summarize the various environmental pollution and its control measures.
- CO4** Get familiarized on climate and social issues arising due to environmental disorders.
- CO5** Gain awareness on Green technology and its tools.

### CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
<b>CO1</b>	3	-	-	-	3	2	-	-	-
<b>CO2</b>	3	-	-	-	3	2	-	-	-
<b>CO3</b>	3	-	-	-	3	3	-	-	-
<b>CO4</b>	2	-	-	-	3	3	-	-	2
<b>CO5</b>	3	-	-	2	3	-	-	-	2
<b>Course Correlation Mapping</b>	<b>3</b>	-	-	<b>2</b>	3	<b>3</b>	-	-	<b>2</b>

*Correlation Levels: 3: High; 2: Medium; 1: Low*

## **COURSE CONTENT**

### **Module 1: ENERGY SOURCES**

**(06 Periods)**

**Renewable energy Resources:** Solar energy - solar cells, wind energy, tidal energy.

**Non-renewable energy resources:** Natural gas, coal gas, biogas.

### **Module 2: WATER POLLUTION**

**(06 Periods)**

Potable water, Sources of water, impurities in water and their consequences, Eutrophication, Effect of Hardness of water, Municipal and Industrial wastewater management.

### **Module 3: ENVIRONMENTAL POLLUTION AND ITS CONTROL MEASURES**

**(06 Periods)**

Definition, causes, effects and control measures of: Air, Water (thermal and marine pollution), Land pollution, Radiation pollution and Nuclear hazard, Noise pollution, Overgrazing, effects of modern agriculture – fertilizer and pesticides.

### **Module 4: ENVIRONMENTAL AND SOCIAL ISSUES**

**(06 Periods)**

**Climate changes:** global warming, acid rain, ozone layer depletion, nuclear accidents.

**Social Issues:** Population growth, variation among nations and population explosion. Urban problems related to Water conservation, rain water harvesting and watershed management.

### **Module 5: GREEN TECHNOLOGY**

**(06 Periods)**

Introduction, principles of green chemistry, tools of green chemistry, Green Computing, green construction, Green manufacturing Systems.

**Total Periods: 30**

## **EXPERIENTIAL LEARNING**

1. Submit a document on your plan of action in maintaining the sustainable environment.
2. Visit the Tirupathi Municipal corporation water treatment plant and submit a report on your observations
3. List any two major environmental issues in Tirupathi and make a report with solutions using your expertise.
4. Submit your ideas on the importance of Environmental Education for technical students.
5. How do unequal urban planning and green space distribution affect temperatures in a city?
6. How are water sources affected by urbanization?

## **RESOURCES**

### **TEXT BOOKS:**

- 1 Anubha Kaushik and C. P. Kaushik, Perspectives in Environmental Studies, New Age International (P) Ltd. Publications, 6 th Edition, 2018.
- 2 Erach Barucha, Environmental Studies, Orient Blackswan, 2nd Edition, 2013.

**REFERENCE BOOKS:**

- 1 Benny Joseph, Environmental Studies, Tata McGraw-Hill, 2nd Edition, 2009.
- 2 Cunningham W.P. and Cunningham M.A., Principles of Environmental Science, Tata McGraw-Hill Publishing Company, New Delhi, 8th Edition, 2016.

**VIDEO LECTURES:**

- 1 <https://study.com/academy/lesson/what-is-environmental-science-definition-and-scope-of-the-field.html>
- 2 <https://www.youtube.com/watch?v=Y5B1nWYle40>
- 3 <https://www.digimat.in/nptel/courses/video/127105018/L26.html>

**Web Resources:**

- 1 <https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf>
- 2 <https://www.hzu.edu.in/bed/E%20V%20S.pdf>
- 3 <https://cpcb.nic.in/7thEditionPollutionControlLawSeries2021.pdf>
- 4 <https://www.clearias.com/environmental-laws-india/>

## PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
<b>22BS102013</b>	<b>INORGANIC AND PHYSICAL CHEMISTRY</b>	3	-	3	-	4.5
<b>Pre-Requisite</b>	-					
<b>Anti-Requisite</b>	-					
<b>Co-Requisite</b>	-					

**COURSE DESCRIPTION:** This course provides a detailed discussion on the chemistry of p, d and f block elements, Theories of Bonding in Metals, liquid state, Solutions and applications of X-ray diffraction to study solids.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

- CO1.** Understand the advanced concepts of p, d and f block elements.
- CO2.** Study and Analyze the properties and conductivity of metals.
- CO3.** Explain the liquid crystals properties and their applications.
- CO4.** Identify and Summarize the important feature of solutions.
- CO5.** Know basics and role of X-ray diffraction to study solids.
- CO6.** Work independently and in teams to solve problems with effective communications

### CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
<b>CO1</b>	3	-	2	-	-	-	-	-	2	-	-	3
<b>CO2</b>	3	-	-	-	-	-	-	-	-	-	-	3
<b>CO3</b>	3	-	-	-	-	-	-	-	-	-	-	3
<b>CO4</b>	3	1	-	-	-	-	-	-	-	-	-	-
<b>CO5</b>	3	-	-	1	-	-	-	-	2	-	-	-
<b>CO6</b>							3	3				
Course Correlation Mapping	3	1	2	1	-	-	3	3	2	-	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

## COURSE CONTENT

### Module 1: CHEMISTRY OF p-BLOCK ELEMENTS

(08 Periods)

Group 13: Synthesis and structure of diborane and higher Boranes ( $B_4H_{10}$  and  $B_5H_9$ ), Boron nitrogen compounds ( $B_3N_3H_6$  and BN), Lewis acid nature of  $BX_3$

Group 14: Preparation, classification and uses of silicones.

Group 15: Nitrides –Classification –ionic, covalent and interstitial. Reactivity– hydrolysis. Preparation and reactions of hydrazine, hydroxyl amine, phosphazenes.

Group 16: Oxides and Oxoacids of Sulphur (structures only).

Group 17: Pseudohalogens, Structures of Interhalogen compounds.

### Module 2: CHEMISTRY OF d AND f -BLOCK ELEMENTS

(10 Periods)

**d-block Elements:** Characteristics of d-block elements with special reference to electronic configuration, variable valence, magnetic properties, catalytic properties and ability to form complexes. Stability of various oxidation states.

**f-block Elements:** Chemistry of lanthanides - electronic structure, oxidation states, lanthanide contraction, consequences of lanthanide contraction, magnetic properties. Chemistry of actinides - electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

### Module 3: THEORIES OF BONDING IN METALS

(08 Periods)

Metallic properties and its limitations, Valence bond theory, Free electron theory, Explanation of thermal and electrical conductivity of metals, Band theory- formation of bands, explanation of conductors, semiconductors and insulators.

### Module 4: LIQUID STATE AND SOLUTIONS

(10 Periods)

**Liquid State:** Structural differences between solids, liquids and gases. Liquid crystals, Classification of liquid crystals, Properties of Liquid crystals, Application of liquid crystals.

**Solutions:** ideal solutions, Raoult's law. Ideally dilute solutions, Henry's law. Non-ideal solutions. Azeotropes-HCl- $H_2O$ , ethanol-water systems, Partially miscible liquids-phenol-water, Effect of impurity on consolute temperature. Immiscible liquids and steam distillation. Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

### Module 5: SOLID STATE

(09 Periods)

Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. The law of symmetry. Definition of lattice point, space lattice, unit cell. Bravais lattices and crystal systems. X-ray diffraction and crystal structure. Bragg's law. Defects in crystals.

**Total Periods: 45**



## EXPERIENTIAL LEARNING

**LIST OF EXERCISES:** (Minimum 10 exercises shall be conducted)

### Qualitative inorganic analysis

Analysis of mixture salt containing two anions and two cations (From two different groups) from the following.

**Anions:**

Carbonate  
Sulphate  
Chloride  
Bromide  
Acetate  
Nitrate  
Borate  
Phosphate

**Cations:**

Lead  
Copper  
Iron  
Aluminum  
Zinc  
Manganese  
Calcium  
Strontium  
Barium  
Potassium  
Ammonium

A student has to identify two cations and two anions from the mixture selected by the faculty on the given day.

## RESOURCES

### TEXT BOOKS:

- 1 Madan Malik Tuli, Text Book of Inorganic Chemistry, 4<sup>th</sup> Edition, S. Chand & Company, New Delhi, 2018
- 2 Samuel Glasstone, Text book of Physical Chemistry, 2nd Edition, D. Van Nostrand company, inc., 1940.

### REFERENCE BOOKS:

- 1 J.E. Huheey, Inorganic Chemistry, 2nd Edition, McGraw Hill, 2015.
- 2 Bahl and Tuli, Advanced physical chemistry, 28<sup>th</sup> Edition, schamd publishers, 2020.

### VIDEO LECTURES:

- 1 <https://www.youtube.com/watch?v=Nmp6APGBtz0>
- 2 <https://youtu.be/ALAAALyxayM>

### Web Resources:

- 1 [https://books.google.co.in/books?id=UOV9\\_MJH7w8C&printsec=frontcover&source=gbs\\_ge\\_summary\\_r&cad=0#v=onepage&q&f=false](https://books.google.co.in/books?id=UOV9_MJH7w8C&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false)
- 2 <https://www.ebooknetworking.net/ebooks/inorganic-chemistry-malik-madan-tuli.html>
- 3 <https://www.sciencedirect.com/book/9780120442621/a-textbook-of-physical-chemistry>
- 4 <https://chemistryhall.com/best-physical-chemistry-textbook/>

## PROGRAM CORE

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>
<b>22BS102006</b>	<b>BIOMOLECULES</b>	3	-	3	-	4.5
<b>Pre-Requisite</b>	-					
<b>Anti-Requisite</b>	-					
<b>Co-Requisite</b>	-					

**COURSE DESCRIPTION:** This course provides a detailed discussion on Carbohydrates, Amino acids and Proteins, Lipids and Fatty acids, Nucleic Acids and chromatin, Porphyrins and cytochromes, and hands on experience on carbohydrate, amino acid, lipid and nucleic acid analysis.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

- CO1** Understand the basic concepts of carbohydrates' structures, reactions and functions.
- CO2** Identify different amino acids present in the proteins and their functions.
- CO3** Demonstrate the role of lipids in the formation of bio-membranes.
- CO4** Understand the composition, structure and function of Nucleic acids and Porphyrins and Renaturation kinetics of DNA.
- CO5** Analyze carbohydrates, amino acids, proteins, lipids and nucleic acids qualitatively, and work independently and in teams to solve problems with effective communications.

### CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	-	-	-	-	-	-	-	-	3	-
<b>CO2</b>	3	3	-	-	-	-	-	-	-	-	3	-
<b>CO3</b>	3	3	-	-	-	-	-	-	-	-	3	-
<b>CO4</b>	3	3	-	-	-	-	-	-	-	-	3	-
<b>CO5</b>	3	3	-	3	-	-	3	-	-	-	3	-
<b>Course Correlation Mapping</b>	<b>3</b>	<b>3</b>	-	<b>3</b>	-	-	<b>3</b>	-	-	-	<b>3</b>	-

*Correlation Levels:                      3: High;                      2: Medium;                      1: Low*

## **COURSE CONTENT**

### **Module 1: CARBOHYDRATES**

**(10 Periods)**

Classification of carbohydrates, Anomers, Epimers, Monosaccharides, disaccharides- Maltose, Lactose, Sucrose, Cellobiose, Trehalose. Trisaccharides- Melezitose, Gentiobiose, Polysaccharides- structural (Cellulose and Chitin), Storage Polysaccharides- Starch, Glycogen, Mucopolysaccharides- Hyaluronic acid, Heparan sulfate, Dermatan sulfate, Keratan sulfate, Heparin, Chondroitin sulfate. Glycolipids and Glycoproteins, Bacterial cell wall polysaccharides, Blood group substances

### **Module 2: AMINOACIDS AND PROTEINS**

**(10 Periods)**

Aminoacid classification, Essential aminoacids, Reactions due to carboxyl and Amino groups, Peptide bond, Titration curve of Glycine and Side chain containing aminoacids, Proteins- Primary, Secondary, Teritiary and Quarternary structures, Protein sequencing methods, Isolation and characterization of Proteins, Denaturation and Renaturation of proteins, Structure of Hemoglobin, Natural peptides- Glutathione.

### **Module 3: LIPIDS AND FATTY ACIDS**

**(9 Periods)**

Classification of Lipids, Essential Fatty acids, Triglycerides, Phospholipids, Membrane structure and composition, Membrane theories, Bilayer formation, Micelles, Liposomes, Vesicles, Poly unsaturated fatty acids (PUFA's), Saponification number, Iodine number, Acid number, RM number, Rancidity, Lipoproteins and their formation, Waxes and oils, Fats, Sphingolipids, Prostaglandins and their functions.

### **Module 4: NUCLEIC ACIDS AND CHROMATIN**

**(10 Periods)**

Structures of Nitrogenous bases, , Nucleosides, Nucleotides. Phosphodiester bond and its formation, Types of DNA and RNA, Nucleases, Watson Crick model, Denaturation Kinetics, melting temperature (T<sub>m</sub>), Hyperchromic effect, Hypochromic effect, Renaturation Kinetics, Cot curves, deviations from Watson crick base pairing, Chargaff's rule, Chromatin, Chromosomes, Histones, Polyamines.

### **Module 5: PORPHYRINS**

**(06 Periods)**

Porphyrin types, Porphobilinogen, Heme, Chlorophyll, cytochromes, cyanocobalamin, Identification of Porphyrins, Porphyrins, synthesis of heme, carotenoids, Xanthophylls.

**Total Periods: 45**

## **EXPERIENTIAL LEARNING: (Minimum 10 experiments shall be conducted)**

### **LIST OF EXERCISES:**

1. Qualitative Analysis of Carbohydrates – Glucose, Fructose, Xylose
2. Qualitative Analysis of Carbohydrates – Disaccharides Lactose, Maltose, Sucrose
3. Qualitative Analysis of Carbohydrates - Polysaccharide Starch
4. Qualitative Analysis of Aminoacids Aromatic aminoacids- Phenyl alanine, Tyrosine, Tryptophan
5. Qualitative Analysis of Aminoacids - Methionine, Histidine
6. Qualitative Analysis of Aminoacids - Arginine and Proline
7. Qualitative Analysis of Lipids
8. Qualitative analysis of Nucleotides and Nitrogen bases
9. Preparation of Acidic, Basic and Neutral Buffers using pH meter
10. Absorption spectra of Proteins and Nucleic acids
11. Absorption spectra of proteins
12. Absorption maxima of p-Nitro phenol

## **RESOURCES**

### **TEXT BOOKS:**

- 1 E. S. West, W. Todd, H.S.Mason, J.T Van Bruggen, Text book of Biochemistry, 4<sup>th</sup> Edition, MacMillan, 1974.
- 2 D. Voet and J. G. Voet, Biochemistry, 5th Edition, John Wiley and Sons, 2018.
- 3 J. Jayaraman, Laboratory manual of Biochemistry, 2<sup>nd</sup> Edition, New Age,2012.

### **REFERENCE BOOKS:**

- 1 D. L. Nelson and M. M. Cox, Lehninger's Principles of Biochemistry, Eighth Edition, W. H. Freeman publishers, 2021.
- 2 J. M. Berg, L. Stryer, J. Tymoczko and G. Gatto, Biochemistry, W. H. Freeman Publishers, 9th Edition, 2019.

### **VIDEO LECTURES:**

- 1 <https://www.Youtube.com/watch?v=ArKSKLGk304>
- 2 <https://www.Youtube.com/watch?v=sEVJXB5ZidA>
- 3 <https://www.Youtube.com/watch?v=s1MoBTEcVYY>

### **Web Resources:**

- 1 <https://www.Youtube.com/watch?v=b1nxDW5HPjE>
- 2 <https://www.Youtube.com/watch?v=6u0jHuG3kgc>
- 3 <https://www.Youtube.com/watch?v=piXHivrTT-E>
- 4 [https://www.Youtube.com/watch?v=o\\_-6JXLYS-k](https://www.Youtube.com/watch?v=o_-6JXLYS-k)

## PROGRAM CORE

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>
<b>22BS102007</b>	<b>BIOPHYSICAL TECHNIQUES</b>	3	-	3	-	4.5
<b>Pre-Requisite</b>	<b>22BS102006 - BIOMOLECULES</b>					
<b>Anti-Requisite</b>	-					
<b>Co-Requisite</b>	-					

**COURSE DESCRIPTION:** This course provides a detailed discussion on Biophysical concepts, Chromatography, Centrifugation, Electrophoresis, Spectroscopy and Radioisotopes, and hands-on experience on Isolation and characterization of biomolecules.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

- CO1.** Understand biophysical concepts, water quality parameters and water pollutants.
- CO2.** Identify different tools for tissue homogenization and techniques to separate Biochemical constituents.
- CO3.** Analyze various biochemical constituents in biological mixtures by using techniques such as Chromatography, Electrophoresis and identification by spectroscopy.
- CO4.** Gain knowledge on Radioisotopes, radioactive emission, radioactive hazards and applications of radioisotopes in biology.
- CO5.** Apply suitable methods for isolation and characterization of different biological constituents.
- CO6.** Work independently and in teams to solve problems with effective communications.

### CO-PO-PSO Mapping Table:

Learning Outcomes	Program Outcomes									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	-	1	3	-	-	-	-	-	3	-
<b>CO2</b>	3	3	-	2	-	-	-	-	-	-	3	-
<b>CO3</b>	3	3	-	2	-	-	-	-	-	-	3	-
<b>CO4</b>	3	3	-	2	-	-	-	-	-	-	3	-
<b>CO5</b>	3	3	-	3	-	-	-	-	-	-	3	-
<b>CO6</b>	3	3	-	-	-	-	3	-	-	-	3	-
<b>Course Correlation Mapping</b>	<b>3</b>	<b>3</b>	-	<b>2</b>	<b>3</b>	-	<b>3</b>	-	-	-	<b>3</b>	-

**Correlation Levels:      3: High;      2: Medium; 1: Low**

## **COURSE CONTENT**

### **Module 1: BIOPHYSICAL CONCEPTS**

**(08 Periods)**

Water as biological solvent, Buffers, Henderson Hasselbalch equation. Acid dissociation  $K_a$ ,  $pK_a$ , measurement of pH, Biological relevance of pH, pH meter, Oxygen electrode, water quality parameters, BOD, COD, DO and TDS, Electrical conductivity.

### **Module 2: HOMOGENIZATION AND CENTRIFUGATION**

**(07Periods)**

Homogenization techniques - Mortar and Pestle, Potter Elvehjem, Ultra sonication, French press and Microfluidizer. Principles of centrifugation, Svedberg, Centrifugal force, RCF, RPM, Preparative centrifugation, Differential centrifugation Density gradient-Rate zonal and isopycnic, Ultracentrifugation, Analytical ultra centrifugation, sedimentation equilibrium and Sedimentation velocity.

### **Module 3: CHROMATOGRAPHY**

**(10 Periods)**

Chromatography principle, Types of chromatography, Paper chromatography,  $R_f$  Value and its importance. Partition Principle and Partition coefficient, Thin layer chromatography, Gel filtration, Ion exchange and separation of metal ions using Ion exchange chromatography, Affinity chromatography, Determination of Molecular weight of protein by Gel filtration chromatography.

### **Module 4 ELECTROPHORESIS**

**(10 Periods)**

Basics of Electrophoresis, Paper Electrophoresis, SDS PAGE, Native PAGE, Determination of Molecular weight using SDS PAGE, Isoelectric focussing, Chromato focussing, Capillary Electrophoresis, Immuno Electrophoresis.

### **Module 5 SPECTROSCOPY AND RADIOISOTOPES**

**(10 Periods)**

Laws of Absorption, Absorbance, Transmittance, Colorimeter, U.V- Visible spectroscopy and its applications, Fluorescence, Jabalonski diagram, Stoke's shift and Fluorimetry, Radio activity, Half life period, Radio activity units, safety measures in Radiation laboratories, Different types of radio activity measurements, GM counter, Liquid scintillography, Uses of Radio isotopes in Biology, Half life, Units of Radioactivity.

**Total Periods: 45**

## **EXPERIENTIAL LEARNING (Minimum 10 experiments shall be conducted)**

### **LIST OF EXERCISES:**

1. Separation of Amino acids by Paper Chromatography
2. Separation of carbohydrates by TLC
3. Separation of Plant pigments by TLC
4. Separation of Nucleic acids by Agarose Gel Electrophoresis
5. Extraction of starch from potatoes
6. Isolation of DNA from Plant source
7. Isolation of DNA from bacteria/yeast
8. Isolation of Albumin from Egg
9. Isolation of Cholesterol from Egg yolk.
10. Isolation of Casein from milk
11. Immobilization of Yeast
12. Paper Electrophoresis of serum proteins.

## **RESOURCES**

### **TEXT BOOKS:**

1. A. Upadhyay, K. Upadhyay and N. Nath, Biophysical Chemistry Principles and Techniques, Fourth Revised Edition, Himalaya publishing house, 2020.
2. J. Jayaraman, Laboratory manual in Biochemistry, 3<sup>rd</sup> Edition, New Age, 2012.

### **REFERENCE BOOKS:**

1. K. Wilson and J. Walker, Principles and Techniques of Biochemistry and Molecular Biology, 8<sup>th</sup> Edition, Cambridge University Press, 2018.
2. G. Karp, J. Iwasa and W. Marshall, Cell and Molecular Biology: Concepts and Experiments, 8<sup>th</sup> Edition, Wiley publisher, 2015.

### **VIDEO LECTURES:**

1. <https://www.youtube.com/watch?v=ZCzgQXGz9Tg>
2. <https://www.youtube.com/watch?v=bFzHhM1iMKA>

### **Web Resources:**

1. <https://www.youtube.com/watch?v=sajIWFUGEbw>
2. <https://www.youtube.com/watch?v=8cYvyYOjzOc>

## PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
<b>22BS102001</b>	<b>INTRODUCTION TO BIOINFORMATICS</b>	3	-	3	-	4.5
<b>Pre-Requisite</b>	-					
<b>Anti-Requisite</b>	-					
<b>Co-Requisite</b>	-					

**COURSE DESCRIPTION:** This course provides a detailed discussion on Introduction to Bioinformatics, Biological databases, data storage and retrieval methods, sequence alignments, and sequence structure and visualization tools. Also, hands-on experience on different basic Bioinformatics tools.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

- CO1.** Understand interdisciplinary nature of bioinformatics, different tools used in Molecular biology.
- CO2.** Identify databases to be searched for Biomolecules data.
- CO3.** Analyze protein and nucleic acid sequences with appropriate sequence alignment methods using different tools.
- CO4.** Analyze Biological data using different bioinformatics tools.
- CO5.** Work independently and in teams to solve problems with effective communications.

### CO-PO-PSO Mapping Table:

Learning Outcomes	Program Outcomes									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
<b>CO1</b>	3	-	-	-	-	-	-	-	-	3	-	-
<b>CO2</b>	3	2	-	-	-	-	-	-	-	3	-	-
<b>CO3</b>	3	3	-	3	-	-	-	-	-	3	-	-
<b>CO4</b>	3	3	-	3	-	-	-	-	-	3	-	-
<b>CO5</b>	3	3	-	-	-	-	3	-	-	3	-	-
<b>Course Correlation Mapping</b>	<b>3</b>	<b>3</b>	-	<b>3</b>	-	-	<b>3</b>	-	-	<b>3</b>	-	-

**Correlation Levels:      3: High;      2: Medium;1: Low**



## **COURSE CONTENT**

### **Module 1: INTRODUCTION TO BIOINFORMATICS (10 Periods)**

Introduction to Bioinformatics, Inter disciplinary nature of Bioinformatics, bioinformatics and its relation with molecular biology. Examples of related tools (FASTA, BLAST, BLAT, RASMOL), databases(GENBANK, Pubmed, PDB ) and software(Chimera, Ligand Explorer). Generation of large scale molecular biology data. (Through Genome sequencing, Protein sequencing, Gel electrophoresis, NMR Spectroscopy, X-Ray Diffraction, and microarray). Applications of Bioinformatics.

### **Module 2: BIOLOGICAL DATABASE (11 Periods)**

Introduction to data types, Classification and Presentation of Data. Quality of data General Introduction of Biological Databases; Nucleic acid databases, NCBI, DDBJ, and EMBL. Protein databases, Primary, Composite, and Secondary. Specialized Genome databases: (SGD, TIGR, and ACeDB). Human Genome database. Structure databases (CATH, SCOP, and PDBsum).

### **Module 3 DATA STORAGE AND RETRIEVAL (09 Periods)**

Flat files, relational, object oriented databases and controlled vocabularies. File Format (Genbank, DDBJ, FASTA, PDB, SwissProt). Introduction to Metadata and search; Indices, Boolean, Neighboring search. Ontologies, interchange languages and standardization efforts.

### **Module 4 SEQUENCE ALIGNMENTS (09 Periods)**

Introduction to sequences, alignments and Dynamic Programming, Local alignment and Global alignment, Pairwise alignment (BLAST and FASTA Algorithm), multiple sequence alignment – progressive alignment, (Clustal W, CINEMA ), databases of multiple alignment and searching. Phylogenetic trees. Alignment Matrices – BLOSUM and PAM.

### **Module 5 Sequence and Structure visualization tools (06 Periods)**

Sequence visualization tools (Artemis, Seqvista), Structure visualization tools (Rasmol, SPDBV, Cn3d, PyMol, Chimera), Comprehensive packages, Commercial packages.

**Total Periods: 45**

## **EXPERIENTIAL LEARNING (Minimum 10 experiments shall be conducted)**

### **LIST OF EXPERIMENTS**

1. Introduction to databases and database searching
2. Database searching – Nucleic acid and protein sequence identification
3. Pair wise sequence analysis using BLAST
4. Pair wise sequence analysis using FASTA
5. Multiple sequence alignment using different programs
6. Colour schemes for Multiple sequence alignment using different editors
7. Generation of Phylogenetic trees
8. Molecular display program Rasmol
9. Molecular display program SPDBV
10. Molecular display program PyMol
11. Molecular display program Chimera
12. Demonstration of different Molecular drawing tools

## **RESOURCES**

### **TEXT BOOKS:**

1. Zoe Lacroix and Terence Critchlow, Bioinformatics, 1<sup>st</sup> edition, Morgan Kaufmann Publishers, 2003.
2. Orpita Bosu and S. K. Thukral, Bioinformatics, 1<sup>st</sup> edition, Oxford University press, 2007.

### **REFERENCE BOOKS:**

1. D. W. Mount, Bioinformatics: Genome and sequence analysis, 2<sup>nd</sup> edition, CBS Publications, New Delhi, 2004.
2. I. F. Tsigelny, Protein Structure Prediction, Bioinformatics approach, 1<sup>st</sup> edition, International University Line, 2002.

### **VIDEO LECTURES:**

1. <https://archive.nptel.ac.in/content//storage/102/106/102106065/MP4/mod01lec01.mp4>
2. <https://archive.nptel.ac.in/content//storage/102/106/102106065/MP4/mod01lec06.mp4>
3. <https://archive.nptel.ac.in/content//storage/102/106/102106065/MP4/mod02lec11.mp4>

### **Web Resources:**

1. <https://www.youtube.com/watch?v=28IMfTQTFas>
2. <https://www.youtube.com/watch?v=g9PJEDmoWn4>
3. <https://www.youtube.com/watch?v=LhpGz5--isw>
4. <https://www.youtube.com/watch?v=cq5lpR2Hqgw>

## PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
<b>22BS102014</b>	<b>BASIC ORGANIC CHEMISTRY</b>	3	-	3	-	4.5
<b>Pre-Requisite</b>	-					
<b>Anti-Requisite</b>	-					
<b>Co-Requisite</b>	-					

**COURSE DESCRIPTION:** This course provides a detailed discussion on basis of organic chemistry alkanes, cycloalkanes, alkenes and alkynes. Benzene and its reactivity. Surface chemistry and selectrochemistry of organic compounds.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

- CO1.** Recall and apply the basic concepts of nomenclature, classification and basic properties of organic compounds.
- CO2.** Understand and explain differential behaviour organic compound based on the fundamental concepts learnt.
- CO3.** Formulate and identify the mechanism of organic reactions by recalling and correlating the fundamental properties of the reactants learnt.
- CO4.** Describe the concept of aromaticity, molecular structure of benzene based on modern concepts. Ring activating and deactivating groups.
- CO5.** Correlate and explain stereo chemical properties of organic compounds and configurations.
- CO6.** Develops independent working ability, through problem solving and effective communication.

### CO-PO-PSO Mapping Table:

Learning Outcomes	Program Outcomes									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
<b>CO1</b>	3	-	-	-	-	-	-	-	-	-	-	3
<b>CO2</b>	3	1	-	-	1	-	-	-	-	-	-	3
<b>CO3</b>	3	1	-	-	1	-	-	-	-	-	-	3
<b>CO4</b>	2	1	-	-	1	-	-	-	-	-	-	3
<b>CO5</b>	2	2	-	-	-	-	-	-	-	-	-	3
<b>CO6</b>	3	-	1	1	1	2	2	1	1	-	-	3
<b>Course Correlation Mapping</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	-	-	<b>3</b>

**Correlation Levels:      3: High;      2: Medium;      1: Low**

## **COURSE CONTENT**

### **Module 1: NOMENCLATURE, CLASSIFICATION AND BASIC PROPERTIES (09 Periods)**

Trivial, IUPAC nomenclature, Classification, Geometry of molecules, Hybridization. Cleavage of bonds: homolytic and heterolytic cleavages. Inductive, mesomeric, resonance, hyperconjugation and steric effects. Tautomerism: Definition, keto-enol tautomerism. Stability of reaction intermediates, carbocation, carbanion, and free radicals.

### **Module 2: ALKANES AND CYCLOALKANES (08 Periods)**

**Alkanes:** General methods of preparation of alkanes Wurtz, Wurtz-Fitting and Corey-House reaction. Physical and chemical properties of alkanes, isomerism and its effects on properties. Free radical substitution, Halogenation, concept of reactivity v/s selectivity.

**Cycloalkanes:** Nomenclature, Preparation by Freund's method, Types of cycloalkanes and their relative stability, Baeyer strain theory, Conformations of cyclohexane with energy diagram.

### **Module 3: ALKENES AND ALKYNES (10 Periods)**

**Alkenes:** General methods of preparation, physical and chemical properties.

**Reaction Mechanisms:** Elimination (E1, E2, E1c<sub>b</sub>, Hoffmann and Saytzeff), electrophilic addition (Markownikoff's/ AntiMarkownikoff), Free radical addition, addition of hydrogen, halogen, hydrogen halide (Markownikoff's rule), hydrogen bromide (peroxide effect). Hydroboration, ozonolysis, hydroxylation.

**Dienes:** Stability of dienes (conjugated, isolated and cumulative dienes)

General methods of preparation, mechanism of dehydrohalogenation.

**Reactions:** Mechanism of 1,2- and 1,4-additions, Diels-Alder reactions.

**Alkynes:** Preparation: Mechanism of dehydrohalogenation and dehydrogenation.

**Reactions:** Acidity of alkynes, Mechanism of addition of water, hydrogen halides and halogens, oxidation, ozonolysis and hydroboration/oxidation.

### **Module 4: BENZENE AND ITS REACTIVITY (08 Periods)**

Concept of aromaticity - aromaticity (definition), Huckel's rule - application to Benzenoid (Benzene, Naphthalene) and Non-Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation), Molecular structure of Benzene based on modern concepts (VBT and MOT).

**Reactions:** Mechanism of nitration, Friedel Craft's alkylation and acylation. Orientation of aromatic substitution-Definition of ortho, para and meta directing groups. Ring activating and deactivating groups with examples (i) Amino, methoxy and methyl groups (ii) Carboxy, nitro, nitrile, carbonyl and sulphonic acid groups (iii) Halogens.

### **Module 5: STEREOCHEMISTRY OF CARBON COMPOUNDS (10 Periods)**

Optical isomerism: Optical activity-wave nature of light, plane polarised light, optical rotation and specific rotation.

Chiral molecules-definition and criteria (Symmetry elements)-Definition of enantiomers and diastereomers-Explanation of optical isomerism with examples Glyceraldehyde, Lactic acid, Alanine, Tartaric acid, 2,3-dibromopentane.

D,L and R,S configuration methods and E,Z- configuration with examples.

**Total Periods: 45**

## EXPERIENTIAL LEARNING

**LIST OF EXPERIMENTS:** (Minimum 10 exercises shall be conducted)

### ORGANIC QUALITATIVE ANALYSIS

1. Determination of melting and boiling points of organic substances.
2. Analysis of Organic compounds:
  - a. Identification of acidic, basic, phenolic, and neutral organic substances.
  - b. Detection of N, S and halogens.
  - c. Test for aliphatic and aromatic nature of substances.
  - d. Test for saturation and unsaturation.
  - e. Identification of functional groups:
    - i) Carboxylic acids ii) Phenols iii) Aldehydes iv) Ketones v) Esters
    - vi) Carbohydrates vii) Amines viii) Amides ix) Halogen compounds
  - f. Preparation of derivatives for the functional groups

## RESOURCES

### TEXT BOOKS:

1. R.P. Goyal, *Unified Chemistry-1*, Shivalal Agarwala & Company, New Delhi, 8<sup>th</sup> edition, 2015.
2. B.S. Furniss, A.J. Hannaford, P.W. G. Smith and A.R. Tatchell, *Vogel's Text Book of Practical Organic Chemistry*, Pearson Education, London, 5<sup>th</sup> edition, 2005.

### REFERENCE BOOKS:

1. Jerry March, *Advanced Organic Chemistry*, John Wiley And Sons, New York, 4<sup>th</sup> Edition, 1992.
2. P. S. Kalsi, *Stereochemistry: Conformation and Mechanism*, Wiley Eastern Ltd, New Delhi, 2<sup>nd</sup> edition, 1993.

### VIDEO LECTURES:

1. <https://archive.nptel.ac.in/courses/104/101/104101115/>
2. <https://archive.nptel.ac.in/courses/104/106/104106127/>
3. <https://www.youtube.com/watch?v=nDV5yWfHKko>

### Web Resources:

1. <https://www.vedantu.com/chemistry/benzene-reactions>
2. [https://www.angelo.edu/faculty/kboudrea/organic/IUPAC\\_Handout.pdf](https://www.angelo.edu/faculty/kboudrea/organic/IUPAC_Handout.pdf)
3. <https://www.vanderbilt.edu/AnS/Chemistry/Rizzo/chem220a/Ch3slides.pdf>
4. [https://faculty.ksu.edu.sa/sites/default/files/vogel\\_-\\_practical\\_organic\\_chemistry\\_5th\\_edition.pdf](https://faculty.ksu.edu.sa/sites/default/files/vogel_-_practical_organic_chemistry_5th_edition.pdf)

## PROGRAM CORE

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>
<b>22BS101011</b>	<b>GENERAL CHEMISTRY</b>	3	-	-	-	3
<b>Pre-Requisite</b>	-					
<b>Anti-Requisite</b>	-					
<b>Co-Requisite</b>	-					

**COURSE DESCRIPTION:** This course provides a detailed discussion on basis of organic chemistry alkanes, cycloalkanes, alkenes and alkynes. Benzene and its reactivity. Surface chemistry and selectrochemistry of organic compounds.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

- CO1.** Understand and explain differential behaviour organic compound based on the fundamental concepts learnt.
- CO2.** Formulate and identify the mechanism of organic reactions by recalling and correlating the fundamental properties of the reactants learnt.
- CO3.** Describe the concept of aromaticity, molecular structure of benzene based on modern concepts. Ring activating and deactivating groups.
- CO4.** Explain about colloids, emulsions and their properties. Adsorption isotherms. Formation of molecular orbital, shapes of the molecules and predict the magnetic behaviour of the molecule.
- CO5.** Correlate and explain stereo chemical properties of organic compounds and configurations.

### CO-PO-PSO Mapping Table:

Learning Outcomes	Program Outcomes									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
<b>CO1</b>	3	-	-	-	-	-	-	-	-	-	-	3
<b>CO2</b>	3	-	-	-	-	-	-	-	-	-	-	3
<b>CO3</b>	3	-	-	-	-	-	-	-	-	-	-	3
<b>CO4</b>	3	1	-	1	-	-	-	-	1	-	-	3
<b>CO5</b>	3	-	-	-	-	-	-	-	-	-	-	3
<b>Course Correlation Mapping</b>	<b>3</b>	<b>1</b>	-	<b>1</b>	-	-	-	-	<b>1</b>	-	-	<b>3</b>

**Correlation Levels:      3: High;      2: Medium;      1: Low**

## **COURSE CONTENT**

### **Module 1: THEORIES OF BONDING IN METALS**

**(08 Periods)**

Valence bond theory, Explanation of metallic properties and its limitations, Free electron theory, thermal and electrical conductivity of metals, limitations, Band theory, formation of bands, explanation of conductors, semiconductors: n-type and p-type, extrinsic & intrinsic semiconductors, and insulators.

### **Module 2: MATERIAL SCIENCE**

**(08 Periods)**

Classification of materials- metals, ceramics, organic polymers, composites

**Ceramics**-Types and applications

**Conducting polymers**: Definition, types of conducting polymers: Intrinsic and extrinsic conducting polymers with examples, engineering applications of conducting polymers

**Composites** – Introduction, types of composites: fiber reinforced particulate and layered composites with examples, advantages of composites and applications

### **Module 3: CHROMATOGRAPHY**

**(10 Periods)**

Definition, principles of chromatography, Nature of adsorbents, solvent systems, Rf values, factors effecting Rf values.

Classification of chromatography methods: paper chromatography- choice of paper and solvent systems, developments of chromatogram - ascending, descending and radial, applications; Thin layer Chromatography- Preparation of plates. Development of the chromatogram, Detection of the spots, Applications.

### **Module 4: CHEMICAL BONDING AND MOLECULAR STRUCTURE**

**(10 Periods)**

Valence bond theory, hybridization, VB theory as applied to  $\text{ClF}_3$ ,  $\text{Ni}(\text{CO})_4$ , Molecular orbital theory - LCAO method, bonding and anti-bonding MOs and their Characteristics, construction of M.O. diagrams for homo-nuclear and hetero-nuclear diatomic molecules ( $\text{N}_2$ ,  $\text{O}_2$ ,  $\text{CO}$  and  $\text{NO}$ ), Comparison of VB and MO approaches.

### **Module 5: SURFACE CHEMISTRY**

**(09 Periods)**

**Colloids**: Definition. Solids in liquids (sols), properties - kinetic, optical, electrical. Stability of colloids, Hardy-Schulze law, protective colloid, gold number. Liquids in liquids (emulsions) properties, uses. Liquids in solids (gels) preparation, uses.

**Adsorption**: physisorption, chemisorption. Freundlich, Langmuir adsorption isotherms. Applications of adsorption.

**Total Periods: 45**

## EXPERIENTIAL LEARNING

### LIST OF EXERCISES:

1. How can you use metallic bonding theory to explain the physical properties of metals?
2. Narrate the role of material science modern technology
3. How do you do a chromatography experiment at home?
4. Is chemical bonding and molecular structure important? Justify
5. Describe the role of surface chemistry in day to day life

## RESOURCES

### TEXT BOOKS:

1. *G.M. Barrow, Physical Chemistry*, 6<sup>th</sup> Edition, Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2007.
2. Arun Bahl, B.S. Bahl, and G.D. Tuli. **Essential of Physical Chemistry, 28<sup>th</sup> Edition**, S. Chand & Company, New Delhi, **2020**

### REFERENCE BOOKS:

1. J.C. Kotz, P.M. Treichel, and J.R. Townsend, *General Chemistry*, 3<sup>rd</sup> Edition, Cengage Learning India Pvt. Ltd., New Delhi, 2009.
2. G.E. Rodgers, *Inorganic and Solid State Chemistry*, 1<sup>st</sup> Edition, Cengage Learning India Ltd., 2008.

### VIDEO LECTURES:

1. <https://archive.nptel.ac.in/courses/113/104/113104106/>
2. <https://www.nagwa.com/en/videos/639142632348/>
3. <https://www.youtube.com/watch?v=SnbXQTTHGs4>

### Web Resources:

1. [https://chem.libretexts.org/Bookshelves/General\\_Chemistry/Map%3A\\_General\\_Chemistry\\_\(Petrucci\\_et\\_al.\)/11%3A\\_Chemical\\_Bonding\\_II%3A\\_Additional\\_Aspects/11.7%3A\\_Bonding\\_in\\_Metals](https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_General_Chemistry_(Petrucci_et_al.)/11%3A_Chemical_Bonding_II%3A_Additional_Aspects/11.7%3A_Bonding_in_Metals)
2. <https://www.britannica.com/technology/materials-science>
3. [https://chem.libretexts.org/Bookshelves/Analytical\\_Chemistry/Supplemental\\_Modules\\_\(Analytical\\_Chemistry\)/Instrumentation\\_and\\_Analysis/Chromatography](https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Instrumentation_and_Analysis/Chromatography)
4. <https://ncert.nic.in/textbook/pdf/kech104.pdf>
5. <https://www.vedantu.com/chemistry/surface-chemistry>



## PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
<b>22BS101022</b>	<b>FOOD AND NUTRITION</b>	3	-	-	-	3
<b>Pre-Requisite</b>	-					
<b>Anti-Requisite</b>	-					
<b>Co-Requisite</b>	-					

**COURSE DESCRIPTION:** This course provides a detailed discussion on Food and Wellness, Energy value of food, Nutritional value of Carbohydrates, Nutritional value of Protein and Lipids, and Nutritional value of Vitamins and Minerals.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

- CO1.** understand the fact that "Food as medicine", different functions of food, balanced diet and health cum wellness.
- CO2.** Analyze parameters of Obesity via BMR and Calorific values of different food components.
- CO3.** Identify the importance of carbohydrates and fiber food on health.
- CO4.** Analyze nutritional value of proteins, lipids and fatty acids.
- CO5.** identify sources of vitamins and minerals, and their vital role in normal functioning of the body.

### CO-PO-PSO Mapping Table:

Learning Outcomes	Program Outcomes									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	-	-	-	3	-	-	-	-	3	-
<b>CO2</b>	3	3	-	-	-	3	-	-	-	-	3	-
<b>CO3</b>	3	3	-	-	-	3	-	-	-	-	3	-
<b>CO4</b>	3	3	-	-	-	3	-	-	-	-	3	-
<b>CO5</b>	3	3	-	-	-	3	-	-	-	-	3	-
<b>Course Correlation Mapping</b>	<b>3</b>	<b>3</b>	-	-	-	3	-	-	-	-	<b>3</b>	-

**Correlation Levels:      3: High;      2: Medium; 1: Low**

## **COURSE CONTENT**

### **Module 1: FOOD AND WELLNESS**

**(09 Periods)**

Food and its Importance: Definition-food, nutrition, optimum nutrition. Functions of foods physiological, psychological and social functions. Basic five food groups. Balanced diet-definition and objectives, food guide pyramid and its uses. Definition of health and wellness - Factors affecting health and wellness. Physiological, psychological and social health.

### **Module 2: ENERGY VALUE OF FOOD**

**(08 Periods)**

Energy: Energy - Units of energy - Calorie, Joule, Determination of energy content of foods: RQ, SDA of food, Basal Metabolic rate (BMR), Determination of BMR (Benedict's oxy calorimeter), Factors affecting BMR. Thermic effect of food, Factors affecting Thermic effects of food.

### **Module 3: NUTRITIONAL VALUE OF CARBOHYDRATES**

**(10 Periods)**

Nutrition: Nutrients, Nutritional Status, Health. Carbohydrates -Nutritional classification, Function, Digestion and Absorption, effects of deficiency, sources and requirements Fibre-Definition, Types, and Role of fibre in health.

### **Module 4 NUTRITIONAL VALUE OF PROTEIN AND LIPIDS**

**(10 Periods)**

Protein: Protein- Nutritional value, Functions, Digestion and Absorption, Sources and Requirements, Deficiency. Evaluation of protein quality - PER, BV, NPU, NPR, chemical score, mutual and amino acid supplementation of proteins. Lipids value, Functions, Digestion and Absorption, Sources and Requirements, Deficiency. Essential fatty acids - Functions, Sources.

### **Module 5 NUTRITIONAL VALUE OF VITAMINS AND MINERALS**

**(08 Periods)**

Vitamins and Minerals - Vitamins - Fat Soluble Vitamins (A, D, E, K): Functions, Sources, Requirements, Deficiency and Excess. Water Soluble Vitamins (B1, B2, B3, B4, B6, B12 & C)

**Total Periods: 45**

## **EXPERIENTIAL LEARNING:**

1. Assignment on effect of heat and pH on vegetable pigments like: chlorophyll, carotenoids, anthocyanin, anthoxanthin.
2. Assignment on Factors affecting the quality of pulses- Use of hard water, soft water, sodium bicarbonate, vinegar; pressure cooking and preparation of few pulse based recipes.
3. Seminar on smoking temperature of different fats and oils (safflower oil, groundnut oil & palm oil)
4. Report writing on Fruits - Study of different methods of preventing enzymatic browning of cut fruits, pectin content of fruits.
5. Assignment on analysis for protein in given food samples
  - a) Albumin (egg)
  - b) Casein (milk)
6. Seminar on minerals in given food samples.
  - a) Calcium (Ragi)
  - b) Iron (Red rice flakes)
  - c) Phosphorus (Ragi)
  - d) Magnesium (Agathi)
7. Prepare a report on General visit to food Industry and Factories

## **RESOURCES**

### **TEXT BOOKS:**

1. T. Swaminathan, Essentials of Food and Nutrition, Bangalore Printing Publishing Co, 2018.
2. B. Srilakshmi, Nutrition Science, Fifth Edition, New Age International (P) Ltd, New Delhi 2008.

### **REFERENCE BOOKS:**

1. W. W. K. Hoejer et al., Life time Physical Fitness and Wellness, 15th Edition, Cengage Learning, 2018.
2. S. J. Greenberg, and D. Pargman, Physical Fitness - A Wellness Approach, Prentice Hall International (UK) Limited, London, 1989.

### **VIDEO LECTURES:**

1. [https://www.youtube.com/watch?v=6hFxSJcq-KU&ab\\_channel=Reactions](https://www.youtube.com/watch?v=6hFxSJcq-KU&ab_channel=Reactions)
2. [https://www.youtube.com/watch?v=p79D6u-6pN4&ab\\_channel=UniversityofCaliforniaTelevision%28UCTV%29](https://www.youtube.com/watch?v=p79D6u-6pN4&ab_channel=UniversityofCaliforniaTelevision%28UCTV%29)

### **Web Resources:**

1. [https://fssai.gov.in/upload/knowledge\\_hub/1381085b34c171e808eSafe%20&%20Nutritious%20Food.pdf](https://fssai.gov.in/upload/knowledge_hub/1381085b34c171e808eSafe%20&%20Nutritious%20Food.pdf)
2. [https://en.wikipedia.org/wiki/Food\\_energy](https://en.wikipedia.org/wiki/Food_energy)
3. <https://www.nutrition.gov/topics/whats-food/carbohydrates>

## SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
<b>22LG107601</b>	<b>PROFESSIONAL ETHICS AND HUMAN VALUES</b>	2	-	-	-	2
<b>Pre-Requisite</b>	-					
<b>Anti-Requisite</b>	-					
<b>Co-Requisite</b>	-					

**COURSE DESCRIPTION:** This course deals with personal conviction, and ethics and describes the accepted principles and standards of conduct regarding moral duties and virtues as applied to an organization. Codes of professional ethics guide the stakeholders of an organization about the desirable and undesirable acts related to the profession.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

- CO1.** Demonstrate the principles of ethics, professional values, and social responsibility.
- CO2.** Analyze the problems in the implementation of moral autonomy and use ethical theories in resolving moral dilemmas.
- CO3.** Develop suitable strategies to resolve problems that arise in practicing professional ethics and Industrial standards.
- CO4.** Function as a member, consultant, manager, advisor and leader in multi-disciplinary teams.
- CO5.** Provide solutions to complex problems associated with professional ethics using analysis and interpretation.

### CO-PO Mapping Table:

Learning Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	-	-	-	-	2	2	2	2	-	-	-
<b>CO2</b>	2	3	2	-	2	2	2	2	2	-	-	-
<b>CO3</b>	2	-	3	-	2	2	2	2	2	-	-	-
<b>CO4</b>	2	-	-	-	-	2	2	2	2	-	3	-
<b>CO5</b>	2	2	3	2	-	3	2	2	2	-	-	-
<b>Course Correlation Mapping</b>	2	3	-	-	2	2	2	2	2	-	3	-

**Correlation Levels: 3: High; 2: Medium; 1: Low**

## **COURSE CONTENT**

### **Module 1: PROFESSIONAL ETHICS**

**(06 Periods)**

Scope and aim of ethics, Senses of ethics, Variety of moral issues, Types of inquiry, Moral dilemmas, Moral autonomy-Kohlberg's theory, Gilligan's theory, Consensus, and controversy.

### **Module2: PROFESSIONAL IDEALS AND VIRTUES**

**(06 Periods)**

Theories on virtues and ideals, Professions, Professionalism, Characteristics, Expectations, Professional responsibility, Integrity, Self-respect, Sense of responsibility, Self-interest, Customs and religion, Self-interest and ethical egoism, Customs and ethical relativism, Religion and divine command ethics, Use of ethical theories, Resolving moral dilemmas and moral leadership.

### **Module 3: SOCIAL EXPERIMENTATION**

**(06 Periods)**

Experimentation, Similarities to standard experiments, Learning from the past and knowledge gained, responsible experimenters, Conscientiousness, Moral autonomy and accountability, The challenger case, Codes of ethics and limitations, Industrial standards and Problems with the law of engineering.

### **Module 4: RESPONSIBILITIES AND RIGHTS**

**(06 Periods)**

Collegiality and loyalty, Respect for authority, Collective bargaining, Confidentiality, Conflict of interests, Occupational crime, Rights of engineers, Professional rights, Whistle-blowing, The BART case, Employee rights, and discrimination.

### **Module 5: HARMONY WITH PROFESSIONALETHICS**

**(06 Periods)**

Acceptance of human values; Ethical Human Conduct; Basis for Humanistic Education, Constitution, and Universal Order; Competence in professional ethics; Case studies: Holistic technologies, Management Models and Production Systems; Transition from the present state to Universal Human Order: socially and ecologically responsible engineers, technologists and managers - enriching institutions and organizations.

**Total Periods: 30**

## **EXPERIENTIAL LEARNING**

1. Demonstrate orally using your experiences of what is naturally acceptable in a relationship – Feeling of respect or disrespect and what is naturally acceptable is to nurture or exploit others.
2. Identify community partners and discuss with a community partner or organization. Prepare a report by identifying and analysing the issues or opportunities.
3. Field experiences may be directed to include a range of time-intensive endeavours that require varying levels of student interaction. Prepare a report on visiting a Juvenile home.
4. Students read a speech in the classroom by former United Nations Secretary-General Kofi Annan on human values.
5. Students are encouraged to bring a daily newspaper to class or to access any news related to the need for human values and note down the points.
6. Bring out the relevance of engineering ethics theory and practice with relevance to current trends.
7. Professional ideals and virtues are important to everyone. Prepare a case study on the professional ideals and virtue of any one of the famous sports personalities from India.

8. Compare the present to the past in engineering experimentations concerning the change in professionalism.
9. Make a study on occupational crime and the role of modern technology in finding solutions.
10. Prepare a case study on how to maintain harmony with different cultural people using professional ethics.

## RESOURCES

### TEXTBOOKS:

1. Gaur R R, Sangal R & G P Bagaria, *Human Values and Professional Ethics*, Excel Books, New Delhi, 2010.
2. Govindarajan, M., Nata Govindarajan, M., Natarajan, S. and Senthilkumar, V. S., *Engineering Ethics*, Prentice Hall of India, 2004.
3. Mike W. Martin and Roland Schinzinger, *Ethics in Engineering*, Tata McGraw-Hill, 3<sup>rd</sup> Edition, 2007.

### REFERENCE BOOKS:

1. S. Kannan and K. Srilakshmi, *Human Values and Professional Ethics*, Taxmann Allied Services Pvt Ltd., 2009.
2. Edmund G. Seebauer and Robert L. Barry, *Fundamental of Ethics for Scientists and Engineers*, Oxford University Press, 2001.
3. Charles F. Fledderman, *Engineering Ethics*, Pearson Education, 2<sup>nd</sup> Edition, 2004.
4. R. Subramanian, *Professional Ethics*, Oxford Higher Education, 2013.

### VIDEO LECTURES:

1. [https://www.youtube.com/watch?v=jfGIq\\_EiXzI](https://www.youtube.com/watch?v=jfGIq_EiXzI)
2. <https://www.youtube.com/watch?v=QFH0tH54oUc>
3. <https://www.youtube.com/watch?v=JJshY11nX14>
4. <https://www.youtube.com/watch?v=TyP09S0UEzA>
5. [https://www.youtube.com/watch?v=0QMwjV\\_ZVtc](https://www.youtube.com/watch?v=0QMwjV_ZVtc)

### Web Resources:

1. <https://siiet.ac.in/wp-content/uploads/2020/09/7.1.10-professional-ethics-manual.pdf>
2. <https://soaneemrana.org/onewebmedia/Professional%20Ethics%20and%20Human%20Values%20by%20R.S%20NAAGARAZAN.pdf>
3. <https://india.oup.com/productPage/5591038/7421214/9780199475070>

## SCHOOL CORE

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>
<b>22BS101036</b>	<b>MIND AND BEHAVIOR</b>	3	-	-	-	3
<b>Pre-Requisite</b>	-					
<b>Anti-Requisite</b>	-					
<b>Co-Requisite</b>	-					

**COURSE DESCRIPTION:** This course provides a detailed discussion on Introduction to Mind and Body, Molecules of Life, Story of Heredity and Mind, Neural signaling and Mind behavior, and Functions and Behavior of Brain.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

- CO1** Understand Mind and body, and coordination of Mind and Body
- CO2** Identify Molecules of life such as water, lipids, proteins etc.,
- CO3** Gain knowledge on aspects of Heredity and Mind.
- CO4** Understand Neural signaling, role of neurotransmitters in neurotransmission.
- CO5** Identify the tests for diagnosis of functions of the brain.

### CO-PO-PSO Mapping Table:

Learning Outcomes	Program Outcomes									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	-	-	-	-	-	-	-	-	3	-
<b>CO2</b>	3	2	-	-	-	-	-	-	-	-	3	-
<b>CO3</b>	3	3	-	-	-	-	-	-	-	-	3	-
<b>CO4</b>	3	3	-	-	-	-	-	-	-	-	3	-
<b>CO5</b>	3	3	-	-	-	-	-	-	-	-	3	-
<b>Course Correlation Mapping</b>	<b>3</b>	<b>3</b>	-	-	-	-	-	-	-	-	<b>3</b>	-

*Correlation Levels: 3: High; 2: Medium; 1: Low*

## **COURSE CONTENT**

### **Module 1: Introduction to Mind and Body** **(05 Periods)**

human evolution, mind-body problem, nervous systems, brains, neurons, coordination of mind and body.

### **Module 2: Molecules of Life** **(05 Periods)**

water, polarity, hydrophilic, hydrophobic, phospholipids, membranes, proteins, chemistry and life.

### **Module 3: Story of Heredity and Mind** **(06 Periods)**

DNA back story, Darwin, Bohr, Delbrück, gene, genetic code, ion channels and pumps, membrane potential, neural signaling

### **Module 4: Neural signaling and Mind behavior** **(06 Periods)**

synapses, neurotransmitters, ionotropic and GPCR receptors, autonomic nervous system, seizures, pharmacology, psychoactive drugs, neural wiring and guidance, neuroplasticity.

### **Module 5: Functions and Behavior of Brain** **(08 Periods)**

sensory perception, chemotaxis, olfaction, taste, flavor, vision, retina, photoreceptors, receptive fields, cortical visual areas, hearing, Fourier analysis, hair cell, vestibular, somatosensation, motor circuitry, mirror neurons, lesions, brain imaging, x-ray, CT, MRI, EEG, ECoG, MEG, PET, fMRI

**Total Periods: 45**

## **EXPERIENTIAL LEARNING**

1. Submit a document on activities of Brain
2. Discuss about sleep and dreams
3. Assignment on different diagnostic tools used for brain function
4. Seminar on Neural function and Brain
5. Case study of different behaviors
6. Group discussion on Logical thinking

## **RESOURCES**

### **TEXT BOOKS:**

- 1 S. M. Breedlove, N. V. Watson & M. R. Rosenzweig, : Biological Psychology: An Introduction to Behavioral, cognitive and Clinical Neuroscience, 6th Edition, Sinauer Associates Inc., 2010.
- 2 V.S. Ramachandran, The Tell-Tale Brain, 1st Edition, RHI publisher, 2012.

### **REFERENCE BOOKS:**

- 1 R.M. Sapolsky, Behave, The best selling exploration of why humans behave as they do, 1st edition, Vintage publishers, 2018.
- 2 J. Mitterer, D. Coon, T. Martini, Introduction to psychology: Gateways to Mind and Behavior, 16th Edition, Wadsworth publishing Co Inc, 2021.



**VIDEO LECTURES:**

- 1 [www.biopsychology.com](http://www.biopsychology.com)

**Web Resources:**

- 1 [www.sinauer.com/ebooks](http://www.sinauer.com/ebooks)
- 2 [www.ncbi.nlm.nih.gov/sites/entrez](http://www.ncbi.nlm.nih.gov/sites/entrez)

## UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
<b>22CE201701</b>	<b>DISASTER MANAGEMENT</b>	3	-	-	-	3
<b>Pre-Requisite</b>	-					
<b>Anti-Requisite</b>	-					
<b>Co-Requisite</b>	-					

**COURSE DESCRIPTION:** This course provides a detailed discussion on disaster prone areas in India, repercussions of disasters and hazards, disaster preparedness and management, risk assessment and disaster management.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

- CO5.** Analyze the vulnerability of an area to natural and man-made disasters/hazards as per the guidelines to solve complex problems using appropriate techniques ensuring safety, environment and sustainability.
- CO6.** Analyze the causes and impacts of disasters using appropriate tools and techniques and suggest mitigation measures ensuring safety, environment and sustainability besides communicating effectively in graphical form.
- CO7.** Suggest the preparedness measures using appropriate tools and techniques and suggest mitigation measures ensuring safety, environment and sustainability.
- CO8.** Analyze the Risk Assessment using appropriate tools and techniques and suggest mitigation measures ensuring safety, environment and sustainability.
- CO9.** Design disaster management strategies to solve pre, during and post disaster problems using appropriate tools and techniques following the relevant guidelines and latest developments ensuring safety, environment and sustainability besides communicating effectively in graphical form.

### CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	3	-	2	2	2	2	2	-	-	-	-
<b>CO2</b>	3	3	-	2	2	2	2	-	-	2	-	-
<b>CO3</b>	3	3	-	2	2	2	2	-	-	-	-	-
<b>CO4</b>	3	3	-	3	2	2	2	-	-	-	-	-
<b>CO5</b>	3	2	3	2	2	2	1	2	-	1	3	2
<b>Course Correlation Mapping</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>-</b>	<b>2</b>	<b>3</b>	<b>2</b>

*Correlation Levels: 3: High; 2: Medium; 1: Low*

## **COURSE CONTENT**

### **Module 1: DISASTER PRONE AREAS IN INDIA (09 Periods)**

**Introduction:** Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types And Magnitude.

**Disaster Prone Areas:** Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics.

### **Module 2: REPERCUSSIONS OF DISASTERS AND HAZARDS (09 Periods)**

Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

### **Module 3: DISASTER PREPAREDNESS AND MANAGEMENT (11 Periods)**

Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

### **Module 4: RISK ASSESSMENT (08 Periods)**

Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

### **Module 5: DISASTER MANAGEMENT (08 Periods)**

Disaster management organization and methodology, Disaster management cycle, Disaster management in India – Typical cases and Cost-benefit analysis, Disaster management programs implemented by NGOs and Government of India, Usage of GIS and Remote sensing techniques in disaster management, Leadership and Coordination in Disaster management, Emerging trends in disaster management.

**Total Periods: 45**

## **EXPERIENTIAL LEARNING**

6. Perform hazard assessment and vulnerability analysis for any nearby town/city and prepare a detailed report of possible impacts of various disasters on environment, infrastructure and development.
7. Prepare a detailed report on the causes and effects of Tsunami that was occurred in the year 2004. Also discuss various advancements in Tsunami warning systems.
8. Identify the major causes of urban floods in cities like Chennai, Hyderabad & Mumbai. Also list various mitigation strategies to reduce the impact of floods.
9. Prepare a detailed report on how various man-made activities are directly/indirectly related to the occurrence of landslides that occurred in recent days in India.
10. Visit AP State Disaster Response and Fire Services Department and record about various methods used by them in mitigating disasters and their management.

## RESOURCES

### TEXT BOOKS:

1. Sharma V. K., *Disaster Management*, Medtech Publishing, 2<sup>nd</sup> Edition, 2013.
2. Anand S. Arya, Anup Karanth, and Ankush Agarwal, *Hazards, Disasters and Your Community: A Primer for Parliamentarians*, GOI-UNDP Disaster Risk Management Programme, Government of India, National Disaster Management Division, Ministry of Home Affairs, New Delhi, Version 1.0, 2005

### REFERENCE BOOKS:

1. Donald Hyndman and David Hyndman, *Natural Hazards and Disasters*, Cengage Learning, USA, 5<sup>th</sup> Edition, 2015.
2. *Disaster Management in India*, A Status Report, Ministry of Home Affairs, Govt. of India, May 2011.
3. Rajendra Kumar Bhandari, *Disaster Education and Management: A Joyride for Students, Teachers, and Disaster Managers*, Springer India, 2014.
4. Singh R. B., *Natural Hazards and Disaster Management*, Rawat Publications, 2009.
5. R. Nishith, Singh AK, *Disaster Management in India: Perspectives, issues and strategies*, New Royal book Company.
6. Sahni, PardeepEt.Al. (Eds.), *Disaster Mitigation Experiences And Reflections*, Prentice Hall of India, New Delhi.
7. Goel S. L. , *Disaster Administration And Management Text And Case Studies*, Deep &Deep Publication Pvt. Ltd., New Delhi

### VIDEO LECTURES:

1. <https://nptel.ac.in/courses/105104183>
2. <https://www.digimat.in/nptel/courses/video/124107010/L01.html>

### Web Resources:

1. <https://egyankosh.ac.in/handle/123456789/25093>
2. <https://www.egyankosh.ac.in/handle/123456789/25912>
3. <https://www.nios.ac.in/media/documents/333courseE/12.pdf>
4. <https://ndmindia.mha.gov.in/images/public-awareness/Primer%20for%20Parliamentarians.pdf>