B.Sc., BIOCHEMISTRY

PREAMBLE

- Biochemistry is the study of chemistry and relating to, biological organisms.
- Biochemistry is sometimes viewed as a hybrid branch of organic chemistry which specializes in the chemical processes and chemical transformations that take place inside of living organisms.
- All life forms alive today are generally believed to have descend from a single proto-biotic ancestor, which could explain why all known living things naturally have similar biochemistries.
- Biochemistry essentially remains the study of the structure and functions of cellular components (such as enzymes and cellular organelles) and the processes carry out both on and by organic macromolecules - especially proteins, but also carbohydrates, lipids, nucleic acids and other biomolecules.
- Biochemistry is most simply put, the chemistry of life.

KARPAGAM ACADEMY OF HIGHER EDUCATION
Coimbatore – 641 021
DEPARTMENT OF BIOCHEMISTRY
FACULTY OF ARTS, SCIENCE AND HUMANITIES
UG PROGRAM (CBCS)-B.Sc., Biochemistry
(2015–2018 and onwards)

Course code	Name of the course	Objectives and out comes		Instruction hours / week			Credit(s)	Maximum Marks		
		PEOs	POs	L	T	P		CIA	ESE	Total
								40	60	100
SEMESTER – I										
15LAU101	Language – I	I	a	5	-	-	5	40	60	100
15ENU101	English – I	I	a	4	-	-	4	40	60	100
15BCU101	Chemistry of Biomolecules	I	b	5	-	-	5	40	60	100
15BCU111	Practical – I Qualitative Analysis of Biomolecules	III	d	-	-	5	3	40	60	100
15BCU102	Allied Chemistry – I	I	d	4	-	-	4	40	60	100
15BCU112	Allied Chemistry Practical - I	III	d	-	-	3	2	40	60	100
15FCA101	Foundation course A –Value Education			2	-	-	1	100	-	100
15SSD101	Soft skill Development- I			2	-	-	-	-	-	-
Semester Total				**22**	**-**	**8**	**24**	**340**	**360**	**700**
SEMESTER – II										
15LAU201	Language – II	I	a	5	-	-	5	40	60	100
15ENU201	English – II	I	a	4	-	-	4	40	60	100
15BCU201	Analytical Biochemistry	III	e	5	-	-	5	40	60	100
15BCU211	Practical – II Quantitaive Estimation and Separation Techniques	III	e	-	-	5	3	40	60	100
15BCU202	Allied Chemistry- II	I	e	4	-	-	4	40	60	100
15BCU212	Allied Chemistry Practical – II	I	e	-	-	3	2	40	60	100
15FCB201	Foundation course B- Environmental Studies	IV	h	2			1	100	-	100
15SSD101	Soft Skill Development- I			2	-	-	1	100	-	100
Semester Total				**22**	**-**	**08**	**25**	**440**	**360**	**800**
SEMESTER – III										
15ENU301	English – III	I	f	4	-	-	4	40	60	100
15BCU301	Protein Biochemistry and Enzymology	I	f	4	-	-	4	40	60	100
15BCU302	Cell Biology	I	f	4	-	-	4	40	60	100
15BCU311	Practical -III Enzyme Kinetics	III	c, f		-	5	2	40	60	100
15BCU303	Allied -Elective I	III	c, f	4	-	-	4	40	60	100
15BCU312	Allied Elective practical – I	III	c, f		-	3	2	40	60	100
15FCC301*	Introduction to Computer / Introdcution to Multimedia			4	-	-	2	100	-	100
15SSD301	Soft Skill Development – II			2	-	-	-			
Semester Total				**22**	**-**	**8**	**22**	**340**	**360**	**700**
SEMESTER – IV										
15ENU401	English –IV	I, II	g	4	-	-	4	40	60	100
15BCU401	Human Physiology	I, II	g	6	-	-	5	40	60	100
15BCU402	Endocrinology	I, II	g	6	-	-	5	40	60	100
15BCU411	Practical – IV Cell Biology and Human Physiology	III	c, g	-	-	5	3	40	60	100
15OEU401	Open Elective-I	III	c, g	-	-	-	3	-	100	100
15BCU404	Allied Elective-II	III	c, g	4	-	-	3	40	60	100
15BCU412	Allied Elective practical – II			-	-	3	2	40	60	100
15SSD301	Soft Skill Development II			2	-	-	1	100		100
Semester Total				**22**	**-**	**8**	**26**	**340**	**460**	**800**

SEMESTER – V										
15BCU501	Metabolic Pathways	V	d, e	5	-	-	5	40	60	100
15BCU502	Molecular Biology	II, III	d, e	5	-	-	5	40	60	100
15BCU503	Immunology	II, III	d, e	5	-	-	5	40	60	100
15BCU504	Plant Biochemistry	I	d, e	5	-	-	5	40	60	100
15BCU505	Core Elective –I	I	i	5	-	-	5	40	60	100
15OEU501	Open elective I	V	d	-	-	-	3	-	100	100
15BCU511	Practical –V Molecular Biology and Plant Biochemistry	V	d, e	-	-	5	3	40	60	100
15BCU521	Internship program			-	-	-	2	50	-	50
Semester Total				**25**	**-**	**5**	**33**	**290**	**460**	**750**
SEMESTER – VI										
15BCU601	Clinical Biochemistry	V	i, j	5	-	-	5	40	60	100
15BCU602	Drug Biochemistry	I	g	5	-	-	5	40	60	100
15BCU603	Core Elective – II	V	i, j	5	-	-	4	40	60	100
15BCU611	Practical –VI Clinical Biochemistry	II	i, j	-	-	5	3	40	60	100
15BCU691	Project	IV	j	4	-	6	6	60	90	150
	NCC/NSS/Sports/Club activity etc			-	-	-	-	-	-	-
Semester Total				**19**	**-**	**11**	**23**	**220**	**330**	**550**
Grand Total				**132**	**-**	**48**	**180**	**1970**	**2330**	**4300**

Blue – Employability
Green – Entrepreneurship
Red – Skill Development

***Foundation Course C**	
15FCC301A	Introduction to Computer
15FCC301B	Introduction to Multimedia

Allied Elective-1 (Theory)		**Allied Elective-1 (Practical)**	
15BCU303 A	General Microbiology	15BCU312A	General Microbiology
15BCU303 B	Nutritional Biochemistry	15BCU312B	Nutritional Biochemistry
15BCU303 C	Food Preservation Technology	15BCU312C	Food Preservation Technology

Allied Elective-2 (Theory)		**Allied Elective-2 (Practical)**	
15BCU404 A	Bioinformatics	15BCU412 A	Bioinformatics
15BCU404 B	Biostatistics	15BCU412 B	Biostatistics
15BCU404 C	Biophysics	15BCU412 C	Biophysics

Open Elective (Theory)	
15OEU501	First Aid and Safety

Core Elective – I (Theory)		**Core Elective – II (Theory)**	
15BCU505 A	Human Genetics	15BCU603A	Introduction to Biotechnology
15BCU505B	Fundamentals of Nanotechnology	15BCU603B	Bioethics and Biosafety
15BCU505C	Cancer Biology	15BCU603C	Stem Cell Biology

Code	Additional Course*	Ins	Marks			Exam / Hrs	Credit
			CIA	ESE	Total		
15BCU506	Good laboratory Practices	-	-	100	100	3	04
15BCU604	Hospital Management	-	-	100	100	3	04

* Additional credit not counted for program requirement

For B.Sc. (Hons) in Biochemistry

Code	Subjects	Ins	Marks			Exam / Hrs	Credit
			CIA	ESE	Total		
15BCU507	Advanced Biochemistry	-	-	100	100	3	05
15BCU605	Advanced Analytical Techniques and Research Methodology	-	-	100	100	3	05

Code: 15BCU101

15	-Academic Year
BC	-Biochemistry
U	- Bachelor's Degree
First Digit	- Semester number (1, 2, 3 and)
Second digit	- Theory (0); Practical (1); Project (9)
Last digit	- Paper number in the concerned semester (1, 2…)

PROGRAMME OUTCOME (POs).

The Biochemistry graduate will be able to acquire

a. Critical Thinking and Language Training: The ability to analyze information objectively and make a reasonable judgment and conclusion by evaluating data, facts, observable phenomenon, and research findings from a set of information and distinguish among priorities to solve a problem To train them to communicate science by improving their English vocabulary. Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

b. **Ethics:** Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

c. **Social Interaction:** Elicit views of others, mediate disagreements and help reach conclusions in group settings. Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

d. Understanding cellular function: To equip them with basic and advanced knowledge in cell biology in order to get entry/placed in cell based research and development institution/laboratories.

e. Protein based skills: To make them understand protein, enzymes and human physiology to lay solid foundation and to get through competitive examinations. To equip them to get placed in recombinant protein production industries/laboratory.

f. Understanding of endocrine system and metabolism: To train them on the regulatory role of hormone on the metabolism of carbohydrates, lipids, amino acids and nucleic acid.

g. Molecular and Genetic understanding: To train them on the genetic regulation of immune system and to use computational tools.

h. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

i. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

j. Skill development: To gain hands on experience on various biochemical experiments and to equip them to interpret the data.

PROGRAMME SPECIFIC OUTCOME (PSOs)

k. Be able to demonstrate foundation knowledge in the areas of Biochemistry like cell biology, biomolecules, protein biochemistry, molecular biology, Pharmaceutical chemistry and hormonal biochemistry

l. Be able to integrate knowledge learned in discipline specific courses likeMicrobiology, Plant Biochemistry, Nutritional biochemistry, Biostatistics, Drug Biochemistry and biotechnology

m. To use standard laboratory protocols in biochemistry, modern instrumentations, proper laboratory safety protocols and classical techniques to carry out experiments and also use computers in data acquisition and processing and use available software as a tool in data analysis.

n. To understand the applications of biological sciences in genetics, biochemical correlations of diseases, micro biology, Genetic engineering and biotechnology

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

I. To give students a basic knowledge in biochemistry and to teach on ethics.

II. To develop analytical and critical-thinking skills that allows independent exploration of biological phenomena through the scientific methods.

III. To acquaint knowledge on modern methods of biochemical experimentation to implement for future studies.

IV. To motivate students for social responsibilities and to educate them on ethical values in addition to inculcating environmental awareness.

V. To enable them to execute a research objective through experimentation.

Mapping of PEOs and POs

POs	a	b	c	d	e	f	g	h	i	j	k	l	m	n
PEO I	X	X		X		X	X				X			
PEO II			X			X	X				X	X	X	X
PEO III			X	X	X		X				X	X	X	X
PEO IV								X		X				X
PEO V				X	X				X	X	X	X	X	X

Semester I

16LSU101 **TAMIL-1** **4H-4C**

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

பாடத்திட்டப்பொதுநோக்கம்

1. கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
2. ஆய்வுநோக்கைமேம்படுத்துதல்.
3. இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
4. மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
5. வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
6. அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப்பயன்விளைவு

1. இந்தியகுடியுரிமைப்பணிமுதலானபோட்டித்தேர்வுகளில், விருப்பப்பாடமாகஇந்தியகுடியுரிமைப்பணிமுதலானபோட்டித்தேர்வுகளில், விருப்பப்பாடமாகஇடம்பெறுகின்ற, ‘தமிழ்இலக்கியவரலாறு’ குறித்தமுழுமையானஅறிமுகம்பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல்மற்றும்தொல்லியல்சார்ந்தஆவணத்தேடலுக்குரியஆய்வுமனப் பான்மையுடன், இலக்கியங்களைஅணுகுதல்.
3. தமிழின்வளர்ச்சித்துறையாகிய, ‘அறிவியல்தமிழ்’ ; ‘இணையதமிழ்’ குறித்தபன்நோக்குஅணுகுமுறையிலானஆய்வுச்சிந்தனைமேம்பாடு.
4. வேலைவாய்ப்புக்குரியசுயதிறன்மேம்பாட்டுடன், படைப்பாக்கத்திறன்மேம்பாடும்பெற்றிருத்தல் .
5. சமுதாயமற்றும்வாழ்வியல்மதிப்புகளைப்பேணுவதற்குக்கருவியாகஇலக்கியங்க ளைநாடுகின்றமனப்பான்மைவளர்ச்சி.
6. மொழிபெயப்புத்துறைசார்ந்தவேலைவாய்புத்திறன்பெற்றிருத்தல்

தாள்கள்வரிசையும்தேர்வுச்செயல்திட்டமும்பகுதி-I தமிழ்

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வு மணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு
ஒன்று	I	4	3	40 / 60	100	4

பகுதி – I, தமிழ் | பருவம் I

15LAU101 : **தமிழ் முதல் தாள்** | 5-H,5-C

அலகு – I : இக்கால இலக்கியம்

தத்துவம் : மகாகவி பாரதியார் – பகைவனுக்கு அருள்வாய்.
கவிஞர் ந.பிச்சமூர்த்தி – கிளிக்கூண்டு

இயற்கை : பாவேந்தர் பாரதிதாசன் – அழகின் சிரிப்பு – ஞாயிறு.

சமுதாயம் : கவிக்கோ அப்துல் ரகுமான் – இன்றைய நிலை

அறிவியல் : கவிஞர் சிற்பி பாலசுப்பிரமணியன் – காலம்.

பெண்ணியம் : கவிஞர் சிவரமணி – வையகத்தை வெற்றிகொள்ள

சூழலியல் : அன்பாதவன் - மரணம்

காதல் : வைரமுத்து - காதல் உயில்

தன்னம்பிக்கை பா.விஜய் - தன்னம்பிக்கை

அலகு – II : அற இலக்கியம்

1. திருக்குறள் - தேர்ந்தெடுக்கப்பட்ட குறள்கள் 20
2. நான்மணிக்கடிகை - தேர்ந்தெடுக்கப்பட்ட ஐந்து பாடல்கள்
3. திரிகடுகம் - தேர்ந்தெடுக்கப்பட்ட ஐந்து பாடல்கள்

அலகு - III : சிற்றிலக்கியம்

1. நரிவிருத்தம் - அறன் வலியுறுத்தல்
2. தமிழ் விடு தூது - தமிழின் சிறப்புரைத்தல்
3. மதுரை மீனாட்சியம்மைப் பிள்ளைத்தமிழ் - தொடுக்கும் கடவுள் பழம்பாடல்

அலகு – IV : சிறுகதை

1. புதுமைப்பித்தன் - நிகும்பலை
2. தனுஷ்கோடி ராமசாமி - கந்தகக் கிடங்கிலே
3. கந்தர்வன் - துண்டு
4. வாஸந்தி - வடிகால்
5. சி.ஆர். ரவீந்திரன் - வழுக்குமரம்

அலகு- V : மொழிப்பயிற்சி

1. விண்ணப்பங்கள் எழுதுதல் மற்றும் கடிதப் பயிற்சி
2. மொழிபெயர்ப்புப் பயிற்சி

பாட நூல்: **கற்பகச்சோலை – தமிழ் ஏடு.** கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

Part I TAMIL 2015. Karpagam University, Coimbatore – 21.

15ENU101 **ENGLISH -I** **Semester I**
4H- 4C

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course Objectives:

- To help students enhance their Language skills
- To introduce different kinds of literary works
- To familiarize different genres of Literature
- To instruct moral values through literature
- To improvise their productive and receptive skills
- To strengthen the basic knowledge about grammar

Course Outcomes (CO's):

1. Develop the four types of skills
2. Reading and comprehending literary works
3. Genres of literature to provide moral education
4. Develop communication skills in business environment
5. Interpersonal skills will be developed
6. Betterment of language competence

UNIT I:

Prose: Google Guys (Extract) – Richard L Brandt
Poetry: The Blind Pedlar – Osbert Sitwell
Short Story: A Garden So Rich – Christie Craig
Vocabulary: Prefixes, Antonyms, Sentence Completion
Grammar: Articles, Adverbs, Pronouns
Composition: Proverb Expansion

UNIT II:

Prose: Happiness 101 – Geeta Padmanabhan
Poetry: An Old Woman **–** Arun Kolatkar
Vocabulary: Suffixes, Analogies
Grammar: Nouns, Adjectives
Composition: Dialogue Writing

UNIT III:

Prose: Structured Procrastination – John Perry
Short Story: The Umbrella Man – Roald Dahl
One-Act Play: The Boy Who Stopped Smiling – Ramu Ramanathan
Vocabulary: Synonyms, Euphemisms, Word Definitions
Grammar: Verbs, Conjunctions and Interjection, Indirect/Reported Speech

UNIT IV:

Poetry: No Sentence – Anjum Hassan
One-Act Play: While the Auto Waits- O' Henry
Vocabulary: Words Often Confused, Anagrams

Grammar: Prepositions, Voice- Active and Passive
Composition: Letter Writing- Informal

UNIT V:
Short Story: The Bird **–** Amar Jalil
One-Act Play: The Cellphone Epidemic – Claudia I. Haas
Vocabulary: Portmanteau Words, One Word Substitute
Grammar: Questions, Pronunciation
Composition: Letter Writing- Formal

PRESCRIBED TEXT

Rao, G. Chandralekha and et al. *Spring* 2013. Emerald Publishers: Chennai.

REFERENCE

Syamala, V. English for Communication. 2006. Emerald Publishers: Chennai

Semester I

15BCU101 CHEMISTRY OF BIOMOLECULES 5H-5C

Instruction hours/week: L: 5 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

Equip the students:

- To understand the properties and importance of water in biological system
- To know the various biomolecules present in biological system
- To introduce the importance of vitamins in human body
- To know the biological significance of carbohydrate metabolites in living systems
- To understand the functional role of nucleic acid in living systems
- To introduce the importance of vitamins in human body

Course Outcomes (CO's)

After successful completion of the course, the student will:

1. Recognize water as a universal solvent and elixir of life by knowing its importance
2. Identify the properties and classification of carbohydrates
3. Recall the role of various lipids in biomembrane including signal transduction
4. Categories the aminoacids and know their properties
5. Differentiate the structure, properties and functions of DNA and RNA
6. List the functions and deficiency disease of fat and water soluble vitamins

UNIT I

Water and Carbohydrates

Water: An introduction to biological molecules. Structure and properties of water as biomolecule.

Carbohydrates: Monosaccharides-Classification, structures, stereochemistry and chemical reactions. Derivatives of monosaccharides. Disaccharides- Classification, structure, chemistry and function. Trisaccharides- Structure of raffinose. Polysaccharides: Storage polysaccharides-starch, glycogen and dextrin. Properties and functions of structural polysaccharides: cellulose, chitin and glycosaminoglycans (Structures not required).

UNIT II

Lipids: Definition. Classification of lipids; Biological significance: Role of lipids in biomembranes. Simple lipids: Physical and chemical properties of fats. Compound lipids: Structure and function of phospholipids, glycolipids and lipoproteins. Derived lipids: Fatty acids- Saturated unsaturated and essential fatty acids. Sterols- structure and functions of cholesterol.

UNIT III

Amino acids: Definition, Amino acids as ampholytes, structure and classification of amino acids, chemical reactions of amino acids due to carboxyl groups and amino groups. Unusual amino acids: Peptides: Structure and properties – Example

UNIT IV

Nucleic acids: Structure of purines and pyrimidines: nucleosides and nucleotides. DNA: Double helix; A, B, & Z forms; circular DNA and super coiling; DNA denaturation and renaturation. RNA: Types and structure of RNA, tRNA-unusual bases.

UNIT V

Vitamins: Definition, Classification, Fat-soluble and water-soluble vitamins-sources, structure and physiological functions. Minerals: Mineral requirement, essential macro minerals and essential micro minerals- sources and functions.

TEXT BOOKS

Ambika, S, 2004. Fundamentals of Biochemistry for Medical Students, CIT Chennai.

Deb A.C., 2011, Fundamentals of Biochemistry, 9th edition New Central Book Agency, Calcutta.

Jain, J.L, Sunjay Jain and Nitin Jain, 2005. Fundamentals of Biochemistry, S. Chand and Company Ltd, New Delhi.

REFERENCES

Lehninger L, D.L. Nelson and M.M. Cox, 2012, Principles of Biochemistry, 6th edition WH Freeman and Company, New York.

Lubert Stryer, L. 2009, Biochemistry, W.H. Freeman and Company, New York.

Robert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell, 2012, Harper's Biochemistry, 29th edition, McGraw-Hill Medical, London.

Semester I

15BCU102 ALLIED CHEMISTRY - I 4H-4C

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

Equip the students:

- On the molecular orbital theory, preparation and properties of inorganic compounds
- On the theory of covalent bond, polar effects and stereochemistry of organic compounds
- About important industrial chemicals like silicones, fuel gases
- About Fertilizers and their impact on environment
- On the elements of photochemistry, chemical kinetics and chromatography
- About the dyes, chemotherapy and vitamins

Course Outcome

After successful completion of the course, the student will:

1. Understand the molecular orbital theory, preparation and properties of inorganic compounds
2. Understand the theory of covalent bond, polar effects and stereochemistry of organic compounds
3. Have knowledge about important industrial chemicals like silicones, fuel gases
4. Know the classes of fertilizers and their impact on environment
5. Understand the elements of photochemistry, chemical kinetics and chromatography.
6. Understand about the dyes, chemotherapy and vitamins

UNIT-I

Chemical Bonding: Molecular orbital theory-linear combination of atomic orbitals-bonding and antibonding molecular orbitals-energy level diagram-bond order- M.O. configuration of H_2, N_2 and F_2 molecules.

Diborane: Preparation, properties and structure. $NaBH_4$: Preparation and uses.

Borazole: Preparation and properties.

Interhalogen compounds: ICl, BrF_3, IF_5 - preparation, properties, uses and structure.

Basic properties of iodine.

Compounds of sulphur: Sodium hydrosulphite- preparation, properties, uses and structure.

Per acids of sulphur: Preparation, properties, uses and structure.

UNIT-II

Industrial Chemistry: Silicones: Synthesis, properties and uses.

Fuels gases: Natural gas-water gas-semi water gas-carbureted water gas-producer gas- oil gas (Manufacturing details not required).

Fertilizers: NPK fertilizer-ammonium sulphate-urea-superphosphate of lime-triple superphosphate- potassium nitrate-ammonium nitrate.

Pollution: Water, air and soil pollution-sources and remedies-acid rain-ozone hole-greenhouse effect.

UNIT- III

Covalent Bond and Stereoisomerism:

Covalent Bond: Orbital overlap, hybridization and geometry of CH_4, C_2 H_4 and C_2H_2. Polar effects: Inductive effect-electromeric effect- mesomeric effect- steric effect- hyperconjugation.

Stereoisomerism: Elements of symmetry-polarised light and optical activity-isomerism in tartaric acid-racemisation- resolution- geometrical isomerism of maleic and fumaric acids-keto-enol tautomerism of acetoacetic esters.

UNIT- IV

Dyes, Chemotherapy and Vitamins:

Dyes: Terms used chromophore, auxochrome, bathachromic shift and hypsochromic shift-classification of dyes – based on chemical structure and application-one example each for azo, triphenylmethane, vat and mordant dyes- preparation.

Chemotherapy: Preparation, uses and mechanism of action sulpha drugs- preparation and uses of prontosil, sulphadiazine and sulphafurazole-structure and uses of pencillins and chloromycetin.

Vitamins: Diseases caused by the deficiency of vitamins A, B_1, B_2, C and D-sources of these vitamins.

UNIT- V

Elements of Photochemistry, Chemical Kinetics and Chromatography:

Elements of Photochemistry: Photochemical laws-Beer Lambert's law-Grotthuss-Draper law-Stark-Einstein law (statement only).

Chemical Kinetics: Rate-order-molecularity-pseudo first order reactions-zero order reactions-determination of order of reaction-measurement of order and rates of reactions-effect of temperature on reaction rate-energy of activation.

Chromatography: Principles and applications of Column, Paper and Thin Layer Chromatography.

TEXT BOOKS

1. V.Veeraiyan & A.N.S. Vasudevan, Text Book of Allied Chemistry (II Edition), Highmount Publishing House, Chennai (2005).
2. B.R.Puri and L.R.Sharma, Principles of Inorganic Chemistry, Shoban lal & Company Ltd., Jalandar (2002).
3. B.S.Bahl & Arun Bahl, Advanced Organic Chemistry, S.Chand & Company Ltd., New Delhi (2005).
4. Puri, Sharma & Pathania, Physical Chemistry, Vishal Publishing Company Ltd., Jalandhar (2003).

REFERENCE

1. R.Gopalan & S.Sundaram, Allied Chemistry (III Edition), Sultan Chand & Sons., New Delhi (2003).

Semester I

15BCU111 PRACTICAL I 5H-3C

QUALITATIVE ANALYSIS OF BIOMOLECULES

Instruction hours/week: L:5 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- To know the safety measures to be followed in laboratory
- To give hands on experience on the preparation of buffers and various solutions.
- To identify and separate the biomolecules
- To quantify the vitamin in a sample
- To acquire knowledge in the quantitative estimation of biomolecules
- To know the importance of biological macromolecules

Course outcomes (CO's)

1. Gain knowledge on lab safety
2. Trained on preparation of reagents and solution
3. Able to analyse biomolecules and vitamins qualitatively
4. Able to analyse biomolecules and vitamins quantitatively
5. Able to identify different disaccharides and polysaccharides experimentally
6. Handle the instruments associated with the practical

I. Qualitative Analysis

1. Reactions of monosaccharide- Glucose, Fructose, Galactose and Pentose

2. Reactions of disaccharides and polysaccharides- Sucrose, Lactose, Maltose and Starch

3. Reactions of amino acids- Histidine, Tyrosine, Tryptophan, Methionine and Cysteine
4. Lipid Analysis- (Group Experiments)

    a. Determination of Acid number and peroxide value
    b. Determination of Iodine number
    c. Determination of Saponification Number
    d. Determination of RM number

REFERENCES

Jayaraman J, 2007. Laboratory Manual in Biochemistry, New Age International Publishers, New Delhi.

Sadasivam S and A. Manickam, 2009. Biochemical Methods, New Age International Publishers, New Delhi.

Singh.S.P. 2009. Practical Manual of Biochemistry, CBS Publishers, New Delhi.

Semester – I

15BCU112 ALLIED CHEMISTRY PRACTICAL -I 3H – 2C

Instruction Hours/week: L: 0 T:0 P:3 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objective

To impart hands-on training on:

- Preliminary tests for identification of an organic compound
- Detection of elements
- Identification of aromatic or aliphatic compound
- Different functional groups and its nature
- Confirmatory test for aldehydes, ketones, amines and amides
- Confirmatory test for carbohydrates, phenol, acids, esters and nitro compounds

Course Outcomes (CO's)

After successful completion of the course, the student will:

1. Perform preliminary tests for identification of an organic compound
2. Perform and detect the elements present in the given compound
3. Identify and differentiate between aromatic and aliphatic compound
4. Identify different functional groups and its nature
5. Perform confirmatory test for aldehydes, ketones, amines and amides
6. Perform confirmatory test for carbohydrates, phenol, acids, esters and nitro compounds

Contents

Systematic analysis of an organic compound, preliminary tests, detection of elements present, aromatic or aliphatic, saturated or unsaturated, nature of the functional group, confirmatory tests– aldehydes, ketones, amines, diamide, carbohydrates, phenols, acids, esters & nitro compounds.

Note: Each student should analyse minimum 6 compounds.

REFERENCE BOOKS:

1. R. Ramasamy, Allied Chemistry Practical Book, Priya Publications, Karur (2008).
2. A.O. Thomas, Practical Chemistry for B.Sc. Main Students, Scientific Book Centre, Cannanore-1, Kerala (2010).
3. V.Venkateswaran, R.Veeraswamy and A. R. Kulandaivelu, Basic Principles of Practical Chemistry, 2nd Edition, S.Chand Publications, New Delhi (2004).

Semester-I

15FCA101 FOUNDATION COURSE A-VALUE EDUCATION 2H -1C

Instruction hours/week: L:2 T:0 P :0 **Marks:** Internal: 100 External: - Total: **100**

End Semester Exam: 3 Hours

Course Objective

- To improve the integral development of human begins
- To train the students towards sustainable lifestyle
- To create awareness about the values and their significance and role
- To imbibe the concept of discipline and freedom
- To give students a deeper understanding about the purpose of life.
- To teach and inculcate the essential qualities to become a good leader.

Course Outcomes (CO's)

After successful completion of the course, the student will:

1. Understand the importance of value based living.
2. Gain deeper understanding about the purpose of their life.
3. Understand and start applying the essential steps to become good leaders.
4. Emerge as responsible citizens with clear conviction to practice values and ethics in life.
5. Become value based professionals.
6. Contribute in building a healthy nation

UNIT – I

Concept of Self, self-awareness, self-esteem and self-confidence. Concept of personality, determinants and disorgiansation of it. Personality development – meaning.

UNIT – II

Goal setting – meaning and importance; steps in goal setting Manners and Etiquette – meaning need and importance; means to improve. Positive thinking.

UNIT – III

Discipline – meaning. Concept of Roles and Responsibility Time Management – Meaning and steps for effective time management.

UNIT – IV

Interpersonal relationship – meaning and importance; means to improve it. Healthy friendship.

UNIT – V

Family Relationship importance of it; Means to improve. Spiritualism – meaning. Its relationship with Altruism, sacrifice, self control, tolerance and truthfulness.

TEXT BOOK

1. Karpagam University Study Material, 2015.

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பகுதி – I, தமிழ் | பருவம் II

15LAU201 : தமிழ் இரண்டாம் தாள் | 5-H,5-C

அலகு - I : பக்தி இலக்கியம்

1. சைவம் - மூவர் தேவாரத்திலிருந்து தேர்ந்தெடுக்கப்பெற்ற15 பாடல்கள்
2. வைணவம் – ஆண்டாள் நாச்சியாரின் திருப்பாவையிலிருந்து 11 பாடல்கள்

அலகு – II : சங்கஇலக்கியம்

அ). எட்டுத்தொகை

நற்றிணை: 1. இலை இல பிடவம், திணை – முல்லை,
ஆசிரியர் – விழிக்கட் பேதைப் பெருங்கண்ணனார்.
2. மடல் மா ஊர்ந்து, திணை – குறிஞ்சி, ஆசிரியர் – மடல் பாடிய மாதங்கீரனார்.

குறுந்தொகை : 1. உள்ளார் கொல்லோ, திணை – பாலை, ஆசிரியர் – பெருங்கடுங்கோ.
2. யாரினும் இனியன், திணை – மருதம், ஆசிரியர் – வடமவண்ணக்கன் தாமோதரனார்.

ஐங்குறுநூறு : 1. நுண்ணேர் புருவத்த, திணை – குறிஞ்சி, ஆசிரியர் – கபிலர்.
2. அவறொறுந் தேரை, திணை – முல்லை, ஆசிரியர் - பேயனார்.

பதிற்றுப்பத்து – ததைந்த காஞ்சி, ஆசிரியர் - பாலைக் கௌதமனார்.

பரிபாடல் - வையை - திரை இரும் பனிப் பௌவம், ஆசிரியர் - மையோடக் கோவனார்.

கலித்தொகை – கடும் புனல் கால் பட்டு, திணை – பாலை, ஆசிரியர் - பெருங்கடுங்கோ.

அகநானூறு - 1. ஆடு அமைக் குயின்ற, திணை – குறிஞ்சி, ஆசிரியர் – கபிலர்.
2.யான் எவன் செய்கோ தோழி, திணை – பாலை, ஆசிரியர் – நோய்பாடியார்.

புறநானூறு - 1. சிறப்பில் சிதடு முறுப்பில், திணை – பொதுவியல்,
ஆசிரியர் – உறையூர் முதுகண்ணன் சாத்தனார்.
2.இளையரு முதியரும் வேறுபுலம் படர – ஆசிரியர் – கயமனார்.

ஆ). பத்துப்பாட்டு - சிறுபாண் ஆற்றுப்படை – கடையெழு வள்ளல்களின் சிறப்பு,
நல்லியக்கோடனின் சிறப்பு, ஈகைத் திறம்.

அலகு - III : காப்பியங்கள்

1.மணிமேகலை –பாத்திரம் பெற்ற காதை – தீவதிலகை, மணிமேகலைக்குச் சொல்லியது,
சிறைக்கோட்டம் அறக்கோட்டமாக்கிய காதை – மணிமேகலை வேண்ட,
மாவண்கிள்ளி, சிறைக்கோட்டத்தை அறக்கோட்டமாக்கியது.

2. கம்பராமாயணம் - இலக்கியநயம் மிக்க, தேர்ந்தெடுக்கப்பெற்ற 41 பாடல்கள்.

அலகு - IV : கட்டுரைகள்

1.திருக்குறளில் மனிதவள மேலாண்மைக் கருத்துக்கள் - திருமிகு ஹரி விஜயலட்சுமி.

2. தமிழர் வளர்த்த நுண்கலைகள்: சிற்பமும் ஓவியமும் – தொ.மு. பாஸ்கரத் தொண்டைமான்.

3. சமயமும் தமிழும் – பேராசிரியர் அ.ச.ஞானசம்பந்தன்.

4.தமிழில் அறிவியல் – ஒரு பார்வை - பேராசிரியர் சிவகுமார்.

5. இன்றைய நெருக்கடிப் பிரச்சனைகள் - நீர்வளம் - முனைவர் ச. முத்துக்குமரன்.

அலகு - V : இலக்கணமும் மொழிப்பயிற்சியும்

1.எழுத்து, சொல், பொருள் இலக்கண எழுத்துப்பயிற்சிகள்

2.பொதுக் கட்டுரைகள்

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

Part I TAMIL 2015. Karpagam University, Coimbatore - 21, India

Semester II

15ENU201 ENGLISH- II 4H-4C

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives:

- To help students enhance their Language skills
- To introduce different kinds of literary works
- To familiarize different genres of Literature
- To instruct moral values through literature
- To improvise their productive and receptive skills
- To strengthen the basic knowledge about grammar

Course Outcomes (CO's):

1. Develop the four types of skills
2. Reading and comprehending literary works
3. Genres of literature to provide moral education
4. Develop communication skills in business environment
5. Interpersonal skills will be developed
6. Betterment of language competence

UNIT I:

Prose: The Unexpected- Robert Lynd
Poetry: The Village Schoolmaster – Oliver Goldsmith
Short Story: The Lion's Share – Arnold Bennett
Vocabulary: Homonyms
Grammar: Irregular Verbs

UNIT II:

Prose: Travel by Train – J. B. Priestly
Poetry: The Gift of India **–** Sarojini Naidu
Grammar: Sentence patterns
Composition: Reading Comprehension

UNIT III:

Prose: Women's Education is Almost More Important than the Education of Boys and Men – Indira Gandhi
Short Story: The Necklace – Guy De Maupassant
One-Act Play: The Referee – W.H. Andrews and Geoffrey Dearmer
Vocabulary: Similes
Grammar: Discourse Markers
Composition: Report Writing

UNIT IV:

Poetry: Ozymandias – P.B. Shelley
One-Act Play: The Pot of Broth- W.B. Yeats
Vocabulary: Collective Nouns

Grammar: Correction of Sentences
Composition: Picture Reading

UNIT V:

Short Story: The Silver Butterfly– Pearl S. Buck
One-Act Play: The Bear – Anton Chekov
Vocabulary: Acronyms
Grammar: Question Tags
Composition: Drafting Advertisement

Prescribed Text

Wings of Communication 2014**.** Board of Directors. Emerald Publishers: Chennai

Reference

Syamala, V. English for Communication. 2006. Emerald Publishers: Chennai.

Semester II

15BCU201 ANALYTICAL BIOCHEMISTRY 5H-5C

Instruction hours/week: L:5 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course Objectives

Equip the students:

- On maintenance of safety documents.
- On the preparation of SOPs
- On the detection of radioisotopes
- Interpretation of virtual lab experiment
- Different methods of centrifugation (differential/density gradient)
- Determination of pKa for biological buffers using Henderson-Hasselbach equation

Course Outcomes (CO's)

After successful completion of the course, the student will:

1. Maintain safety documents.
2. Prepare SOPs
3. Detect radioisotopes
4. Interpret virtual lab experiments
5. Use different methods of centrifugation (differential/density gradient)
6. Determine pKa for biological buffers using Henderson-Hasselbach equationin a given situation

UNIT I

pH, Handerson and Hasselbach equation; measurement of pH- Glass electrode, pH scale; Buffer- buffer solutions, buffer systems of blood. pH indicators. Various ways of expressing the concentrations of solutions- molality, molarity, normality, Mole fraction, ppm, serial dilution. Simple problems to be worked out.

UNIT II

Chromatography: Principle- partition co-efficient. Types- paper chromatography, TLC, adsorption, ion exchange, molecular sieve and affinity chromatography.

Electrophoresis- Principle, instrumentation and applications of paper electrophoresis, agarose gel electrophoresis, PAGE.

UNIT III

Centrifugation: Principle and technique of preparative and analytical centrifuge. Types of centrifuge, types of rotors, centrifugation types- Density gradient and differential centrifugation- Separation of cell organelles.

Radio active Isotopes: Radioactive decay, units of radio activity, detection and measurement of radioactivity- Geiger-Muller counter, Scintillation counter, Autoradiography, biochemical applications of radio isotopes.

UNIT IV

Colorimetry: Colour and absorption spectra. Beer Lambert's law- deviation from Beer's law. Working of single cell photoelectric colorimeter. Measurement of extinction. Calibration curve.

Spectrophotometry: Principle, instrumentation and applications of double beam spectroscopy, spectro fluorimetry, mass spectroscopy and atomic absorption spectroscopy, comparison and advantages of spectrophotometer over colorimeter.

UNIT V

Nanotechnology: Introduction and Approaches to nanomaterials fabrication (Bottom up and Top down assembly), MEMS and NEMS-introduction and its applications, Carbon nano structures-Carbon Nano tubes fibers & Crystals-applications, DNA to build nanotubes, DNA as smart glue and DNA as wire template. Applications of Nanotechnology in medicine and biology.

TEXT BOOKS

Gopalan.R, P.S, Subramanian and K. Rangarajan. 2003. Elements of Analytical Chemistry, Sultan Chand and Sons, New Delhi.

Sharma. B. K. 2004. Instrumental Methods of Chemical Analysis, GOEL Publishers, Meerut.

Merrit W.1986. Instrumental Methods of Analysis, CBS Publishers, New Delhi.

REFERENCES

Chatwal Anand. 2003. Instrumental Methods of Chemical Analysis, Himalaya Publishing House, Hydrabad.

David T, Plummer. 2002.An Introduction to Practical Biochemistry, McGraw Hill Publishing Company, New Delhi.

Frank.J, Owens. 2007. Introduction to Nanotechnology. Wiley publications, Washington, United States .

Wilson K, and Walker J, 2004. Practical Biochemistry- Principles and Techniques, Cambridge University Press, London.

15BCU202 **ALLIED CHEMISTRY - II** **Semester – II**
4H – 4C

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course Objectives

Equip the students:

- To be conversant with the extraction of metals
- About coordination chemistry
- On the preparation, properties, uses and structure of naphthalene and heterocyclic compounds
- To acquire knowledge on electrochemistry, biological functions of amino acids and proteins
- To acquire knowledge on thermodynamic laws, entropy, enthalpy change and the principles of electroplating
- To acquire knowledge on aromatic and heterocyclic compounds

Course Outcomes (CO's)

After successful completion of the course, the student will understand:

1. The metallurgy of metals and the theories of coordination compounds and
2. The industrial importance of EDTA, haemoglobin and chlorophyll
3. The concept of aromaticity and preparation of aromatic compounds including heterocyclic compounds
4. The preparation, classifications and properties of amino acids, proteins and carbohydrates
5. The concepts of first and second laws of thermodynamics
6. The fundamentals of electrochemistry

UNIT-I

Metals and Coordination Chemistry:

Metals: General methods of extraction of metals-methods of ore dressing-types of furnaces-reduction methods-electrical methods-types of refining-Van Arkel process-Zone refining.

Coordination Chemistry: Nomenclature-theories of Werner, Sidgewick and Pauling-chelation and its industrial importance-EDTA-haemoglobin-chlorophyll-applications in qualitative and quantitative analysis.

UNIT-II

Aromatic Compounds and Heterocyclic Compounds:

Aromatic Compounds: Aromaticity-Huckel's (4n+2) rule- aromatic electrophilic substitution in benzene- mechanism of nitration, halogenation, alkylation, acylation and sulphonation.
Naphthalene: Isolation, preparation, properties and structure.

Heterocyclic Compounds: Preparation and properties of pyrrole, furan, thiophene and pyridine.

UNIT-III

Amino acids, Proteins and Carbohydrates:

Amino acids: Classification, preparation and properties. Peptides-preparation of peptides (Bergmann method only).

Proteins: Classification, properties, biological functions and structure.

Carbohydrates: Classification, preparation and properties of glucose and fructose- discussion of open chain and ring structures of glucose and fructose-glucose-fructose interconversion.

UNIT-IV

Energetics: Type of systems-processes and their types - isothermal, adiabatic, reversible, irreversible and spontaneous processes-statement of first law of thermodynamics-need for the second law of thermodynamics-heat engine-Carnot cycle-efficiency-Carnot theorem-thermodynamics scale of temperature-Joule-Thomson effect- Enthalpy- Entropy and its significance-Free energy change.

UNIT-V

Electrochemistry: Kohlrausch law-conductometric titrations-hydrolysis of salts-galvanic cells-E.M.F.-standard electrode potentials-reference electrodes- electrochemical series and its applications-buffer solution-buffer solution in the biological systems-pH and its determination-principles of electroplating.

TEXT BOOKS

1. V.Veeraiyan & A.N.S. Vasudevan, Text Book of Allied Chemistry (II Edition), Highmount Publishing House, Chennai (2005).
2. B.R.Puri and L.R.Sharma, Principles of Inorganic Chemistry, Shoban lal & Company Ltd., Jalandar (2002).
3. B.S.Bahl & Arun Bahl, Advanced Organic Chemistry, S.Chand & Company Ltd., New Delhi (2005).
4. Puri, Sharma & Pathania, Physical Chemistry, Vishal Publishing Company Ltd., Jalandhar (2003).

REFERENCES

1. R.Gopalan & S.Sundaram, Allied Chemistry (III Edition), Sultan Chand & Sons., New Delhi (2003).

Semester II

15BCU 211 PRACTICAL- II 5H-3C

QUANTITATIVE ESTIMATION AND SEPARATION TECHNIQUES

Instruction hours/week: L:0 T:0 P:3 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

To impart hands-on training:

- On the strength of concentrated acids
- On serial dilution of concentrated solutions
- How to determine the molar extension coefficient?
- How to obtain UV spectrum for a given compound?
- How to quantify nucleic acids using spectrophotometer?
- How to estimate the purity of nucleic acids

Course Outcomes (CO's)

After successful completion of the course, the student will:

1. Know the strength of laboratory acids and bases
2. Prepare serial dilution of concentrated solutions
3. Determine the molar extension coefficient
4. Obtain UV spectrum for a given compound
5. Quantify nucleic acids using spectrophotometer
6. Assess the purity of nucleic acids

I. Quantitative estimation of the following in unknown solution.

1. Estimation of glucose (Anthrone method)
2. Estimation of phosphorus (Fiske-Subbarow method)
3. Estimation of urea (Dam TSC method)
4. Estimation of uric acid (Caraway method)
5. Estimation of iron (Wong's method)
6. Estimation of protein (Lowry's method)
7. Estimation of DNA (Diphenylamine method)
8. Estimation of RNA (Orcinol method)

II. Preparation of buffers and measurement of pH using indicators and pH meter

III. Separation techniques (Group experiments)

1. Paper chromatography of sugars or amino acids (ascending)
2. Separation and identification of amino acids from mixture using TLC
3. Separation of plant pigments by column chromatography
4. Separation of amino acids by paper electrophoresis

REFERENCES

Harold Varley. 2005. Practical Clinical Biochemistry, CBS Publishing, New Delhi.

Jayaraman J. 2007. Laboratory Manual in Biochemistry, New Age International Publishers, New Delhi.

Sadasivam S and A. Manickam. 2009. Biochemical Methods, New Age International Publishers, New Delhi.

Singh.S.P.2009. Practical Manual of Biochemistry, CBS Publishers, New Delhi.

Semester – II

15BCU212 ALLIED CHEMISTRY PRACTICAL -II 3H – 2C

Instruction hours/week: L:0 T:0 P:3 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

To impart hands-on training on:

- Estimation of sodium carbonate and sodium hydroxide
- Estimation of sulphuric acid
- Estimation of potassium permanganate
- Estimation of ferrous sulphate using permanganometry
- Estimation of oxalic acid using permanganometry
- Estimation of calcium using permanganometry

Course Outcomes (CO's)

After successful completion of the course, the student will:

1. Estimate sodium carbonate and sodium hydroxide using standards
2. Estimate sulphuric acid using standard oxalic acid
3. Estimate potassium permanganate by alkalimetry method
4. Estimate ferrous sulphate using stand Mohr's salt
5. Estimate oxalic acid using standard ferrous sulphate
6. Estimate calcium using direct method

Contents

I. VOLUMETRIC ANALYSIS

A. Acidimetry & Alkalimetry

1. Estimation of sodium carbonate using standard sodium hydroxide.
2. Estimation of sodium hydroxide using standard sodium carbonate.
3. Estimation of sulphuric acid using standard oxalic acid.
4. Estimation of potassium permanganate using standard sodium hydroxide.

B. Permanganometry

1. Estimation of ferrous sulphate using standard Mohr's salt.
2. Estimation of oxalic acid using standard ferrous sulphate.
3. Estimation of calcium-direct method.

REFERENCE BOOKS:

1. R. Ramasamy, Allied Chemistry Practical Book, Priya Publications, Karur (2008).

2. A.O. Thomas, Practical Chemistry for B.Sc. Main Students, Scientific Book Centre, Cannanore-1, Kerala (2010).

3. V. Venkateswaran, R. Veeraswamy and A. R. Kulandaivelu, Basic Principles of Practical Chemistry, 2nd Edition, S. Chand Publications, New Delhi (2004).

SEMESTER-II

15FCB201 FOUNDATION COURSE B-ENVIRONMENTAL STUDIES 2H - 1C

Instruction hours/week: L:2 T:0 P:0 **Marks:** Internal: **100** External: **-** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

Equip the students:

- To understand the concepts and components of ecosystem
- To understand the significance of eco components and measures to maintain ecosystem
- To teach the ethical and legal perspectives on ecosystem management
- To understand the undesired effects of environmental pollution
- To devise a strategy to avoid environmental pollution
- To understand the concept of conservation

Course Outcomes (CO's)

1. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
3. Understand the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
4. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
5. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
6. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

UNIT - I: Eco system and natural resources: Environment – Definition – components - Ecosystem -Definition, Concept, Scope, importance, structure and functions of ecosystem. Energy flow, Ecological succession. Food chains and food webs. Classification of ecosystem. Natural resources: Forest resources; water resources.

UNIT - II: Environmental pollution: Cause, effects and control measures of Air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution and nuclear hazards pollution. Solid waste management.

UNIT - III: Biodiversity and its conservation: Introduction- Definition, genetic, species and ecosystem diversity, biogeographical classification of India- Value of biodiversity: Consumptive, productive uses; social, ethical, aesthetic and option values. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.

UNIT - IV: Social issues and the environment: Urban problems related to energy- water conservation and management -Rain water harvesting- water shed management. Resettlement and Rehabitilisaion. Natural resources and associated problems and sustainable utilization. Environmental Education.

UNIT - V: Environment ethics: Environmental Ethics - Gender equity, ethical basis of environment education and awareness, conservation ethic and traditional value systems of India. Valuing nature, cultures, social justice, Human heritage, equitable use of resources, preserving resources for future generation, common property resources, Ecology and its uses and its degradation, Introduction to Environmental Protection Act (EPA).

TEXT BOOKS

1. Agarwal, K.M., P.K. Sikdar and S.C. Deb, 2002. A Text Book of Environment, Mac Millan India Ltd, Kolkatta, India.

2. Kotwal, P.C. and S. Banerjee, 2002. Biodiversity Conservation – In Managed forest and protected areas, Agrobios, India.
1.
2. Singh, M.P., B.S. Singh and Soma S. Dey, 2004. Conservation of Biodiversity and Natural Resources. Daya Publishing House, Delhi.

3. Uberoi, N.K., 2005. Environmental Studies, Excel Books Publications, New Delhi, India.

4. Shaw, R and Krishnamurthy, R.R. 2009. Disaster management: global challenges and local solutions Universities Press (India) Private Ltd, Hyderabad.

4. Sorokin Pitirim. A, 1942. Man and Society In Calamity. New York: Dutton,

5. Patrick L.Abbott, 2008. Natural Disasters, Mc Graw Hill, New York. Page: 1-7.

Semester-II

15SSD101	**SOFT SKILL DEVELOPEMENT -I**	**2H -1C**

Instruction hours/week: L:2 T:0 P:0 **Marks:** Internal: **100** External: **-** Total: **100**

End Semester Exam: 3 Hours

.

Semester III

15ENU301 **ENGLISH-III** **4H-4C**

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course Objectives:

- To help students enhance their Language skills
- To introduce different kinds of literary works
- To familiarize different genres of Literature
- To instruct moral values through literature
- To improvise their productive and receptive skills
- To strengthen the basic knowledge about grammar

Course Outcomes (CO's):

1. Develop the four types of skills
2. Reading and comprehending literary works
3. Genres of literature to provide moral education
4. Develop communication skills in business environment
5. Interpersonal skills will be developed
6. Betterment of language competence

UNIT I

Listening: Listening comprehension – Listening for Specific Information –Note Taking – Interpreting Charts and Diagrams.

UNIT II

Speaking: Essentials of effective communication – Greeting and Introducing – Making requests – Asking for permission – Giving and Denying Permission – Offering and Accepting Help – Asking for and Declining Help – Giving Instructions and Orders - Talking about likes and dislikes.

Telephone Skills – Understanding telephone conversation – handling calls – leaving messages –making requests - giving instructions and orders

Discussion Skills – Giving your opinion – agreeing and disagreeing – Making suggestions – Interrupting – questioning – reporting – Dealing with questions.
(Completing dialogues)

UNIT III

Reading: Reading – Reading with a purpose –Skimming and Scanning – locating main points – reading critically – Sequencing of sentences – Reading comprehension.

UNIT IV

Writing: Paragraph Writing – Descriptive and Narrative. Safety Instructions/ Suggestions. Expansion of Abbreviations – Spellings- Report writing.

Translation- Translating short sentences and passages from English to Tamil and from Tamil to English.

UNIT V

Vocabulary: Improve English vocabulary: Synonyms – Antonyms – Prefixes – Suffixes – Idioms – Collocations – Different types of English – British and American (Choose the best answer type from a database of 50 words each for each topic)

Functional Grammar: Forming questions, getting answers – Articles – Parts of Speech – Punctuation – Common mistakes in English (Homophones)(Exercise based)

REFERENCES

Language in Use: Kenneth Anderson, Cambridge University Press.
Study Speaking: A course in Spoken English for Academic Purpose: Kenneth Anderson, Joan MacLean and Tony Lynch, Cambridge University Press, 2008.
Spoken English Part I & II (for Tamil speakers), Orient Longman Pvt. Ltd.
Dr. J. John Love Joy, Dr.Francis M.Peter S.J. "Lets Communicate – Basic English for Everyone", Vaigarai Publications, 1st edition, Dindigul 2007.

Semester III

15BCU301 PROTEIN BIOCHEMISTRY AND ENZYMOLOGY 4H-4C

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

- The course exhibits in depth knowledge on its structural organization, separation, purification and characterization of proteins by adopting various methods and techniques.
- The course also describes about some applications of specialized proteins.
- To study the kinetics of enzyme catalysed reactions
- To learn the mechanism of action of enzymes and enzyme inhibition concepts
- To understand various modes of enzyme regulation
- To learn the application of enzymes in health and diseases

Course outcomes (CO's)

1. The student gathers information on protein structure, its separation techniques and other latest developments.
2. Information on specialized proteins and its application will be known to the students.
3. Understand the basic concepts on enzymes
4. Relate the initial velocity and substrate concentration of enzymes and be able to understand the kinetics of inhibition reactions
5. Relate the regulation pattern of enzymes for its application in health and diseases
6. Understand the application of enzymes as marker in various disease conditions

UNIT I

Protein-Introduction, classification, protein-structure: strong and weak bonds; primary structure- insulin, secondary structure- collagen and keratin, tertiary and quaternary structure - myoglobin and hemoglobin.

UNIT II

Protein- Properties and biological importance of proteins. Peptides – primary structure of biologically active peptides- Glutathione, Oxytocin and Vasopressin. Extraction, purification and characterization of protein. Denaturation and renaturation of protein.
Identification of N and C terminal residues of proteins.

UNIT III

Enzymes - Introduction, classification, nomenclature and properties of enzymes. Active site, Lock and key and induced-fit theories, specificity of enzymes. Enzyme activity; units of enzyme activity-international unit, turnover number, specific activity. Factors affecting enzyme activity.

UNIT IV

Enzyme Kinetics - Derivation of Michaelis- Menton equation, Definition of km, LB plot and Eadie and Hofstee plot. Enzyme inhibition-types and differentiation of competitive, uncompetitive, non-competitive inhibitors (Derivation is not needed), allosteric and covalent

modification. Coenzymes- structure and properties of TPP, coenzyme A, flavin coenzyme, Nicotinamide coenzymes, biotin and lipoic acid.

UNIT V

Application of enzymes- Industrial enzymes, Immobilized enzymes-sources, preparation techniques and application. Clinical application of enzymes. Biosensors-colorimetric, potentiometric, optical and immunosensors.

TEXT BOOKS

Trevor and Palmer, 2004. Enzymes, East West Press Pvt Ltd, New Delhi.

Chapline M.F, and C.Bucke.1990. Protein Biotechnology, Cambridge University Press, London.

Vidhya V.G, B Anusha. 2009. Enzyme Technology, Mjp Publishers, India.

REFERENCES

Gary Walsh. 2014. Proteins Biochemistry and Biotechnology, 2nd edition, John Wiley & Sons Ltd, New York.

Glazer A.N, H.Nikaido. 2007. Fundamentals of Applied Microbiology. 2nd edition, W H. Freeman Company, NewYork.

Nicholas C. Price and Lewis Stevens. 2004. Fundamentals of Enzymology, 3rd Edition, Oxford Univ. Press, New York.

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

Equip the students with:

- To understand the basic structure of prokaryotic cell and model organism for its study
- To understand the basic structure of eukaryotic cell and model organism for its study
- To know the tools required for studying cell morphology
- To enlight the students with structure and functions of various organelle
- To understand the cytoskeletal network and extracellular matrix
- To introduce the cell cycle, cell division and cell death process

Course outcomes (CO's)

After successful completion, the students will:

1. Differenttiate the prokaryotic and eukaryotic cell
2. Understand the pricnciple behind studying the cell morphology using various microscope
3. Identify the structure and functions of each organelle in cell
4. Recognise the mechanism behind the protein sorting and transport to their destinations like lysosome, mitochondria and chloroplast
5. Maintenance of cytoskeleton structure and function of micro, macro and intermediary filaments
6. Identify the proteins involved in cell cycle and cell cell interaction

UNIT-I

An overview of cells: Origin and evolution of cells. Cell theory, Classification of cells: prokaryotic cells, eukaryotic cell; comparison of prokaryotic and eukaryotic cells. Molecular composition of cell.

UNIT-II

Cell membrane: Fluid mosaic model of membrane structure. Membrane lipids-properties; Membrane proteins and their properties. Membrane carbohydrates and their role. Transport across membranes -Diffusion, active and passive transport, endocytosis and ion channels

UNIT-III

Cell organelles

Mitochondria: - Structure and functions, Electron transport complexes.

Endoplasmic reticulum: Types, structure and functions. Golgi apparatus: structure and functions. Lysosomes: structure and functions, morphology and functions of peroxisomes and glyoxysomes.

UNIT-IV

Nucleus: - Structure and functions. Nuclear envelope and Nucleopore complex-structure. Selective import of protein to nucleus

Nucleolus: Ribosomal RNA genes. Chromosomes: chromatin structure.

Cell cycle: Phases of cell cycle, cell cycle check points. Cell division- Mitosis and meiosis. Nucleus during mitosis.

UNIT-V

Cytoskeleton: Micro, macro and intermediary filaments-structure and functions. Micro tubules: chemistry and functions; cilia and flagella.
Cell signalling – Signalling molecules & Receptors (over view)
Cell–cell interaction – cell adhesion protein, tight junction, gap junction.

TEXT BOOKS

Ajay Paul. 2007. Text Book of Cell and Molecular Biology,1st edition. Books and Allied (P) Ltd, Kolkata.

P.S.Verma and V.K.Agarwal. 2005. Cell Biology Molecular Biology and Genetics, VII Edition, S.Chand and company Ltd, New Delhi.

R.M.Shukla. 2013. A textbook of Cell Biology, Dominant Publishers and Distributors.

C.B.Powar, 2001. Cell Biology, 3rd edition, Himalaya Publishing House.

REFERENCES

Harvey Lodish, Arnold Berk, Chris A. Kaiser and Monty Krieger. 2012. Molecular Cell Biology, 7th edition. W.H. Freeman & Company, London.

Garrette & Grisham. 2004. Principles of biochemistry, 4th edition. Saunders college publisher, Philadelphia,United States.

Geoffrey M. Cooper and Robert E. Hausman 2013.Cell-A Molecular Approach, 6th Edition.. Sinauer Associates. USA

Gerald Karp 2013. Cell and Molecular Biology, 7th edition. John Wiley and Sons, Inc, Hoboken, United States.

Semester III

15BCU303A ALLIED ELECTIVE I-GENERAL MICROBIOLOGY 5H -2C

Instruction hours/week: L:5 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

Equip the students with:

- Origin of microbiology field and theories
- Diverse nature of microbial organisms
- Life cycle of viruses
- Life cycle of bacteria
- Life cycle of algae
- Life cycle of fungi and protozoa

Course outcomes (CO's)

After successful completion, the students will understand:

1. Origin of microbiology field and theories
2. Diverse nature of microbial organisms
3. Life cycle of viruses
4. Life cycle of bacteria
5. Life cycle of algae, fungi and protozoa
6. Emerging microbial threats

UNIT I

Basics of Microbiology: Bacteria- size, shape and arrangement of bacterial cells. Bacterial cell wall structure and chemical composition. Flagella and motility, pili (fimbreae) capsules and spores. Bacterial reproduction and nutrition. Algae- occurrence, biological and economic importance of algae. Characteristics of algae and classification. Fungi- Importance of fungi, morphology, reproduction- asexual and sexual.

UNIT II

Microscopy: Introduction, Bright field microscopy, Dark field microscopy, Phase contrast microscopy, TEM, SEM.

Techniques of Microbiology: Sterilization techniques, pure culture methods. Methods of preservation and maintenance. Staining- simple, Gram, acid fast, endospore and flagella. Microbial growth- determination of growth curve and generation time.

UNIT III

Virology: Viruses- Morphology and structure- types of phages, phage structure, replication of bacterial viruses- adsorption, penetration, transcription, assembly and release. Lysogeny- mechanism of lysogeny. Retroviruses: HIV- AIDS virus working of immune system in the presence of HIV, replication in target cell. Mechanism of oncogenesis.

UNIT IV

Microbial diseases: Host parasite interaction, exo and endotoxins. Food and water borne diseases- pathogenesis and symptoms of typhoid, cholera, bacillary dysentery and hepatitis. Air borne diseases- Aetiology, symptoms and prevention of TB, chickenpox and influenza. Direct contact diseases- and symptoms of rabies and leprosy**.**

UNIT V

Applied microbiology: Water microbiology- bacteriological examination of water, sewage treatment. Industrial microbiology- design of fermenter, types of fermentation- solid- state and submerged fermentation, batch culture and continuous culture. Production of penicillin, citric acid and amino acids.

TEXTBOOK

Powar.C.B and H.F.Dahinwala.2007.General Microbiology, Himalaya Publishing house, Mumbai.

REFERENCES

Prescott.L,J. Harley and D. Klein .2007.Microbiology, 7th edition McGraw Hill Publishers, London.

Pelzar.A .2004.Microbiology, McGraw Hill Publishers, London

Semester III

15BCU303B ALLIED ELECTIVE I-NUTRITIONAL BIOCHEMISTRY 5H -2C

Instruction hours/week: L:5 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with

- Concepts of nutrition
- Calorific value of carbohydrates, fats and proteins
- Recommended dietary allowances
- Nutrition as a strategy to prevent diseases
- Nutrition deficiency disorders
- Food drug interactions

Course outcomes (CO's)

After successful completion, the students will understand

1. Concepts of nutrition
2. Calorific value of carbohydrates, fats and proteins
3. Recommended dietary allowances
4. Nutrition as a strategy to prevent diseases
5. Nutrition deficiency disorders
6. Food drug interactions

UNIT-I

Energy- Definition of kilocalories, joule, energy value of foods, physiological fuel values, SDA of foods, determination of energy requirement of body, basal metabolic rate-determination, factors influencing BMR.Definition for normal and balanced diet. Calorie requirement of adults, children and old age people. Recommended dietary allowances (RDA) –ICMR Different food groups.

UNIT-II

Carbohydrates- Functions, Sources, requirement, Hyperglycemia, hypoglycemia,
Protein- functions, sources and requirement, Definition of Biological Value, NPU, Digestibility coefficient. PER-definition and measurement

UNIT-III

Lipids- Functions, sources, requirement, digestion, absorption and utilization importance of essential fatty acids, their requirements and deficiency. Vitamins and Minerals: normal requirements, excess, deficiency, Significance.

UNIT-IV

Therapeutic diet - Principles of therapeutic diet, modifications of normal diet, different types of diet, difference between normal and therapeutic diet.Objectives of diet therapy. Principles of diet preparation and counseling. Diet in allergy- definition, common food allergy tests of allergy

and dietetic treatment. Diet in Diabetes, Allergy, Anemia, GI tract disorders, liver disorders and obesity.

UNIT-V

General principles and methods of food preservation: Preservation with chemicals-Microbial inhibitors, inorganic preservatives, antibiotics, mold inhibitors and antioxidants.

REFERENCES

Gordon M, Wardlaw and Paul M. 2012. Perspectives in Nutrition: U.S.A. McGraw Hill Publishers. 9rd Edition. New Delhi

Srilakshmi.B. 2015 Food Science:. New Age International (P) Ltd. Publishers. 6nd Edition., New Delhi

Srilakshmi.B. 2014 Nutrition Science: New Age International (P) Ltd. Publishers.4th Edition. New Delhi.

Swaminathan.M. 2008. Essential of Food and Nutrition Vol II The Bangalore Printing and Publishing Co. Ltd., Bangalore.

Semester III
5H -2C

15BCU303C ALLIED ELECTIVE I-FOOD PRESERVATION TECHNOLOGY

Instruction hours/week: L:5 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

Equip the students with

- Concepts of nutritional preservation methods
- Principles of food processing
- Microbiology of food
- Packaging techniques
- Calorific value of carbohydrates, fats and proteins assessment in preserved samples
- Legislations related to food storage

Course outcomes (CO's)

After successful completion, the students will understand

1. Concepts of nutrition
2. Calorific value of carbohydrates, fats and proteins
3. Recommended dietary allowances
4. Nutrition as a strategy to prevent diseases
5. Nutrition deficiency disorders
6. Food drug interactions

UNIT I:

Microbiology of Food: History of microbiology of food. Types of micro-organism normally associated with food -mold, yeast, and bacteria, Microbial growth pattern, physical and chemical factors influencing destruction of micro-organisms. Micro-organisms in natural food products and their control mechanisms. Food chemistry- definition and importance

UNIT II:

Principles of Food Processing: Principles of Preservation methods. Dehydration: Novel evaporation /dehydration techniques, spray drying. Vacuum drying- osmotic dehydration - efficient drying systems, High salt and high sugar preservations, infrared heating Freezing of foods, freeze concentration and drying, methods of freeze concentration. High Temperature operations, sterilization and Pasteurization.

UNIT III:

Types of Preservation Technology: Microwave Processing: Microwave, properties, heating mechanism. Applications of microwave in food processing, effect of microwave on food nutrient. Food Irradiation Technology: General aspects of irradiation, ionizing radiation, irradiation process, units, mechanism, advantages and disadvantages of irradiation process. Ultrasound in food processing and preservation: Introduction and its application in food processing.

UNIT IV:

Food Packaging: Introduction to packaging.Packaging operation, package-functions and design. Principle in the development of protective packaging. Deteriorative changes in foodstuff and packaging methods for prevention, shelf life of packaged foodstuff, methods to extend Shelf-life. Evaluation of packaging, and package performance, packaging equipment, package standards and regulation, bar coding material. Biodegradable packaging.

UNIT V:

Food Quality and Food Laws: Objectives, Importance and functions of quality control. Methods of quality, assessment of food materials-fruits, vegetables, cereals, dairy products, meat, poultry, egg and processed food products. Sanitation and hygiene - Integrated Food Laws

TEXT BOOKS:

Barbosa-Canovas, G.V., & Gould, G.W. 2000. "Innovation in Food Processing". Technomic Publication, Lancaster, UK:

William C. Frazier & Dennis C Westhoff. 2008. "Food Microbiology" Fourth Edition, Tata McGraw-Hill Education Publication, India.

REFERENCES:

Bibek Ray., (2003) "Fundamental Food Microbiology", 3rd edition. CRC Press LLC, N.W. Corporate Blvd., Boca Raton, Florida 33431.

Precott, Harley.2004. " Microbiology" Sixth edition, McGraw-Hill Science, NewYork
Michael J. Waites, Neil L. Morgan, John S. Rockey, Gary Higton. 2001. "Industrial Microbiology: An Introduction", Blackwell Science, oxford,UK

Vijaya Ramesh K. 2007. "Food microbiology". First Edition MJP Publishers, 2007.

Semester III

15BCU311 **PRACTICAL – III** **5H-2C**

ENZYME KINETICS

Instruction hours/week: L:0 T:0 P:5 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students:

- To understand the basic concepts of enzymes
- To study the kinetics of enzyme catalysed reactions
- To learn the mechanism of action of enzymes and enzyme inhibition concepts
- To understand various modes of enzyme regulation
- To learn the application of enzymes in health
- To learn the application of enzymes in diseases

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Understand the basic concepts on enzymes
2. Relate the initial velocity and substrate concentration of enzymes and be able to understand the kinetics of inhibition reactions
3. Understand the basis of enzyme inhibitor drugs
4. Be able to understand the regulation pattern of various enzymes
5. Relate the regulation pattern of enzymes for its application in health and diseases
6. Understand the application of enzymes as marker in various disease conditions

1. Enzyme kinetics

(a) Acid Phosphatase

(i) Preparation of crude enzyme extract from potato
(ii) Effect of pH on the activity of acid phosphatase
(iii)Effect of temperature on the activity of acid phosphatase
(iv)Effect of enzyme concentration on the activity of acid phosphatase
(v) Effect of substrate concentration on the activity of acid phosphatase

(b) Catalase

(i)Preparation of crude enzyme extract from Chow-Chow
(ii)Effect of pH on the activity of catalase
(iii)Effect of temperature on the activity of catalase
(iv)Effect of enzyme concentration on the activity of catalase
(vi)Effect of substrate concentration on the activity of catalase

2. Estimation of salivary amylase activity

3. Assay the activity of
   (i) SGOT in serum
   (ii) SGPT in serum
   (iii) Alkaline phosphatase in serum

REFERENCES

Harold Varley.2003. Practical Clinical Biochemistry, CBS Publishers, New Delhi.

Jayaraman J ,2007. Laboratory Manual in Biochemistry, New Age International Publishers, New Delhi.

Sadasivam S,and A. Manickam ,2009. Biochemical Methods, New Age International Publishers, New Delhi.

Singh.S.P.2009. Practical Manual of Biochemistry", CBS Publishers, New Delhi.

Semester III

15BCU312 A **ALLIED PRACTICAL– III** **3H-2C**

GENERAL MICROBIOLOGY

Instruction hours/week: L:0 T:0 P:3 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam: 3 Hours

Course objectives

To impart hands-on training on

- Sterilization methods
- Autoclave, filtration techniques
- Preparation of microbial culture media
- Assessment of bacterial strains
- Pure cultures using streaking methods
- Colony counting

Course outcomes (CO's)

After successful completion, the students will understand

1. Sterilization methods
2. Autoclave, filtration techniques
3. Preparation of microbial culture media
4. Assessment of bacterial strains
5. Pure cultures using streaking methods
6. Colony counting

Microbiology

1. Student's microscope- parts.
2. Sterilization techniques.
3. Preparation of liquid and solid culture media.
4. Agar slant, agar deep, agar plates: culture characteristics.
5. Pure culture techniques- Pour plate and streak plate method.
6. Motility test- Hanging drop preparation.
7. Growth curve of *E. coli*.
8. Enumeration of microbial population of soil, milk and water.
9. Staining methods- simple, Grams, endospore, negative and fungal staining.
10. Characterization of microbial cultures- carbohydrate fermentation- glucose, sucrose and lactose, IMVIC test of enteric bacteria.
11. Antibiotic sensitivity test.

REFERENCES

Kannan N, 2003. Laboratory Manual in Microbiology, Panima Publishing Corporation, Bangalore.

Sadasivam S, and A. Manickam, 2009. Biochemical Methods, New Age International Publishers, New Delhi.

Semester III

15BCU312B ALLIED PRACTICAL– III 3H-2C

NUTRITIONAL BIOCHEMISTRY

Instruction hours/week: L:0 T:0 P:3 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam: 3 Hours

Course objectives

To impart hands-on training on:

- Content analysis of food sample
- Estimation of carbohydrates, fats and proteins
- Estimation of aminoacids in good grains
- Estimation of vitamins in fruits
- Analysis of milk and milk products
- Estimation of iron

Course outcomes (CO's)

1. Content analysis of food sample
2. Estimation of carbohydrates, fats and proteins
3. Estimation of aminoacids in good grains
4. Estimation of vitamins in fruits
5. Analysis of milk and milk products
6. Estimation of iron

Experiments:

1. Determination of moisture content of food sample
2. Determination of ash content of food sample
3. Estimation of total carbohydrates in potato.
4. Estimation of crude fibre in food.
5. Estimation of oil content in oil seeds.
6. Estimation of free fatty acids in oil seeds.
7. Estimation of crude protein in food sample.
8. Estimation of methionine in food grains.
9. Estimation of ascorbic acid in citrus fruit.
10) Analysis of milk and milk products-
    i. Lactose content of milk
    ii. Calcium content in milk.
11. Estimation of iron in apple juice.

REFERENCES

1. Jayaraman J. 2007. Laboratory Manual in Biochemistry, New Age International Publishers, New Delhi.
2. Sadasivam S and A. Manickam. 2009. Biochemical Methods, New Age International Publishers, New Delhi.
3. Singh.S.P.2009. Practical Manual of Biochemistry, CBS Publishers, New Delhi.

Semester III

15BCU312C **ALLIED PRACTICAL– III** **3H-2C**

FOOD PRESERVATION TECHNOLOGY

Instruction hours/week: L:0 T:0 P:3 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

To impart hands-on training on:

- Food packaging technology
- Evaluating the tensile strength of packaging materials
- Analysis of colliform microbes
- Analysis of fungal contamination
- Analysis of food adulteration
- Determining the shelf life of packaged food

Course outcomes (CO's)

1. Food packaging technology
2. Evaluating the tensile strength of packaging materials
3. Analysis of colliform microbes
4. Analysis of fungal contamination
5. Analysis of food adulteration
6. Determining the shelf life of packaged food

1. Preparation of syrups, Grape squash and orange squash.
2. Water vapor transmission rate of different packaging materials
3. Determination of migration characteristics of packaging materials
4. Determination of migration characteristics of packaging materials using different simulants
5. Determination of bacterial counts of polymer – packed foods during storage
6. Determination of tensile strength of given packaging material
7. Determination of bursting strength of given packaging material
8. Determination of coliforms and fungal counts of polymer – packed foods during storage
9. Microwave and radiation preservation of meat, poultry and fish
10. Identification and chemical resistance of plastic films.
11. Estimation of shelf-life of packaged food stuff.
12. Detection of adulteration in foods.

TEXT BOOKS

Coles, R., Dowell, D.M., Kirwan, J. 2003. Food Packaging Technology. Black Well Publishing Ltd., 2003.

Plummer, D.T. 1971. An Introduction to Practical Biochemistry. Mc-Graw Hill Pub.Co., New York.

Raghuramulu, N, Madhavan Nair, K , and Kalyanasundaram, S. 1983. A Manual of Laboratory Techniques. National Institute of Nutrition, ICMR, Hyderabad.

REFERENCES

ShafiurRahman M. 2006. Handbook of Food Preservation. Marcel Dekker Publisher, Inc.NY.

Stanburry P.P. and Whitaker, A. 1984. Principles of Fermentation Technology.Pergamon Press, Oxford UK.

Semester III

15FCC301A INTRODUCTION TO COMPUTERS 4H-2C

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **100** External: **-** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with :

- Know the basic concept of computers.
- Input/Output systems
- Understand the concept of MS-word, MS-Excel.
- Be able to work in MS-PowerPoint.
- Knowledge about internet and the usage of E-Mail services.
- Search engines

Course outcomes (CO's)

After successful completion, the students will understand:

1. Basic concepts of computer
2. Input/Output systems
3. Working with MS-word, MS-Excel.
4. The presentation of data using MS-PowerPoint.
5. About internet and the usage of E-Mail services.
6. Search engines

UNIT-I

Introduction- Characteristics of computers- development of computers- generations of computers- classification of computers-the computer system- types of Input/ Output and memory devices-computer software-categories of software.

UNIT-II

Starting with MS Office Word – Working with Text – working with tables-Checking spelling and grammar- adding graphics to document- Mail merge- printing a document – Advanced features of MS Office Word- Keyboard shortcuts.

UNIT III

Starting with MS Office Excel- Working with Excel workbook-working with worksheet-formulas and functions-inserting charts-sorting-importing data-printing in excel- Advanced features of MS Office Excel.

UNIT IV

Starting with MS Office PowerPoint – Working with PowerPoint- Working with different views-Designing Presentations- Slide Show.- Printing in PowerPoint.

UNIT-V

The Internet-Evolution of Internet-Owner of Internet- Anatomy of Internet – Internet Terminology- Getting Connected to Internet- Web Brower- Electronic Mail- Search engines-Uses of internet to society.

TEXT BOOK

1. Fundamentals of Computers: For Undergraduate Courses in Commerce and Management, ITL Education Solutions.2011. Pearson, New Delhi.

REFERENCES

1. Pradeep K.Sinha , Priti Sinha. Computer Fundamentals, 2007, 6th Edition BPB Publications, New Delhi.

2. Rajaraman V. 2003.Fundamentals of Computers, Prentice-Hall Of India Pvt. Limited, Chennai.

3. Wallace Wang. Microsoft Office 2007 For Dummies,1st Edition Wiley Publishing Inc.

15FCC301B INTRODUCTION TO MULTIMEDIA 4H-2C

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **100** External: **-** Total: **100**
End Semester Exam: 3 Hours

Course objectives

- To acquire basic knowledge on Multimedia devices.
- To understand current trends in multimedia by experiencing a variety of applications and development packages.
- To identify a range of concepts, techniques and tools for creating and editing the interactive multimedia applications.
- To identify the current and future issues related to multimedia technology.
- To identify both theoretical and practical aspects in designing multimedia systems surrounding the emergence of multimedia technologies using contemporary hardware and software technologies.

Course outcomes (CO's)
After successful completion, the students will

- Define what is multimedia.
- Discuss the effects of multimedia in your daily life.
- Identify five multimedia components.
- Explain why multimedia is so powerful to encrease human-computer interaction.
- Examine multimedia applications in several areas.
- Understand analog and digital conversion process

UNIT - I
Multimedia – An overview: Introduction – Multimedia presentation and production – Characteristics of Multimedia presentation – Hardware and Software Requirements – Uses of Multimedia. Text: Types of text - Font - Text File formats. Image: Image data representation – Image file formats – Image processing software. Graphics: Advantages of graphics – Uses – Components of a graphics system.

UNIT - II
Audio: Sound waves – Types and properties of sound – Components of audio system – Digital audio - Musical Instrument Digital Interface (MIDI) – Audio file formats – Audio processing software. Video: Motion video – Television systems – Video file formats – Video processing software. Animation: Uses of animation – Computer based animation – Animation file formats – Animation software.

UNIT - III
Introducing Photoshop elements: About elements – Welcome screen – Create mode – Menu bar – Toolbox – Options bar – Panels. Organizing images: Obtaining images – Tagging images - Searching for images - Opening and saving images. Selecting Areas – Layers – Text and Drawing Tools.

UNIT - IV

Understanding Flash: Understanding Flash basic elements – Creating a simple animation. Learning Flash Toolbox: Learning the toolbox – Using tools. Learning Flash Panels: Understanding the panels. Using timeline and layers: Understanding how timeline works – Understanding layers. Drawing objects: Drawing lines and fills – Using colors – Rotating, skewing and scaling – Grouping objects.

UNIT - V

Creating animation – How animation works – Creating motion tweens – Creating shape tweens. Understanding masks – Creating masks. Creating symbols and using the library: Learning about symbols – Creating symbols – Using libraries. Learning Basic ActionScript concepts: ActionScript basics – Data type basics.

TEXT BOOKS

1. Ranjan Parekh, 2013, Principles of Multimedia, 2nd Edition, Tata McGraw hill . (Unit I, Unit II)
2. Nick Vandome, 2011, Photoshop Elements 9, Tata McGraw hill. (Unit III)
3. Brian Underdahl, 2002, Macromedia Flash MX – A Beginners Guide, Dreamtech Press. (Unit IV, Unit V)

REFERENCES

1. Tay Vaughan, 2002, Fundamentals of Multimedia, 5th Edition, Tata McGraw-Hill.
2. Bill Sanders. 2001. Flash5 Action Script, 1st Edition, Dream Tech Press, New Delhi

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Semester IV

15ENU401 **ENGLISH-IV** **4H-4C**

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course Objectives:

- To help students enhance their Language skills
- To introduce different kinds of literary works
- To familiarize different genres of Literature
- To instruct moral values through literature
- To improvise their productive and receptive skills
- To strengthen the basic knowledge about grammar

Course Outcomes (CO's):

1. Develop the four types of skills
2. Reading and comprehending literary works
3. Genres of literature to provide moral education
4. Develop communication skills in business environment
5. Interpersonal skills will be developed
6. Betterment of language competence

UNIT I – Concept of Communication – Barrier to Communication –Body language – Personality Development – Etiquette and Manners- Soft Skills – Emotional Intelligence

UNIT II – Listening Comprehension – Reading Comprehension – Paragraph writing – Precis Writing – Writing Resume and Covering Letter -Speaking – Welcome Address, Vote of Thanks, Compering, Debates, Role Play, Dialogues – Vocal Communication Techniques. Voice, Quality, Volume, Pitch

UNIT III – Dicto Composition – Letter Writing (Informal, Letters to the Editor etc) – Term paper – Book reviews

UNIT IV – Business Correspondence – Layout of Business Letter – Formal Styles of Business Letters – Letters of Acceptance, Appointment, Resignation, Complaint, Sending E-mails.

UNIT V – Effective Presentation – Planning – Audience Analysis –Logical Sequencing – Timing of the Presentation – Conclusion – Answering Queries – Group Discussion – Interview.

Prescribed Text:

Juneja. P. Om and Aarati Mujumdar, *"Business Communication -Techniques and Methods"*, Orient Blackswan Pvt. Ltd., Hyderabad: 2010.

REFERENCES

Badi, R.V and K. Aruna. Business Communication, 2008, Vrinda Publications: New Delhi.

Balasubramanian M and G Anbalagan. Performance in English. 2007.Anuradha Publications: Kumbakonam
Mohan, Krishna and Meenakshi Raman.2008, Effective English Communication, Tata McGraw Hill: New Delhi.
Selley, John. Oxford Guide to Effective Writing and Speaking. 2005. OUP: New Delhi.

15BCU401 **HUMAN PHYSIOLOGY** **Semester IV** **6H-5C**

Instruction hours/week: L:6 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives
Equip the students:

- On the concept of homeostasis
- On the physiological functioning of cardiovascular system
- On the physiological functioning of renal system
- On the physiological functioning of gastro-intestinal and hepatic system
- On the physiological functioning of muscular skeletal system
- On the physiological functioning of reproductive system

Course outcomes (CO's)
After successful completion of the course, the student will:

1. Understand the concept of hoemostasis
2. Understand the physiological functioning of cardiovascular system
3. Understand the physiological functioning of renal system
4. Understand the physiological functioning of gastro-intestinal and hepatic system
5. Understand the physiological functioning of muscular skeletal system
6. Understand the physiological functioning of reproductive system

UNIT I
Blood: composition and functions; RBC-Hemoglobin, Hemopoesis, Leukocytes, and Platelets; Blood coagulation mechanism; blood groups and blood transfusion.
Body Fluids: ECF and ICF: Ionic composition of body fluids; body buffers

UNIT II
Digestive system: Introduction to digestive system, secretion of digestive juices; digestion and absorption of carbohydrates; proteins; and fats.
Respiratory system: Diffusion of gases in lungs, transport of oxygen from lungs to tissues through blood, factors influencing the transport of oxygen. Transport of CO_2 from tissues to lungs through blood, factors influencing the transport of CO_2.

UNIT III
Physiology of vision: Structure of eye; Receptor mechanisms of eye: Photo pigments, visual cycle and colour adaptation.
Skeletal muscle: Strucure and properties Myosin, actin and regulatory proteins, sarcomere unit; mechanism of contraction of muscle fiber

Circulatory systems: Introduction, functions of circulation, heart as a pump, special junctional tissue of the heart, cardiac cycle (only the normal values), definition of Blood pressure, physiological variation and significance of blood pressure and factors controlling blood pressure.

UNIT IV

Nervous system: Structure of Neuron, resting and action potential, propagation of nerve impulses, structure of synapse, Synaptic transmission (electrical and chemical theory)

Structure of neuronmuscular junction and mechanism of neuro muscular transmission, Neuro transmitters-Acetyl choline, GABA,

Kidney: Structure of nephron; composition and mechanism of urine formation; micturition; renal regulation of acid-base balance.

UNIT V

Male reproductive system: structure and functions of testis. Spermatogenesis, causes of male infertility.

Female reproductive system: structure of ovaries; ovarian cycle and menstrual cycle. Pregnancy and lactation. Causes of female infertility

TEXTBOOKS

Chatterjee.C.C .2012. Human Physiology, 11th edition, Mical Alli Agency, Calcutta.

Saradha S.2004. Textbook of Human Physiology, S. Chand and Company, New Delhi.

REFERENCES

Guyton C and J.E Hall. 2010. Textbook of Medical Physiology, 12th Editon. Prism Indian edition, W.B. Saunders Company, New Delhi.

Robert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell. 2012. Harper's Illustrated Biochemistry. 29th edition, McGraw Hill and London.

Semester IV

15BCU402 **ENDOCRINOLOGY** **6H-5C**

Instruction hours/week: L:6 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

Equip the students on:

- The fundamentals of hormones and receptors
- Different mechanisms of hormonal actions
- Understanding of physiological and biochemical actions of hypothalamic, thyroid and pituitary hormones
- The role and applications of gastrointestinal hormones
- Understanding the clinical significance of adrenal and gonadal hormones
- Understanding of various endocrine disorders

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Gain knowledge on functions, classification and transport of hormones
2. Understand the role of secondary messengers, effector systems and protein kinases, tyrosine kinases in hormonal action
3. Have knowledge on the biochemical action and regulation of various endocrine hormones
4. Understand the role and applications of gastrointestinal hormones
5. Have knowledge on the role and functions of adrenal and gonadal hormones
6. Be able to identify an endocrine disorder if symptoms are available

UNIT I

Hormones – Introduction, classification of hormones, chemical structure (any two for each classes). Mechanism of hormone action –Receptors: Nuclear receptors and modification of gene expression; Cytosolic hormone receptors; plasma membrane receptors and second messengers- cAMP, cGMP,$Ca^{2+}$and $IP_{3.}$

Hormonal regulation of physiological processes (Basic concepts with special reference to carbohydrate)

UNIT II

Endocrine hypothalamus- Hypothalamic-pituitary axis, hypophysiotropic hormones, mechanism of action. Pituitary hormones - anatomy of pituitary gland, Hormones of the pituitary- Adenohypophysis and Neurohypophysis -Roles and mechanism of action, pathophysiology. Neuro hormones-functions.Growth hormones: somatotropins and somatimedins –role and pathophysiology

UNIT III

Thyroid gland – synthesis and chemistry of hormones , physiological roles and pathophysiology.

Parathyroid gland- synthesis, chemistry , metabolism and physiological roles .

melanotropic hormones - chemistry, mechanism of action, pathophysiology

Endocrine role of pincal gland

UNIT IV

Gastro intestinal hormones; Endocrine pancreas- insulin , glucagons , somatostatin . pancreatic peptide- chemistry, mechanism of action and physiological roles.

Adrenocortical hormones - source , chemistry, physiological role and pathophysiology.

Adrenal medullary hormones - source, chemistry, physiological role and pathophysiology.

UNIT V

Hormones of male reproductive system -source, chemistry, physiological role, mechanism of action and pathophysiology.

Hormones of female reproductive system- chemistry, physiological role, mechanism of action and pathophysiology.

Endocrinology of pregnancy, parturtion and lactation. Human infertility – reseasons, therapy and treatments.

Endocrine role of heart and kidney

TEXT BOOK

Madhavan Kutty K, Singh H.D, Sarada Subramanyam, 2012. Text Book of Human Physiology, 6th Edition, S Chand & Co., Pvt., Ltd, New Delhi

REFERENCES

Guyton C. and John E. Hall, 2015. Textbook of Medical Physiology. 13th edition. Saunders Publishing. Philadelphia, USA.

White A., Handler P., and Smith E. L. 2010. Principles of biochemistry: Vol II 5th Edition, McGraw-Hill Kogakusha Ltd., New Delhi

Semester IV

15BCU411 PRACTICAL-IV 5H- 3C

CELL BIOLOGY AND HUMAN PHYSIOLOGY

Instruction hours/week: L:0 T:0 P:5 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with:

- Mitotic stages in onion root
- Cell viability analysis using trypan blue
- Separation of sub cellular organelles
- Basics of histophathology
- Analysis of blood
- Urine analysis

Course outcomes (CO's)

After successful completion, the students will understand:

1. Mitotic stages in onion root
2. Cell viability analysis using trypan blue
3. Separation of sub cellular organelles
4. Basics of histophathology
5. Analysis of blood
6. Urine analysis

Experiments:

1. Preparation of onion root squash and observation of cell
2. Cell size determination using ocular and stage micrometer
3. Determination of cell viability using trypan blue exclusion (Demo)
4. Observation of mitotic stages in Onion root
5. Osmotic, chemical and enzymatic lysis of cells-Observing extent of cell lysis by release of cellular components (Demo)
6. Separation of cell organelles and determination of markers
7. Histopathology (Demo)

   Fixation, dehydration, embedding, sectioning and staining of tissues

HUMAN PHYSIOLOGY

Blood:

1. Collection of blood-finger tip, vein puncture
2. Separation o f plasma and serum
3. Preservation of whole blood
4. Enumeration of red blood cells
5. Enumeration of white blood cells
6. Differential leucocytes count
7. Determination of blood groups
8. Determination of bleeding time
9. Determination of clotting time

10. Widal test (Kit method)
11. VDRL test (Kit method)
12. RA factor (Kit method)
13. C-reactive protein (Kit method)
14. ASO titre (Kit method)
15. Pregnancy test- Gravintex test (Kit method)

Urine collection:
Random, 12, 24 hrs, First morning urine, Preservatives

8.**Urine routine analysis** - Colour, appearance, specific gravity, pH, sugar, albumin, bilirubin, bile salts and bile pigments, ketone bodies, urinary deposits – Pus cell, RBC, epithelial cells and casts.

REFERENCES

1. David A Thompson and Cristina C. Thompson, 2011. Cell and Molecular Biology Lab Manual. Create Space Independent Publishing Platform.USA.
2. Elaine N Marieb, 2014. Essentials of Human Anatomy & Physiology- Laboratory manual. 7th edition. Pearson Publisher, Chennai.
3. Guyton C. and John E. Hall, 2015. Textbook of Medical Physiology. 13th edition. Saunders Publishing. Philadelphia, USA.
4. Hable Whitney and Hart Peter, 2009. Cell Biology Lab Manual. 1st edition. Kendall Hunt Publishing Dubuque, IA 52004-1840.
5. Kanai L Mukharjee, 2010. Medical Laboratory Technology- A procedure manual for routine diagnostic tests. Vol:1, 2nd edition. Tata McGraw-Hill publishing company Ltd, New Delhi.
6. Zingade US, 2007. Manual of Practical Physiology. 1st edition. Jaypee Brothers Medical Publishers Pvt. Ltd. New Delhi.

Semester IV

15OEU401 **OPEN ELECTIVE** **3C**

FIRST AID AND SAFETY

Instruction hours/week: L:0 T:0 P:0 **Marks:** Internal: - External: **100** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with:

- Handling emergency situations
- First aid for respiratory system
- First aid for circulatory system
- First aid for nervous system
- First aid for bone, joint and muscle system
- First aid for chemical poisoning

Course outcomes (CO's)

After successful completion, the students will understand:

1. Handling emergency situations
2. First aid for respiratory system
3. First aid for circulatory system
4. First aid for nervous system
5. First aid for bone, joint and muscle system
6. First aid for chemical poisoning

UNIT I

Introduction to first aid: Basic anatomy and physiology of body systems, Emergency action principles. Survey the scene-Do a primary survey, Call for emergency services. Do a secondary survey and appropriate emergency first aid. First Aid Kit.

UNIT II

First aid for Respiratory system : Disorders of breathing - the important ones- Choking, Drowning, Asthmatic attack. Hypoxia from inhalation of fumes, carbon monoxide poisoning, lung disease. Hyperventilation . Rescue breathing for non-breathing casualty.

UNIT III

First aid for circulatory system

Disorder of circulation - the important ones, Shock from blood and fluid loss, Anaphylactic shock, Heart attack, CPR Wound – types& first aid. Bleing - types and control of bleeding (direct pressure and indirect pressure), pressure points first aid preservation of amputated body part. Bandage as pressure pad, ring pad and slings for wounds and bleeding

UNIT IV

First aid for the nervous system

Disorders of conscious - the important ones- Faint, Fit (convulsion, epilepsy, fits)
Hypoglycemic coma in diabetic patient (low blood sugar). Stroke and head injury. Drunkenness. First aid for head injury, face injury, chest injury and abdomen injury.

UNIT V

First aid for bones, joints and muscles

Disorders of musculo-skeletal system- fractures, dislocations, sprains and strains, and cramps and their first aid. Burns, heat exhaustion and heat stroke - prevention and first aid, fever - first aid. Cold related injury bites and poisoning (swallow poison, drug overdose, inhaled poisoning, plant and chemical contact).

REFERENCES

Andy A. 2001. Good Housekeeping Family First Aid, Hearst Boo Publishers, Newyork.

Auerbach P.S. 2004 Micine for the Outdoors: The Essential Guide To Emergency Mical Procures And First Aid, fourth ition, Lyons pres, London

Davies A. 2002.The mothercare guide to Emergencies and First Aid. Conran Octopus Limit, London.

http://electricity.pondicherry.gov.in/shock/index.htm

http://www.keepkidshealthy.com/WELCOME/firstaid.html

Semester IV

15BCU404A ALLIED ELECTIVE II-BIOINFORMATICS 4H-3C

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

Equip the students with:

- History of bioinformatics
- Biological database creation
- Utilization of available database
- Gene prediction using bioinformatics tools
- Prediction of protein structure using computational tools
- Statistical analysis

Course outcomes (CO's)

After successful completion, the students will understand:

1. History of bioinformatics
2. Biological database creation
3. Utilization of available database
4. Gene prediction using bioinformatics tools
5. Prediction of protein structure using computational tools
6. Statistical analysis

UNIT-I

Introduction to Bioinformatics: Objectives, History of Bioinformatics, Human Genome Project, application of bioinformatics – Molecular medicine, biotechnology, agricultural, forensic analysis.

UNIT-II

Introduction to Biological databases-Types of databases, sequence databases-nucleic acid sequence databases-Gene bank, EMBL, DDBJ, protein sequence database- Swiss-Prot, PIR, PDB structural databases, Serach and retrieval of Entrez, bibliographic databases-Pubmed.

UNIT-III

Sequence alignment-local, global, pairwise and multiple alignment, Similarity searching programs- BLAST, FASTA; Gene prediction strategies and programs- Genscan, Genemark.

UNIT-IV

Protein secondary structure prediction, three dimensional structure prediction, Comparative modeling and visualization of molecules. Visualization-Rasmol, Deep view.

UNIT-V

Source of data – Primary and secondary data. Classification and tabulation of data. Diagrammatic and graphic presentation of data.

Measures of central tendency: arithmetic mean, median, mode.

Measures of variation: range, quartile deviation, mean deviation, standard deviation (simple problems only).

TEXT BOOKS

Palanichamy. 1999. Statistical methods for Biologists. 3rd edition. Palani Paramount Publications, Palani.

S.P.Gupta. 2007. Statistical methods. Sultan Chand and Sons Educational Publishers, New Delhi.

Ignacimuthu. S, 2013. Basic Bioinformatics, 2nd edition Alpha Science Intl Ltd Chennai.

S.C. Rastogi. 2009. Bioinformatics Concepts, Skills & Applications, CBS Publishers & Distributors, India.

REFERENCES

Abraham Silberchatz Henry K.Forth and Sudharshan, 1997. "Database System Concepts" Tata McGraw Hill, New Delhi.

Arthur M. Lesk, 2014. Introduction to Bioinformatics, 4th edition. Oxford University Press, Oxford.

Attwood. K. and J. Parry-Smith, 2003. Introduction to Bioinformatics, Pearson Education, Singapore.

David W. Mount, 2013. Bioinformatics: Sequence and Genome Analysis. 2nd edition, Cold Spring Harbour Laboratory Press, New York.

Sundararajan. S and R. Balaji, 2003. Introduction to Bioinformatics, Himalaya Publishing House, Mumbai.

Steve Selvin. 2005. Biostatistics. 1st edition. Pearson Education Pte Ltd., New Delhi.

Jerald H Zar. 2005. Biostatistical Analysis. 4th edition. Pearson Education Pte Ltd., New Delhi.

Daniel. 2006. Biostatistics: A Foundation for analysis in the health sciences. 7th edition. John Wiley and Sons, Inc., New York.

Sundar Rao. P.S.S., and J.Richard., 2012. 5th edition, Introduction to Biostatistics and Research Methods, PHI Publication, New Delhi.

Semester IV

15BCU404B ALLIED ELECTIVE II-BIOSTATISTICS 4H-3C

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with:

- Data collection
- Various ways of representation of data
- Measures of central values and standard deviation.
- Determination of the relationship between two variables.
- Correlation and regression analysis
- Determining the level of significance of a particular data by various parameters.

Course outcomes (CO's)

After successful completion, the students will understand:

1. Data collection
2. Various ways of representation of data
3. Measures of central values and standard deviation.
4. Determination of the relationship between two variables.
5. Correlation and regression analysis
6. Determining the level of significance of a particular data by various parameters.

UNIT-I

Definitions-Scope of Biostatistics- Variables in biology, collection, classification and tabulation of data- Graphical and diagrammatic representation.

UNIT – II

Measures of central tendency – Arithmetic mean, median and mode. Measures of dispersion-Range, standard deviation, Coefficient of variation.

UNIT – III

Correlation – Meaning and definition - Scatter diagram –Karl Pearson's correlation coefficient. Rank correlation.

UNIT – IV

Regression: Regression in two variables – Regression coefficient problems – uses of regression.

UNIT – V

Test of significance: Tests based on Means only-Both Large sample and Small sample tests - Chi square test - goodness of fit.

TEXT BOOK

1. Pillai R.S.N., and Bagavathi V., 2002.,Statistics , S. Chand & Company Ltd, New Delhi.

REFERENCES

1. Jerrold H.Zar, 2003, Biostatistical Analysis, Fourth Edition, Pearson Education (Pte) .Ltd, New Delhi.

2. Dr.P.N.Arora, 1997, A foundation course statistics, S.Chand & Company Ltd, New Delhi.

3. Navnitham P.A , 2004, Business Mathematics And Statistics, Jai Publications, Trichy,

4. Gupta S.P., 2001, Statistical methods, Sultan Chand & Sons, New Delhi.

Semester IV

15BCU404C ALLIED ELECTIVE II-BIOPHYSICS 4H-3C

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with:

- Separation techniques
- Centrifugation and filtration techniques
- Concepts of thermodynamics
- Crystallographic methods
- Structure prediction using NMR
- Spectroscopic techniques

Course outcomes (CO's)

After successful completion, the students will understand:

1. Separation techniques
2. Centrifugation and filtration techniques
3. Concepts of thermodynamics
4. Crystallographic methods
5. Structure prediction using NMR
6. Spectroscopic techniques

UNIT I: Separation Techniques

Biosepartions – batch filtration – continuous filtration – centrifugation – sedimentation velocity and equilibrium methods – reverse osmosis – ultra filtration – micro filtration,

UNIT II: Chemical Equillibrium

Chemical equilibrium – law of mass action – equilibrium constant – electrochemistry – electrolysis – Galvanic cell – fuel cells – Nernst equation – Chemical thermodynamics – heat of reaction – entropy – enthalpy.

UNIT III: Crystallography

Study of size, shape and molecular weight of macromolecules – X-ray studies – Goniometer – Bragg's spectrometer – reciprocal lattice – isomorphous replacement – refinement of structure.

UNIT IV: Structural Studies

NMR spectra – experimental arrangement – chemical shift – two dimensional NMR – electron spin resonance technique – hyperfine structure – mass spectrometry

UNIT V: Spectroscopy

Spectroscopy – visible, fluorescence, IR, UV and Raman spectroscopic studies – electron microscope – scanning, tunneling electron microscopes – aromic force microscope working and applications

TEXT BOOKS

1. Sicasankar. B (2005). Bioseparations – principles and techniques Prentice – Hall of India Pvt. Ltd.
2. Vasanthapattabhi and Goutham N. (2003) Biophysics. Narosa Publishing house

REFERENCES

3. Raymon chang (1977). Physical chemistry with applications to biological systems Macmillan Publishing Co., INC
4. Coggle J.E (1971). Biological effects of radiation Wykeham Publications (London) Ltd

Web resources

1. www.springer.com/physics/biophysics
2. onlinelibrary.wiley.com/doi/10.1016/0

Semester IV

15BCU412A ALLIED ELECTIVE PRACTICAL- II 3H-2C

BIOINFORMATICS

Instruction hours/week: L:0 T:0 P:3 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

To impart hands-on training on:

- MS-office
- Analysis of databases such as SWISS PROT, NCBI
- Retrival of protein structures from PDB
- Secondary structure prediction
- Molecular visualization tools
- Multiple sequence alignment

Course outcomes (CO's)

After successful completion, the students shall be able to

1. MS-office
2. Analysis of databases such as SWISS PROT, NCBI
3. Retrival of protein structures from PDB
4. Secondary structure prediction
5. Molecular visualization tools
6. Multiple sequence alignment

Experiments:

1. Introduction to MS Office
2. Analysis of databases
   - NCBI
   - EMBL
   - DDBJ
   - PIR
   -SWISS PROT

3. Retrieval of protein structures –PDB
4. Bibliographic Databases
   - Pubmed
   - Medline

5 Secondary structure prediction
   - SOPMA

6. Molecular Visualization and analysis
   - RASMOL

7. Sequence similarity search for a pair of sequences using
   - BLAST
   - FASTA

8. Multiple sequence alignment
   - CLUSTAL

REFERENCE BOOKS

Allen Bregman, 2001. Laboratory Investigations in Cell and Molecular Biology, Wiley..

Arthur M. Lesk, 2014. Introduction to Bioinformatics, 4th edition. Oxford University Press, Oxford.

Attwood. K. and J. Parry-Smith, 2003. Introduction to Bioinformatics, Pearson Education, Singapore.

Dealtry G.B.and Rickwood D.. 1992, Cell biology-Lab Fax (1st edition) Black well Scientific Publishers, New Delhi.

David W. Mount, 2013. Bioinformatics: Sequence and Genome Analysis. 2nd edition, Cold Spring Harbour Laboratory Press, New York.

Mani K., N. Vijayaraj. 2004. Bioinformatics- A practical approach, Aparnaa publication, India.

Rajan S.and.Selvi Christy R, 2011. Experimental procedures in Life Sciences,
Published by Anjanna Book House, Chennai.

Semester IV

15BCU412B ALLIED ELECTIVE PRACTICAL- II 3H-2C

BIOSTATISTICS

Instruction hours/week: L:0 T:0 P:3 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with:

- Definition and representation styles of data
- Analysis of data using correlation to understand the interdependence
- Analysis of data using regression to understand the interdependence
- To learn various measures of central values and standard deviation.
- To understand the relationship between two variables.
- To test the significance of a particular data by various parameters.

Course outcomes (CO's)

After successful completion, the students will:

1. Use appropriate representation styles to present the data
2. Perform correlation analysis
3. Perform regression analysis
4. Calculate mean, median, mode and standard deviation.
5. Calculate the relationship between two variables.
6. Test the significance of a particular data by various parameters.

Experiments:

1. Through understanding of the usage of SPSS package.
2. Application of various statistical tools to interpret research data in a clear and easily understandable manner

1. Mean for individual, discrete series using SPSS Package.
2. Mean for continuous series using SPSS Package.
3. Median for individual and discrete series using SPSS Package..
4. Median for continuous series using SPSS Package..
5. Mode for individual and discrete series using SPSS Package..
6. Standard deviation for individual and discrete series using SPSS Package.
7. Coefficient of variation for individual and discrete series using SPSS Package.
8. Karl Pearson's Correlation using SPSS Package.
9. Rank Correlation Coefficient for Untied Rank using SPSS Package.
10. Rank Correlation Coefficient for Tied Rank using SPSS Package.

Semester IV

15BCU412C ALLIED ELECTIVE PRACTICAL- II 3H-2C
BIOPHYSICS

Instruction hours/week: L:0 T:0 P:3 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

- To know about fluid friction
- Understand the interfacial surface tension between two liquids
- Understand the surface tension
- To understand the basic terms and concepts of Biophysics
- Are able to describe biophysical phenomena with simple physical models
- Know the ratio between the speed of light in medium to speed in a vacuum

Course outcomes (CO's)

After successful completion, the students will understand:

1. About the fluid friction
2. Interfacial surface tension between two liquids
3. Surface tension calculation
4. Basic terms and concepts of Biophysics
5. Biophysical phenomena with simple physical models
6. Resolving power of a telescope

1. Internal friction of low liquids by Poiseullie's flow method
2. Internal friction of high viscous liquids by Stokes method
3. Interfacial surface tension between two liquids
4. Surface tension of liquids by capillary rise /drop weight method
5. Specific rotatory power of sugar solution using polarimeter
6. Specific rotatory power of biological solution using polarimeter
7. Refractive index of liquids using spectrometer
8. Wave length of prominent lines of mercury spectrum using a plane transmission grating
9. Resolving power of a telescope
10. Emissivity of a surface - spherical calorimeter

RERERENCES

Gupta S.L. and V.Kumar, 2002, Practical Physics, 25th Edition, Pragathi Prakashan, Meerut

Ouseph C.C., U.J. Rao and V. Vijayendran 2007, Practical Physics and Electronics, S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai

Singh S.P., 2003, Advanced Practical Physics – 1, 13th Edition, Pragathi Prakashan, Meerut

Singh S.P., 2000, Advanced Practical Physics – 2, 12th Edition, Pragathi Prakashan, Meerut

		Semester-IV
15SSD301	**SOFT SKILL DEVELOPEMENT -II**	**2H -1C**

Instruction hours/week: L:2 T:0 P:0 **Marks:** Internal: **100** External: **-** Total: **100**

End Semester Exam: 3 Hours

Semester V

15BCU501 METABOLIC PATHWAYS 5H-5C

Instruction hours/week: L:5 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objective

Equip the students with

- Insight on various metabolic pathways in human and also in plants
- The pathways related with energy production through catabolism of carbohydrates and lipids
- The metabolic pathways that involve with the synthesis of macromolecule
- Understanding the molecules within cells and interactions between cells that allows construction of multi cellular organisms.
- Molecular machinery of living cells.
- Metabolic pathways of amino acids and nucleic acid metabolism.

Course outcomes (CO's)

After successful completion, the students will understand:

1. Insight on various metabolic pathways in human and also in plants
2. The pathways related with energy production through catabolism of carbohydrates and lipids
3. The metabolic pathways that involve with the synthesis of macromolecule
4. Understanding the molecules within cells and interactions between cells that allows construction of multi cellular organisms.
5. Molecular machinery of living cells.
6. Metabolic pathways of amino acids and nucleic acid metabolism.

UNIT I

Introduction to intermediary metabolism

Introduction, overview of intermediary metabolism- the basic metabolic pathways, anabolic, catabolic and amphibolic pathways. Biological oxidation-oxidation, reduction equilibria; redox potential, enzymes and coenzymes involved in oxidation and reduction. ETC: Role of respiratory chain in energy capture. Oxidative phosphorylation- Mechanism of oxidative phosphorylation - Chemiosmotic theory, uncouplers of oxidative phosphorylation.

UNIT II

Carbohydrate metabolism

Introduction, fate of absorbed of carbohydrate, utilization of glucose, general processes of carbohydrate metabolism-glycolysis and citric acid cycle, glycogenesis, glycogenolysis and gluconeogenesis. Alternate pathways of carbohydrate metabolism-pentose phosphate pathway (HMP shunt), Glucuronic acid cycle and Glyoxylate cycle.

UNIT III

Metabolism of lipids

Introduction- Blood lipids and plasma lipoproteins- biomedical importance, fate of dietary lipids. Oxidation of Fatty acids: β- oxidation, α-oxidation and ω oxidation. Oxidation of fatty acids with odd numbers of carbon atoms. Biosynthesis of saturated fatty acids: Extra mitochondrial and microsomal system for elongation of fatty acids. Biosynthesis of Phospholipids: Phosphatidyl choline, Phosphatidyl ethanolamine, Phosphatidyl inositol and Phosphatidyl serine. Degradation of phospholipids, Biosynthesis of glycolipids, Biosynthesis of Cholesterol. Ketone bodies – formation, importance.

UNIT IV

Metabolism of protein and amino acids

Introduction, fate of dietary proteins, catabolism of aminoacid nitrogen-oxidative deamination; non-oxidative deamination, transamination-formation of ammonia, transport of ammonia, disposal of ammonia -urea cycle. Amino acid decarboxylation, Catabolism of carbon skeleton of aminoacids- glycine, tyrosine, phenyl alanine, glutamic acid and lysine.

UNIT V

Metabolism of purine and pyrimidine nucleotides

Introduction, biomedical importance, biosynthesis of purine and pyrimidine nucleotides, de novo synthesis of purines and pyrimidines, salvage pathways , catabolism of purines and pyrimidines.

Inter relationship of carbohydrate, protein and fat metabolism. TCA cycle as a central core in the inter relationships in metabolism and inter conversion of major food stuffs - Carbohydrate, fats and proteins.

TEXT BOOKS

Deb C., 2011, Fundamentals of Biochemistry, 9th edition New Central Book Agency, Calcutta.

Robert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell, 2012,
Harper's Biochemistry, 29th edition, McGraw-Hill Medical, London.

Lehninger L, D.L. Nelson and M.M. Cox, 2012, Principles of Biochemistry, 6th edition. WH Freeman and Company, New York .

REFERENCES

Donald Voet, Jodith Voet and Charette.2012. Fundamentals of Biochemistry, 4th edition, John Wiley and Sons, Inc, New York.

Pamela C, Champ Richard and A. Harvey.2008. Biochemistry. Lipponcott Company Piladelphia.

Semester V

15BCU502 **MOLECULAR BIOLOGY** **5H-5C**

Instruction hours/week: L:5 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

- To enlight the students with genome organization of DNA
- To study the mechanism of replication DNA in prokaryotes
- To study the mechanism of replication DNA in eukaryotes
- To understand the mechanism of recombination and transposition of DNA
- To understand DNA damage, mutation
- DNA repair process

Course outcomes (CO's)

After successful completion, the students will be able to

1. Understand genome organization of DNA
2. Comprehend the mechanism of replication DNA in prokaryotes
3. Comprehend the mechanism of replication DNA in eukaryotes
4. Explain the mechanism of recombination and transposition of DNA
5. Explain DNA damage, mutation
6. Explain DNA repair process

UNIT-I

Nucleic acids: Evidences for DNA as Genetic material – Bacterial Transformation, Transduction and conjugation. DNA Organization- Chromatin, Histones and Nucleosomes: Chromosomal Organization of genes-solitary genes, tandemly repeat genes, simple sequence DNA, mobile DNA elements- transposans, mechanism of transposition.

UNIT II

Replication: Semi conservative mechanism and experimental proof, Bi-directional replication, Rolling circle model. Formation of DNA from nucleotides - Enzymology of replication, initiation, elongation and termination of replication in prokaryotes. Differences between eukaryotic replication and prokaryotic replication.

UNIT III

Transcription: Prokaryotic Transcription: RNA polymerases, Initiation, elongation and termination. Post transcriptional modifications: RNA Splicing, RNA editing, Processing of Eukaryotic mRNA, rRNA, tRNA. Prokaryotic gene regulation: Operon model – Lac operon, Trp Operon. Eukaroyitc gene regulation- RNA interference, Si RNA.

UNIT IV

Translation: Composition of Prokaryotic and Eukaryotic Ribosomes.

Genetic code – Experimental evidences and features. Translation: Initiation, elongation and termination of protein synthesis in prokaryotes, Translation in Eukaryotes, Post translational modifications of proteins, Inhibitors of protein synthesis.

UNIT V

Recombination: Definition, types of recombination, Holliday model for Homologous recombination. Gene mutations: Types – Missense mutation and other point mutations, spontaneous mutations and induced mutations, silent mutations.

DNA Repair Mechanism: Photo repair, Excision repair, Mis-match repair, SOS repair.

TEXT BOOKS

Harvey Lodish, Arnold Berk, Chris A. Kaiser and Monty Krieger. 2012. Molecular Cell Biology, 7th edition. W.H. Freeman & Company, London.

Lehninger L, D.L. Nelson and M.M. Cox, 2012, Principles of Biochemistry, 6th edition, WH Freeman and Company, New York.

REFERENCES

Benjamin L.2004. Genes VIII, Oxford University Press, Pearson ucation Ltd, London.

Gerald Karp 2013. Cell and Molecular Biology, 7th edition. John Wiley and Sons, Inc, Hoboken, United States.

Freifelder D.2001. Molecular Biology, Narosa Publishing House, Madras.

Gardner and Simmons.2001. Principles of Genetics, John Wiely & Sons, New York.

Semester V

15BCU503 **IMMUNOLOGY** **5H-5C**

Instruction hours/week: L:5 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives
Equip the students with:

- Basics of immunology
- History of immunology
- Components of immunity
- Immunodeficiency and hyperfunctioning of immune system
- Transplantation
- Immunotechniques

Course outcomes (CO's)
After successful completion, the students will understand:

1. Basics of immunology
2. History of immunology
3. Components of immunity
4. Immunodeficiency and hyperfunctioning of immune system
5. Transplantation
6. Immunotechniques

UNIT I
Basics of immunology : Introduction, Innate and acquired immunity, Cells of immune system. structure and function of T, B, NK cells, neutrophils, eosinophils and basophils. monocytes and macrophages ; Primary and secondary lymphoid organs. Humoral and cell mediated immunity.

UNIT II
Components of Immunity
Antigen: Definition, requirement for antigenecity, properties of antigen-specificity, cross reactivity, immunogenicity; epitopes, adjuvents, hapten.
Antibody-Definition, properties, classes, subclasses structure, specificity and distribution; self-antigens (MHC) - Class I, II, III molecules, role of MHC in antigen processing and presentation.

UNIT III
Hypersensitivity
Hypersensitivity- Type I, II, III & IV; Factors causing hypersensitivity; Mechanism, Pathogenesis, prevention and treatment**.**
Complement- definition, classical and alternate pathways, biological importance of complement system, complement deficiency diseases.

UNIT IV
Transplantation Immunology

Transplant-Mechanism of Allograft rejection; Auto immune diseases- Rheumatoid arthritis, myasthenia gravis, Graves's disease, Systemic lupus erythematosis.
Vaccination- passive and active. Preparation of live and attenuated vaccines, novel vaccines.

UNIT V

Immunotechniques

Antigen- antibody interaction-Precipitation reaction-immuno diffusion, immuno electrophoresis; Agglutination- blood grouping; Immuno techniques – Principle and application of RIA, ELISA, Fluorescent antibody techniques, immuno blotting, hybridoma technology - elementary concepts only.

TEXT BOOKS

Janis Kuby, 2006. Immunology,6th Edition. W.H. Freeman and Company, New York.

Pathak S., U.Palan, 2005 .Immunology essentials and fundamentals, capital publishing company, Banglore, 2nd edition.

Vaman Rao C. 2006. Immunolgy, Narosa publishing house, 2nd edition.

REFERENCES

Charles. A. Janeway and Jr. Paul Traverse, 2004. Immunobiology, Blackwell Scientific Publishers, Oxford

Ian R. Tizard, 2009. Immunology- An Introduction, 8th Edition.Saunders College Publishers, Sydney.

Ivan Riott and Janathar Brotoff, 2006. Immunology, 7th Edition Mosby Publishers, Sydney.

Semester V

15BCU504 PLANT BIOCHEMISTRY 5H-5C

Instruction hours/week: L:5 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

Equip the students with

- Plant cell structure
- Transport mechanism in plants
- Photosynthesis in plants
- Microenvironment for plant growth and nitrogen fixation
- Plant growth regulators
- Photomorphogenesis in plants

Course outcomes (CO's)

After successful completion, the students will understand

1. Plant cell structure
2. Transport mechanisms in plant cell
3. Photosynthesis and carbohydrate metabolism
4. Various microenvironment and hormones required for plant growth
5. The process of nitrogen fixation
6. Photoperiodism and senescence in plants

UNIT-I

Plant Cell and Transport mechanisms: cell wall-structure and functions. Plastids: types and functions Transport mechanisms: diffusion, vacuole and turgor pressure, osmosis and imbibition, conditions necessary for imbibition. Absorption and translocation of water: Mechanism-Active and passive absorption, Factors affecting absorption of water. Ascent of sap: Mechanism and theories.

UNIT-II

Photosynthesis: Photosynthetic pigments: Chlorophyll, carotenoids and phycobillin: Photosynthetic apparatus-structure and functions of chloroplasts: light absorption. Light reactions-Two kinds of chemical system-Photosystem I&II, evidences in support of light reaction. Hill's reaction; Emerson effect, cyclic and non-cyclic phosphorylation. Dark reaction : Calvin's cycle (C3 plants). Hatch-slack cycle (C4 plants) and CAM plants. Factors affecting photosynthesis. Photorespiration.

UNIT-III

Cycles of elements and Plant Nutrition: Nitrogen cycle-Ammonification, nitrification, nitrate reduction and denitrification. Nitrogen fixation: Symbiotic and non-symbiotic nitrogen fixation. Sulfur cycle: Release of sulfur from organic compounds; Oxidation of sulfur compounds; Reduction of sulfate. Phosphorus cycle and carbon cycle. Plant nutrition: Specific roles of essential elements and their deficiency symptoms in plants. Macronutrients: Carbon, Hydrogen, Oxygen, Nitrogen, Sulfur, Phosphorus, Calcium and Potassium. Micronutrients: Manganese, Boron, Copper, Zinc, Molybdenum and Chlorine.

UNIT-IV

Plant growth regulators: Auxins: Chemistry, biosynthesis, mode of action, bioassay, practical applications of synthetic auxins. Gibberellins: Chemistry, biosynthesis and mechanism of action, role of endogenous gibberellins, bioassay and practical applications. Chemistry, mode of action and physiological role of cytokinins, abscisic acid and ethylene.

UNIT-V

Photomorphogenesis

Photoperiodism. Photochrome-function in growth and development of plant. Biochemistry of seed germination. Senescence: Biochemical changes during senescence. Senescence process in life cycle of plants.

TEXT BOOKS

Verma.S.K and Mohit Verma, 2007. A Text Book of Plant Physiology, Biochemistry and Biotechnology. 6th edition.S.Chand and Co, New Delhi.

Goodwin.T.W and Mercer.E.I. 1990. Introduction to Plant Biochemistry, 1st edition, Robert Maxwell.M.C Publisher, New York.

James Bonner and Joseph F Varner. 1977. Plant Biochemistry. 3rd edition. Academic Press, New York.

REFERENCES

Bob Buchannan ,2002. Biochemistry and Molecular Biology of Plants, IK. International, New York.

Hans-Valter Heldt ,2005. Plant Biochemistry and Molecular Biology, Oxford University Press, England.

Michael Wink, 2010. Functions and Biotechnology of Plant Secondary Metabolites, Second edition, Blackwell Publishing Ltd, London.

Semester V

15BCU511 **PRACTICAL-V** **5H- 3C**

MOLECULAR BIOLOGY AND PLANT BIOCHEMISTRY

Instruction hours/week: L:0 T:0 P:5 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

To make the students:

- To provide hands on experience on extraction of enzymes from the plant source.
- To make them learn about isolation of bioactive compounds from fruits and vegetables.
- To learn to isolate the pigments from plants.
- To learn them about various tissue culture techniques
- To learn the PTC media preparation, culturing techniques
- To know about the Plant tissue culture

Course outcomes (CO's):

The students shall be able to

1. Gain knowledge on the isolation and enzymes and bioactive compounds from the plants.
2. Use experimental techniques related to isolation.
3. Get aware about the plant tissue culture techniques
4. Prepare the plant tissue lysates
5. Know about the estimation of vitamin
6. Isolate the DNA and RNA of enzymes from plant and animal source

MOLECULAR BIOLOGY

1. Isolation and estimation of genomic DNA, RNA and protein from plant and animal sources
2. Plasmid DNA isolation
3. Agarose gel electrophoresis of DNA
4. Separation of serum proteins by poly acrylamide gel electrophoresis (PAGE)
5. Restriction digestion of DNA (Demo)
6. Competent *E.coli* preparation(Demo)
7. Transformation and selection of transformed cell (Demo)
8. Western blotting (Demo)

(II) Plant Biochemistry

10. Estimation of starch
11. Estimation of chlorophyll
12. Estimation of vitamin C
14. Estimation of glutathione
15. Estimation of vitamin E

(III) Plant tissue culture (Demo)

16. Preparation of Tissue culture media
17. Surface sterilization
18. Callus induction

TEXT BOOKS

S.S.Purohit., 2002. A Laboratory manual of Plant Biotechnology. Agro Botanica Publishers, New Delhi.

Joseph Sambrook and Michael R. Green 2012 Molecular Cloning: A Laboratory Manual (Fourth Edition) Cold Spring Harbor Laboratory Press

S.Sadasivam and A. Manickam. 2009. Biochemical methods. (2ndedition). New age International Pvt Ltd Publishers, New Delhi and TNAU, Coimbatore.

REFERENCES

James Bonner and Joseph F Varner. 1977. Plant Biochemistry. 3rd edition. Academic Press, New York.

Singh.S.P. 2009. Practical Manual of Biochemistry, CBS Publishers, New Delhi.

J.Jayaraman. 2007. A Laboratory manual in Biochemistry. (1stedition). New age International Pvt Ltd Publishers, New Delhi.

H.S.Chawla 2006, A Laboratory manual for Plant biotechnology, Oxford and IBH publishers' co Pvt Ltd, New Delhi.

Semester V

15BCU505A **CORE ELECTIVE I** **5H-5C**

HUMAN GENETICS

Instruction hours/week: L:5 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

- To provide the student with the basic principles of human genetics
- Specific objectives of this course are to provide an understanding and discuss ramifications of inherence, gene structure and function, gene mutation, and research related to genetics and its applications.
- The students are expected to have basic knowledge of chromosome structure, genome organization and cell division.
- To know about the genetic diversity
- To know about some common inherited human genetic disorders
- To understand the chromosomal changes

Course outcomes (CO's)

1. Comprehensive, detailed understanding of the chemical basis of heredity
2. Comprehensive and detailed understanding of genetic methodology and how quantification of heritable traits in families and populations provides insight into cellular and molecular mechanisms.
3. Understanding of how genetic concepts affect broad societal issues including health and disease, food and natural resources, environmental sustainability, etc.
4. Understanding the role of genetic mechanisms in evolution.
5. The knowledge required to design, execute, and analyze the results of genetic experimentation in animal and plant model systems.
6. Understand that the evolution is an active biological process which impacts the human gene pool

UNIT I

History and Development of Human Genetics: Genes, Hereditary traits, Genetic Disease, Mutations and polymorphisms, Organization of Human Genome: Repetitive DNA in Human Genome, Simple sequence repeat loci; Intron, exon, UTR, regulatory sequence, non-coding RNAs, mitochondrial genome.

UNIT II

Diseases and disorders: Chromosomal disorders: Structural and numerical; Autosomal/sex chromosomal/sex reversal; Mechanisms – mitotic/meiotic non-disjunction/ chromosomal rearrangements; Inborn errors of metabolism, Haemoglobinopathies.

UNIT III

Identification of disease gene/locus: Methods of genetic study in human: Mendelian pedigree pattern and analysis expressivity chromosomal basis of genetic disorders: Chromosomal Analysis, Karyotypes and identification of chromosome variation; Nucleic acid hybridization assays, cytogenetic mapping Single gene disorders: Genetic mapping (Microsatellite and other DNA polymorphisms in mapping), LOD score; Physical mapping, sequencing strategies (PCR

based Sanger sequencing to exome sequencing) Concept of non mendelian inheritance and complex diseases

UNIT IV

Human genome analysis: Conception, mapping, cloning and sequencing, Outcome- Generation of 'OMICS' era, significant leads. Genetic variation in health and disease: Human genetic diversity- Methods of study – Biochemical/molecular genetic markers; some examples. Tracing human migrations with autosomal, Y-chromosomal and mitochondrial markers.

UNIT V

Ethical, legal and social issues in Human genetics: Prenatal/adult (individual/family/population) screening of mutation/risk factor for genetic diseases; Confidentiality/privacy, Discrimination, Ethical dilemma, Human rights, Surrogate mothers; Organ banking and transplantation; Research ethics; Medical ethics in India.

TEXTBOOKS

Korf B R. and M B Irons. 2013. Human genetics and genomics, 4th edition, Wiley-Blackwell Publishers.

Mange E J. and A P Mange. 1999. Basic Human Genetics, 2nd edition, Sinaur Associates Publishers.

Vogel T and A Motulsky, 2010. Human genetics: Problems and Approaches, 4th edition, Springer Publishers, Verlog.

REFERENCES

Strachan T. and A Read. 2010. Hman Molecular Genetics, 4th edition, Garland Science.

Pasternak J J. 1999. An Introduction to Human Molecular Genetics: Mechanisms of Inherited Diseases, Fitzgerald Science Press, Bethesda, MD.

Blackmore W A. 1999. Chromosome Structural Analysis- A Practical Approach, Oxford University Press, Oxford.

Semester V

15BCU505B **CORE ELECTIVE I** **5H-5C**

FUNDAMENTALS OF NANOTECHNOLOGY

Instruction hours/week: L:5 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

- To understand the fundamental concepts of nanotechnology.
- To provide an introduction to and an overview over nanotechnology
- To know a basic understanding of the physical laws and effects that are active in the nano-world
- To understand the concepts and strategies used today and in the near future to build molecular machines
- To understand the applications of nanotechnology will influence science of tomorrow and will change many sides of our life.
- To know the impact of nanotechnology on our society.

Course outcomes (CO's)

After successful completion, the students will understand

1. The basic knowledge in nanotechnology.
2. About bionanomaterials and its applications
3. What forces act between atoms and/or molecules when nanoparticles are generated
4. The basic principles of molecular machines
5. the functioning of molecular switches
6. The properties of carbon-nanotubes and their role for engineering nano-electronic devices.

UNIT I

Nanostructre and Properties: Structure- size Dependence of properties, Localized particles-Donors, Acceptors and Deep Traps, Mobility, Excitons Properties of nanoparticles-Metal nanoclusters –theoretical modeling of nanoparticles, geometric structure, electronic structure, Semiconducting nanoparticles-optical properties, photofragmentation, Coulombic explosion.

UNIT II

Types of nanoparticles: Metal nanoparticles-Gold, silver and Titanium nanoparticles. Metal bivalent-Zinc, copper. Magnetic nanoparticle – iron. Characterization of nanoparticles-Absorption spectrum, Electron microscopy (SEM, TEM), EDX, XRD, Zeta potential.

UNIT III

Biological Materials: Biological building blocks-sizes of building blocks and nanostructures, polypeptide Nanowire and protein nanoparticles. Nucleic acids-DNA Double nanowire, biological nanostructures-examples of proteins, miscelles and vesicles, multilayer films.

UNIT IV

Synthesis of Nanomaterials: Top down – ball milerling; Bottom up – co-precipitaion – sol-gel – electrodeposition – using natural nanoparticles – chemical vapor deposition. The Carbon

Nanotube – New Forms of Carbon – Types of Nanotubes – Formation of Nanotubes – Uses for nanotubes – Biological Applications

UNIT V

Applications of nanotechnology: Nanomachines and nanodevices- nanobots, Microelectromechanical systems (MEMSs), Nanoelectrochemical systems (NEMSs)-fabrication, nanodevices and nanomachines, Nanobots, molecular and supramolecular switches-photochemical switching, current-voltage characteristics

TEXT BOOKS

Charles P. Poole, Jr., Frank J. Owens "Introduction to Nanotechnology" John Wiley & Sons, 2003

Poole C.P., and Owens J.F.,"Introduction to Nanotechnology" Wiley- Interscience, 2003.

REFERENCES

Jacob N. Israelachvili **"**Intermolecular and surface forces" Academic Press, 2008

Ratner M.A., Ratner D.,"Nanotechnology: A Gentle Introduction to the Next Big Idea" **,**First Edition,Prentice Hall PTR, 2002.

Wilson M., Kannangara K., Smith G., Simmons M., and Raguse B.,"Nanotechnology: basic science and emerging technologies" , Overseas Press, 2005.

Semester V

15BCU505C **CORE ELECTIVE I** **5H-5C**

CANCER BIOLOGY

Instruction hours/week: L:5 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

- To initiate and promote the analysis of cancer as a complex biological system.
- This will encourage the emergence of integrative cancer biology as a distinct field.
- To understand various genetic and molecular changes normal cells undergo during transformation into malignant cancer cells.
- To understand the mechanisms underlying carcinogenesis.
- To understand the cell cycle, angiogenesis and apoptosis.
- To know about the fundamental principles behind cancer diagnosis, prevention, and therapeutic management

Course outcomes (CO's)

After successful completion, the students will

1. Be familiar with basic facets of carcinogenesis and methods to study the process
2. Get knowledge about the emerging themes and provides in depth analysis of cancer and its therapeutic approaches.
3. Know the role of growth factors, oncogenes, tumor suppressor genes, angiogenesis, and signal transduction mechanisms in tumor formation
4. Understand factors that contribute to cancer development and discuss cancer prevention and currently available therapeutic treatments.
5. Understand how genetics contributes to predisposition and progression of cancer.
6. Understand the differences and overlap of cancers by tissue type.

UNIT I

Introduction: Cancer- definition, hallmarks of cancer, Distinction between normal cell and cancer cell, cytological changes in cancer cells, Molecular changes in cancer cells, Genetic changes in cancer cells, Types of cancer, development of cancer, causes of cancer, properties of cancer cells.

UNIT II

Mutagens and mutations, Mechanisms of oncogene activation, Role of growth factors and receptors in carcinogenesis, Retroviral oncogenes, protooncogenes, tumor suppressor genes - P53 and Rb and their functions.

UNIT III

Cell cycle: cell cycle-G1 to S, progression of S phase, G2 to M phase, Anaphase check points and components involved as regulators of check points, role of cyclins and CDKs.

UNIT-IV

Cell death: Types of cell death-apoptosis, necrosis and others. Apoptosis during developmental process and irregular apoptosis and disease. Death causing genes – Ceds, proteins – Caspases, mechanism of programmed cell death (PCD), Pathways of apoptosis-intrinsic and extrinsic.

UNIT V

Treatment of cancer: Early detection of cancer, molecular diagnosis, treatment -radio therapy, chemotherapy, immunotherapy and use of RNAi techniques and stem cells.

TEXT BOOKS

Alberts. B., Bray, D., Lewis, J., Raff, M., Roberts, K and Watson, J.D. (1994). Molecular Biology of the cell. Garland Publisher Inc., New York

Bishop J.A. (1982). Retroviruses and cancer genes. Advances in cancer research.

Elliot and Elliot. (2001). Biochemistry and Molecular Biology. Oxford University Press.

REFERNCES

Gerald Karp. (1996). Cell and Molecular Biology. John Wiley and Sons. Inc

Lodish,H., Ber, A., Zipuoskry, L.S., Matsudaira, P., Bahimore, D and Damell J. (2001) Molecular Biology W.H Freeman G Co. 47

Semester V

15BCU506 GOOD LABORATORY PRACTICES 4C

Instruction hours/week: L:0 T:0 P:0 **Marks:** Internal: - External: **100** Total: **100**

End Semester Exam: 3 Hours

Course Objectives:

Equip the students

- To understand the basic quality control procedures in the laboratory
- To ensure safety in laboratory
- To understand the good laboratory procedures
- To acquaint with standard operating procedures
- To understand the importance of quality audit procedures
- To learn the laboratory safety and regulations

Course Outcomes (COs):

After completion of this course the student will be able to

1. understand the basic quality control procedures in the laboratory
2. Follow safety procedures in laboratory
3. Follow good laboratory procedures
4. Acquaint with standard operating procedures
5. Do quality audits
6. Maintain laboratory safety and regulations

UNIT I

Basic Concepts: Quality concepts, Quality Assurance, Good Manufacturing Practices, Responsibilities, Ensuring safety in laboratories: Introduction, principles-engineering controls, work practices and administrative control, personal protective equipment. General safety-biological safety, chemical safety and fire safety.

UNIT II

Quality Control: Quality control laboratory: Responsibilities, good laboratory practices, routine controls, instruments, protocols, non-clinical testing, controls on animal house, data generation and storage, quality control documents, retention samples, records, audits of quality control facilities.

UNIT III

Good Laboratory Practice (GLP): GLP – an overview and basic information, Scope. Principles of GLP: Test Facility Organization and Personnel, Quality Assurance Programme, Facilities, Apparatus, Material, and Reagents, TestSystems, Test and Reference Items, Standard Operating Procedures, Performance of the Study, Reporting of Study Result, Storage and Retention of Records and Materials. Responsibilities in GLP Implementing of GLP in non GLP analytical laboratory

UNIT IV

Inspections, Quality Audit and Quality System Reviews: Inspections of pharmaceutical manufacturers, role of quality audit, role of inspectors, methods of inspection- routine, concise, follow-up and special inspections, frequency and duration of inspections, preparations for inspections, conduct, report and regulatory actions. Loan License Auditing – Concepts, Auditing, role of quality circle in quality assurance.

UNIT V

Laboratory Regulations and Safety: List of Regulations to be followed**.** Laboratory safety procedure- glass ware, equipment safety, hands protection, precaution to be undertaken to prevent accident and contamination.

TEXT BOOKS

Weinberg S. 1995. Good Laboratory Practice Regulations, 3rd edition, CRC Press, U.S.A.

Harburn K, 1990. Quality Control of Packing Materials in Pharmaceutical Industry, CRC Press, U.S.A.

Prichard E. 1995. Quality in the Analytical Chemistry Laboratory, 1st edition, Wiley, U.S.A.

REFERENCES

Richard A.G., G. Richard. 2009. New Drug Approval Process Drugs and the Pharmaceutical Sciences), 5th edition CRC Press, U.S.A.

Wenclawiak B.W., Koch M , Hadjicostas E. 2004. Quality Assurance in Analytical Chemistry: Training and Teaching. 1st edition, springer. U.S.A.

B. Sc (Hons)

Semester - V

15BCU507 ADVANCED BIOCHEMISTRY 5C

Instruction hours/week: L:0 T:0 P:0 **Marks:** Internal**: -** External**: 100** Total**: 100**

End Semester Exam: 3 Hours

Course objectives

- To understand the basic concepts of chemical reactions that occur in living systems
- To know the basics about the genetic materials
- To understand the Interactions between DNA and protein
- To understand the sources of toxic emissions
- To evaluate the environmental impact of toxic compounds in emissions and immissions
- To evaluate personal and authoritative rights and duties with toxic pollutants.

Course Outcomes (COs):

After completion of this course the student will be able to

1. Comprehensive, detailed understanding of the chemical basis of heredity
2. Understand the cell cycle, angiogenesis and apoptosis.
3. To understand the properties and importance of water in biological system
4. Compare the level of toxic pollutants evacuated in the environment, with the related concentration limits, according to specific regulations
5. Assess the influence of the toxic compounds released on the public health
6. Assess safety conditions and apply related safety regulations when dealing with toxic substances.

UNIT I

Genetic elements :Structure of double strand DNA (B,A, C, D & Z DNA). The biological significance of double strandness, sequence dependent variation in DNA. Physical properties of DNA, chemicals that react with DNA; Types of RNAs and their biological significance.

UNIT II

DNA Bending: Introduction-The Wedge model and Junction model for DNA bending. Protein induced DNA bending. DNA Supercoiling: Introduction- Heterogenicity in forms of DNA molecule. Supercoil form of DNA. DNA knots and catenanes.

DNA-Protein interaction: Introduction- General consideration on protein binding. Specific DNA-Protein interaction.

UNIT III

Cell Cycle and its regulation: Check points, Involvement of CDK's and cyclins, proteins in cell cycle. Cell cycle control of DNA replication: cell cycle and cancer. Apoptosis: Characteristics and features of cell death and mechanism; Anti -apoptotic genes. Telomeres and telomerases in genomic instability.

UNIT IV

Microbial quality of water: Treatment of municipal waste and industrial effluents. Disposal of waste. Bioremiation: Degradation of pesticides by microbes Biological control: Bacteria-*Bacillus thuringenesis*, Virus-*Polyhrosis virus*, Fungi-*Berveria bassiana,* Protozoa-*N.algereae*, Parasite-*Tricoderma,* Biofertilizer-Nitrogen fixing bacteria- Cyanobacterium and Azospirillum. Role of VAM in plant nutrition.

UNIT V

Toxins: Exo and endo toxins; fungal toxins and bacteriocins. Secondary metabolites from microbes. Food preservation and Spoilage: Methods of food preservation, food preservatives, flavour enhancers, emulsifiers, stabilizers, colours, sweetners, antioxidants and food additives. Chemical and microbial spoilage of foods. Food safety.

REFERENCE BOOKS

Sinden R.R ,2006. DNA structure and function. Academic Press, London.

Geoffrey M. Cooper and Robert E. Hausman 2013.Cell-A Molecular Approach, 6th Edition. Sinauer Associates. USA.

Norman W. Desrosier N.W., 2008. The Technology and Food preservation. The Avi Publishing Company, Inc., Westport, Connecticut.

Grainger J.M and J,M Linch, 2005. Microbial Methods of Environmental Biotechnology, 4th edition, John Willey and Sons, New York.

Semester V

15BCU521 INTERNSHIP PROGRAMME 2C

Instruction hours/week: L:0 T:0 P:0 **Marks:** Internal: **50** External: **-** Total: **50**

End Semester Exam: 3 Hours

15BCU601 **CLINICAL BIOCHEMISTRY** **Semester VI**
5H-5C

Instruction hours/week: L:5 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

- To understand the functions of hepatic, renal and cardiovascular system
- To evaluate the functions of hepatic, renal and cardiovascular system
- To learn fatty acid synthesis and degradation and their regulation
- To study the regulation of amino acid metabolismand its regulations with Metabolic disorders.
- To understand the inter relationship of carbohydrate, lipid, protein and nucleic acid metabolism and understand the importance of TCA cycle.
- To aware about the homeostasis of glucose metabolites by intrinsic and extrinsic control mechanism.

Course outcomes (CO's)

After completion of this course the student will

1. Acquire the basis behind the assessment of vital organ functioning through liver function, kidney function and cardiomarker assessment.
2. Able to differentiate normal and abnormal functioning of human body.
3. Gain knowledge on glucose anabolic and catabolic pathways that ultimately control the glucose homeostasis.
4. Know the metabolic pathway of amino acid and their regulation with associated disorders.
5. Learn fatty acid synthesis and degradation and their regulation
6. Able to explain the role of lipids, their metabolism and their stringent control by hormones and other factors.

UNIT I

Disorders of carbohydrate metabolism: Normal sugar level in blood, renal threshold, regulation of blood glucose concentration; Diabetes Mellitus: Types, pathophysiology; Diagnosis -OGTT, glycosylated hemoglobin, complications- diabetic ketoacidosis and diabetic coma. Hypoglycemia: Definition and causes. Renal glycosuria- fructosuria, pentosuria and galactosuria.

Disorders of Aminoacid metabolism: Cysteinurea. Hartnup disease. Fanconi syndrome, Homocysteinuria, Alkaptonuria, Phenylketonuria, albinism and maple syrup urine disease.

UNIT II

Disorders of Lipid metabolism: Introduction, clinical manifestation, biochemical abnormalities of lipoprotein-Abetalipoproteinemia, Hyperlipoproteinemias, Hypobetalipoproteinemias; hyperlipidemia, hypercholesterolemia, Cholesterol Acyl Transferase Deficiency. Atherosclerosis, Fatty liver, liver cirrhosis.

UNIT III

Disorders of Purine and Pyrimidine metabolism: Clinical manifestation, biochemical abnormalities, Hyper uricemia- Gout, Lesch-Nyhan syndrome, Von-Gierke's disease. Hypo uricemia – xanthinuria; Orotic aciduria.

Disorders of Bilirubin metabolism: Definition, clinical manifestation, Jaundice- types, biochemical abnormalities of Criggler-Najjar syndrome. Gilbert's disease and Dubin Johnson disease.

UNIT IV

Gastric, pancreatic and intestinal function

Gastric function – Introduction- test of gastric function – insulin stimulation test, determination of gastrin in serum, tubeless gastric analysis.

Pancreatic function- Introduction, pancreatic function test- serum amylase and lipase, direct stimulation test-secretion of CCK, indirect stimulation test-lundh test.

Intestinal function- Introduction, tests used in the diagnosis of malabsorption, determination of total fecal fat, xylose excretion test and determination of total protein

UNIT V

Liver disease and liver function tests- Bilirubin metabolism and jaundice, liver function tests- Estimation of conjugated and total bilirubin in serum, Detection of bilirubin and bile salts in urine, Thymol turbidity test, serum enzymes in liver disease- Serum transaminases (SGOT and SGPT), and phosphatases.

Kidney function tests – Introduction, physical examination of urine, elimination tests- clearance test, insulin clearance, creatinine clearance and urea clearance: Renal blood flow and filtration fraction, clinical significance of GGT, LDH and creatine phosphokinase in kidney function.

Coagulation tests- prothrombin time, Activated Partial Thromboplastin Time (APTT) and lupus anticoagulant.

TEXT BOOKS

Ambika S. 2004, Fundamentals of Biochemistry for Medical Students, CIT Chennai.

Harper's illustrated Biochemistry, 2012, McGraw Hill publishers, New Delhi.

Chatterjea MN, 2011, Text book of medical biochemistry, 8th edition, JB publisher.

REFERENCES

Philip D.Mayne, 1994, Clinical Chemistry in Diagnosis and Treatment, ELBS Publications, New York.

Carl A. Burtis, Edward R. Ashwood and William Heinmann Teitz, 1999, Textbook of Clinical Biochemistry, W.B. Saunders Company, London.

Varley H 2003, Practical Clinical Biochemistry, CBS Publishing, New Delhi.

Macleod.J, C. wards and I. Bouchier.1995, Davidson's Principles and Practice of Micine, English Language Book Society.

Robert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell ,2012.

Harper's illustrated Biochemistry, Appleton and Lange Publishers, London, 29th edition

Semester VI

15BCU602 DRUG BIOCHEMISTRY 5H-5C

Instruction hours/week: L:5 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

- This paper gives insight knowledge about the emerging themes of drug biochemistry.
- Provides an in depth analysis of specific drug classes, its metabolism and therapeutic approaches.
- Equip the students with Pharmacokinectics and Pharmacodynamics
- To get knowledge on drug tolerance and dependence
- Gain knowledge on genetically engineered drugs
- To understand the mechanism of action of drugs and its undesired effects of drugs

Course outcomes (CO's)

After successful completion, the students will understand

1. What the body does to a drug and what a drug does to a body
2. Drug metabolism
3. The principles and procedure for genetically engineered drugs
4. How the drugs elicit the desired effect and undesired effects
5. The goal of the paper will ensure the widespread visibility and high impact of Drugs.
6. Thereby promoting on emerging research, pointing the way for the establishment of new medicines – from the identification of targets, through to the synthesis and evaluation of putative therapeutic entities.

UNIT I

Introduction to drug Biochemistry: Classification, routes of administration – factors influencing dosage and drug action, Absorption and distribution of drugs, binding of drugs to plasma proteins, Drug Dose relationship (LD_{50}, ED_{50}, therapeutic index), Drug – Receptor interaction, Drug binding forces, Receptor theories, Drug – Receptor interaction.

UNIT II

Drug metabolism: Drug Biotransformation pathways - phase I – oxidation, reduction and hydroxylation. Phase II- Conjugation, Elimination of drugs from body system. Storage of drugs in adipose tissue.

UNIT III

Drug abuse; drug dependence; drug resistance- Biological mechanism, ways to overcome.

Chemotherapy: Antibacterials – Mode of action of sulfonamides, penicillin, streptomycin, tetracycline, chloramphenicol, antiviral drugs, antifungal drugs; Antimetabolites of folate, purines & pyrimidines, Anti tubercular drugs.

UNIT IV

Mechanism of action drugs used in the treatment of diabetes mellitus (Acarbose, Biguanides), AIDS (Azidophymidine, Didanosine), cancer(Mechlorethamine, Busulfan), heart (Amrinone, Digoxin) and kidney disorder (Benzophiadiazines, furosemide); antiepileptic drug(Lamictal, Tapclob), drugs for cough (Dextromethorphane Hydrobromide, Noscapine) and bronchial

asthma (Salbutamol,Aminophylline), diuretics (Manitol, Xanthine), anti ulcer drugs (Cimetidine, Ranitidine) and drugs for fever (Paracetamol, Ibuprofen).

UNIT V

Toxicology- Introduction, definition and disciplines of toxicology, classification of toxicity and toxicants, Mechanisms of toxic effect, treatment of intoxication, methods in toxicology testing, heavy metal toxicity and chelation therpy. Environmental pollution, mycotoxins, mushroom poisons

TEXTBOOK

Satoskar.R.S, S.P.Bhandarkar and S.S.Ainapuri. 2003. Pharmacology and Pharmacotherapeutic, 18th edition,Popular Prakashan, Mumbai.

REFERENCES

Hamilton.D, R.J. Philips and D. Scott .2004. Occupational, Industrial and Environmental Toxicology, Moshy Inc Publishers.

Berg G,M.I., R.G. Hendrickson and A.Morocco 2005. Medical Toxicology Review. McGraw Hill Mical Publishing Company**.**

William Foye, 2012. Principles of Medicinal Chemistry, 7th edition, B.I. Wanerly Pvt. Ltd, New Delhi.

Grahame-Smith D.G and J. K. Aronson, 2002.Oxford textbook of Clinical Pharmacology and Drug Therapy: 3rd edition. Oxford University Press.

K.D.Tripathy (2009). Essentials of Medical Pharmacology, Jaypee brothers medical publishers, New Delhi.

Semester VI

15BCU603A **CORE ELECTIVE -II** **5H-4C**

INTRODUCTION TO BIOTECHNOLOGY

Instruction hours/week: L:5 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

- To give students both a theoretical background and a working knowledge of the instrumentation and techniques employed in a biotechnology laboratory
- Able to understand about the gene structure, replication, transcription, translation recombination mechanism of DNA.
- Know the regulation of the synthesis of DNA, RNA and protein.
- Know the DNA sequencing and Gene transfer techniques
- Understand the plant tissue culture technique
- Perform techniques involving the manipulation of DNA; and explore career opportunities in biotechnology

Course outcomes (CO's)

After successful completion, the students

1. Understand the background of gene structure and flow of genetic information from DNA to RNA.
2. Understand the animal cell culture and stem cells
3. Understand the genetic engineering of plants
4. Understand the transgenic animals and gene therapy
5. Understand the DNA, genes, and gene Expression
6. Understand the recombinant DNA technology

UNIT -I

Introduction – Basic steps in gene cloning. Vehicles in gene cloning-Plasmids- basic features, size and copy number, classification. Bacteriophage- basic features, life cycle. Cosmids and phagemids.Viral vectors and plant vectors.

UNIT- II

Introduction of DNA into living cells-methods, microinjection, electroporation, shotgun methods.Transformation and transfection in *E.coli* – recombinant selection and screening.
Maximizing the expression of cloned genes in *E.coli*- Promoters, Cassettes and production of fusion protein.

UNIT- III

DNA sequencing-Sanger and Maxim Gilbert method.PCR- techniques and applications.
DNA foot and finger printing- applications. Hybridization probes- radiolabelled and non-radiolabelled.Hybridization techniques- Southern, Northern, Western blotting techniques.Site directed mutagenesis. DNA microarray.

UNITI- IV

Gene transfer techniques- Microinjection, biolistic methods, vector based transfer.Plant tissue culture-Media composition, nutrients and growth regulators, callus culture.Genetic engineering

of plants-methodology- plant transformation with Ti plasmidof *Agrobacterium tumifaciens*. Production of herbicide resistance plant (with reference to glyphosate only). Applications of transgenic plants.

UNIT –V

Genetic engineering of animals – methodology-production of transgenic mice (with reference to insulin only). Knock out mice, Applications of Transgenic animals. Animal biotechnology-Artificial insemination and embryo transfer. *In vitro* fertilization (IVF).

Animal cell culture-Facilities and culture media for animal cell culture. Primary cell culture techniques-cell separation and monolayer culture. Cell lines. Recombinant proteins from cell cultures: interferons, viral vaccines. Gene therapy.

TEXT BOOKS

U.Sathyanarayana 2005. Biotechnology, 1st edition, Uppala Author-Publisher Interlinks, Vijayawada.

Kumar H.D.1991. A Textbook of Biotechnology 2nd edition, East-West Press Private Ltd.

Kumaresan V.2005. Biotechnology, 1st edition, Saras Publications.

Singh B. D. 2004. Biotechnology, Kalyani Publishers, Chennai.

REFERENCES

Bernard Glick and Pasternick, 2002. Molecular Biotechnology, Panima Publishing Corporation, Delhi.

Brown T. A 2010. Gene cloning- an introduction, 6th edition, Wiley-Blackwell, London.

Mahesh S., A. B. V.Murthy 2003. Biotechnology, New age International Publishers, New Delhi.

Old & Primrose 2003. Principles of Gene manipulation, S. B. Blackwell scientific publication, New York.

Semester VI

15BCU603B **CORE ELECTIVE-II** **5H-4C**

BIOETHICS AND BIOSAFETY

Instruction hours/week: L:5 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with:

- To enable students to understand the ethical issues in life sciences and animal handling and to give a more insight in to IPR.
- To understand the food safety
- To understand the Biosafety guidelines and regulations
- Know the conservation and sustainable use of biodiversity
- Components of clinical research (Phases)
- Fundamentals of IPR and patents laws

Course outcomes (CO's)

After successful completion, the student will understand:

1. Food safety
2. Application and level of bioafety
3. CPCSEA Guidelines for using small experimental animals
4. Human ethics committee and their guidelines
5. The patent procedure
6. Intellectual property rights and Patents laws

UNIT I

Bioethics – Positive effects, Negative effects. Consumer traits – food safety- Environmental concerns- Economic and Social Concerns.

Biosafety – Introduction, definition, need, application and level of bioafety. Bioethics - Introduction to Bioethics in life sciences;

UNIT II

Biosafety guidelines and regulations- National and International Guidelines. Introduction – Regulatory framework in various countries – USA- European Union-Canada-Australia- South Africa- Asian Region- International Guidelines. Biosafety guidelines in India. Guidelines for research in transgenic organisms. Human ethics committee and their guidelines

UNIT III

CPCSEA Guidelines for Laboratory Animal Facility Goal- Veterinary care- Animal procurement- acclimatization, Quarantine, Sterilization and separation – Surveillance, diagnosis, treatment and control of disease- Animal care and technical personnel, Personal hygiene- Animal experimentation involving hazardous agent- Multiple surgical procedures on single animal- Duration of experiments- Physical restraint- Physical relationships of animal facilities to laboratories – rehabilitation and sacrifice procedure. Functional areas - Environment- Animal husbandry- Activity – Food- Bedding- Water- Sanitation and cleanliness. Assessing the effectiveness of sanitation – Waste disposal- Pest control- Emergency , weekend and holiday care.

UNIT IV

Participation of public and NGO's in biosafety and protection of biodiversity – introduction. Participation – consultative processes – public participation and education – role of NGO's in biosafety and biotechnology – environmental and food safety. Food supply and population. Role of public and NGO's in protection, conservation and sustainable use of biodiversity.

UNIT V

Intellectual Property Rights - An introduction- Types; Origin of the Patent Regime- Early patterns Act & Indian Pharmaceutical Industry – History of Indian Patent System- The Present Scenario – Basis of Patentability –Patent Application Procedure in India- Patent Granted Under Convention Agreement- Patent Procedure – Opposition to Grant of Patent. Grant and Sealing- Exclusive Rights – Grant of Exclusive Rights- Special Provision for selling or distribution – Suits relating to infringements.

TEXT BOOKS

Sateesh M K. 2008. Bioethics and Biosafety, I K International Publishers Pvt Ltd.

Shaleesha A.S. 2008. Bioethics, Published by Wisdom Educational Service, Chennai.

REFERENCES

Deepa Goel. 2013. IPR, Biosafety and Bioethics, 1st edition, Pearson Education Publishers, Chennai.

Geetha B. and R Ramamurthy. 2007. Bioethics and Biosafety, 1st edition, APH Publications.

15BCU603C **CORE ELECTIVE - II** **5H-4C**

STEM CELL BIOLOGY

Instruction hours/week: L:5 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

- The course is to offer the student state of the art education of stem cell and how the pluripotent cells and multipotent cells can be used to treat the neurodenerative disorders, cardiovascular disorders and diabetes.
- Explain the specific characteristics of stem cells.
- Relate the importance of stem cells to the development and maintenance of multicellular organisms.
- Understand how cell-cell signaling maintains stem cells and influences differentiation of specialized cell.
- Understand how defects in stem cell behavior can lead to medical problems.
- Describe current limitations of stem cell biology applications and areas of active research

Course outcomes (CO's)

After successful completion, the student will:

1. Get the knowledge of wide ranging, topics related to stem cells, regenerative biology and embryonic cells.
2. Differentiate between embryonic and adult stem cells, and describe their characteristics
3. Define the molecular mechanisms of stem cell differentiation
4. Discuss potential applications of stem cells in regenerative medicine.
5. Gain a knowledge of the intrinsic and extrinsic factors important for stem cell renewal and differentiation.
6. Understand the clinical significance of stem cell research and the possible problems that need to be overcome.

UNIT I

Introduction to Stem Cells – Definition, Classification, characteristics, Differentiation and dedifferentiation, Basic culture procedures – Isolation, culture methods, identification, stem cell markers, feeder layer; Instrumentations in stem cell biology.

UNIT II

Different kinds of stem cells – Adult Stem cells-stem cell niche, Embryonic stem cells, Embryonic Germ cells, Hematopoietic stem cell, Neural stem cells, muscle and cardiac stem cells, Umbilical cord blood stem cells, cancer stem cells, Mesenchymal stem cells, Induced pluripotent Stem cells.

UNIT III

Therapeutic applications – stem cells and neurodegenerative disorders, stem cells and diabetes, stem cells and cardiac disorders, regeneration of epidermis, Success stories of stem cell therapy. Stem cell banking.

UNIT IV

Cell Cycle Control, Checkpoints, and Stem Cell Biology: regulation of the eukaryotic cell cycle - The spindle checkpoint - Cell cycle checkpoints in a changing cell cycle and their relationship to stem cells.

UNIT V

Regenerative medicine: Current stem cell therapies, Correlation between stem cells and cancer, Stem cells and aging. Hematopoietic stem cells and their clinical application. Treatment of neural diseases (Parkinson's disease, Huntington's disease and Alzheimer's disease). Repair of damaged organs (liver and pancreas).

TEXT BOOK

Essentials of Stem cell Biology – Robert Lanza, John Gearhart, Brigid Hogan, Academic Press,2005.

REFERENCES

Daniel R. Marshak, Richard L. Gardner, David Gottlieb Stem Cell Biology. Cold Spring Harbor Laboratory Press, 2001.

Lodish,H., Ber, A., Zipuoskry, L.S., Matsudaira, P., Bahimore, D and Damell J. (2001) Molecular Biology W.H Freeman G Co. 47

Semester VI

15BCU611 **PRACTICAL- VI** **5H-3C**

CLINICAL BIOCHEMISTRY

Instruction hours/week: L:0 T:0 P:5 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

- Understand the *in vitro* study of the biological properties that contribute to the prevention, diagnosis, prognosis and monitoring of diseases and disease states in humans.
- To teach students on phlebotomy, serum and/or plasma collection.
- The estimation of biomolecules such as glucose and cholesterol
- Assessment of renal function through the analysis of urea and uric acid in serum
- Assessment of liver function through the estimation of bilirubin
- To impart skills to assess various biomolecules to diagnose the functioning of vital organs.

Course outcomes (CO's)

1. Know the analytical methods commonly used in the clinical laboratory.
2. Know how can contribute the clinical laboratory to assess the health status of individuals
3. Students acquire the skills to perform phlebotomy and to estimate biomarkers to assess the vital organ functions.
4. Explain the physiopathological bases and the biochemical markers of the most prevalent diseases in our population
5. Interpret and integrate the analytical data from the principal biochemical tests for the screening, diagnosis, prognosis and monitoring of pathologies
6. Use clinical laboratory techniques to determine biochemical markers of different pathologies and critically assess the results, speculating on the nature of any possible underlying pathologies.

BLOOD ANALYSIS

1. Determination of blood sugar by O-Toluidine method.
2. Determination of urea DAM-TSC method.
3. Determination of phosphorus by Fiske-Subbarow method.
4. Determination of alkaline phosphatase in serum.
5. Determination of acid phosphatase in serum.
6. Determination of cholesterol in serum by Zak's method.
7. Determination of total proteins by Lowry's method and Biuret method.

URINE ANALYSIS

8. Determination of creatinine by picric acid method.
9. Determination of urea DAM-TSC method.
10. Determination of uric acid by Caraway's method.
11. Determination of calcium by permanganate method.
12. Determination of phosphorus by Fiske-Subbarow method.

KIT METHOD (Group experiments)

13. Estimation of triglycerides in serum
14. Estimation of creatinine in serum
15. Estimation of haemoglobin in serum
16. Extraction of lipids from liver and estimation of cholesterol

REFERENCES

Jayaraman.J.2007. Laboratory Manual in Biochemistry, New Age International Publishers, New Delhi.

Patel.H .2003.A Manual of Medical Laboratory Technology, Navaneet Prakashan limit, Bombay.

Sadasivam.S, and A. Manickam .2009.Biochemical Methods, New Age International Publishers, New Delhi.

Singh.S.P.2009. Practical Manual of Biochemistry, CBS Publishers, New Delhi.

15BCU691	**PROJECT**	**Semester VI** **10H-5C**

Instruction hours/week: L:4 T:0 P:6 **Marks:** Internal**: 60** External**: 90** Total**: 150**

End Semester Exam: -

15BCU604 **HOSPITAL MANAGEMENT** **Semester VI** **4C**

Instruction hours/week: L:0 T:0 P:0 **Marks:** Internal: - External: **100** Total: **100**
End Semester Exam: 3 Hours

Course objectives
Equip the students with:

- Managerial skills
- Hospital organization
- Specialized service areas
- Human Resources
- Finances
- Quality Assurance

Course outcomes (CO's)
After Successful completion, the students will understand:

1. The Managerial skills required for hospital management
2. Hospital organization
3. Overview of specialized service areas
4. Human Resources required for the running of the hospital
5. Maintenance of income and expenditure documents
6. Ensuring Quality Assurance

UNIT –I
Managerial skills: Planning, Information system, communication, Delegation, Decision making, Monitoring and evaluation, Managing time, Meetings, Negotiations and Innovation.

UNIT-II
Hospital organization: Hospital Organization – Structure and functions – Objectives, Types of hospitals, Hospital organizational principles. Hospital organizational functions – Organization and function of the governing body, senior management executives, The department heads. Hospital committees. The Clinical Services – The medical staff organization, The nursing services – objectives, administrations, Rules, policies and procedures, Meetings and audit.

UNIT III
Specialized service areas: Casuality services- Characteristics, management problems, instructions. Disaster: Be prepared- Plan of action, Outpatient services- location, physical infrastructure facilities, problem in functioning of OPD. Day care, The operating department, diagnostic services, medical records- nature and contents, Pharmacy –functions, problems in drugs supply, physical facilities and legal implications.

Unit IV
Human resources: Personnel – introduction, problem people, restraining, performance appraisal system- objectives, technology of appraisal, conflicts in appraisal. Material and management - objectives, process of material and management.

Unit V

Finances: Methods of financing, internal control, preparation of income and expenditure account. Activity based costing in hospitals- objectives, clinical budgeting and advantages.

Quality assurance: Quality management in hospitals, quality management programs.

TEXTBOOK

C.M. Francis, 1995**.** Hospital administration. 2nd edition, JAYPEE brothers medical publishes Pvt. Ltd. New Delhi, India.

REFERENCES

C.M. Francis and Mario C de Souza, 2000**.** Hospital administration. 3rd edition, JAYPEE brothers medical publishes Pvt. Ltd. New Delhi, India.

B.M. Sakharkar, 1999. Principles of hospital administration and planning.1st edition, JAYPEE brothers medical publishes Pvt. Ltd. New Delhi, India.

B. Sc (Hons)

Semester - VI

15BCU605 **5C**

ADVANCED ANALYTICAL TECHNIQUES AND RESEARCH METHODOLOGY

Instruction hours/week: L:0 T:0 P:0 **Marks:** Internal: - External: **100** Total: **100**

End Semester Exam: 3 Hours

Objective:

Equip the students with:

- Principles of NMR and X-Ray Crystallography
- Principles of Ultrasound imaging
- Working principles of EEG, ECMO
- Fundamentals of nanotechnology
- Experimental design
- Clinical Research

Outcome:

After successful completion, the students will understand:

- Principles of NMR and X-Ray Crystallography
- Principles of Ultrasound imaging
- Working principles of EEG, ECMO
- Fundamentals of nanotechnology
- Experimental design
- Clinical Research

UNIT I

NMR-Principles, features of NMR spectra, NMR imaging. X-Ray crystallography-Determination of molecular structure. X-Ray Comput Tomography (CAT Scan)-basic principles and system components.

UNIT II

Ultrasonic imaging systems-physical principles- mical ultra sound. ECG-Electrical and mechanical activity of heart, leads, heart sound, artificialheart valve, Pacemaker- heart lung machine. Electroencephalography (EEG) - Electrical activity of the brain, Applications. Fibre optics- Sources, detectors, application, Endoscope.

UNIT III

Nanotechnology-Introduction, development of nanotechnology, fundamental concepts, nano materials, tools - nano tubes, nanopores, cantilevers, dentrimers and quantum dots.
Nano voyage into medical application and drug designing. Nano integrate eco system.

UNIT IV

Analysis and Identification of research requirements: Prioritization of research area. Review of work done in identification area - time scheduling - laboratory facilities, Research duration – choice of research topic – Methodology – Procure, experiment design.

Experiment design: Regarding observation. Types of observation. Laboratory setting sample; Data collection – Presentation of and analysis of collect data. Preparation of result reports and Publication of research findings in peer review journals, impact factor.

UNIT V

Quality Control: Introduction, GLP, equipments and computer system, quality assurance unit, standard operating procures, reagents and solutions and conduct of study, study protocol and study report and record retention and retrival. Clinical trial: Types, Design, Clinical trial protocol, Design features, Statistical power, Phases- Phase 0, Phase I, Phase II, Trial design, Phase III, Phase IV. Intellectual Property rights in India

TEXT BOOKS

Kothari, C. R. 2009. Research Methodology – Methods and Techniques.
New Age International Pvt. Ltd, New Delhi.

Gupta. S.P, 2007. Statistical Methods. Sultan Chand and Co. New Delhi.

REFERENCES

Beck J.C, 2004. PR: Patents - Trademarks-Plant-Copyright, Plant Breers Rights - Intellectual GeriatricsReviem Syllabus.5th edition. AGS Publishers, New York.

Kenneth W.H, and P.S.Khandpur, 2005, Handbook of Biomedical Instrumentation-. A Biologist's Guide to principles and techniques of practical Biochemistry, Tata Mcgrow Hill ,Cambridge University press, London.

Mick Wilson,Kamali Kannangara,Geoff Smith,Michelle Simmons,Burkhard Raguse 2005 "Nanotechnology-Basic Science and emerging technologies"-Overseas Press.

Richard Booker,Earl Boysen 2006. Nanobiotechnology, Pointer publishers, Rajastan.

Pocock SJ, 2004, Clinical Trials: A Practical Approach, John Wiley & Sons, ISBN 0-471-90155-5.