

BACHELOR OF SCIENCE IN BIOCHEMISTRY

ELIGIBILITY

A pass in Higher Secondary Examination conducted by the Government of Tamil Nadu with Physics /Biology /Chemistry /Biochemistry /Microbiology /Home science as one of the paper are only eligible for Examinations accepted as equivalent there by Academic Council, subject to such conditions as may be prescribed there to are permitted to appear and qualify for the **Bachelor of Science in Biochemistry Degree Examination** of this College after a course of study of three academic years.

OBJECTIVES OF THE COURSE

1. Offering the students a good understanding of the basic principles of biochemistry at the molecular and cellular levels
2. Be able to immediately recognize the different types of biochemical molecules and know their essential chemical characteristics that make them indispensable for life
3. Understand basic energy metabolism of cells
4. Know the structure of DNA and RNA and why these molecules have different roles in the storage and decoding of the information of heredity and cell function
5. Describe how enzymes work and know how to determine basic enzyme kinetics
6. Making students appreciate that biochemistry is a subject of central and practical importance, contributing to both basic and applied research in industry, medicine, agriculture, pharmacy, food technology, biotechnology, etc.

SCHEME OF EXAMINATIONS

Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Max Marks			Credit Points
				CA	CE	Total	
First Semester							
PART - I							
15UTL11U 15UHL11H 15UML11M 15UFL11F	Tamil -I Hindi-I Malayalam-I French - I	6	3	25	75	100	4
PART - II							
15UEG12E	English-I	6	3	25	75	100	4
PART - III							
15UBC13A	Core -I : Biomolecules	5	3	25	75	100	4
15UBC13B	Core- II : Cell Biology	5	3	25	75	100	4
15UCY1AA	Allied -I : Chemistry- I	4	3	20	55	75	3
	Allied Practical-I: Chemistry	2		-	-	-	-
PART - IV							
15UFC1FA	Environmental Studies	2	3	-	50	50	2
		30				525	21
Second Semester							
PART - I							
15UTL21U 15UHL21H 15UML21M 15UFL21F	Tamil -II Hindi-II Malayalam-II French - II	6	3	25	75	100	4
PART - II							
15UEG22E	English-II	6	3	25	75	100	4
PART - III							
15UBC23A	Core- III : Basic Microbiology	5	3	25	75	100	4
15UBC23P	Core Practical -I: Biochemistry-I	5	3	25	75	75	3
15UCY2AA	Allied- II : Chemistry- II	4	3	20	55	75	3
15UCY2AP	Allied Practical-I: Chemistry	2	2	20	30	50	2

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7/4/16.
SoS Chairman/HoD
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PART - IV							
15UFC2FA	Value Education: Human Rights	2	3	-	50	50	2
		30				550	22
Third Semester							
PART - I							
15UTL31U 15UHL31H 15UML31M 15UFL31F	Tamil -III Hindi-III Malayalam-III French - III	5	3	25	75	100	4
PART - II							
15UEG32E	English-III	5	3	25	75	100	4
PART - III							
15UBC33A	Core -IV : Enzyme and Enzyme Technology	4	3	25	75	100	4
15UBC33B	Core- V : Bioinstrumentation	4	3	25	75	100	4
15UMA3AC	Allied -III : Basic Mathematics	5	3	20	55	75	3
PART - IV							
	NMEC- I:	2	2	-	50	50	2
15UBC3SA	Skill based Subject -I: Bioinformatics	3	3	20	55	75	3
15UFC3FA 15UFC3FB 15UFC3FC 15UFC3FD 15UFC3FE	Tamil / Advanced Tamil (OR) Yoga for Human Excellence / Women's Rights/ Constitution of India	2	3	-	50	50	2
		30				650	26
Fourth Semester							
PART - I							
15UTL41U 15UHL41H 15UML41M 15UFL41F	Tamil -IV Hindi-IV Malayalam-IV French - IV	5	3	25	75	100	4
PART - II							
15UEG42E	English-IV	5	3	25	75	100	4
PART - III							
15UBC43A	Core -VI : Intermediary Metabolism	4	3	25	75	100	4

B.Sc- Biochemistry (Students admitted from 2015-2016 onwards)

15UBC43P	Core Practical- II: Biochemistry-II	4	6	20	55	75	3
15UCS4AA	Allied- IV: Basics of computers	3	3	20	55	75	3
15UCS4AP	Allied Practical-II: Fundamentals of Computers	2	2	20	30	50	2
PART - IV							
	NMEC-II:	2	3	-	50	50	2
15UBC4SA	Skill based Practical-I : Bioinformatics	3	3	20	55	75	3
15UFC4FA 15UFC4FB 15UFC4FC	Tamil / Advanced Tamil (OR) General Awareness	2	3	-	50	50	2
		30				675	27
Fifth Semester							
PART - III							
15UBC53A	Core- VII: Molecular Biology	6	3	25	75	100	4
15UBC53B	Core- VIII: Human Physiology	5	3	25	75	100	4
15UBC53C	Core- IX: Clinical Biochemistry	6	3	25	75	100	4
15UBC53P	Core Practical- III: Biochemistry-III	5	6	20	55	75	3
	Elective - I	5	3	25	75	100	4
PART - IV							
15UBC5SA	Skill based Subject- II: Nutritional Biochemistry	3	3	20	55	75	3
		30				550	22
Sixth Semester							
PART - III							
15UBC63A	Core -X : Immunology and Immuno Techniques	6	3	20	55	75	3
15UBC63B	Core -XI: Genetic Engineering	6	3	20	55	75	3
15UBC63P	Core Practical- IV: Biochemistry-IV	5	6	20	55	75	3
	Elective - II	5	3	25	75	100	4
	Elective - III	5	3	25	75	100	4

B.Sc- Biochemistry (Students admitted from 2015-2016 onwards)

PART IV							
15UBC6SP	Skill based Subject - III: Plant Physiology and Biochemistry	3	3	20	55	75	3
PART - V							
15UEX65A	Extension Activity	-	-	50	-	50	2
		30				550	22
GRAND TOTAL						3500	140

ELECTIVE - I

(Student shall select any one of the following subject as Elective in fifth semester)

S.No	Subject Code	Name of the subject
1.	15UBC5EA	Plant andAnimal Biotechnology
2.	15UBC5EB	Principles of Genetics
3.	15UBC5EC	Health Management

ELECTIVE - II

(Student shall select any one of the following subject as Elective in sixth semester)

S.No	Subject Code	Name of the Subject
1.	15UBC6EA	Medicinal Chemistry
2.	15UBC6EB	Concepts in Drug discovery
3.	15UBC6EC	Concepts in Clinical Trials

ELECTIVE - III

(Student shall select any one of the following subject as Elective in sixth semester)

S.No	Subject Code	Name of the Subject
1.	15UBC6EV	Biochemistry- Mini project
2.	15UBC6ED	Endocrinology
3.	15UBC6EE	Diagnostic biochemistry

NON MAJOR ELECTIVE COURSES

- The Department offers the following two papers as Non Major Elective Course for other than the Biochemistry students.
- Student shall select any one of the following subject as Non Major Elective Course during their fourth semester

S. No.	Semester	Course Code	Course Title
1.	III	15UED34C	General Biochemistry
2.	IV	15UED44C	Antioxidants and phytochemistry

FOR COURSE COMPLETION

Students have to complete the following Subjects:

1. Language papers (Tamil/Malayalam/French/Hindi, English) in I and II semester.
2. Environmental Studies in I semester.
3. Value Education in II and III semester respectively.
4. General Awareness in IV semester.
5. Allied papers in I, II, III and IV semesters.
6. Two Non Major Elective Course in the fourth and Fifth semester.
7. Extension activity in V semester.
8. Elective papers in the fifth and sixth semesters.

Total Credit Distribution

Subjects	Credits	Total		Credits	Cumulative Total
Part I: Tamil	4	4 x 100	400	16	32
Part II: English	4	4 x 100	400	16	
Part III:					
Core	4	9 x 100	900	36	82
Core	3	3 x 75	225	09	
Core Practical	3	3 x 75	225	09	
Allied	3	4 x 75	300	12	
Allied Practical	2	2 x 50	100	4	
Electives	4	3 x 100	300	12	
Part IV:					
Skill Based Subiect	3	4 x 75	300	12	24
NMEC	2	2 x 50	100	4	
Environmental studies	2	1 x 50	50	2	
Value Education	2	2x 50	100	4	
General Awareness	2	1x 50	50	2	
Part V:					
Extension Activity	2	1 x 50	50	2	2
Total			3500	140	140

15UTL11U	பகுதி - 1 : தமிழ் தாள் -1	முதல் பருவம்
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Total Credit: 4
Hours per week: 6

(இரண்டு ஆண்டுகள் தமிழ் பயிலும் மாணவர்களுக்குரியது)

(கவிதை, சிறுகதை, இதழியல், இலக்கணம், இலக்கிய வரலாறு)

அலகு -1 கவிதைகள்

1. பாரதியார் – செந்தமிழ்நாடு
2. பாரதிதாசன் – புத்தகச் சாலை, நீங்களே சொல்லுங்கள்
3. கவிமணி – ஒற்றுமையே உயிர்நிலை
4. சிற்பி – பெல்ஜியம் கண்ணாடி
5. மு.மேத்தா – மரங்கள்
6. ஆ.வெண்ணிலா – நீரில் அலையும் முகம்

அலகு - 2 சிறுகதைகள்

1. புதுமைப்பித்தன் – கடவுளும் கந்தசாமிப் பிள்ளையும்
2. ஜெயகாந்தன் – யுக சந்தி
3. தி.ஜானகிராமன் - சிலிர்ப்பு
4. நாஞ்சில் நாடன் – சூடிய பூ சூடற்க
5. பட்சி – பெத்த வயிறு

அலகு - 3 நீதி இலக்கியம்

1. திருக்குறள் - அறன் வலியுறுத்தல்
2. ஏலாதி – (பா.எண் : 15,16,26,39,47)
- 3.கார்நாற்புது – (முதல் 10 பாடல்கள்)

அலகு - 4 இதழியல் கலை

1. இதழியல் விளக்கம் (இதழியல் விளக்கமும் இலக்கணமும், இதழ்களின் பணிகளும் பொறுப்புகளும், இதழ்களின் வகைகள்)
2. தமிழ் இதழ்கள் (நாளிதழ்கள், வார இதழ்கள், மாத இதழ்கள்)
3. தமிழ் ஊடகங்கள் (வானொலி, தொலைக்காட்சி, இணையம்)

அலகு – 5 இலக்கிய வரலாறும் இலக்கணமும்

1. தமிழ்க் கவிதையின் தோற்றமும் வளர்ச்சியும் (மரபுக்கவிதை, புதுக்கவிதை)
2. தமிழ்ச் சிறுகதையின் தோற்றமும் வளர்ச்சியும்
3. பதினெண் கீழ்க்கணக்கு நூல்கள்
- 4.இலக்கணம் : அ)ஒற்றுமிகும் இடங்கள், ஆ) ஒற்று மிகா இடங்கள்

பார்வை நூல்கள்

- 1 . தமிழ்த்துறை வெளியீடு
2. இலக்கிய வரலாறு – பேராசிரியர் முனைவர் பாக்யமேரி
3. இதழியல் கலை - மா.பா.குருசாமி

15UHL11H	PART-I: HINDI-I	SEMESTER- I
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Total Credit: 4
Hours per week: 6

Prose, Non-detailed Text, Grammar & Translation Books Prescribed:

1. PROSE : Nuthan Gadya Sangrah

EDITOR: Jayaprakash (Prescribed Lessons – only 4)

Lesson 1 - Razia

Lesson 2 – Makreal

Lesson3- Bahtha Pani Nirmala

Lesson 4 – Rashtrapitha Mahathma Gandhi

PUBLISHER: Sumitra Prakashan Sumitravas,
16/4 Hastings Road,
Allahabad – 211 001.

2. NON DETAILED TEXT: Kahani Kunj.

EDITOR: Dr.V.P.Amithab. (Stories 1 -4 only)
Publisher : Govind Prakashan Sadhar Bagaar,
Mathura,
Uttar Pradesh – 281 001.

3. GRAMMAR : Shabdha Vichar (Sangya, Sarvanam, Karak,
Visheshan) ONLY
(Noun, Pronoun, Adjective, Case Endings)
Theoretical & Applied. Book for

REFERENCE : Vyakaran Pradeep by Ramdev.
Publisher : Hindi Bhavan,
36, Tagore Town
Allahabad – 211 002. 4.

4. TRANSLATION: English- Hindi only. Anuvadh Abhyas – III (1-10
lessons Only)

PUBLISHER: Dakshin Bharath Hindi Prachar Sabha
Chennai -17.

5. COMPREHENSION : Passage from Anuvadh Abhyas – III (16- 30)

Dakshin bharath hindi prachar sabha, Chennai- 17.

15UML11M	PART-I: MALAYALAM-I	SEMESTER-I
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Total Credit: 4
Hours per week: 6

Paper I Prose, Composition & Translation

This paper will have the following five units:

- Unit I &II** - Novel
Unit III & IV - Short story
Unit V - Composition & Translation

TEXT BOOKS:

- Unit I &II - Naalukettu - M.T. Vasudevan Nair (D.C. Books, Kottayam, Kerala)
Unit III & IV - Manikkianum Mattu Prathana Kathakalum - Lalithampika Antharjanam (D.C.Books, Kottayam, Kerala)
Unit V -Expansion of ideas, General Essay and Translation of a simple passage from English about **100** words) to Malayalam.

REFERENCE BOOKS:

1. **Kavitha Sahithya Charitram** -Dr. M.Leelavathi (Kerala Sahithya Academy, Trichur)
2. **Malayala Novel Sahithya Charitram** -K.M.Tharakan(N.B.S. Kottayam)
3. **Malayala Nataka Sahithya Charitram**-G.Sankarapillai(D.C.Books, Kottayam)
4. **Cherukatha Innale Innu** -M.Achuyuthan(D.C. Books, Kottayam)
5. **Sahithya Charitram Prasthanangalilude**-Dr. K.M. George,(Chief Editor) (D.C. Books, Kottayam)

15UFL11F	PART-I: FRENCH-I	SEMESTER- I
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Total Credit: 4
Hours / week: 6

French Language for Under-graduate Degree Programmes

Compétence Culturelle	Compétence De communication	Compétence grammaticale
UNITÉ 1 - Ici, en France		
<ul style="list-style-type: none"> • Moi et les Autres • La France Express 	<ul style="list-style-type: none"> • INTERACTION: s'identifier • RÉCEPTION ECRITE: Comprendre une annonce d'aéroport • RÉCEPTION ORALE: comprendre l'écrit de la rue (Panneaux, plaques, rues...) • PRODUCTION ÉCRITE: écrire un SMS 	<ul style="list-style-type: none"> • Le présent des verbes: Je suis, je reste, J'arrive • Le lieu: (je suis) à... (je suis) ici • L'infinifitif
UNITÉ 2 - Ici, en classe		
<ul style="list-style-type: none"> • Moi et le francais • Le francais dane le monde 	<ul style="list-style-type: none"> • INTERACTION: Se présenter • RÉCEPTION ORALE: Comprendre des consignes Orales • RÉCEPTION ÉCRITE: Comprendre une fiche D'inscription • PRODUCTION ÉCRITE: écrire un texte à 'impératif 	<ul style="list-style-type: none"> • Tu/vous • Le present des Verbes en-er et de être:je, tu,vous • La forme Impérative (tu ,vous) Des verbes en-er
UNITÉ 3 - Samedi		
<ul style="list-style-type: none"> • Le fil du temps 	<ul style="list-style-type: none"> • INTERACTION: S'informer • RÉCEPTION ORALE: Comprendre une annonce • RÉCEPTION ÉCRITE: 	<ul style="list-style-type: none"> • Les articles Défines:le,la,les • A,de+le,la,les: Au,aux,du,des,à l', de l' • Être(présent)l'heure • Ll faut+nom Ll faut+infinitive • Pharses verbe+complément, Complément+verbe

UNITÉ 4 - Dimanche		
<ul style="list-style-type: none"> • Les activités Culturelles des Français 	<ul style="list-style-type: none"> • INTERACTION: Acheter,demander des Informations • RECEPTION ORALE: Comprendre les Titres du journal à la radio • RÉCEPTION ÉCRITE: Comprendre les Informations • PRODUCTION ÉCRITE: Inventer des noms de journaux 	<ul style="list-style-type: none"> • Faire, present • Avior, present • Ll y a • Le présent des verbes en-er: Regarder • Combien? • Quand? • Complément de nom: Tremblement de terre, les noms de pays.... • Du,des,de la(reprise U2) • Les adjectifs possessifs: Mon,ta,son, Ma,ta,sa Mes,tes,ses
UNITÉ 5 - Dommage!		
<ul style="list-style-type: none"> • Un baby-boom en 2000 et 2001 • L'amour, toujours 	<ul style="list-style-type: none"> • INTERACTION: exprimer la tristesse, la peur, conseiller,encourager • RÉCEPTION ORALE: Comprendre une émission De radio • RÉCEPTION ÉCRITE: Comprendre un sondage • PRODUCTION ÉCRITE: écrire des blogs 	<ul style="list-style-type: none"> • Est-ce que • Le present des verbes pouvoir,Vouloir • Le conditionnel des Verbs pouvoir, Vouloir • Ne...pas

TEXT BOOK:

1. *Marcella Di Giura Jean-Claude Beacco, Alors I.* Goyal Publishers Pvt Ltd
86, University Block Jawahar Nagar (Kamla Nagar) New Delhi - 110007.

15UEG12E	PART -II: ENGLISH-I	SEMESTER- I
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Total Credit: 4
Hours per week: 6

OBJECTIVES:

1. To develop the language competence of the students.
2. To be enriched with functional English.

UNIT - I

PROSE

1. My Financial Career – Stephen Leacock
2. At School – Gandhi
3. Ecology – Barry Commoner

UNIT - II

SHORT STORIES

1. The Gateman's Gift – R.K. Narayan
2. The Open Window – H.H. Munro
3. The Face of Judas Iscariot – Bonnie Chamberlain

UNIT - III

ONE ACT PLAY

1. The Discovery – Herman Ould

UNIT - IV

FUNCTIONAL GRAMMAR

1. Vocabulary Exercises
2. Synonyms, Compound Words, etc
3. Communication Skills – Tasks
4. Different types of sentences
5. The Structure of Sentences
6. Transformation of Sentences

UNIT - V

COMPOSITION TASKS

1. Greeting, Introducing, Requesting, Inviting
2. Congratulating, Thanking, Apologising, Advice
3. Suggestions, Opinions, Permissions.
4. Comprehension

TEXT BOOKS:

1. *Seshasayee. N.* 2001. **Honeycomb**. Anu Chitra Publications, Chennai.
2. *Syamala, V.* 2002. **Effective English Communication for You**. Emerald Publisher, Chennai.

REFERENCE BOOKS:

1. *Rajamanickam. A.* 2001. **Everyman's English Grammar**. Macmillan.
2. *Krishna Mohan and Meera Banerji.* 2005. **Developing Communication Skills**. Macmillan, Chennai.
3. *Wren, P.C. and H. Martin.* 1998. **High School English Grammar and Composition**. Macmillan.

15UBC13A	CORE -I: BIOMOLECULES	SEMESTER – I
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Total Credit: 4
Hours per week: 5

OBJECTIVES:

On successful completion of the course the students should have understood the significance of the complex bio-molecules, polysaccharides, lipids, proteins, nucleic acids, vitamins and minerals.

CONTENTS

UNIT - I

Water: Structure, Physical properties of water. Weak interaction in aqueous solutions. pH – Introduction, , buffers, Henderson Hasselbalch equation, biological buffer system. Introduction to biological macromolecules - Carbohydrate classification structure, properties & chemical reactions of monosaccharides. Structure, Properties of disaccharides – Maltose, Lactose and Sucrose. Polysaccharides – structure & biological functions of Homo & Hetero polysaccharides. Biological importance of sugar derivates – glycosaminoglycans, proteoglycans & glycoproteins

UNIT - II

Lipids: Definition classification of lipids, physiochemical properties. Storage lipids – fatty acids – types. Structural lipids – phospholipids, glycolipids & sphingolipids. Structure & Biological role of cholesterol,

UNIT - III

Amino acids & Proteins: Classification of amino acids, general properties, Chemical reactions of amino acids due to carbonyl groups and aminogroups. Peptide structure and properties. Protein classification, Physiochemical properties of proteins. Organization of protein Structure – Primary (Insulin), Secondary (Keratin, Collagen) Tertiary (Myoglobin), Quaternary structure (Hemoglobin). Denaturation & Renaturation.

UNIT - IV

Nucleic Acids : Structures of Purines, pyrimidines, Nucleosides and Nucleotides. Properties of nucleic acids. DNA double helical structure, A, B & Z forms. Denaturation & Renaturation of DNA. RNA - Types, structure and function.

UNIT - V

Minerals & Vitamines: Minerals in biological system and their importance – Iron, Calcium, Phosphorous, Iodine, Copper, Zinc. Vitamins – Definition, classification: Fat soluble (Vit A,D,E,K) and Water Soluble vitamins (Vit B Complex & C)-Sources, functions and deficiencies. Role of vitamins as antioxidants and cofactors.

TEXT BOOKS:

1. *Lehninger, A.L., Nelson, D.L., Cox, M.M.*1993. **Principles of Biochemistry** (Second Edition), CBS Publishers.
2. *Lubert stryer.* (1995). **Biochemistry** (Forth Edition), *Freeman and company.*

REFERENCE BOOKS:

1. *Jain J L* (2014) **Fundamentals of Biochemistry**, 7th edition, *S. Chand and Company publication*
2. *Deb A C* (1989) **Fundamentals of Biochemistry** (Third Edition), *New Central Agency, Calcutta.*
3. *Zubay* (2008) **Biochemistry** (First edition) *William.C.Brain publishers.*
4. *Voet D and Voet J G* (2008) **Biochemistry** (Third edition). *John Wiley and Sons (Asia) pvt ltd.*

15UBC13B	CORE- II: CELL BIOLOGY	SEMESTER - I
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Total Credit: 4
Hours per week: 5

OBJECTIVES:

The subject aims to build the concepts regarding:

1. Understanding the structural and functional aspects of the cell to provide the student with strong foundation in the molecular mechanisms underlying cellular function
2. Learn on the various cell organelles with their functions.

CONTENTS

UNIT -I

An overview of cells: Origin and evolution of cells, cell theory, Classification of cells: Prokaryotic and eukaryotic cells. Comparison of microbial, plant, and animal cells.

UNIT- II

Structure and function of Cell wall, Fluid mosaic model of cell membrane, structure and function of capsule. Transport across membranes: Diffusion, active and passive transport, Ion channels.

UNIT- III

Structure and function of Endoplasmic reticulum, Golgi apparatus, Ribosomes, Lysosomes, Peroxisomes and Glyoxysomes.

UNIT- IV

Structure and function of Mitochondria, Chloroplast, Cytoskeleton: Types, Microtubules, Actin and Myosin, Intermediate filaments – structure and functions. Cilia and Flagella.

UNIT- V

Structure and function of Nucleus and Chromosomes, Cell division in Prokaryotes and Eukaryotes; Mitosis and Meiosis; Cell cycle: Phases of cell cycle, Apoptosis and cell death.

TEXT BOOKS:

1. *Verma P.S. and Agarwal V.K. (2014) Cell Biology, Genetics, Molecular Biology, Evolution and Ecology.* S. Chand Publications, New Delhi.
2. *Gerald Karp, (2008) Cell and Molecular Biology, Concepts and Experiments. (Fifth Edition),* John Wiley and Sons , USA

REFERENCE BOOKS:

1. *Geoffrey M. Cooper, Robert E Hausman, (2004) The cell, A Molecular approach (Third Edition),* ASM Press, Washington D.C. USA
2. *De Robertis E.D.P and De Robertis E.M.F. (2005) Cell and Molecular Biology. (Eighth Edition) Indian Edition,* Lippincott Williams and Wilkins, USA
3. *Harvey Lodish, Arnold Berk, Paul Matsudaira, Chris A. Kaiser, Monty Krieger, Matthew P. Scott, Lawrence Zipursky, and James Darnell (2008) Molecular Cell Biology (Sixth Edition),* WH Freeman and Company, New York.

15UCY1AA	ALLIED -I: CHEMISTRY-I	SEMESTER- I
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Total Credits: 3

Hours/ Week: 4

OBJECTIVES:

On successful completion of this course the students shall gain knowledge in the basics of chemistry which helps bioscience students to understand chemical bonding in the biomolecules and the techniques involved in the biochemistry.

CONTENTS**UNIT - I****Chemical bonding:**

1. Molecular Orbital Theory, bonding, antibonding, and nonbonding orbitals. MO configuration of H_2 , N_2 , O_2 , F_2 - bond order - diamagnetism and paramagnetism.
2. Ionic Bond: Nature of ionic bond, structure of NaCl and CsCl, factors influencing the formation of ionic bond.
3. Covalent Bond: Nature of covalent bond, structure of CH_4 , NH_3 , H_2O , shapes of $BeCl_2$, BF_3 , based on VSEPR theory and hybridization.

UNIT - II**Solutions:**

1. Normality, molarity, molality, molefraction, moleconcept.
2. Primary and secondary standards - preparation of standard solutions.
3. Principle of Volumetric analysis (with simple problems).
4. Strong and weak acids and bases - Ionic product of water- pH, pKa, pKb, Buffer solution and pH and pOH simple calculations.

UNIT-III**Basic Organic Chemistry:**

1. Electron displacement effect in organic compounds - Inductive effect - Electromeric effect - Resonance effect, Hyperconjugation, Steric effect, acidity of organic acids and bases.
2. Isomerism, Symmetry of elements (Plane, Centre and Axis of symmetry), Molecules with one chiral carbon and two adjacent chiral carbons -Optical isomerism of tartaric acid, Enantiomers - Diastereomers - Separation of racemic mixture - Geometrical isomerism (maleic & fumaric acid).

UNIT - IV

1. Surface Chemistry:

Adsorption - Chemisorption - Physisorption. Difference between chemisorption and physisorption - Applications of adsorption - Factors influencing adsorption. Isobar, Isostere.

2. Chromatography - Principle & applications of Column, Paper and Thin Layer Chromatography.

UNIT - V

Dyes:

1. Terms used - Chromophore, Auxochrome, Bathochromic shift, Hypsochromic shift, Hyperchromic shift, Hypochromic shift. Classification of dyes based on chemical structure & application- Preparation of azo (Methyl orange) and triphenyl methane (Malachite green) dyes.

TEXT BOOKS:

1. *R. D. Madan. 2001. Modern Inorganic Chemistry.* S. Chand & Company, New Delhi.
2. *Puri , Sharma, Pathania. 2004. Principles of Physical Chemistry,* Vishal Publishing Company, Jalandhar.
3. *M. K. Jain, S. C. Sharma. 2001. Organic Chemistry,* Shoban Lal Nayin Chand, Jalandhar.
4. *Gopalan R. 1991. Elements of Analytical Chemistry,* Sultan Chand & Sons, New Delhi.

15UTL21U	பகுதி - 1: தமிழ் தாள் - 2	இரண்டாம் பருவம்
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Total Credit: 4

Hours per week: 6

(இரண்டு ஆண்டுகள் தமிழ் பயிலும் மாணவர்களுக்கு உரியது)

சமய இலக்கியங்கள்

அலகு -1 சைவ வைணவ இலக்கியங்கள்

1. திருஞானசம்பந்தர் - தோடுடைய செவியன் (11 பாடல்கள்)
2. குலசேகர ஆழ்வார் - திருவேங்கட மலைத்தொடர்பு வேண்டல்

அலகு -2 கிறித்துவ இசுலாமிய இலக்கியங்கள்

1. கண்ணதாசன் - இயேசு காவியம் - மலைப்பொழிவு
2. உமறுப்புலவர் - சீறாப்புராணம் - மானுக்குப் பிணை நின்ற படலம்

அலகு -3 சமயச் சான்றோர் வரலாறு

1. சைவ சமயச் சான்றோர்
திருநாவுக்கரசர், மாணிக்கவாசகர்
2. வைணவ சமயச் சான்றோர்
பெரியாழ்வார் , ஆண்டாள்
3. கிறித்துவ சமயச் சான்றோர்
கால்டுவெல், ஜி.யூ.போப்
4. இசுலாமிய சமயச் சான்றோர்
குணங்குடி மஸ்தான் , சவ்வாதுப் புலவர்

அலகு - 4 சமய இலக்கிய வரலாறு

1. சைவம் 2. வைணவம்

அலகு - 5 இலக்கணம்

1. பெயர்ச்சொல்
2. வினைச்சொல்
3. இடைச்சொல்
4. உரிச்சொல் - பொது இலக்கணம்

பார்வை நூல்கள்

- 1 . தமிழ்த்துறை வெளியீடு
2. தமிழ் இலக்கிய வரலாறு - பேராசிரியர் முனைவர் பாக்யமேரி

15UHL21H	PART - I: HINDI - II	SEMESTER- II
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Total Credit: 4
Hours per week: 6

(Modern Poetry, Novel, Translation & Letter Writing)

1. Modern Poetry: Shabari – By Naresh Mehtha

Publishers: Lokbharathi Prakashan I Floor, Duebari Building
Mahathma Gandhi Marg, Allahabad -1.

2. Novel: Seva Sadhan – By Prem Chand
Publisher:

3. Translation: Hindi – English Only, anuvadh abyas – iii) lessons.1 – 10
only

publisher: dakshin bharath hindi prachar sabha,
Chennai. 600 017.

4. Letter Writing: (Leave letter, Job Application, Ordering books, Letter to
Publisher, Personal letter).

15UML21M	PART-I: MALAYALAM-II	SEMESTER- II
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Total Credit: 4
Hours Per Week: 6

PAPER II PROSE: NON-FICTION

This Paper will have the following five units:

UNIT I & II

Biography

UNIT III, IV & V

Travelogue

TEXT BOOKS:

1. Unit I & II *Changampuzha Krishna Pillai: Nakshatrangalude Snehabhajanam* –M.K. Sanu (D.C. Books, Kottayam).
2. Unit III, IV & V *Kappirikalude Nattil* – S.K. Pottakkadu (D.C. Books, Kottayam)

REFERENCE BOOKS:

1. Jeevacharitrashathyam –Dr. K.M. George(N.B.S. Kottayam)
2. Jeevacharitrashathyam malayalathil- Dr. Naduvattom Gopalakrishnan(Kerala Bhasha Institute, Trivandrum)
3. Athmakathashathyam malayalathil –Dr. Vijayalam Jayakumar(N.B.S. Kottayam)
4. Sancharashathyam Malayalathil-Prof.Ramesh Chandran. V,(Kerala Bhasha Institute, Trivandrum)

15UFL21F	PART- I: FRENCH -II	SEMESTER- II
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Total Credit: 4
Hours / week: 6

French Language for Under-graduate Degree Programmes

Compétence Culturelle	Compétence De communication	Compétence grammaticale
UNITÉ 6 – Super!		
<ul style="list-style-type: none"> • L'égalité homme/femme 	<ul style="list-style-type: none"> • INTERACTION: Exprimer des sentiments, exprimer la joie, le plaisir, le bonheur • RÉCEPTION ORALE: Comprendre un jeu radiophonique • RÉCEPTION ÉCRITE: Comprendre des annonces • PRODUCTION ÉCRITE: Écrire des cartes postales 	<ul style="list-style-type: none"> • Les noms de professions masculine/feminine • Le verbe finir et les Verbes du groupe en-ir • Le present de l'impératif • Savoir(present) • Le participe passé: Fini, aimé, arrive, dit,écrit • Quel(s), quelle(s)..: Interrogatif et Exclamatif • À + infinitive • Les articles: n,une,des
UNITÉ 7 – Quoi?		
<ul style="list-style-type: none"> • Le 20 siècle: Petits progrès Grand progrès 	<ul style="list-style-type: none"> • INTERACTION: Decrire quelque chose, une personne • RECEPTION ORALE: Comprendre un message publicitaire • RÉCEPTION ÉCRITE: Comprendre un dépliant touristique • PRODUCTION ÉCRITE: Écrire des petites annonces 	<ul style="list-style-type: none"> • On • Plus, moins • Le verbe aller: • Present, impératif • Aller + infinitive • Le pluriel en -x
UNITÉ 8 – Et après		
<ul style="list-style-type: none"> • Nouvelles du jour 	<ul style="list-style-type: none"> • INTERACTION: Raconteur,situer un récit dans le temps • RÉCEPTION ORALE: Comprendre une description • RÉCEPTION ÉCRITE: 	<ul style="list-style-type: none"> • L'imparfait:: quel-Ques forms pour introduire le récit:Il faisait, il y avait, il Était • Un peu, beaucoup, trop,Assez • Très

	<p>Comprendre un test</p> <ul style="list-style-type: none"> • PRODUCTION ÉCRITE: écrire des cartes postales 	<ul style="list-style-type: none"> • Le verbe venir: Présent, impératif • En Suisse, au Maroc, aux Etats-Unis
UNITÉ 9 – Mais oui!		
<ul style="list-style-type: none"> • La génération des 20-30 ans 	<ul style="list-style-type: none"> • INTERACTION: Donner son opinion, Expliquer pourquoi • RÉCEPTION ORALE: Comprendre des informations à la radio • RÉCEPTION ÉCRITE: Comprendre un texte informatif • PRODUCTION ÉCRITE: écrire un mél de protestation 	<ul style="list-style-type: none"> • Répondre, prendre: Présent, impératif, part Passé • Parce que pourquoi • Tout/tous, toute/s Tous/toutes les... (répétition action)
UNITÉ 10 – Mais non!		
<ul style="list-style-type: none"> • De la ville à la campagne 	<ul style="list-style-type: none"> • INTERACTION: Débat:: exprimer l'accord, exprimer le Désaccord • RECEPTION ORALE: Comprendre un message sur un répondeur téléphonique • RÉCEPTION ÉCRITE: Comprendre un témoignage • PRODUCTION ECRITE: Rediger des petites Announces immobilières 	<ul style="list-style-type: none"> • Le verbe devoir: Present et participe passé • Le verbe vivre, present • Aller + infinitive • Venir+ infinitive • Etre pour/contre

TEXT BOOK:

1. *Marcella Di Giura Jean-Claude Beacco, Alors I.* Goyal Publishers Pvt Ltd 86, University Block Jawahar Nagar (Kamla Nagar) New Delhi – 110007.

15UEG22E	PART - II: ENGLISH-II	SEMESTER -II
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Total Credit: 4
Hours Per Week: 6

OBJECTIVES:

1. To develop the language competence of the students.
2. To be enriched with functional English.

CONTENTS

UNIT - I

PROSE

1. Words of Wisdom – Chetan Bhagat
2. Forgetting – Robert Lynd
3. My Early Days – Dr. Abdul Kalam

UNIT - II

SHORT STORIES

1. Am I Blue? – Alice Walker
2. Last Leaf – O Henry
3. Selfish Giant – Oscar Wilde

UNIT - III

ONE ACT PLAY

1. Soul Gone Home - Langston Hughes

UNIT - IV

FUNCTIONAL GRAMMAR

1. Lexical Skills and Question Forms
2. Idioms and Phrases – Subject-Verb Agreement
3. Spelling, Antonyms and Synonyms, Infinitives
4. Vocabulary, Report Writing
5. Plurals, Particles in Adjectives
6. Apostrophe, Archaic Words, Art of Persuasion
7. Syllables, Changing Adjectives to Nouns
8. Homonyms, Prepositions
9. Compound Words, Acronyms, Collective Nouns, Degrees of Comparison

UNIT - V

COMPOSITION TASKS

1. Letter Writing - Structure
2. Business Correspondence – Memos, reports, proposals
3. Resume & C.V.
4. Advertisements
5. Notices, Agenda, Minutes
6. Circulars
7. Essay Writing
8. Précis Writing
9. Dialogue Writing
10. Soft Skills, Business English

TEXT BOOKS:

1. *Board of Editors*. 2012. **Radiance – English for Communication**, Emerald Publishers.
2. *Syamala, V.* 2002. **Effective English Communication for You**. Emerald Publisher, Chennai.

REFERENCE BOOKS:

1. *Rajamanickam. A.* 2001. **Everyman's English Grammar**. Macmillan.
2. *Krishna Mohan and Meera Banerji.* 2005. **Developing Communication Skills**. Macmillan, New Delhi.
3. *Wren, P.C. and H. Martin.* 1998. **High School English Grammar and Composition**. Macmillan

15UBC23A	CORE- III: BASIC MICROBIOLOGY	SEMESTER - II
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Total Credit: 4
Hours per week: 5

OBJECTIVE:

At the end of the course the students should be able to Establish good clinical microbiological services in a hospital and in the community Plan, execute, analyze and present the research work in microbiology

CONTENTS

UNIT-I

Definition, History and scope of Microbiology. Differentiation of Prokaryotes (Bacteria) and Eukaryotes (Fungi). Classification of microorganism. Microscopy - Principles of Microscope- Simple and compound microscope- Dark field, phase contrast Fluorescence and electron microscopy.

UNIT- II

Nutritional requirements - carbon, nitrogen, hydrogen, oxygen, sulfur, and phosphorous, nutritional classification of microorganism. Nutritional uptake by cell- facilitated diffusion, active transport, group translocation. Media preparation - solid. and liquid. Types of media - crude, semi synthetic, synthetic, enriched, enrichment, selective, differential and special purpose media (one example for each) physical conditions required for microorganisms - temperature, atmosphere. pH pressure. Microbial growth and measurement. Pure culture techniques - tube dilution, pour plate, spread and streak plate method. Anaerobic culture technique - wright's tube, roll tube, mcIntost fildes jar method.

UNIT- III

Sterilization and disinfection - Principles - methods of sterilization- dry heat, moist heat, filtration, Radiation, Tyndallization, Chemical sterilization- Chemical agents: mode of action (Phenol, detergents, Aldehydes, Gaseous agents) Phenol coefficient test - Sterility testing.

UNIT- IV

Antimicrobial spectrum of antibiotics and mode of action of the following antibiotics: a) Antibacterial- Penicillin, Streptomycin, and tetracyclines b) Antifungal- Nystatin and cyclohexamide, c) Antiviral- Acrucloguanosine (nucleoside)

UNIT- V

Microbial diseases: - Normal human micro flora; host - parasitic interaction; epidemics; exo Endotoxins. Air borne diseases: - Aetiology, symptoms and prevention of Tuberculosis, Diphtheria, Polio - myelitis and Influenza. Food and Waterborne diseases:- Aetiology, symptoms and pathogenesis of Typhoid, Cholera, Bacillary dysentery and Hepatitis. Direct contact disease: - Aetiology and symptoms of Rabies.

TEXT BOOKS:

1. *Anantha Narayanan R, C .K Jayaram panicker* (1992), **Text Book of Microbiology**, 4th edition, Orient Longman Publication.
2. *Dubay R C, and Maheswari D.K* (2014) **Text Book of Microbiology**, S.Chand and Company Pvt Ltd.
3. *Arora R, Arora B*, (2008). **Text Book of Microbiology**, 3rd Edition.

REFERENCE BOOKS:

1. *Pelczar J, R E. C .S John Noel R Krieg* (1986) **Microbiology**: MC Graw Hill Book Company,
2. *Prescott L. M, Harley J .Hand D. Klein D.A* (1993), **Microbiology**, C. Brown Publishers, 1993.
3. *Ronald M.* (1993) **Microbiology-Fundamentals and Applications**, Macmillan Publishing Company, New York,.

15UBC23P	CORE PRACTICAL - I : BIOCHEMISTRY-I	SEMESTER - II
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Total Credit: 3
Hours per week: 5

OBJECTIVES:

At the end of this practical, the students will be able to:

1. Understand structures and the properties of basic biomolecules.
2. Understand and use of buffers, calculating the pH of a buffer and the concentration of the solution.

BIOMOLECULES

1. Preparation of Normal and Molar solutions

2. Preparation of Buffer Solutions

- a. Phosphate
- b. Citrate
- c. Tris
- d. Acetate

3. Determination of pH using pH paper and pH meter.

4. Adjustment and Change of pH using Acid and Alkaline solutions

5. Qualitative Analysis

Carbohydrate

Monosaccharides: Glucose, Fructose, Galactose

Disaccharides: Sucrose, Lactose, Maltose

Polysaccharides: Starch

Amino Acids

Glycine, Tyrosine, Tryptophan, Cysteine and Arginine

6. Estimation of amino acids by formal titration

7. Analysis of Oils:

- a. Determination of Saponification number of edible oil
- b. Determination of acid number of edible oil
- c. Determination of Iodine number of oil

1. Cell Staining - Cytochemical methods for determination of Cellular and Subcellular Components (Demonstration)

MICROBIOLOGY

9. Laboratory precautions

10. Culture media preparation -liquid and solid medium

11. Selective and differential medium

12. Methods of sterilization and testing of sterility

13. Staining of bacteria-simple, gram, negative, fungal, endospore.

14. Motility test - hanging drop

15. Growth curve - turbidity method

16. Isolation and Serial of dilution of microbes from soil.

TEXT BOOKS:

1. *David T. Plummer* (2002) An introduction to practical bio-chemistry, First Edition, TMH- New Delhi
2. *Varley* (2005) practical, clinical Biochemistry, Harold 4th edition, CBS publishers & Distributors Pvt Ltd.

REFERENCE BOOKS:

1. *Keith Wilson, John Walker* (2004) Practical Biochemistry, 5th edition, Cambridge University press publications.
2. *Kent Lewandrowski* (2002) Clinical Chemistry, 1st edition Lippincott Williams & Wilkins publication .

15UCY2AA	ALLIED -II: CHEMISTRY- II	SEMESTER -II
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Total Credits: 3

Hours/ Week: 4

OBJECTIVES:

On successful completion of this course the students shall gain knowledge in the basics of chemistry which helps bioscience students to understand the periodic table, IUPAC nomenclature of organic compounds, enzyme kinetics and water technology.

CONTENTS

UNIT - I

Periodic Table:

1. Long form of periodic table - Classification of elements on the basis of electronic configuration - Periodicity in properties - Causes of periodicity - atomic and ionic radii - electron affinity - ionization energy - electronegativity - Pauling and mullikan scale - Allred and Rochow's scale - factors affecting the magnitude of electronegativity - application of electronegativity.

UNIT - II

1. Carbohydrates: Classification, preparation, properties & structure of glucose, fructose, inter conversion of glucose to fructose and fructose to glucose, mutarotation.
2. Vitamins: Sources of vitamins, Disease caused by the deficiency of vitamins.

UNIT - III

1. IUPAC Nomenclature of organic compounds - alkanes, alkenes, alcohols, ethers, aldehydes, ketones, carboxylic acids(dicarboxylic), benzene and naphthalene derivatives.
2. Heterocyclic Compounds - Preparation and properties of Furan, pyrrole, pyridine & thiophene.

UNIT - IV

Kinetics:

1. Rate, rate law, order and molecularity, derivation of rate expressions for I and II order kinetics.
2. Catalysis – homogenous, heterogeneous catalysis, enzyme catalysis (Definition alone), enzymes used in industry.

UNIT - V

Water Technology:

1. Hard water – types, disadvantages, determination by EDTA titration.
2. Softening methods – Zeolite – demineralization – reverse osmosis – purification of drinking water, BOD, COD.

TEXT BOOKS:

1. *R. D. Madan. 2001. Modern Inorganic Chemistry. S. Chand & Company, New Delhi.*
2. *Puri , Sharma, Pathania. 2004. Principles of Physical Chemistry, Vishal Publishing Company, Jalandhar.*
3. *M. K. Jain, S. C. Sharma. 2001. Organic Chemistry, Shoban Lal Nayin Chand, Jalandhar.*
4. *Gopalan R. 1991. Elements of Analytical Chemistry, Sultan Chand & Sons, New Delhi.*

15UCY2AP	ALLIED PRACTICAL- I: CHEMISTRY	SEMESTER II
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Total Credits: 2

Hours/ Week: 2

CONTENTS

I Volumetric analysis

1. Estimation of Sodium Hydroxide using standard Sodium Carbonate.
2. Estimation of Hydrochloric acid using standard Oxalic acid.
3. Estimation of Oxalic acid using standard Sulphuric acid.
4. Estimation of Ferrous sulphate using standard Mohr salt solution.
5. Estimation of Oxalic acid using standard Ferrous sulphate solution.
6. Estimation of Ferrous ions using Mohr salt solution.

II Organic Analysis

1. To distinguish between aliphatic & aromatic.
2. To distinguish between saturated & unsaturated.
3. Detection of Elements (N, S, Halogens).
4. Functional group tests for phenols, acids (mono & di), aromatic primary amine, monoamide, diamide, carbohydrate.

Functional group characterized by Confirmatory test.

TEXT BOOK:

1. V. Venkateswaran, R. Veeraswamy & A. R. Kulandaivelu. 2004. **Basic Principles of practical chemistry**, Sultan Chand & Co.

15UTL31U	பகுதி -1 : தமிழ் தாள் -3	மூன்றாம் பருவம்
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Total Credits: 4
Hours / Week: 5

காப்பியம் – சிற்றிலக்கியம் – நாடகத்தமிழ்

அலகு -1 காப்பியங்கள்

1. சிலப்பதிகாரம் – மங்கல வாழ்த்துப் பாடல்
2. மணிமேகலை – மலர்வனம் புக்க காதை
3. சீவக சிந்தாமணி – பதுமையார் இலம்பகம் (முதல் 20 பாடல்கள்)

அலகு – 2 சிற்றிலக்கியங்கள்

1. கலிங்கத்துப்பரணி – களம் பாடியது
2. மீனாட்சியம்மை பிள்ளைத்தமிழ் – வருகைப் பருவம்

அலகு – 3 நாடகத்தமிழ்

1. சேர தாண்டவம் – பாரதிதாசன்

அலகு - 4 காப்பியம், சிற்றிலக்கியம் – வரலாறு

1. காப்பியங்களின் தோற்றமும் வளர்ச்சியும்
2. சிற்றிலக்கியத்தின் தோற்றமும் வளர்ச்சியும்
3. நாடகத்தின் தோற்றமும் வளர்ச்சியும்

அலகு- 5 இலக்கணம்

1. எழுத்து ,அசை, சீர், தளை, அடி, தொடை – விளக்கம்
2. அணி – உவமையணி, தற்குறிப்பேற்றஅணி
3. அலுவலகம் சார்ந்த கடிதம் – விண்ணப்பங்கள் , வேண்டுகோள் ,முறையீடு

பார்வை நூல்கள்

- 1 . தமிழ்த்துறை வெளியீடு
2. இலக்கிய வரலாறு – பேராசிரியர் முனைவர் பாக்யமேரி
3. இதழியல் கலை - மா.பா.குருசாமி

15UHL31H	PART - I: HINDI -III	SEMESTER -III
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Total Credits: 4

Hours/week: 5

(Poetry, History of Hindi Literature, Alankar)

1. **Poetry:** Kavya Prasar – By
Dr.Balanath Puplicher: Jawahar Pusthakalay Sadar Bazaar,
Mathura – U.P. 281 001. (Pracheen – Kabir, Tulsi, Sur &
Meera, Aadhunic – Gupt, Prasad, Panth, Nirala, Dinakar,
Agneya

Short Notes On Poets -Only the above mentioned.

2. History of Hindi Literature:

(Only Aadi Kaal and Bhakthi Kaal. Only a general
knowledge.) ALANKAR: Anupras, Yamak, Slesh,
Vakrokthi, Upama, Rupak,

REFERENCE BOOKS:

1. Hindi Sahithya Ka Saral Ithihass By Rajnath Sharma, Vinod Pustak
Mandir, Agra – 282 002. Kavya Pradeep Rambadri Shukla, Hindi
Bhavan, 36, Tagore Town, Allahabad – 211 002.
3. **Alankar:** Anupras, Yamak, Slesh, Vakrokthi, Upama, Rupak,

15UML31M	PART-I: MALAYALAM-III	SEMESTER III
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Total Credits: 4
Hours/week: 5

PAPER III- POETRY

This Paper will have the following five units:

UNIT I, II & III

A part of Ezuthachan's Work

UNIT IV & V

A Khandakavya of Vallathol

Text Books prescribed:

UNIT I, II & III

Karnnaparvam – Ezuthachan
(Poorna Publications, Calicut)

UNIT IV & V

Achanum Makalum – Vallathol (D.C. Books, Kottayam)

15UFL31F	PART -I FRENCH-III	SEMESTER -III
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Total Credits: 4**Hours/week: 5****French Language for Under-graduate Degree Programmes**

Compétence Culturelle	Compétence de Communication	Compétence Grammatical
UNITÉ 1- Excuses et vœux		
<ul style="list-style-type: none"> Convivialité (lieux et société, l'apéritif) 	<ul style="list-style-type: none"> INTERACTION ORALE: Accueillir quelqu'un, s'excuser, remercier RÉCEPTION ORALE: Comprendre des annonces enregistrées RÉCEPTION ÉCRITE: Comprendre une affiche PRODUCTION ÉCRITE: Écrire des cartes de vœux 	<ul style="list-style-type: none"> Pronoms personnels toniques <i>moi, je...; toi... tu</i> Pronoms personnels objets <i>Me, te, le...</i> Les verbes en -er comme appeler, acheter Les adjectifs possessifs <i>nos, vos, leurs</i>
UNITÉ 2 – Bravo et merci		
<ul style="list-style-type: none"> Communication et technologies (le portable, internet) 	<ul style="list-style-type: none"> INTERACTION ORALE: Interagir au téléphone, féliciter RÉCEPTION ORALE: Comprendre une émission à la radio RÉCEPTION ORALE: Comprendre une définition PRODUCTION ÉCRITE: Écrire des plaques commémoratives 	<ul style="list-style-type: none"> Oui, que Le passé composé Le participe passé <i>J'ai eu, elle a été</i> Longtemps, pendant ..., de... à
UNITÉ 3 – Faire et dire		
<ul style="list-style-type: none"> Jeunes : enquête 	<ul style="list-style-type: none"> INTERACTION ORALE: Demander de l'aide, donner des instructions RÉCEPTION ORALE: Comprendre un message enregistré RÉCEPTION ÉCRITE : Comprendre un article d'un magazine de consommateurs 	<ul style="list-style-type: none"> Ce/ cet, cette, ces Le verbe voir Envoyer, appuyer Les articles partitifs <i>du, de la (de l'), des, de</i>

	<ul style="list-style-type: none"> • PRODUCTION ÉCRITE : Écrire un règlement 	
UNITÉ 4 – Faire ci ou faire ça		
<ul style="list-style-type: none"> • Les vacances des Français 	<ul style="list-style-type: none"> • INTERACTION ORALE : Proposer quelque chose, accepter, refuser • RÉCEPTION ORALE : Comprendre une émission de cuisine • RECEPTION ÉCRITE : Comprendre une brochure d'informations • PRODUCTION ÉCRITE : Ecrire un texte de promotion touristique 	<ul style="list-style-type: none"> • <i>S'il y a du soleil :</i> L'hypothèse (supposition, Condition) la préposition <i>S i + indicatif</i> • <i>Sinon... ou + indicatif</i> • <i>Sortir, partir</i> • <i>Quelques, plusieurs</i> • <i>Le long de</i> • <i>Au milieu de...</i> • <i>Au sommet de...</i>
UNITÉ 5 – Cœur et santé		
<ul style="list-style-type: none"> • Author du Couple 	<ul style="list-style-type: none"> • INTERACTION ORALE: Exprimer son intérêt pour quelqu'un, exprimer l'affection • RECEPTION ORALE: Comprendre une chanson • RECEPTION ÉCRITE: Lire un horoscope • PRODUCTION ÉCRITE: Écrire une lettre au courrier du cœur 	<ul style="list-style-type: none"> • J'étais... L'imparfait(1) • Aussi brillant que... • Le plus beau, le moins cher • Le verbe connaître

TEXT BOOK:

1. *Marcella Di Giura Jean-Claude Beacco, Alors II .* Goyal Publishers Pvt Ltd 86, University Block ,Jawahar Nagar (Kamla Nagar), New Delhi – 110007.

15UEG32E	PART- II ENGLISH -III	SEMESTER III
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Total Credits: 4
Hours per week: 5

OBJECTIVES:

1. To develop the language competence of the students.
2. To be enriched with functional English.

UNIT -I

PROSE

1. On Habits – A. G. Gardiner
2. Men and Women – Virginia Woolf
3. Sweets for Angels – R. K. Narayan

UNIT -II

SHORT STORIES

1. The Ant and the Grasshopper – Somerset Maugham
2. A Day's Wait – Ernest Hemingway
3. The Doll's House – Catherine Mansfield

UNIT III

ONE ACT PLAY

1. The Bishop's Candlesticks- Norman McKinnel
2. A Kind of Justice- Margaret Wood

UNIT -IV

FUNCTIONAL GRAMMAR

1. The Noun
2. The Adjective
3. The Adverb
4. Sentence Structure
5. Sentence Pattern

UNIT -V

COMPOSITION TASKS

1. Human relationships in academic and professional life
2. Deciding on a career
3. Finding a Job
4. Going for an Interview
5. Writing Projects
6. Account of a task completed
7. Recommendation for promotion
8. Writing recording of achievement
10. Story Writing

TEXT BOOKS

1. *Daniel, James. P.C. 2013. Focus: A Course in Language and Communication Skills*, Harrows Publications, Bangalore, 560068.
2. *Daniel, James.P.C. 1989. English for Career Development, a Course in Functional English*, Orient Longman Private Limited Publications, Bangalore.

REFERENCE BOOKS:

1. *Rajamanickam. A. 2001. Everyman's English Grammar*. Macmillan, Chennai.
2. *Krishna Mohan and Meera Banerji. 2005. Developing Communication Skills*. Macmillan, New Delhi.
3. *Wren, P.C. and H. Martin. 1998. High School English Grammar and Composition*. Macmillan, Chennai.

15UBC33A	CORE -IV: ENZYME AND ENZYME TECHNOLOGY	SEMESTER - III
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Total Credit: 4
Hours per week: 4

OBJECTIVES:

On successful completion of the course the students will acquire knowledge about

1. Techniques of isolation & purification of the enzymes
2. Kinetics of the enzymes
3. Enzymes that are used in medicine and industry

CONTENTS

UNIT - I

Enzymes: Introduction, Definition, International Classification of enzymes, Numbering and nomenclature. Functional and nonfunctional enzymes Enzyme units. Definition of active sites. Theories proposed – Lock and Key or template model and induced fit model, ordered and random binding of substrate. Enzyme specificity – Group specificity, optical specificity. Extraction, Purification and characterization of enzymes: Source and extraction procedures. Purification: Dialysis Ultra filtration, density gradient centrifugation, Fractional precipitation by change of pH, Fractional denaturation by heating, Fractional precipitation with organic solvents, Fractional precipitation by salts, Crystallization, sequence of fractional methods, Temp, organic solvents, salts. Criteria of Purity of Enzymes.

UNIT - II

Enzyme kinetics and enzyme inhibitors: Enzyme Kinetics: Derivation of Michalies-Mentons equation, transformation of MM equation, Line-Weaver Burk plot and Eadie Hoffste plot. Effect of pH, Temperature, substrate concentration and enzyme concentration on enzyme activity, turn over number of enzymes. Enzyme Inhibition: Competitive, non-competitive and un-competitive inhibition. Regulatory enzymes, allosteric enzymes with reference to aspartate transcarbamylase, covalent by modulate enzymes and Isoenzymes. Ribozymes, Abzymes. Simple problems related with enzyme kinetics.

UNIT - III

Coenzymes: Definition, Structure and functions of TPP, NAD, NADP, FAD, FMN, Coenzyme A, Metal cofactors. Multienzyme Complex: Pyruvate dehydrogenase. Mechanism of enzyme action: General acid base catalysis, covalent catalysis, Proximity orientation. Mechanism of action of Lysozyme and chymotrypsin. Measurement of enzymatic reactions:

UNIT - IV

Enzyme Technology: Immobilized enzymes: Source and techniques of immobilization. Effect of immobilization on enzyme activity. Application of immobilized enzymes. Industrial Production of enzymes: Amylase, Proteases, Pectinases. Industrial uses of enzymes.

UNIT -V

Uses of Enzymes in analysis: Enzymes as Biosensors - Calorimetric biosensors, Potentiometric biosensors, Amperometric biosensors, Optical biosensors and immunosensors. Its Principle, technique, mechanism and examples. Enzyme engineering: Artificial enzymes. Enzymes used in diagnosis and various diseases with normal and abnormal values. Antioxidant enzymes.

TEXT BOOKS:

1. *Trevor Palmer (2001) Understanding enzymes*, 1st edition, Horwood publishing house, Chichester
2. *Bhatt S.M. (2014) Enzymology and Enzyme technology*, 15th edition, S. Chand publishers, New Delhi
3. *Trevor Palmer (2004) Enzymes: Biochemistry, Biotechnology, Clinical chemistry*, 1st edition, Affiliated East West press private limited, New Delhi.

REFERENCES BOOKS:

1. *Nicholas C Price and Lewis Stevens (1999) Fundamentals of Enzymology*, 3rd edition, Oxford University Press.
2. *Choudhary and Anjana Singh (2012), Fundamentals of Enzymology*, 1st edition, Oxford Book Company.

15UBC33B	CORE-V: BIOINSTRUMENTATION	SEMESTER - III
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Total Credit: 4

Hours per week: 4

OBJECTIVES:

On successful completion of the course the students would have to understand Principles, procedures and applications of various biochemical techniques and instrumentation required for conducting analysis and research

CONTENTS

UNIT-I

Separation Techniques. Different methods of protein precipitation: Precipitation using inorganic salts (salting out) and organic solvents, isoelectric precipitation, Dialysis, Ultrafiltration, Lyophilization

UNIT-II

Chromatography-principle, materials, methods and applications of paper chromatography, TLC, GLC, Adsorption, Ion-exchange, Affinity chromatography and Molecular sieve. HPLC, FPLC and GC-MS, NMR, Atomic absorption spectroscopy, [principles only].

UNIT-III

Electrophoresis. Basic Principle of electrophoresis, Paper electrophoresis, Gel electrophoresis, discontinuous gel electrophoresis, PAGE, SDS-PAGE, Native gels, denaturing gels, agarose gel electrophoresis, buffer systems in electrophoresis, electrophoresis of proteins and nucleic acids, protein and nucleic acid blotting, detection and identification (staining procedures), molecular weight determination, Isoelectric Focusing of proteins

UNIT-IV

Centrifugation. Principle of centrifugation, basic rules of sedimentation, sedimentation coefficient, various types of centrifuges, different types of rotors, differential centrifugation, density gradient centrifugation (Rate zonal and Isopycnic).

Spectrophotometry. Principle of UV-Visible absorption spectrophotometry, instrumentation and applications. **Fluorimetry.** Phenomena of fluorescence, intrinsic and extrinsic fluorescence, instrumentation and applications

UNIT-V

Radio isotopic techniques-Radioactive decay, units of Radioactivity, detection and measurement of Radioactivity, GM counter, Scintillation counter, Auto radiography. Applications of Radio isotopes in biological and medical sciences.

TEXT BOOKS:

1. *Sharma B.K. (1982). Instrumental method of chemical analysis*, 5th Edition Mc Grawhill, New Delhi
2. *David T. Plummer. (1998.) An Introduction to Practical Biochemistry* (Third Edition)

REFERENCE BOOKS:

1. Keith Wilson, Kenneth H. Goulding, (1992) **A Biologists guide to Principles and Techniques of practical Biochemistry** (Third Edition). Cambridge University Press.
2. Freifelder, D. (1982) **Physical Biochemistry** 2nd edition, W.H. Freeman and Co., N.Y. USA.
3. Cooper, T.G. (1977) **The Tools of Biochemistry** John Wiley and Sons, N.Y. USA.

15UMA3AC	ALLIED- III: BASIC MATHEMATICS	SEMESTER -III
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Total Credit: 3
Hours per week: 5

OBJECTIVE

On successful completion of this course the students shall enrich to solve various problems in bioscience which helps the students to do research problems

UNIT - I

Binomial, Exponential and Logarithmic series (Statement only) – Application to Summation of series only.

UNIT - II

Quadratic equation – Matrices – Determinant of a matrix – Inverse of a matrix – Characteristic equation of a matrix – Eigen values – Solutions of simultaneous linear equations in three variables using matrices.

UNIT - III

Differentiation of algebraic – Exponential logarithmic and trigonometric functions – Physical interpretations of derivatives with reference to velocity and acceleration – Application of differentiation to maxima and minima (Simple problems).

UNIT - IV

Partial differentiations (Simple problems) – Integration of Simple algebraic , exponential and trigonometric functions – substitution method – Integration by parts.

UNIT - V

Measures of central tendency – Mean , Median , Mode – Measures of dispersion – Quartile deviation - Mean deviation - Standard deviation – Correlation – Karl Pearson's Coefficient of correlation – Rank correlation.

TEXT BOOKS

1. *Manichavasagam Pillai, T.K and Narayanan,S. 2002. Calculus - Volume I and II.* Viswanathan Publishers and Printers Pvt.Ltd.
2. *Manichavasagam Pillai, T.K and Narayanan,S. 2002. Algebra.* Viswanathan Publishers and Printers Pvt.Ltd.
3. *Gupta.S.P. Statistical Methods. 2004. Sultan Chand and Sons.*

15UED34C	NMEC-I: GENERAL BIOCHEMISTRY	SEMESTER -III
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Total Credit: 2

Hours per week: 2

OBJECTIVES:

The course will provide an understanding of the concepts of biochemistry

CONTENTS

UNIT-I

Introduction to carbohydrates - Definition, classification, biological significance and functions. Lipids- Definition, classification, significance and functions of lipids-simple, compound and derived lipids. Amino acids: Definitions, classification of essential and non essential amino acids.. Classification and functions of peptides and proteins.

UNIT-III

Nucleic acids: Bases, nucleotides and nucleosides, DNA. Double helix; functions of DNA and RNA: functions. Vitamins: Definition, classification, Sources and physiological functions of water and fat soluble vitamins. Minerals: Mineral requirement, essential macro and micro minerals: - Sources and functions.

UNIT-III

An overview of cells and their molecular composition:- prokaryotic and eukaryotic cells and their comparison. Cell organelles and their functions: Cell membrane, Endoplasmic reticulum, Golgi apparatus, lysosomes, peroxisomes and glyoxysomes. Mitochondria, Cytoskeleton, Nucleus: Chromosomes; chromatin structure.

UNIT IV

Introduction -Classification of enzymes. - Definition of active sites. Functions of Enzymes. Bioenergetics- Endergonic and Exergonic reactions, entropy, enthalpy, standard free energy, high and low energy phosphates.

UNIT-V

Hormones- General classification of hormones, pancreatic, thyroid, parathyroid, hypothalamus, pituitary, adrenal and prostaglandins hormonal functions.

TEXT BOOKS:

1. Deb, AC,(1989) **Fundamentals of Biochemistry**, New central Agency, Calcutta, 3rd edition.
2. Satyanarayana, U (2005) **Biochemistry**, Books and Allied P Ltd , 2nd Edition
3. Verma, P K and Agarwal V K (1988) **Cell biology**, Genetics, Evolution and Ecology, S Chand and Company, 10th Edition
4. *Jain J.L* (2014). **Fundamentals of Biochemistry**, 7th edition, S. Chand and Company publication

15UBC3SA	SKILL BASED SUBJECT- I: BIOINFORMATICS	SEMESTER -III
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Total Credit: 3
Hours per week: 3

CONTENTS

OBJECTIVES:

1. Understand the theories used to build tools and their relationship and basic concepts involved in drug design.
2. Understand Genomic data acquisition and analysis, comparative and predictive analysis of DNA and protein sequence, Phylogenetic inference etc.

UNIT- I

BioInformatics:Introduction, definition, objectives and scope. BioInformatics and Internet.Useful BioInformatics sites on www. Application of BioInformatics.

UNIT -II

Biological databases:Primary protein database – SWISS PROT, TrEMBL, PIR, PDB.

Primary nucleic acid database – EMBL, GEN BANK, DDBJ.Data mining of biological databases.

UNIT -III

Tools for database search:FASTA- Histogram, Sequence listing, Search and Programs.

BLAST – Algorithm, Services, MEGABLAST, PHI BLAST, PROTEIN BLAST, GRAPPED BLAST, PSI BLAST

UNIT- IV

Protein Primary structure analyses and prediction: Identification and characterization.

Gene Identification and prediction – pattern recognition, prediction method – laboratory based approaches – southern blotting, northern blotting, zoo blot, *In situ* hybridization.

UNIT- V

BioInformatics and drug design:Introduction, approaches – ligand based, target based. Methods of drug designing – CAMD, docking program

TEXT BOOKS:

1. *Westhead D.R, Parish J.H and Twyman R.M.* (2003) **Instant notes in BioInformatics**, 1st Edition, Viva Books Private limited, New Delhi.
2. *Attwood.T.K. Parry D.J. and Smith* (2001). **Introduction to BioInformatics**, 1st Indian Report, Pearson Education, New Delhi.

REFERENCES:

1. *Rastogi.S.C, Namita – Mendiratta and Parag Rastogi,* (2004) **BioInformatics – Concepts, Skills and applications.** CBS publishers, New Delhi.
2. *Mani K and Vijayraja* (2004), **BioInformatics – A Practical Approach**, Aparna Publishing House, First Edition, Coimbatore

15UTL41U	பகுதி - 1 தமிழ் தாள் - 4	நான்காம் பருவம்
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Total Credits: 4

Hours/Week: 5

(இரண்டு ஆண்டுகள் தமிழ் பயிலும் மாணவர்களுக்கு உரியது)

சங்க இலக்கியமும் நாட்டுப்புற இலக்கியமும்

அலகு - 1 எட்டுத்தொகை

1. குறுந்தொகை - (நெய்தல், பாடல் எண் : 57 - சிறைக்குடி ஆந்தையார்)
(மருதம், பாடல் எண்: 61 - தும்பிசேர்கீரன்)
(முல்லை, பாடல் எண்: 167 - கூடலூர்கிழார்)
2. கலித்தொகை - (குறிஞ்சிக்கலி, பாடல் எண் :16 - கபிலர்)
3. அகநானூறு - (பாலை, பாடல் எண் : 43 - நல்லந்துவனார்)
4. புறநானூறு - (பா.எண் : 279 - ஒக்கூர் மாசாத்தியார்,
பா.எண்: 312 - பொன்முடியார்)

அலகு - 2 பத்துப்பாட்டு

1. முல்லைப்பாட்டு - நப்பூதனார்

அலகு - 3 நாட்டுப்புறவியல்

1. நாட்டுப்புறப்பாடல்கள் - அறிமுகம்
2. தாலாட்டுப் பாடல்கள்
3. தொழிற்களப் பாடல்கள்

அலகு - 4 இலக்கிய வரலாறு

1. பத்துப்பாட்டு
2. எட்டுத்தொகை

அலகு - 5 இலக்கணம்

1. அகத்திணை - விளக்கம்
2. புறத்திணை - விளக்கம்

பார்வை நூல்கள்

- 1 . தமிழ்த்துறை வெளியீடு
2. இலக்கிய வரலாறு - பேராசிரியர் முனைவர் பாக்யமேரி
3. நாட்டுப்புற இயல் ஆய்வு - சு. சக்திவேல்

15UHL41H	PART-I :HINDI-IV	SEMESTER-IV
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Total Credits: 4
Hours / Week: 5

Drama, One Act Play, General Essay)

1. **Ladai** Sarveshwar Dayal Saksena Publisher : Vani Prakashan
New Delhi – 110 002.

2. **One act play :** Ekanki Panchamruth (Excluding Bohr Ka Thara)

Publisher: Govind Prakashan Mathura

3. **General essay**

REFERENCE BOOKS:

1. Aadarsh Nibandh Vinodh Pustak Mandir Hospital Road, Agra – 282
002.

15UML41M	PART-I: MALAYALAM-IV	SEMESTER- IV
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Total Credits: 4
Hours / Week: 5

Drama & Folklore Paper IV. Drama & Folklore

Unit I, II & III A Drama

Unit IV & V Folklore

TEXT BOOKS:

1. Unit I, II & III Lankalakshmi – C. N. Sreekantan Nair (D.C. Books, Kottayam).
2. Unit IV & V Oru Vadakkanveeragatha – M.T. Vasudevan Nair (Puthariyamkam, Sahithya Kairali Publications, Bhagavathinada P.O.

REFERENCE BOOKS:

1. Natyasasthram, K.P. Narayana Pisharodi, Trans. (Kerala Sahithya Akademi, Thrissur).
2. Malayala Nataka Sahithya Charithram, G. Sankara Pillai (Kerala Sahithya Akademi, Thrissur).
3. Malayala Nataka Sahithya Charithram, Vayala Vasudevan Pillai (Kerala Sahithya Akademi Thrissur).
4. Natakam – Oru Patanam (C. J. Smaraka Prasanga Samithi, Koothattukulam).
5. Natakaroopacharcha, Kattumadam Narayanan (NBS, Kottayam)
6. Folklore – Raghavan Payyanadu (Kerala Bhasha Institute, Trivandrum)

15UFL41F	PART - I FRENCH - IV	SEMESTER-IV
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Total Credits: 4

Hours/week: 5

French Language for Under-graduate Degree Programmes

Compétence Culturelle	Compétence de Communication	Compétence Grammatical
UNITÉ 6 – Problèmes problems		
<ul style="list-style-type: none"> Le bénévolat 	<ul style="list-style-type: none"> INTERACTION ORALE: Interroger sur la tristesse, l'abattement, exprimer sa sympathie, rassurer RÉCEPTION ORALE: Comprendre une interview à la radio RECEPTION ÉCRITE: Comprendre un test de magazine PRODUCTION ÉCRITE: Écrire une lettre à un(e) amie 	<ul style="list-style-type: none"> Les pronoms indéfinis rien, quelque chose Le verbe crier Du pluriel: eau, eu, al Se soigner, s'excuser, se renseigner, s'appeler La phrase négative: ne... plus, ne... jamais, ne... rien, ne... personne
UNITÉ 7 – C'est qui? C'est comment?		
<ul style="list-style-type: none"> Les classes sociales 	<ul style="list-style-type: none"> INTERACTION ORALE: Décrire quelqu'un RECEPTION ORALE: Comprendre un bulletin météo RECEPTION ÉCRITE: Comprendre une courte interview PRODUCTION ÉCRITE: Écrire des notices biographiques 	<ul style="list-style-type: none"> Les adjectifs qualificatifs: Formes au masculin et au féminin Il fait beau, il neige, il pleut... Le verbe décrire Les verbes en -indre Les adjectifs possessifs féminins mon, ton, son devant voyelle ou h
UNITÉ 8 – Et après? Et après		
<ul style="list-style-type: none"> La mémoire et l'histoire 	<ul style="list-style-type: none"> INTERACTION ORALE: Raconter une anecdote, une histoire, attirer l'attention RÉCEPTION ORALE: Comprendre une interview à la radio 	<ul style="list-style-type: none"> L'imparfait(2) Les verbes en -oir Les pronoms démonstratifs ça et cela Près de... Loin de...

	<ul style="list-style-type: none"> • RÉCEPTION ÉCRITE: Comprendre des faits divers • PRODUCTION ÉCRITE: Écrire une brève 	<ul style="list-style-type: none"> • La forme passive
UNITÉ 9 – Sûr et certain		
<ul style="list-style-type: none"> • L'université en France 	<ul style="list-style-type: none"> • INTERACTION ORALE : Exprimer un point de vue, exprimer une certitude • RÉCEPTION ORALE : Comprendre et apprécier un poème • RÉCEPTION ÉCRITE : Comprendre un appel à participer à la vie collective • PRODUCTION ÉCRITE : Ecrire une lettre de motivation 	<ul style="list-style-type: none"> • Le futur des verbes <i>parler, Avoir, être, voir</i> • Le verbe <i>valoir</i> • Par • Les pronoms démonstratifs <i>celui-ci, celle -là</i>
UNITÉ 10 – Peut –être...peut-être		
<ul style="list-style-type: none"> • Le système de santé en France 	<ul style="list-style-type: none"> • INTERACTION ORALE : Exprimer une incertitude, exprimer l'évidence • RÉCEPTION ORALE : Comprendre et apprécier une chanson • RECEPTION ÉCRITE : Comprendre un débat d'idées • PRODUCTION ÉCRITE : Écrire au courrier des lecteurs 	<ul style="list-style-type: none"> • Les pronoms personnels objets, indirect <i>lui, leur</i> • L'impératif affirmative + COD et COL • Les verbes <i>en – ayer</i> • L'interrogation à inversion

TEXT BOOK:

1. *Marcella Di Giura Jean-Claude Beacco, Alors II* . Goyal Publishers Pvt Ltd
86, University Block ,Jawahar Nagar (Kamla Nagar), New Delhi - 110007.

15UEG42E	PART - II: ENGLISH - IV	SEMESTER IV
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Total Credits: 4
Hours per Week: 5

OBJECTIVES:

1. To develop the language competence of the students.
2. To be enriched with functional English.

CONTENTS

UNIT -I

1. Mobile and Mixed-up – Anil Darker
2. My Vision for India – Dr. Abdul Kalam
3. Common Sense – Sedgwick, Woodworth

UNIT -II

SHORT STORIES

1. A Room 10 x 8 –K.S. Duggal
2. A Face on the Wall – E.V. Lucas

UNIT -III

SHORT PLAY

1. The Death Trap – H. H. Munro
2. The Never Never Nest – Cedric Mount

UNIT- IV

FUNCTIONAL ENGLISH

1. Communication Skills – Listening, Telephone, Resume & E-Mail
2. Interview & Group Discussion, Parts of the Exercises in each chapter.

UNIT -V

COMPOSITION TASKS

1. Public Speaking – speaking on an official occasion
2. Participating in a meeting
3. Airing grievances
4. Interview Skills
5. Conducting an Interview
6. Interviewing the expert
7. Netiquette
8. Negotiation Skills

TEXT BOOKS:

1. *Nayar, Nandini.* 2014. **Treasure Hunt.** Board of Editors, Foundation Books, Chennai.
2. *Daniel, James .P.C.* 1989. **English for Career Development, a Course in Functional English,** Orient Longman Private Limited Publications, Bangalore.

REFERENCE BOOKS:

1. *Rajamanickam. A.* 2001. **Everyman's English Grammar.** Macmillan, Chennai.
2. *Krishna Mohan and Meera Banerji.* 2005. **Developing Communication Skills.** Macmillan, New Delhi.
3. *Wren, P.C. and H. Martin.* 1998. **High School English Grammar and Composition.** Macmillan, Chennai.

15UBC43A	CORE -VI : INTERMEDIARY METABOLISM	SEMESTER - IV
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Total Credit: 4
Hours per week: 4

OBJECTIVES:

1. To provide information related to carbohydrate, fat, protein and Nucleic acid metabolism that takes place in our body.
2. To Understand the Interrelationship between carbohydrate, fat and protein metabolism.

CONTENTS

UNIT -I

Bioenergetics: - Free energy and the laws of thermodynamics; Role of high energy compounds as energy currency of the cell; free energy of hydrolysis of ATP and other organophosphates. The basic metabolic pathways, anabolic, catabolic and amphibolic pathways.

UNIT- II

Fate of absorbed carbohydrates. Glycolysis: - Pathways and energetics; Oxidation of pyruvate to acetyl CoA. TCA Cycle: - Pathway and energetics; anaplerotic reaction. Gluconeogenesis; Pasteur effect. Glycogenesis and glycogenolysis. Pentose Phosphate Pathway (HMP shunt). Glucuronic Acid Cycle and glyoxylate cycle (Entner- Duodorfi pathway). Metabolism of other hexoses: - Fructose and galactose.

Electron transport chain: - Role of respiratory chain in mitochondria; in energy capture; respiratory control. Oxidative phosphorylation: - Mechanism of oxidative phosphorylation; Chemiosmotic theory; uncouplers of oxidative phosphorylation.

UNIT- III

Blood lipids and phase of dietary lipids. Oxidation of fatty acids: - Carnitine cycle; beta oxidation. Alpha oxidation and omega oxidation. Biosynthesis of propionyl CoA. Biosynthesis of saturated fatty acids: - Extra - mitochondrial in a microsomal system for synthesis of fatty acids. Biosynthesis of unsaturated fatty acids: - Monounsaturated and polyunsaturated fatty acids.

Biosynthesis and degradation: - Lecithin, cephalin, inositol, phosphatidyl serine, cholesterol.

UNIT -IV

Fate of dietary proteins, metabolic nitrogen pool. Catabolism of amino acid: Oxidative deamination, non - oxidative deamination, transamination, amino - acid decarboxylation, catabolism of carbon skeleton of amino acids. Catabolism of glycine, phenylalanine and tyrosine.

UNIT -V

Interrelation between carbohydrates, fat and protein metabolism. Nucleic acid :Metabolism of purines: - de novo synthesis, salvage pathways; catabolism. Metabolism of pyrimidines - de novo synthesis, salvage pathways; catabolism. Metabolism of micronutrients

TEXT BOOKS:

1. *Reginald H Garret and Charles M Grisham, 1995. **Biochemistry**, Sounders College Publishers*
2. *Robert K Murray, 2005. **Harpers Illustrated Biochemistry**, 26th Edition, 2003, Lange Medical Publications*
3. *Donald Voet, Judith G. Voet and Charlotte W.Pratt, 1999. **Fundamentals of Biochemistry**, John Wiley and Sons, Inc .*

REFERENCE BOOKS:

1. *Mathews,C.K., Vanholde K.E., Ahern K.G., 1999. **Biochemistry**, 3rd Edition, Pearson Education.*
2. *David L.Nelson and Michael M.Cox (2005) **Lehninger Principles of Biochemistry**. 4th edition.W.H.Freeman and company.*

15UBC43P	CORE PRACTICAL - II: BIOCHEMISTRY-II	SEMESTER - IV
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Total Credit: 3
Hours per week: 4

OBJECTIVES:

Upon completion of this practical the students will gain.

1. Knowledge on the Isolation, purification and kinetics of enzymes
 2. Practical skill on separation techniques.
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1. Kinetic study of the following enzyme:
 - a. Kinetics study of alpha Amylase.
 - a. Specific activity, Substrate Concentration, pH , Temperature.
 - b. Acid phosphatase – Potato / Green Gram .**
 - c. Extraction of Acid phosphatase from potato/Green gram.
 - d. Purification of Acid phosphatase by ammonium sulphate precipitation.
 - e. Estimation of Protein.
 - f. Separation by SDS-PAGE .
 - g. Kinetic study of acid phosphatase (Specific activity, Substrate Concentration, pH and Temperature) .
 2. Isolation and estimation of glycogen from liver tissue (rat or goat).
 3. Isolation and estimation of ascorbic acid from citrus fruit.
 4. Paper Chromatographic separation and detection of amino acids.
 5. Separation of Sugars by TLC - Group Experiment.
 6. Separation of Plant Pigments by Column Chromatography - Group Experiment

REFERENCE BOOKS:

1. *David T.Plummer (1998).***An Introduction to Practical Biochemistry**, 1998. 3rd Edition, Tata McGraw Hill Publishing company ltd.
2. *John M.Clark. Jr. (1994)* **Experimental Biochemistry**, WH Freeman and Company.
3. *Rober Switzer, Iliam Grarity (1999).***Experimental Biochemistry**, 3rd Edition, WH Freeman and company.
4. *Keith Wilson, John Walker (2010).* **Principle of Practical Biochemistry**, 7th edition, Cambridge University Press.

15UCS4AA	ALLIED - IV: BASICS OF COMPUTERS	SEMESTER - IV
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Total Credits:3
Hours Per Week:3

CONTENTS

OBJECTIVE

On successful completion of this course, the students shall enrich the knowledge in the applications of internet in biosciences which helps them to gather updated information.

UNIT-I

General format of representing a number-Classification of number system: Positional and Non-positional number system. Decimal, Binary, Octal and Hexadecimal. Conversion from one system to another.

UNIT-II

Fundamentals of Information technology: History and Generations of computers-classification of programming languages- Operating systems and their types.

Definitions of Compilers, Linker, Loaders, Assembler and Interpreter. Algorithms Flowchart and its components.

UNIT-III

Internet: Evolution of Internet-Internet terminologies: WWW, FTP, HTML, HTTP, Gopher, E-mail browsers, protocol Archie Telnet, Search engines.

Application of Computers in education, business, entertainment, science, engineering and medicine

UNIT IV

Database systems; Definitions: Data abstraction, Instances, Schemes, Entity, Entity set: Strong and weak entity sets, Primary key, Foreign key, Super key.

Database models: Basic concepts of E-R model, Hierarchical model.

UNIT-V

Networking: Network architectures, Topologies, LAN, WAN, MAN AND Components of a network: Hubs, Routers, Repeaters, Bridges, Modems and cables.

Linux: Installation-Basic commands.

TEXT BOOKS

1. *Leon A and Leon M*, 2009. **Fundamentals of Information technology**, second edition, Vikas publishing House Pvt. Ltd.
2. *Date C.J.* 2003. **Introduction to Database systems**. 8th edition, Pearson publisher.

REFERENCES BOOKS

1. *Leon A and Leon M*, 2009. **Fundamentals of Information technology**, second edition, Vikas publishing House Pvt. Ltd.
2. *Date C.J.* 2003. **Introduction to Database systems**. 8th edition, Pearson publisher.
3. *Andrew S. Tanenbaum*, 2002, **Computer networks**, Fourth edition, Prentice Hall.

15UCS4AP	ALLIED PRACTICAL- II: FUNDAMENTALS OF COMPUTERS	SEMESTER -IV
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Total Credits:2
Hours Per Week:2

CONTENTS

OBJECTIVE:

Upon completion of this practical the students will gain

Knowledge on the hard ware components, operating systems, programming languages and basics of internet usage

Computer Fundamentals:

Computers: Desktop, Laptop and Servers. Parts of Computers and computer peripherals, Demo on Assembling of Computer.

Operating systems: UNIX, Windows 2000, XP and Redhead Linux.

Important Programs of Windows OS: Microsoft Office 2003 and its modules, media player

Other Programs: Acrobat files and readers, Paint brush, Corel Draw, Quicktime player, and Photo shop.

www, IP, HTTP, FTP, Internet explorer and Its components, Browsing of web pages and Downloading files.

Email, POP3, Creation of email ID in g.mail, sending, receiving of emails, attaching of files to emails and configuring outlook express/outlook.

TEXT BOOK:

1. *Balagurusamy .E*, 2004, **Programming In Basics**, 3rd edition, Tata McGraw-Hill Education

REFERENCE BOOK:

1. *Patrick Naughton*, Internet complete reference

15UED44C	NMEC - II: ANTIOXIDANTS AND PHYTOCHEMISTRY	SEMESTER -IV
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Total Credit: 2
Hours per week: 2

OBJECTIVES:

The course will provide knowledge for the students on the free radicals, antioxidants, secondary metabolites and its uses in therapy

CONTENTS

UNIT - I

Free radicals -types, free radicals induced damages, lipid peroxidation , reactive oxygen species. disease caused by radicals, free radicals and cancer.

UNIT - II

Antioxidants - antioxidant defence system - Enzymic antioxidants-antioxidant effect of SOD, catalase, Glutathione Peroxidase. Non Enzymic antioxidants- antioxidant effect of Vit A, Vit C, Vit E, glutathione and selenium.

UNIT - III

Secondary metabolites: Phytochemicals, terpenes, polyphenols, procyanidins, flavonoids, xanthenes, alkaloids and pigments -Occurrence ,distribution & functions.

UNIT - IV

Terpenes, phenols, flavonoids and nitrogenous compounds and their roles alternative medicine

UNIT - V

Plant Therapeutics : plants with hepatoprotective , nephroprotective, hypoglycemic, anticancer, antimicrobial ,anti-inflammatory properties.

TEXT BOOKS:

1. *Dey P.M, Harborne J. .*(2000) **Plant Biochemistry**, Harcourt Asia PTE LTD.
2. *Malik C.P, Srivastava A.K* (2010) **Text Book of Plant Physiology**, Kalyani Publishers.
3. *Kumar G.S.* (2014) **Text book of Pharmacognosy and phytochemistry**,1st Edition, S Chand,New Delhi
4. *Horborne J.B.* (2008). **Phytochemical method A guide to Modern technique of Plant Analysis**. Springer,New Delhi.

15UBC4SA	SKILL BASED PRACTICAL -I: BIOINFORMATICS	SEMESTER -IV
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Total Credit: 3
Hours Per Week: 3

CONTENTS

- Working with MS-Office Packages One exercise each in Word, Excel, Power point and Access.
- Working with HTML Tags and HTML Forms. Creating HTML Pages.
- Biological Databanks Sequence Databases, Structure Databases, Specialised Databases.
- Data retrieval tools and methods.
- Database file formats.
- Molecular visualization.
- Gene structure and function prediction (using Gen Scan, GeneMark).
- Sequence similarity searching (NCBI BLAST).
- Protein sequence analysis (ExPASy proteomics tools).
- Multiple sequence alignment (Clustal).
- Molecular phylogeny (PHYLP).
- Analysis of protein and nucleic acids sequences
- Sequence analysis using EMBOSS or GCG Wisconsin Package

REFERENCE BOOK:

1. *Rastogi S.C*, 2003. **Bioinformatics – concepts, skills and applications**, 1st edition. CBS publishers.
2. *Lesk A M*, 2002. **Introduction to bioinformatics**, Oxford University Press.

15UBC53A	CORE- VII: MOLECULAR BIOLOGY	SEMESTER - V
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Total Credit: 4
Hours per week: 6

OBJECTIVES:

On successful completion of the course the student should have

1. understood the synthesis of genetic material, RNA and proteins and
2. learnt about gene repair mechanism and gene mutation.

CONTENTS

UNIT - I

Evidences for DNA as genetic material: Experimental proof DNA replication in prokaryotes; Formation of DNA from nucleotides; Semiconservative mechanism and experimental proof; RNA priming; Bidirectional replication; thetamide, rolling circle model. Enzymology of DNA replication; Initiation, elongation and termination; Fidelity of replication. Differences in eukaryotic replication; DNA repair mechanism: Excision repair, mismatch repair, photo activation and SOS repair.

UNIT -II

Prokaryotic transcription: Central dogma; RNA polymerases Initiation, elongation and termination of transcription. Role of eukaryotic RNA polymerases.

RNA splicing and processing of mRNA, tRNA and rRNA. Reverse transcription.

UNIT - III

Genetic code: Experimental evidences; Features of genetic code. Composition of prokaryotic and eukaryotic ribosomes. tRNA - structure; activation of amino acids, coding and non - coding strands of DNA. Translation - Initiation, elongation and termination of protein synthesis; Inhibitors of protein synthesis. Post - Translational modifications of proteins.

UNIT - IV

Recombination in bacteria: Transformation, Transduction and Conjugation. Recombination: - Mechanism; forms of recombination, Holliday model for homologous recombination. Prokaryotic gene regulation: Operon model; lac operon - positive and negative control; trp operon - repression and attenuation.

UNIT - V

Gene mutations:- Types - Nutritional, Lethal, Conditional mutants. Missense mutation and other point mutations. Spontaneous mutations; chemical and radiation- induced mutations – Ames test; reversion techniques; selection of mutants; Auxotrophs; Replica plating; Penicillin cycling. Bacterial transposons:- Insertion sequences; Mechanism of transposition in bacteria.

TEXT BOOKS:

1. *Eldon John Gardner, Michael J. Simmons and Peter Snustad, D.* (2006), **Principles of Genetics**, 8th Edition. John Wiley and Sons, New Delhi
2. *David Freifelder, (2008),* **Molecular Biology**, 2nd Edition, Narosa Publishing House, New Delhi

REFERENCE BOOK:

1. *Robert. F. Weaver (1999),* **Molecular Biology**, 1st Edition , Mc Craw Hill book company, New York

15UBC53B	CORE -VIII: HUMAN PHYSIOLOGY	SEMESTER - V
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TotalCredit:4
Hours Per Week:5

OBJECTIVES:

On successful completion of the course the students should have to understand the general structure and functions of various systems and organs in the body.

CONTENTS

UNIT-I

The body fluid compartments: Intracellular, extracellular and interstitial fluid. Plasma as an extracellular fluid; plasma composition; plasma proteins; Blood cellular components; RBC; Hemostasis and molecular mechanism of Blood coagulation; Role of Vitamin K in coagulation; Anti coagulant and fibrinolytic systems. Anemias, Polycythemia, Haemophilia and Thrombosis.

Gastrointestinal physiology : Secretory functions of the gastrointestinal tract; Digestion and absorption of macro and micronutrients.

UNIT-II

Physiology of vision: Structure of eye, image formation and defects of the eye, Receptor mechanism of the eye, photopigments, Visual cycle and colour adaptation **Skeletal Musculoskeletal system:** Structure of skeletal muscle, Physiology of muscle contraction in striated and nonstriated muscle.

UNIT-III

Respiratory system: Diffusion of gases in lungs, transport of oxygen from lungs to tissues through blood, factors influencing the transport of oxygen. Transport of CO₂ from tissues to lungs through blood, factors influencing the transport of CO₂.

Excretory System: Mechanism of formation of urine, composition of urine, Micturition. Renal regulation of acid balance, hormone of the kidney.

UNIT-IV

Nervous system: Structure of neuron, resting potential and action potential, Propagation of nerve - impulses, Structure of synapse, synaptic transmission (electrical and chemical theory). Structure of Neuro muscular junction and mechanism of neuro muscular transmission, neuro transmitters.

Endocrine system: Chemical nature of hormones, mechanism of action of hormones - intracellular receptor mechanism and second messenger

mechanism (cAMP, cGMP, Ca^{2+}) Structure function and deficiency symptoms of hormones of pituitary, thyroid, parathyroid and adrenal glands. Functions of pancreatic hormones.

UNIT-V

Reproductive physiology: Male Reproductive system: Structure of testis, Spermatogenesis, functions of testis. Female Reproductive system: Ovarian cycle, Structure and hormones of ovaries, menstrual cycle, menopause, pregnancy and lactation. Steroids as contraceptives

TEXT BOOK:

1. *Arthur C. Guyton and John E. Hall* (2000) **Text Book of Medical Physiology**, 10th Edition, Elsevier India Pvt Ltd.

REFERENCE BOOKS:

1. *Chatterjee C.C* (2007) **Human Physiology-Vol I and II**, 11th Edition, Medical Allied Agency.
2. *Elaine N. Marieb* (1999) **Essentials of Human Anatomy & Physiology**, 6th edition, Addison Wesley Longman Inc.
3. *Elaine N. Marieb* (2004) **Human Anatomy and Physiology**, 6th Edition, Pearson Education.

15UBC53C	CORE- IX: CLINICAL BIOCHEMISTRY	SEMESTER - V
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Total Credit: 4
Hours per week: 6

OBJECTIVE:

This course would have make the students understand the significance of diagnostic bio chemistry.

CONTENTS

UNIT-I

Disorders of Carbohydrate metabolism. Normal sugar level in blood, renal threshold and regulation of blood glucose concentration. Hypoglycemia; Definition and causes. Hyperglycemia; Definition and causes. Diabetes mellitus; Introduction, aetiology, types of diabetes mellitus, clinical pathology and diagnosis. Urine testing, random blood sugar and GTT. Acute and chronic complications of Diabetes mellitus. Glycosuria- Differential diagnosis of glycosuria, Fructosuria, Pentosouria, Galactosemia and Glycogen storage diseases

UNIT-II

Disorders of Lipid metabolism. Plasma lipids and lipoproteins. Introduction Hyperlipoproteinemia-Types I, II, III, IV and V. Alphaslipoproteinemia. Hypolipoproteinemia- A beta lipoproteinemia, Hypo beta lipoproteinemia. Tangier`s disease and LCAT deficiency. Atherosclerosis, Fatty liver and hyper lipidemia. Hypercholesterolemia, Lipidosis and Xanthomatosis, Tay-Sach`s disease, Niemann-Pick disease.

UNIT-III

Disorders of Amino acid metabolism, Plasma protein abnormalities; Total plasma (Serum) protein, Fibrinogen, Albumin, Pre-albumin and Globulins. Abnormal non-protein nitrogen; Urea, Uric acid, Creatinine and Ammonia, Porphyria. Aminoacid metabolism: Cystinuria, phenylketonuria, maple syrup disease, alkaptonuria, Albinism and Hartnup disease. Disorders of Purine and pyrimidine metabolism Disorders of Purine metabolism: Normal level of uric acid in blood and urine, miscible uric acid pool, hyper uricemia and Gout; Hypouricemia - Xanthinuria and Liathiasis. Disorders of pyrimidine metabolism: Orotic acid urea.

UNIT-IV

Gastric, pancreatic and intestinal functions. Gastric function: Introduction, tests of gastric function – The insulin stimulation test, determination of Gastrin in serum and Tubeless gastric analysis.

Pancreatic Function: Introduction, pancreatic function tests, serum amylase and lipase. Intestinal function: Introduction, test of monosaccharide absorption (xylose excretion test) and determination of total protein (Lowry's method).

UNIT-V

Liver disease and liver function tests: Introduction, bilirubin metabolism and jaundice, liver function tests. Estimation of conjugated and total bilirubin in serum (Diazotization method). Detection of bilirubin and bile salts in urine (Fouchet's test and Hay's sulphur test). Thymol turbidity test, prothrombin time, serum enzymes in liver disease – serum transaminases (SGPT & SGOT) and lactate dehydrogenase (LDH). Kidney function test: Introduction, Physical examination of urine, elimination tests, clearance tests; inulin clearance, Creatinine clearance test and urea clearance test, Renal blood flow and filtration fraction.

TEXT BOOKS:

1. *Burtis A. Carl and Edward R. Ashwood*, (1994) **Tietz text book of clinical chemistry**, 2nd edition W.B.Saunders Company.
2. *Philip D. Mayne*, (2002) **Clinical Chemistry in diagnosis and treatment**. 6th edition, Arnold Association, New Delhi, Publication.
3. *Kumar, Abbas, Fausto, Saunders* (2010). **Rabbits and Corins Pathological Basics of disease**. an Imprint of Elsevier. 7th Edition.

REFERENCE BOOKS:

1. *William J Marshall*, (2008) **Clinical Biochemistry**, Metabolic and clinical aspects - 1st edition-, Elsevier Publication, New York.
2. *Allengaw C.* (1999) **Clinical Biochemistry**, Churchill Livingstone-London.
3. *Longo, Fauci, Kasper, Haase, Jamerson, Loscalzo*, (2012) **Harrison's Internal Medicine**, MC Graw Hill Publishers. 18th Edition.

15UBC53P	CORE PRACTICAL - III: BIOCHEMISTRY-III	SEMESTER - V
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Total Credit: 3
Hours per week: 5

OBJECTIVES:

Upon completion of this practical the students will gain

1. Knowledge on the estimation of constituents in the urine and serum
2. Knowledge in the assay of liver marker enzymes

I. Estimation of the following in urine

- a. Urea by DAM TSC method
- b. Uric acid by Caraway's method
- c. Creatinine by Picric acid method
- d. Calcium by permanganate method
- e. Phosphorus by Fiske and Subbarow method

II . Estimation of the following in serum

- a. Urea by DAM TSC method
- b. Uric acid by Caraway's method
- c. Phosphorus by Fiske Subbarow method
- d. Glucose by O-Toluidine Method
- e. Cholesterol by Zak's method
- f. Hemoglobin by Cyanmethhemoglobin method

III . Determination of the following enzymes in serum

- a. Acid phosphatase
- b. Alkaline phosphatase
- c. SGOT
- d. SGPT

REFERENCE BOOKS:

1. *David T.Plummer (1998).An Introduction to Practical Biochemistry, 3rd Edition*Tata McGraw Hill Publishing Company Ltd.
2. *H. Varley(1998)Practical Clinical Biochemistry, Fourth edition.*

15UBC5EA	ELECTIVE-I : PLANT AND ANIMAL BIOTECHNOLOGY	SEMESTER -V
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Total Credit:4
Hours Per Week:5

OBJECTIVES:

On successful completion of the course the students have to

1. Understood the components of culture media and various tissue culture techniques
2. Learn about the technique of genetic engineering in plants and animals.

CONTENTS

UNIT - I

Plant tissue culture: - Media composition, nutrients and growth regulators, MS medium & B₅ medium. Callus and suspension culture. Initiation and differentiation of PTC. Micropropagation:- Methods, Production of haploid plants, phytochemicals from plant tissue culture.

UNIT - II

Protoplast technology:- Isolation, fusion of protoplasts, Electroporation, Biolistics, Regeneration of plants from protoplasts. Gene Transfer in plants:- Ti plasmid vectors, mechanism of T- DNA transfer, Vir genes. Transgenic plants:- Herbicide, Virus, Pest resistance plants, Male infertility, Genetic engineering of plant oils.

UNIT - III

Mammalian cell culture:- Establishment of cell in culture: Requirements for invitro growth; importance of serum.

Cell-lines; cell transformation – properties of transformed cells, cell separation, Mass cultivation of cells: suspension culture; immobilized cultivation.

UNIT - IV

Genetic Engineering of Animal cells: - Mammalian cell culture in protein production. Gene transfer into mammalian cells, Selectable markers pSV plasmids; retroviral vectors; Expression vectors; reporter genes.

UNIT - V

Animal Biotechnology:- Artificial insemination and embryo transfer, Invitro fertilization (IVF): embryo cloning. Human embryo research, transgenic mice, Gene therapy; the Human Genome Project. Recombinant proteins from cell cultures: - Interferons, Viral vaccines, Hybridoma technology- Monoclonal antibodies- production and applications.

TEXT BOOKS:

1. *Satheesh K.M*, (2010). **Biotechnology**, 2nd edition, New Age International LTD Publishers.
2. *Dubey R.C*, (2003). **A Text book of Biotechnology**, 3rd edition, S. Chand and Company publications
3. *Singh B.D*, (2014). **Plant Biotechnology**, 2nd edition, Kalyani publishers

REFERENCE BOOKS:

1. *Adrian Slater, Nigel W.Scott* , (2008). **Plant Biotechnology**, 2nd edition, Oxford University press publication.
2. *Ranga M.M*, (2003). **Animal Biotechnology**, 2nd edition Dr.Updeshpurchit for agrobios (India)

15UBC5EB	ELECTIVE-I: PRINCIPLES OF GENETICS	SEMESTER -V
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Total Credit: 4
Hours per week: 5

OBJECTIVES:

On successful completion of the course the students have to understand the mendelian principles, chromosomal organizations and variations in chromosomal structure.

CONTENTS

UNIT - I

Mendel's Experiments - principle of segregation - monohybrid crosses - dominance - recessiveness - lethal - principle of independent assortment - gene interaction - genetic versus environmental effects - multiple alleles.

UNIT -II

Cell cycle - mitosis - meiosis - meiosis and Mendel's principles - mechanism of sex determination - environmental factors and sex determination - sex differentiation - sex-linked inheritance

UNIT -III

Chemical composition of eukaryotic chromosomes - packing the giant DNA molecules into chromosomes - euchromatin and heterochromatin - repetitive DNA and sequence organization - Satellite DNAs - telomere structure - replication of eukaryotic chromosomes

UNIT -IV

Linkage and crossing over - chromosome mapping - two factor crosses - three factor crosses - somatic-cell hybridization - molecular mechanism of crossing-over - gene conversion - Discovery of transposable elements - transposable elements in bacteria - transposable elements in eukaryotes

UNIT -V

Variations in chromosome structure - duplications - inversions - translocations - position effects - variations in chromosome number - trisomy in humans - chromosomal mosaics - euploidy - induced polyploidy - applications of polyploidy

TEXT BOOKS:

1. *Eldon John Gardner, M.J. Simmons and D.P. Snustad*, 2005. **Principles of Genetics**, eighth edition, John Wiley & Sons (Asia) Pvt. Ltd., Singapore
2. *Gupta Pk*, 2007. **Genetics classical to modern**. Rastogi Publication.
3. *Robert T Brooker*, 1999. **Genetics, Analysis of and Principles**. Addison's Wesley publishers.
4. *Varma P.A. Agarwal V.K*, 2009. **Genetics**, Schand and Company Pvt Ltd. Multicolour Edition,

REFERENCE BOOKS:

1. *S.B. Primrose, R.M. Twyman and R.W. Old*, **Principles of Gene Manipulation**, Sixth edition, Blackwell science limited, Oxford.
2. *Brown, TA*, 1999. **Genome**. Wiley Bios, John wiley and sons (Asia) PTE Ltd.

15UBC5EC	ELECTIVE-I:HEALTH MANAGEMENT	SEMESTER -V
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Total Credit: 4
Hours per week: 5

OBJECTIVES:

1. To enable students to have an awareness on health
2. To make them aware of the health oriented diseases, its prevention and management.

CONTENTS

UNIT -I

Health: Definition. Concept of health, quality of life, Hygiene. Food factors for human beings and their requirements. Calorific value of food. Obesity: Definition and classification, Genetic and environmental factors leading to obesity, Obesity related diseases and management of obesity.

UNIT- II

Diabetes: Normal level of Blood sugar. Insulin and Glucagons. Types of Diabetes, etiology and pathogen city, Management of Diabetes.

UNIT- III

Cardiovascular diseases: Normal level of Cholesterol, Lipoproteins, Cardiac arrest, Myocardial infarction, Signs and Symptoms, Risk factors, Management of Heart diseases.

UNIT- IV

Kidney Stones : Diet and Prevention, Cancer – Types, Food habits and its preventive measures.

UNIT -V

Health Insurance: Individual mediclaim policy, domiciliary hospitalization, Cancer Insurance, Group Mediclaim Policy.

TEXT BOOKS:

1. Varley , (2005) **Practical, clinical Biochemistry** Harold, 4th edition, CBS publishers and Distributors Pvt Ltd
2. David. T.Plummer, (2002) **An Introduction to practical Biochemistry**, 3rd edition, Tata MC Graw-Hill publications.

3. *Shauna C. Anderson*-(1993) **Clinical Chemistry**, First Edition, ,
W.B.Saunders Company- London.

REFERENCE BOOKS:

1. *Carl A Burtis* (2008) **Text book of clinical chemistry**, first Edition,
2008, Elseveir Publication, New delhi.
2. *Shauna C. Anderson*-(1993) **Clinical Chemistry**, First Edition, ,
W.B.Saunders Company- London.
3. *Philip D. Mayne*,(2002) **Clinical Chemistry in Diagnosis and Treatment**,
Sixth Edition, Arnold Associations, New Delhi.

15UBC5SA	SKILL BASED SUBJECT -II: NUTRITIONAL BIOCHEMISTRY	SEMESTER -V
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Total Credit: 3
Hours per week: 3

OBJECTIVES:

1. To understand the requirement of nutrition for human health
2. To understand the actions of nutrition related processes

CONTENTS

UNIT-I

Introduction to the science of nutrition – function of foods and its relation to nutritional and clinical health, essential nutrients, analysis of food, composition, food habits and food groups.

UNIT-II

Physiological role and nutritional significance of carbohydrates, protein, lipids, vitamins and minerals.

UNIT-III

Energy content of foods. Measurements of energy expenditure: Direct & Indirect calorimetry. Definition of BMR and SDA and factors affecting these. Thermogenic effects of foods. Energy requirements of man and woman and factors affecting energy requirements. Role of dietary fibers in nutrition.

UNIT-IV

Starvation:

Techniques for the study of starvation. Protein metabolism in prolonged fasting. Protein sparing treatments during fasting. Basic concept of High protein low caloric weight reduction diets.

UNIT-V

Clinical Nutrition: Role of diet and nutrition in prevention and treatment of diseases: Dental Caries, Fluorosis, Atherosclerosis and Rheumatic disorders. Inherited metabolic Disorders: Phenylketonuria, Maple Syrup disease & Homocystinuria.

TEXT BOOKS:

1. *Patricia Trueman*,(2007).**Nutritional Biochemistry**, 1st Edition, MJP-Chennai.
2. *Maria c Linder*,(1991). **Nutritional Biochemistry and Metabolism**, 1st Edition, PHI-New Delhi.

REFERENCE BOOKS:

1. Joshi Y K (2003) **Basic Clinical Nutrition**, 1st Edition, Jaypee Brothers,New Delhi.
2. Swaminathan M (1989) **Principles of Nutrition Dietetics**, Bangalore printing Publishing Company

15UBC63A	CORE- X: IMMUNOLOGY AND IMMUNO TECHNIQUES	SEMESTER -VI
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Total Credit: 3
Hours per week: 6

OBJECTIVES:

1. To learn about the structural features of the components of the immune system as well as their functions
2. Understand on the mechanisms involved in immune system development and responsiveness

CONTENTS

UNIT - I

Historical development of the science of the immunology. Innate and acquired immunity, Antibody mediated and cell mediated response tolerance. Primary and secondary lymphoid organs. Structure of T, B and NK cells. Receptors on the surface of lymphocytes. Structure and functions of neutrophils, Macrophages - phagocytosis and inflammation, eosinophils and basophils.

UNIT - II

Antigen: Properties, antigenicity, immunogenicity, antigen determinants, Haptens, Cross reactivity, adjuvants, Self antigens (MHC) an outline only. Antibodies: Properties, classes and subclasses of immunoglobulins: Structure, specificity and distribution, Clonal selection theory of antibody formation. Complement component. Cytokines and their junctions.

UNIT - III

Antigen-antibody interaction - Precipitation and agglutination - Definition and mechanism of formation, Precipitation in gel- Oudin procedure, oahley - Ful thope procedure, immune diffusion, Ouchterlony procedure, Immuno electrophoresis and electro immuno diffusion.

Agglutination: Slide agglutination, Table agglutination, Widal test.

Principle and application: RIA, ELISA, Flouresent antibody technique.

UNIT - IV

Allergy and Hypersensitivity - Type I, II, III and IV, their clinical manifestations.

Immuno Disease: Rheumatoid arthritis, Myasthenia gravis. Immunity to bacteria and viruses. Skin Test: Montex and Penicillin test.

UNIT - V

Transplantation: Allograft rejection: Graft Vs Host Diseases: Immuno suppressors: mechanism of graft rejection.

Tumor: Lymphoid tumors, Resistant to tumors: NK Cells, Tumor immuno therapy Vaccination: Passive and active immunization: Recombinant vaccines: DNA vaccines. Benefits and adverse effects of vaccination.

AIDS: CD4 Cell count in HIV infection.

TEXT BOOKS:

1. *Richard A Goldsby, Thomas J. Kindt, Barbara A Osborne and Janis Kuby* (2003) Immunology, 5th Edition, W.H. Freeman & Company.
2. *Ananthanarayanan R and Yayaraman Panikar* (2013) Text book of microbiology, 9th Edition, University Press(India) Private Ltd.

REFERENCE BOOK:

1. *Nandini Shetty* (2005) Immunology, Revised 2nd Edition, New Age International Publishers.

15UBC63B	CORE -XI: GENETIC ENGINEERING	SEMESTER -VI
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Total Credit: 3
Hours per week: 6

OBJECTIVES:

Understand the basic principles of genetics, cloning and sequencing methods.

CONTENTS

UNIT-I

Introduction to genetics. Mendelian genetics. Mendel's laws. Linkage - definition, simple measurement and salient features. Salient features of autosomal dominant, recessive, codominance; X-linked recessive, codominant and dominance; Y-linked characters.

UNIT - II

Basis of gene cloning; Restriction endonucleases - Types and Features; Ligations; Linkers and Adaptors. Vectors of gene cloning: - Plasmid Vectors - Basic feature, pBR332. Bacteriophage vectors; Cosmids. Cloning hosts. Preparation of Plasmid DNA from bacteria.

UNIT - III

Introduction of DNA into bacterial cells: Transformation of E. coli, selection of transformed cells, Identification of recombinants. Introduction of phage DNA into bacterial cell, Identification of recombinant phage. Genomic library and cDNA library. Hybridization probes; Southern, Northern and Western blotting techniques.

UNIT - IV

DNA sequencing methods: Sanger's method, Maxam and Gilbert method- Applications. Genetic Finger Printing, Protein engineering. PCR - Technique and Applications

UNIT - V

Expression vectors for E.Coli:- Constituents; Examples of promoters - Expression cassettes - Problems caused in expression of eukaryotic genes: Fusion proteins: - Applications of gene technology: Recombinant insulin; Recombinant growth hormones. Cloning HBV surface antigen in yeast. Insect cells as host system. Safety aspects and hazards of genetic engineering.

TEXT BOOKS:

1. *Primrose SB and Twyman RM*, (2012) Principles of Gene Manipulation and Genomics, Seventh Edition, Blackwell Publishers.
2. *Satyanarayana.V* , (2000) Biotechnology, Panama Publishing corporations, New Delhi – Publisher Interlinks, First Edition.
3. *Brown T.A*, (2001) Gene cloning and DNA analysis and introduction. Blackwell Sciences, 4th Edition.

REFERENCE BOOKS:

1. *Satyanarayana.V* , (2000) Biotechnology, Panama Publishing corporations, New Delhi – Publisher Interlinks, First Edition.
2. *Ranga M.M* (2012). Animal Biotechnology, ab Agrobios (India). Third Edition.
3. *Brown T.A* (1998) Gene cloning an Introduction, Third Edition, Stanley Thornes(Publishers) Ltd.

15UBC63P	CORE PRACTICAL - IV: BIOCHEMISTRY-IV	SEMESTER -VI
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Total Credit: 3
Hours per week : 5

OBJECTIVES:

Upon completion of this practical the students will gain Knowledge and practical skill in the areas of microbiology, enzyme kinetics, Immunology, plant tissue culture and haematology

CONTENTS

Microbiology:

1. Hanging drop technique.
2. Simple staining
3. Gram staining
4. Endospore staining
5. Negative staining
6. Fungal staining

Enzyme Kinetics:

7. Assay of acid phosphatase activity, specific activity from germinating mungbean seeds.
8. Linearity curve of enzyme.
9. Effect of substrate concentration on acid phosphatase activity and determination of its K_m , V_{max} and K_i (with respect to inorganic phosphate).
10. Effect of pH and temperature on enzyme activity.
11. Purification of enzyme

Immunology:

12. Isolation of peripheral blood mononuclear cells (PBMC) from whole blood
13. Antibody-antigen reactions in gels-Double Immuno diffusion, Single radial Immuno diffusion and immunoelectrophoresis.
14. ELISA test

Plant Biochemistry:

15. Estimation of Chlorophyll

16. Estimation of Starch

Demonstration on plant tissue culture:

17. Preparation of media; sterilization

18. Initiation of callus culture

Haematology:

19. Separation and isolation of serum and plasma from blood.

20. Determination of (i) blood group and Rh factor.

21. Determination of (i) Hemoglobin content, (ii) total count and differential count(TC/DC), (iii) erythrocyte sedimentation rate (ESR), (iv) packed cell volume (PCV).

22. Determination of RBC number, Bleeding time and clotting time

REFERENCE BOOKS:

1. *David T.Plummer*, (1998). **An Introduction to Practical Biochemistry**, 3rd Edition. Tata McGraw Hill Publishing company ltd.
2. *Robert H Smith*, (2005). **Plant Tissue Culture Techniques and Experiments**, Academic press - New Delhi
3. *Raja S and Selvi R*, (2011). **Experimental procedures in life sciences**, Anjana Book House.
4. *James G* ,(2010). **Microbiology laboratory manual**, 7th Edition, Metalic schemen publishers.

15UBC6EA	ELECTIVE- II: MEDICINAL CHEMISTRY	SEMESTER - VI
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Total Credit: 4
Hours Per Week: 5

OBJECTIVES:

1. Understand the development of the traditional and modern methods used for drug discovery and about how molecules interact.
2. Know the fact that the pharmaceutical industry is by far the largest employer of medicine

CONTENTS

UNIT -I

Introduction and receptor concept: Introduction to drugs, classification of drugs, passage of drugs across biological membrane; absorption and distribution of drugs; binding of drugs to plasma proteins.

Drug receptor interaction, binding forces in drug receptor interaction, types of receptors. Receptor theories, isolation of receptors, consequences of drug receptor interaction

UNIT -II

Drug metabolism and elimination: Drug metabolism, methods of study of drug metabolism, microsomal drug metabolism, metabolism via hydroxylation, conjugation deamination, N-Oxidation, azo and nitro reduction, non-microsomal oxidation, Oxidative deamination, purine oxidation, dehalogenation, hydrolysis, action of choline esterase. Elimination of drugs from the body with reference to renal system

UNIT - III

Chemotherapy: Mode of action of sulfonamides, anti-metabolites of folate, purines and pyrimidines. Antibacterials - mode of action and resistance to penicillin, streptomycin, tetracycline and chloramphenicol. Antiviral, antimalarial and antiTB drugs.

UNIT - IV

Drugs acting on CNS and cardio-vascular system:

CNS - structure and mode of action of barbiturates, salicylates, MAO inhibitors and drugs for Parkinson's disease. Alzheimer's disease and other neurodegenerative disorders. Cardio-vascular disease: Structure and mode of action of cardiac glycosides, heparin and coumarin.

UNIT - V

Drugs of plant origin: Drug dependents and abuse – management of self-poisoning. Cancer chemotherapy- cytotoxic drugs. Immunosuppressive drug therapy.

TEXT BOOKS:

1. *Satoskar, R.S. Bhandarkar, S.D and Ainapure S.S.*, 16th edition, (1999) **Pharmacology and pharmacotherapeutics**. Popular Prakashnan Bombay.
2. K.D.Tripathi, (2003) **Essentials of Medical Pharmacology**, 5th Edition, Jaypee Brothers medical Publishers Private Limited, New Delhi.

REFERENCE BOOKS:

1. *Satoskar R.S, Bhandarkar S.D and S.S. Ainapure S.S*, (1999). **Pharmacology and pharmacotherapeutics**. 16th edition, Popular Prakashnan Bombay.
2. K.D.Tripathi, (2003) **Essentials of Medical Pharmacology**, 5th Edition, Jaypee Brothers medical Publishers Private Limited, New Delhi.
3. *Rang and Dale's Pharmacology*, 6th Edition, Churchill Livingstone, Elsevier, 2007.
4. *Gary Walsh, Biopharmaceuticals, Biochemistry and Biotechnology*, 2nd Edition, John Wiley, New Delhi, 2003.
5. *Williams M Southerland*, **Foundation of Medicine Biochemistry**, 1st Edition, Churchill Livingstone, London, 1990.

15UBC6EB	ELECTIVE- II: CONCEPTS IN DRUG DISCOVERY	SEMESTER -VI
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Total Credits:4
Hours Per Week:5

OBJECTIVES:

On successful completion of the course the students should have

1. Understood the phases of clinical trials and the basis of approval of new drugs
2. Understood the clinical data management for drug efficacy.

CONTENTS

UNIT-I

Biopharmaceutical Product Pipeline: Drug Discovery - Combinatorial chemistry and molecular diversity. Therapeutic targets for drug discovery.

UNIT-II

Molecular Docking Drug design: Cheminformatics - Role of computational chemistry in therapeutic drug design.

UNIT-III

Peptide and peptidomimetic engineering. Structure activity relationship (SAR and QSAR). Applications of pharmacophore-based and structure-based drug design. Use of X-ray, NMR, computer aided drug design (CADD)

UNIT-IV

Biopharmaceutical Product Pipeline: Drug Development - Drug Regulation, Phases in Drug Development. PK and ADME (Absorption, Distribution, Metabolism, Elimination) studies - cell-based permeability, uptake and cytotoxicity studies. Animal Toxicity Studies. Regulatory processes in New Drug Development (IND; ANDA)

UNIT-V

Overview of Drug Prescribing, Personalized Drugs, Essential Drugs, and Orphan Drugs.

TEXT BOOKS:

1. Guidelines for Good Clinical Practice, Central Drugs Standard Control Organization (CDSCO), Govt. of India
2. Draft Guidelines For Industry on Reporting Serious Adverse Events occurring in Clinical Trials, Central Drugs Standard Control Organization (CDSCO), Govt. of India

REFERENCE BOOKS:

1. Ethical Guidelines for Biomedical Research on Human Participants, 2006. ICMR, New Delhi
2. Intellectual Property Rights Policy, ICMR, New Delhi
3. Guidelines for care and use of Animals in Scientific Research. Revised Edition, 2000. INSA, New Delhi
4. Guidelines for Laboratory Animal Facility, Committee for the Purpose of Control and Supervision on Experiments on Animals (CPCSEA - India). 2001. CPCSEA, Chennai.

15UBC6EC	ELECTIVE-II: CONCEPTS IN CLINICAL TRIALS	SEMESTER -VI
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Total Credits: 4
Hours Per Week: 5

OBJECTIVES:

Understand the basic concepts, processes in clinical trial practices.

CONTENTS

UNIT-I

Types of clinical trials, observational studies and patient-centered therapeutics. Overview of Phase I (Human/ Clinical Pharmacology), Phase II (Exploratory), Phase III (Confirmatory), and Phase IV Clinical Trials. Adverse drug reactions (events) and therapeutic drug monitoring. Draft Guidelines for Industry on Reporting Serious Adverse Events Occurring in Clinical Trials (CDSCO, Government of India)

UNIT-II

Clinical Research in India: Clinical Research Organizational Chart (key functions of Data Management, Pharmacovigilance, Regulatory affairs, Biostatistics and SAS), Contract Research Organizations (CROs).

UNIT-III

The role of MNCs and Indian Pharma companies in Clinical Trials in India. Concepts of cGMP, IPR and Patenting

UNIT-IV

ICMR Ethical Guidelines for Biomedical Research on Human Participants, Chapter I (General Principles), Chapter II (Basic Responsibilities, Composition, Review Procedures only of Institutional Ethics Committee), Chapter III (Informed Consent Process, Compensation, Conflict of Interest, Special Groups, Post-Trial Access, International Collaboration), Chapter IV (Drug Trials only). Also, Definitions, and Declaration of Helsinki from Guidelines of the CDSCO on Good Clinical Practice.

UNIT-V

Care and use of Animals in Scientific Research (INSA and CPCSEA Guidelines) only with reference to - sourcing of experimental animals, housing & environment, breeding and genetics, transgenics, nutrition and feeding, hygiene & disease control, personnel and training, recordkeeping and SOPs, anaesthesia and euthanasia, and Institutional Biosafety Committee

TEXT BOOKS:

1. Guidelines for Good Clinical Practice, Central Drugs Standard Control Organization (CDSCO), Govt. of India
2. Draft Guidelines For Industry on Reporting Serious Adverse Events occurring in Clinical Trials, Central Drugs Standard Control Organization (CDSCO), Govt. of India

REFERENCE BOOKS:

1. Ethical Guidelines for Biomedical Research on Human Participants, 2006. ICMR, New Delhi
2. Intellectual Property Rights Policy, ICMR, New Delhi
3. Guidelines for care and use of Animals in Scientific Research. Revised Edition, 2000. INSA, New Delhi
4. Guidelines for Laboratory Animal Facility, Committee for the Purpose of Control and Supervision on Experiments on Animals (CPCSEA - India). 2001. CPCSEA, Chennai

15UBC6ED	ELECTIVE- III:ENDOCRINOLOGY	SEMESTER -VI
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TotalCredit:4
Hours per week: 5

OBJECTIVES:

Upon completion of this course the student should be knowledgeable in the various hormones and its functions

CONTENTS

UNIT -I

Hormones- definition, classification, biosynthesis and circulation in blood. Mechanism of hormone action. Plasma membrane receptors. Adenylate cyclase, Role of G-proteins. Protein kinases, tyrosine kinase, Inositol phosphate.

UNIT-II

Hormones of the thyroid, Biosynthesis and biological actions of thyroid hormones. Antithyroid agents. Thyroid disease- thyrotoxicosis, Goiter, Grave's disease, Hashimoto's thyroiditis. Parathyroid hormone- Biological actions regulation of calcium and phosphorous metabolism.

UNIT-III

Vasopressin and oxytocin- synthesis and biological effects. Hypothalamic releasing factors. Anterior pituitary hormones- actions. Growth promoting and lactogenic hormones

UNIT -IV

Pancreatic hormones- Insulin- Biosynthesis, regulation of secretion and biological actions. Mechanism of action of insulin. Glucagon, somatostatin and pancreatic polypeptide. Insulin like growth factors.

UNIT -V

Adrenal hormones- Glucocorticoids, Mineralocorticoids- synthesis and biological effects. Catecholamines: biosynthesis and biological effects. Gonadal hormones- Androgens and estrogens.. Abnormal secretion of adrenal hormones- Addison's disease. Cushing's syndrome

TEXT BOOK:

1. *Guyton*, (1991) **Text book of medical physiology** 8th edition, Hall, Saunders Publishing Co.,

REFERENCE BOOK:

1. *Mac E Handley* (1984) **Endocrinology**, 4th edition, Hadley, Prentice Hall.

15UBC6EE	ELECTIVE -III: DIAGNOSTIC BIOCHEMISTRY	SEMESTER -VI
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Total Credit: 4

Hours per week: 5

OBJECTIVES:

To enable students to have an awareness on disease diagnostic methods

CONTENTS

UNIT -I

Introduction: General health, syndrome and common diseases - communicable and non-communicable diseases - Samples for analysis: Blood, urine, pleural fluid, synovial fluid, cerebro spinal fluid and tissues and histology.

UNIT -II

General check up: Blood group, Hb, height and weight, waist to hip ratio, , urine analysis – routine analysis (protein, sugar, pigments and cells). Blood: Total cell count, differential count, erythrocyte sedimentation rate - Test for Surgery: Bleeding time, clotting time.

UNIT -III

Tests for liver function: Enzyme assay (SGOT, SGPT, Alkaline phosphatase, GGT), Total protein, albumin /globulin ratio and their significance- Test for kidney function: Urea and creatinine estimation and their significance

UNIT -IV

Disorders of Lipid metabolism. Plasma lipids and lipoproteins. Introduction Hyperlipoproteinemia-Types I, II, III, IV and V . Test for heart function: Blood pressure (cystolic and diastolic), lipid profile (cholesterol, triglycerides, HDL, LDL estimation) and their importance.

UNIT -V

Non communicable diseases: Diabetes: Blood sugar, urine sugar, glucose tolerance test, HbA1c -Hyper tension: Lipid profile, electrolyte (sodium, potassium, chloride and biocarbonate) investigation.

TEXT BOOKS:

1. *Philip.D.Mayne*, (2002) **Clinical Chemistry** in diagnosis and treatment. Arnold Association, New Delhi, Publication, 6th edition,.
2. Burtis A. Carl and Edward R. Ashwood, (1994) Tietz **text book of clinical chemistry**, 2nd edition, W.B. Saunders company,.

REFERENCE BOOK:

1. *William J Marshal* (2008) **Clinical Biochemistry- Metabolic and clinical aspects**, 1st edition, Elsevier Publication, New York.

15UBC6SP	SKILL BASED SUBJECT-IV: PLANT PHYSIOLOGY AND BIOCHEMISTRY	SEMESTER -VI
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Total Credit: 3
Hours per week: 3

OBJECTIVES:

On successful completion of the course the students should have understood the key physiological, biochemical and molecular biological processes that occur in plants

UNIT -I

Plant cell: - Structure and functions.

Photo synthesis: Photo synthetic pigments - chlorophyll, carotenoids and phycobillin. Light reactions - two kinds of chemical system - photo system I and II -evidences in support of light reaction - Hill's reaction, Arnon' s work and Emerson effect. Dark reaction - Calvin's cycle (C_3 plants). Hatch - Slack cycle (C_4 cycle) and CAM plants. Photorespiration. Aerobic - anaerobic, Glycolysis, Krieb's cycle, oxidation-reduction potential, ATP synthesis, Factors affecting respiration. Transpiration in plants.

UNIT -II

Cycles of elements:

Nitrogen cycle: Ammonification, nitrification, nitrate reduction and denitrification, nitrogen fixation- symbiotic and non-symbiotic nitrogen fixation. Sulphur cycle, phosphorus cycle and carbon cycle. Plant nutrition: Specific roles of essential elements and their deficiency symptoms in plants. Macro nutrients: - Carbon, Hydrogen, Oxygen, Nitrogen, Sulfur, Phosphorus, Calcium, Potassium, Magnesium and Iron. Micro nutrients: - Manganese, Boron, Copper, Zinc, Molybdenum and Chlorine.

UNIT -III

Plant growth regulators:

Chemistry, biosynthesis, mode of action and Practical applications of auxins, gibberellins, cytokinins, abscisic acid and Ethylene. Plant growth inhibitors and retardants.

UNIT -IV

Photo morphogenesis:

Photo periodism. Phytochrome - Function in growth and development of plant. Biochemistry of seed germination. Senescence: Biochemical changes during senescence. Senescence process in life cycle of plants.

UNIT -V

Secondary metabolites:

Nature, distribution and biological functions of alkaloids, terpenes, flavonoids, poly phenols, tannins and steroids. Role of secondary metabolites in pathogens, insects, animals and mankind.

TEXT BOOKS:

1. *Peter Lea* (1997), **Plant Biochemistry and Molecular Biology**, Second edition, John Wiley and Sons, New York
2. *Devlin N. Robert and Francis H. Witham*, (2001), **Plant Physiology**, First edition, CBS, New Delhi.

REFERENCE BOOKS:

1. *William G. Hopkins* (1999), **Introduction to Plant Physiology**, Second edition, John Wiley and sons, New York.
2. *John C.K, Rajani, S. Nadyanda A.F* (1997), **Tissue culture of economic plants**, First edition, Niscom, New Delhi.

15UED34C	NMEC-I : BASICS OF BIOINSTRUMENTATION FOR EMPLOYABILITY	SEMESTER – III
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Total Credit: 2
Hours per week: 2

OBJECTIVES:

On successful completion of the course the students would have to understand Principles, procedures and applications of various biochemical techniques and instrumentation required for conducting analysis focused towards employability in corporate institutions of repute in Biological sciences

CONTENTS

UNIT-I

Spectroscopy techniques Principle and applications of UV-Visible Spectroscopy, IR Spectroscopy, Circular Dichroism, Mass Spectroscopy, Nuclear Magnetic Resonance, Electron Spin Resonance.

UNIT-II

Chromatography techniques- Principle and applications of paper chromatography, Thin layer chromatography, Gel permeation Chromatography, Ion-exchange Chromatography, Affinity chromatography, High performance Liquid Chromatography, Gas Chromatography.

UNIT-III

Electrophoretic techniques: Principle and application of SDS PAGE, Agarose gel electrophoresis; Capillary electrophoresis; Pulsed field gel electrophoresis

UNIT-IV

Centrifugation. Principle of centrifugation, basic rules of sedimentation, various types of centrifuges, different types of rotors. Differential & density gradient centrifugation;

UNIT-V

Radio isotopic techniques-Radioactive decay, units of Radioactivity, detection and measurement of Radioactivity, Auto radiography, Applications of Radio isotopes in biological and medical sciences.

TEXT BOOKS:

1. *Wilson K and Goulding Kenneth H.* A Biologists guide to Principles and Techniques of practical Biochemistry. New York: Cambridge University Press.1992.Print.
2. *Plummer David T.* An Introduction to Practical Biochemistry. New Delhi: Tata McGraw-Hill Education.1988.Print.

REFERENCE BOOKS:

1. *Sharma B.K.* Instrumental method of chemical analysis. New Delhi: McGraw-Hill Education. 1982.Print
2. *Cooper, T.G.* The Tools of Biochemistry. USA: John Wiley and Sons.1977.Print

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