RATHNAVEL SUBRAMANIAM COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)
SULUR, COIMBATORE-641402

DEPARTMENT OF BIOCHEMISTRY
B.Sc.,BIOCHEMISTRY

Syllabus effective for the students admitted during the Academic Year 2019 - 2020 Batch & onwards

(2019 - 2022)
(2020- 2023)

HOD	PRINCIPAL	COE

PROGRAMME OUTCOMES (POs):

PO1	Graduates can have strong fundamentals in their specific discipline along with DIGITAL STRATEGIC knowledge.
PO2	To increase student's ability to communicate effectively with the community /society in verbal /written courage for such as to give or receive clear instruction.
PO3	To enhance their ability to understand and identify the professional and ethical responsibilities.
PO4	To enrich their personality and character development

PROGRAMME SPECIFIC OUTCOMES: (PSOs)

Upon completion of Bachelor of Biochemistry Degree, STUDENTS are able to achieve the following outcomes.

PSO1	To understand the fundamental concepts and master the pertinent experimental and theoretical techniques in Molecular Gene expression, Proteomics, Pathology, Clinical research and Nano-sciences so as to inflate the understanding of biology.
PSO2	To transform the way by using sophisticated technologies and thereby gaining insights from clinical data to make cognizant decisions, predictions and to reveal the proficiency in quantitative reasoning and analytical skill within a student.
PSO3	To understand the research oriented learning that develops methodical and integrative problem-

	solving approaches in the biochemical industries by enabling them to write effective project reports in multidisciplinary environment.
PSO4	To augment the students in pre-clinical studies and cancer biology enabling them to invent new ideas to develop their entrepreneurial skills, decisive thinking and self-governance.

GRADUATE ATTRIBUTES

- DISIPLINEKNOWLEDGE
- PROBLEMANALYSIS
- CRITICALTHINKING
- MODERN TOOLSUSAGE
- SOFTSKILLS
- SELFLEARNING
- LIFE LONGLEARNING
- INDIVIDUAL & TEAMWORK
- PROJECT MANAGEMENT &FINANCE

PROGRAMME: B.Sc., (Biochemistry)

(Effective from the academic year 2019 - 2022)

Structure, Credits & Marks Distribution

Sl No.	Course Type	Number of Courses	Credits	Marks	Total Credits
1	Multi-Indian/ International Languages (MIL)	2	4	200	8
2	Ability Enhancement Compulsory Courses (AECC) – (I & II) : Group-I (English)	2	4	200	8
3	Ability Enhancement Compulsory Courses (AECC) –(II& IV) : Group-II	2	1+3	200	4
4	Discipline Specific Courses (DSC)	12	6	1200	72
5	Discipline Specific Elective Courses (DSE)	4+1	6	500	30
6	Extra Disciplinary Course (EDC) (DSE)	1	6	100	6
7	Skill Enhancement Courses (SEC)	2+1	4	200	8
8	ALCTA– e Learning in MOOC platform	1	4*	Pass	4*
9	Non Credit Courses – Group I	2	-	Grade	-
10	Non Credit Courses – Group II	4	-	Completed	-
Total				**2600**	**136+4***

MULTI-INDIAN/ INTERNATIONAL LANGUAGES (MIL)								
Course	**Course Name**	**L**	**T**	**P**	**CIA**	**ESE**	**Total**	**Credits**
Two Courses – Any ONE Group								
Group I								
MIL	Tamil I	6	-	-	25	75	100	4
MIL	Tamil II	6	-	-	25	75	100	4
Group II								
MIL	Hindi I	6	-	-	25	75	100	4
MIL	Hindi II	6	-	-	25	75	100	4
Group III								
MIL	Malayalam I	6	-	-	25	75	100	4
MIL	Malayalam II	6	-	-	25	75	100	4
Group IV								
MIL	French I	6	-	-	25	75	100	4
MIL	French - II	6	-	-	25	75	100	4
Group V								
MIL	Arabic I	6	-	-	25	75	100	4
MIL	Arabic II	6	-	-	25	75	100	4
Total							**200**	**8**

ABILITY ENHANCEMENT COMPULSORY COURSES (AECC) - GROUP I : (I & II SEMESTER)								
Course	**Course Name**	**L**	**T**	**P**	**CIA**	**ESE**	**Total**	**Credits**
AECC – G-I	English - I	6	-	-	25	75	100	4
AECC – G-I	English - II	6	-	-	25	75	100	4
Total							**200**	**8**

ABILITY ENHANCEMENT COMPULSORY COURSES (AECC) - GROUP II:(II SEMESTER)								
Course	**Course Name**	**L**	**T**	**P**	**CIA**	**ESE**	**Total**	**Credits**
AECC – G-II - 1	Environmental Studies	1	-	-	100	-	100	1
AECC – G-II - 2	Aptitude	3	-	-	100	-	100	3
Total							**200**	**4**

DISCIPLINE SPECIFIC COURSES (DSC)								
Course	**Course Name**	**L**	**T**	**P**	**CIA**	**ESE**	**Total**	**Credits**
DSC - I	Biomolecules	4	-	4	25 40	75 60	100	6
DSC - II	Allied Chemistry	4	-	4	25 40	75 60	100	6
DSC - III	Instrumentation Techniques	4	-	4	25 40	75 60	100	6
DSC - IV	Cellular Biochemistry	4	-	4	25 40	75 60	100	6
DSC – V	Enzymology	4	-	4	25 40	75 60	100	6
DSC – VI	Intermediary metabolism	4	-	4	25 40	75 60	100	6
DSC – VII	Plant and Microbial Biochemistry	4	-	4	25 40	75 60	100	6
DSC –VIII	Clinical Biochemistry	4	-	4	25 40	75 60	100	6
DSC – IX	Biochemical Pharmacology	4	-	4	25	75	100	6
DSC – X	Immunology	4	-	4	25	75	100	6

					40	60		
DSC – XI	Human Physiology	4	-	4	25 40	75 60	100	6
DSC – XII	Genetic Engineering	4	-	4	25	75	100	6
Total							**1200**	**72**

DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE) I : (III SEMESTER)								
Course	**Course Name**	**L**	**T**	**P**	**CIA**	**ESE**	**Total**	**Credits**
One Course – From the Group								
DSE - I - 1	Molecular Biology	5	1	-	25 40	75 60	100	6
DSE - I - 2	Biomedical Instrumentation	5	1	-	25	75	100	6
Total							**100**	**6**

DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE) II :(IV SEMESTER)								
Course	**Course Name**	**L**	**T**	**P**	**CIA**	**ESE**	**Total**	**Credits**
One Course – From the Group								
DSE - II - 1	Clinical Research	5	1	-	25	75	100	6
DSE - II - 2	Marine Biochemistry	5	1	-	25	75	100	6
Total							**100**	**6**

DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE) III :(V SEMESTER)								
Course	**Course Name**	**L**	**T**	**P**	**CIA**	**ESE**	**Total**	**Credits**
One Course – From the Group								
DSE - III - 1	Clinical Data Analytics	5	1	4	25 40	75 60	100	6
DSE - III - 2	Endocrinology	5	1	-	25	75	100	6
Total							**100**	**6**

DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE) IV :(VI SEMESTER)								
Course	**Course Name**	**L**	**T**	**P**	**CIA**	**ESE**	**Total**	**Credits**
One Course – From the Group								
DSE –IV – 1	Clinical Lab Technology	5	1	-	100	-	100	6
DSE – IV - 2	Environmental Biochemistry	5	1	-	100	-	100	6
Total							**100**	**6**

DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE) V: (V- SEMESTER)								
DSE – V - EXTRA DISCIPLINARY COURSE :(EDC)								
Course	**Course Name**	**L**	**T**	**P**	**CIA**	**ESE**	**Total**	**Credits**
One Course – From the Group								
B.A. English	Professional Communication	5	1	-	25	75	100	6
BBA	Entrepreneurship	5	1	-	25	75	100	6
BBA (CA)	Project Management	5	1	-	25	75	100	6
B.COM	Insurance and Risk Management	5	1	-	25	75	100	6
B.COM (CA)	Social Media Marketing	5	1	-	25	75	100	6
B.COM (IT)	E-Commerce	5	1	-	25	75	100	6
B.COM (PA)	Indian Tax System	5	1	-	25	75	100	6
B.COM (BA)	Digital marketing	5	1	-	25	75	100	6
BCA	Responsive Web Design	5	1	-	25	75	100	6
B.Sc., (CS)	Business Analytics	5	1	-	25	75	100	6
B.Sc., (IT)	Big Data Engineering	5	1	-	25	75	100	6
B.Sc., CSHM	Hospitality Management	5	1	-	25	75	100	6
B.Sc., ECS	Fundamentals of Digital Computers	5	1	-	25	75	100	6
B.Sc.,MATHS	Computational Mathematics	5	1	-	25	75	100	6
B.Sc., BC	Health Management	5	1	-	25	75	100	6
B.Sc., BT	Forensic Science	5	1	-	25	75	100	6
B.Sc., MB	Microbes – Health & Disease	5	1	-	25	75	100	6
B.Sc., N&D	Health & Life Style Disorders	5	1	-	25	75	100	6
Total							**100**	**6**

DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE) VI:(VI SEMESTER)								
Course	**Course Name**	**L**	**T**	**P**	**CIA**	**ESE**	**Total**	**Credits**

One Course – From the group								
DSE – VI	Project Report – Viva voce	-	-	-	100	-	100	6
Total							**100**	**6**

SKILL ENHANCEMENT COURSES: GROUP I (III & IV SEMESTER)								
Course	**Course Name**	**L**	**T**	**P**	**CIA**	**ESE**	**Total**	**Credits**
SEC – GI-1	Communicative Skills - I	2	-	-	50	-	50	2
SEC – GI-2	Communicative Skills - II	2	-	-	50	-	50	2
Total							**100**	**4**

SKILL ENHANCEMENT COURSES : GROUP II (V SEMESTER)								
Course	**Course Name**	**L**	**T**	**P**	**CIA**	**ESE**	**Total**	**Credits**
Any ONE Group								
Group A								
SEC –GII – A1	Placement - College to Corporate - I	2	-	-	50	-	50	2
SEC –GII – A2	Placement - College to Corporate - II	2	-	-	50	-	50	2
Group B								
SEC – GII – B	Industrial Biochemistry	4	-	-	100	-	100	4
Total							**100**	**4**

NON CREDIT COURSE – GROUP I (III & IV SEMESTER)			
NCC – G1-1 (III Semester)	Career Skills - I	RVS Training Academy	Grade
NCC – G1-2 (IV Semester)	Career Skills - II	RVS Training Academy	Grade

NON CREDIT COURSE – GROUP II (I - IV SEMESTER)			
Any ONE Course			
NCC – G II	National Service Scheme	NSS	Completion
	National Cadet Corps	NCC	Completion
	Sports	Physical Education	Completion
	Literacy & Cultural Club	Language Department	Completion
	Youth Red Cross / Red Ribbon Club	YRC	Completion
	Fine Arts Club	Language Department	Completion

EXTRA OPTIONAL CREDIT COURSE (ALCTA) I – VI SEMESTER			
Any ONECourse with 4 Extra Credits			
I – VI Semester	e-Learning in MOOC Platform	4 Credits	Completion

SCHEME OF EXAMINATIONS

B. Sc., BIOCHEMISTRY 2019 - 2022 BATCH

Semester	Course Opted	Course Name	D	L	T	P	CIA	ESE	Marks	Credits
I	MIL - I	Tamil-I/Hindi-I / Malayalam – I/ French-I/Arabic- I	3	6	-	-	25	75	100	4
	AECC – G I - 1	English-I	3	6	-	-	25	75	100	4
	DSC – I	Biomolecules	3 3	4	-	4	25 40	75 60	100	6
	DSC – II	Allied Chemistry	3 3	4	-	4	25 40	75 60	100	6
	NCC – GII	NCC/NSS/ SPORTS/CULTURALS	-	1	-	-	-	-	-	-
	LIB	Library	-	1	-	-	-	-	-	-
	Total				**30**				**400**	**20**
II	MIL-II	Tamil-II/Hindi-II/Malayalam – II/French-II/Arabic-II	3	6	-	-	25	75	100	4
	AECC – GI - 2	English-II	3	6	-	-	25	75	100	4
	DSC – III	Instrumentation Techniques	3 4	4	-	4	25 40	75 60	100	6
	DSC – IV	Cellular Biochemistry	3 4	4	-	**4**	25 40	75 60	100	6
	AECC – G II - 1	Environmental Studies	3	1	-	-	100	-	100	1
	NCC – G II	NCC/NSS/ SPORTS/CULTURALS	-	1	-	-	-	-	-	-
	LIB	Library	-	1	-	-	-	-	-	-
	Total				**31**				**500**	**21**

Semester	Course Opted	Course Name	D	L	T	P	CIA	ESE	Marks	Credits
III	DSC – V	Enzymology	3 6	4	-	4	25 40	75 60	100	6
	DSC – VI	Intermediary metabolism	3 6	4	-	4	25 40	75 60	100	6
	DSE - I	Elective - I	3	5	1	-	25 40	75 60	100	6
	SEC – G I – 1	Communicative Skills - I	3	2	-	-	50	-	50	2
	NCC – G I -1	Career Skills - I	3	2	-	-	Grade			
	NCC – G II	NCC/NSS/ SPORTS/CULTURALS	-	1	-	-	-	-	-	-
	Total				**27**				**350**	**20**
IV	DSC – VII	Plant and Microbial Biochemistry	3 6	4	-	4	25 40	75 60	100	6
	DSC – VIII	Clinical Biochemistry	3 6	4	-	4	25 40	75 60	100	6
	DSE - II	Elective - II	3	5	1	-	25	75	100	6
	AECC – G II - 2	Aptitude	3	3	-	-	100	-	100	3
	SEC – G I - 2	Communicative Skills - II	3	2	-	-	50	-	50	2
	NCC – G I - 2	Career Skills - II	3	2	-	-	Grade			
	NCC – G II	NCC/NSS/ SPORTS/CULTURALS	-	1	-	-	-	-	-	-
	Total				**30**				**450**	**23**

Semester	Course Opted	Course Name	D	L	T	P	CIA	ESE	Marks	Credits
V	DSC – IX	Biochemical Pharmacology	3 6	4	-	4	25 40	75 60	100	6
	DSC – X	Immunology	3 6	4	-	4	25 40	75 60	100	6
	DSE-III	Elective-III	3	5	1	-	25	75	100	6
	DSE - V	Elective - V (EDC)	3	5	1	-	25	75	100	6
	Any ONE Group									
	Group A									
	SEC – G II – A - 1	Placement - College to Corporate I	3	2	-	-	50	-	50	2
	SEC – GII – A - 2	Placement - College to Corporate II		2	-	-	50	-	50	2
	Group B									
	SEC – G II – B	Industrial Biochemistry	3	4	-	-	100	-	100	4
	NCC – G II	NCC/NSS/SPORTS/CULTURALS	-	1	-	-	Good/ Satisfactory			
	Total				**32**				**500**	**28**
VI	DSC – XI	Human Physiology	3 6	4	-	4	25 40	75 60	100	6
	DSC – XII	Genetic Engineering	3 6	4	-	4	25 40	75 60	100	6
	DSE-IV	Elective-IV	3	5	1	-	25	75	100	6
	DSE - VI	Elective - VI	3	6	-	-	40	60	100	6
		ALCTA * (e-Learning in MOOC Platform)								4*
	Total				**32**				**400**	**24**
TOTAL									**2600**	**136 +4* =140**

ABBREVIATIONS

MIL - Multi Indian/ International Languages
AECC-G1 - Ability Enhancement Compulsory Courses – I & II: Group - I (English)
AECC-G2 - Ability Enhancement Compulsory Courses – II & II: Group - II
DSC - Discipline Specific Courses
DSE - Discipline Specific Elective Courses
EDC - Extra Disciplinary Course
NCC - Non Credit Course
SEC - Skill Enhancement Courses (Group-I & II)
ALCTA - Advanced Learners Course in Thrust Areas– e Learning in MOOC platform

DSE I -Discipline Specific Elective Courses I: (III Semester)

1. Molecular Biology 2. Biomedical Instrumentation

DSE II- Discipline Specific Elective Courses II: (IV Semester)

1. Clinical Research 2. Marine Biochemistry

DSE III-Discipline Specific Elective Courses III: (V Semester)

1. Clinical Data Analytics 2. Endocrinology

DSE IV- Discipline Specific Elective Courses IV: (VI Semester)

1. Clinical Lab Technology 2. Environmental Biochemistry

DSE V- Discipline Specific Elective Courses II: (V Semester)

1.Extra Disciplinary Course EDC (List enclosed)

DSE VI- Discipline Specific Elective Courses II: (VI Semester)

Project & Viva Voce

NCC - I (Non – Credit course) Group – I

The assessment will be done by RVS Training Academy and grade will be given based on internal evaluation in the respective semester

NCC – II (Non – Credit Course) Group – II

The students shall complete the activities in the concerned semester and completion status will be mentioned in their fifth semester mark statement. However, completing the activities listed in Group – II is mandatory to complete their degrees.

DSE III-Discipline Specific Elective Courses III: (V Semester)

1. Clinical Data Analytics

DSE V- Discipline Specific Elective Courses II: (V Semester)

1.Extra Disciplinary Course EDC (Health Management)

Course Title : **BIOMOLECULES (T)**	Course Code : 13A
Semester : **I**	Course Group : **DSC-I**
Teaching Scheme in Hrs (L:T:P) : **4:0:0**	Credits : **4**
Map Code : **C(THEORY CONCEPTS)**	Total Contact Hours : **60**
CIA : **25 Marks**	SEE : **75 Marks**
Programme: **BSC-BC**	

Course outcome: (Cos)

No.	Course Outcome (Cos): After completion of this course, the students will be able to	PSOs	Cl. Ses	CL
CO1	Understand the features including structure, function of Carbohydrates	PSO 1	12	U
CO2	Understand the various types and properties of lipids	PSO 2	12	U
CO3	Recognize the structure and function of amino acids	PSO 2	12	U & R
CO4	Derive the structure and the nature of the protein molecules	PSO 3	12	U & AN
CO5	Explain the structure-function relationships for nucleic acids and chromatin	PSO3	8	U & AN
CO6	Identify the components of nucleotide and study the structure and functions of two types of nucleic acids DNA and RNA	PSO 3	4	U & AN

UNIT-1 (Lecture hours: 12)

Carbohydrates - Introduction (Definition & Classification),Types of Monosaccharides (Introduction & Classification, Stereochemistry, Cyclic structure & Anomeric forms Haworth projection formula),Disaccharides (Introduction & Classification, chemistry, structure & functions of Sucrose, maltose & lactose),
Polysaccharides (Introduction & Classification Storage polysaccharides), Starch & Glycogen (Structure & Function), Structural polysaccharide(Structure & Function).

UNIT-2 (Lecture hours: 12)

Lipids – Introduction(Definition & Classification),Simple lipids(Fats, oils & waxes. Physical properties - Solubility, specific gravity, melting point, color & odor),
Chemical properties of fats(Hydrolysis, Saponification Number, Iodine Number, RM value, Acid Number and Rancidity of fats),Compound lipids (Structure & functions of Phospholipids, Glycolipids and Lipoproteins),Derived lipids(Saturated, Unsaturated & Essential fatty acids)Sterols and Steroids (Cholesterol and its structure)

UNIT-3 (Lecture hours: 12)

Aminoacid- Introduction(Definition & structure),Classification (Based on functional groups, amino acids as ampholytes),Aliphatic Aminoacids (Structure and properties),
Aromatic aminoacids(Structure and properties),Peptide bond (Structure & properties),Identification(N&C terminal residues)

UNIT-4 (Lecture hours: 12)

Protein - Introduction (Classification & properties),Structure of proteins (Primary, secondary, tertiary & Quaternary structures),Denaturation & Renaturation of proteins (Physical & chemical agents, coagulation, refolding)

UNIT-5 (Lecture hours: 12)

Nucleic acids - Introduction (Definition & Types),Purines(Structure of Adenine, Guanine, Xanthine & Hypoxanthine),Pyrimidines (Structure of Thymine, Uracil & Cytosine),Nucleosides & nucleotides (Structures & Modified Nitrogenous bases),
DNA (DNA double helix - Watson & Crick model, Chargaff's rule),Types(A, B & Z forms),Denaturation & Renaturation (Hyperchromism, Effect of pH & temperature on DNA. Nucleation & zippering reaction),RNA - Types (mRNA, rRNA, tRNA,miRNA, Si RNA -Structures and their biological roles)

Text Books :

Biochemistry | Edition:5 | W.H.Freeman & Company,New York | LUBERT STRYER(2015)
Essentials of Biochemistry | Edition:2 | Books and Allied (P) Ltd | U.CHAKRAPANI AND U.SATHYANARAYANA (2016)
Fundamentals of Biochemistry | Edition:II | S.Chand & Company | JAIN.J.L(2015)
Introduction to Practical Biochemistry | Edition:3 | Tata McGraw-Hill Education | David.T. Plummer AND Plummer.(2017)

Reference Books :

BIOCHEMICAL METHODS | Edition:2 | New Age International | SADASIVAM.S(2017)
Fundamentals of Biochemistry | Edition:1 | John Wiley & Sons Inc USA | DONALD VOET AND JUDITH G. VOET(2014)
LABORATORY MANUAL IN BIOCHEMISTRY | Edition:2 | NEW AGE INTERNATIONAL PUBLISHER | JAYARAMAN.J (2016)
Lehninger Principles of Biochemistry | Edition:3 | Mac millan Worth Publishers USA | DAVID.L NELSON AND MICHAEL.M.COX(2015)

Course Title : **BIOMOLECULES (P)**	Course Code : 13P
Semester : **I**	Course Group : **DSC-I**
Teaching Scheme in Hrs (L:T:P) : **0:0:4**	Credits : **2**
Map Code : H (PRACTICAL - EXPERIMENTS)	Total Contact Hours: **60**
CIA : **40 Marks**	SEE : **60 Marks**
Programme: **BSC-BC**	

1. Qualitative Analysis of Monosaccharides - Glucose and Fructose
2. Qualitative Analysis of Disaccharides - Sucrose and Maltose
3. Qualitative Analysis of Polysaccharides - Starch and Dextrin
4. Determination of Acid number of edible oil. -
5. Determination of saponification number of edible oil -
6. Estimation of unsaturated fat by iodine value of oil. -
7. Qualitative Analysis of Non-polar, Aliphatic Aminoacids - Methionine, Leucine
8. Qualitative Analysis of Aromatic Aminoacids - Tyrosine, Tryptophan
9. Qualitative Analysis of Polar, Uncharged Aminoacid - Serine
10. Qualitative Analysis of Charged Aminoacid - Histidine
11. Identification of protein by Biuret method -
12. Denaturation of protein using Egg -
13. Alkali hydrolysis on RNA
14. Effect of Denaturation of DNA

Course Title	: **ALLIED CHEMISTRY**	Course Code	: 13B
Semester	: **I**	Course Group	: **DSC-II**
Teaching Scheme in Hrs (L:T:P) : **4:0:0**		Credits	: **4 Credits**
Map Code	: **C(THEORY CONCEPTS)**	Total Contact Hours	: **60**
CIA	: **25 Marks**	SEE	: **75 Marks**
Programme: **BSC-BC**			

No	Course Outcome (Cos): After completion of this course, the students will be able to	PSOs	Cl. Ses	BLOOM'S TAXONOMY LEVEL
CO1	Understand the basics of thermodynamic laws and principle	PS01	12	U
CO2	Demonstrate the different aspects of chemical bonding	PS01	12	AN
CO3	Describe the basic rules of organic nomenclature	PS01	12	AP
CO4	Demonstrate titrimetry experiments and assessments of important factors that could affect the analytical result.	PS01	12	AP
CO5	Analyse the concepts of physical chemistry	PS01	6	AN
CO6	Acquire knowledge on Green chemistry	PS01	6	U

UNIT-1 (LECTURE HOURS: 12)

Thermodynamics

Thermodynamics - Introduction (Definition, Energy changes and Importance of Thermodynamics), Types of system (Open, Closed and Isolated), Types of process (Reversible, Irreversible and isothermal),Properties (Extensive and intensive),Laws of thermodynamics(First law and Second law, Enthalpy and Entropy), Free energy (Definition, Spontaneity, Gibbs free energy)

UNIT-2 (LECTURE HOURS:12)

Chemical bonding theory

Structure of atoms and molecules(Introduction), Types of chemical bonds (Ionic, Covalent, and Coordinate), Hybridization (Introduction, Salient Features of Hybridization, Shapes of hybrid orbital),Structure and polarity of water (Hydrogen Bond in Water, Buffer Solutions and Preparations)

UNIT-3 (LECTURE HOURS: 12)

Organic chemistry theory

Organic chemistry (Introduction, Classification, Nomenclature),Isomers and Isomerism (Types and Molecular Formula),Stereoisomerism(Definition and Classification - Optical and Geometric isomerism),Cyclic, Acyclic and Heterocyclic compounds (Introduction, Classification, Structure of Monocyclic, Acyclic and Heterocyclic compounds)

UNIT-4 (LECTURE HOURS: 12)

Volumetric methods theory

Solution (Definition of Ideal and Non-ideal Solutions, Units of Concentration, Molecular Weight, Equivalent Weight, Molarity, Molality, Normality, PPM and Percentage solution), Concepts of volumetric analysis (Introduction, Analysis and Titrant),Principles of acid base titration –(Introduction - Acids, Alkalies, Indicators and Buffers),Titration (Strong acid vs strong base, weak acid vs strong base, weak base vs strong acid), EDTA titration (Introduction , indicators for EDTA titration)

UNIT-5 (LECTURE HOURS: 12)

Physical chemistry theory

Electrochemistry(Definition, Electrolytes, Conductance, Equivalent Conductance, Specific Conductance, Molar conductance),Surface chemistry (Adsorption, Adsorbents, Physisorption and Chemisorption, Colloids, Gels, Emulsions, Electro Osmosis, Inhibition),Environmental chemistry (Concept and Scope of Environmental Biochemistry)

TEXTBOOK

1.B.R. Puri,L.R.Sharma and Madhan S.Pathania,Principles of physical chemistry,(2017),Vishal Publishing Co.
2.B.S. Bahl and Arun Bahl (2014) A textbook of organic chemistry ,S.Chand and Co.Ltd.
3.Principles of Inorganic chemistry | Edition:25 | Shobinlalnagin Chand & Co | Puri&Sharma(2014)
4.Text book of Organic Chemistry | Edition:28 | Sultan chand& sons | H.M. CHAWLA AND P.L. SONI (2014)

Reference Books:

1. Industrial chemistry | Edition:10 | Goel Publishing House Meerut, India | 2.B.K. SHARMA (2007) Chemistry | Edition:4 | Houghton miftin company new york
2. M.Satake,Y.Hayashi(2003),Colloidal and Surface chemistry,Discovery publishing house

Course Title : **ALLIED CHEMISTRY (P)**	Course Code : 13Q
Semester : **I**	Course Group : **DSC-II**
Teaching Scheme in Hrs (L:T:P) : **0:0:4**	Credits : **2**
Map Code : H (PRACTICAL - EXPERIMENTS)	Total Contact Hours: **60**
CIA : **40 Marks**	SEE : **60 Marks**
Programme: **BSC-BC**	

LIST OF EXPERIMENTS

UNIT - I

1. Demonstration of Thermodynamics - Enthalpy and Entropy
2. Preparation of buffer solutions – phosphate buffer and citrate buffer at different pH
3. Estimation of hardness of water
4. Qualitative Analysis of Aromatic compounds - Toluene and Naphthalene
5. Qualitative Analysis of Aliphatic compounds – Glucose, Fructose
6. Qualitative Analysis of Functional group-Carboxylic acid and tryptophan
7. Titration for Acid-Base - Strong Acid vs Strong Base, HCl Vs NaOH

   Strong base Vs weak acid,NaOH Vs CH3COOH(acetic acid)

   Weak base Vs strong acid,Ammonia (NH3) Vs H2SO4

8. Determination of alkalinity in water
9. COD (chemical oxygen demand)-Measure of wastewater quality.

Course Title	: **INSTRUMENTATION TECHNIQUES (T)**	Course Code	: 23A
Semester	: **II**	Course Group	: **DSC-III**
Teaching Scheme in Hrs (L:T:P) : **4:0:0**		Credits	: **4**
Map Code	: **C(THEORY CONCEPTS)**	Total Contact Hours	: **60**
CIA	: **25 Marks**	SEE	: **75 Marks**
Programme: **BSC-BC**			

No.	Course Outcome	PSOs	Cl. Ses	CL
CO1	Understand the terms like pH, pOH, acidic, basic, neutral solutions and universal indicator and acquire the practical skill.	PSO 1	12	U
CO2	Explore the use of suitable chromatographic or electrophoretic techniques for actual analytical problems.	PSO 2	10	AP
CO3	Motivating the students in handling the basic apparatus and instruments.	PSO 2	10	AP
CO4	Identifying the separation of proteins/peptides by selecting appropriate separation techniques .	PSO 2	8	R
CO5	Understand the theoretical principles of radioactivity and appreciate the uses of radioisotopes.	PSO 1	10	R

UNIT – I
(LECTURE HOURS: 10)

pH - Introduction (Definition and applications), Determination of pH (using indicators and pH meter),Electrode - Types(calomel electrode, silver-silver chloride electrode and standard hydrogen electrode),Henderson's Hasselbach equation(Relationship between pKa & pH)
Buffer -Acids & Bases(Buffer system, Bicarbonate Buffer system, Hb Buffer system)

UNIT – II
(LECTURE HOURS: 10)
Chromatography - Definition and its types, Paper Chromatography(Principle, Technique & applications),ThinLayer chromatography(Principle, Technique & applications),Gas Liquid chromatography(Principle, Technique & applications),Ion exchange chromatography(Principle, Technique & applications),HPLC(Principle, Technique & applications), Affinity Chromatography(Principle, Technique & applications), Molecular sieve Chromatography(Principle, Technique & applications)
UNIT – III
(LECTURE HOURS: 10)
Electrophoresis – Introduction(types and Factors affecting electrophoretic mobility),Agarose Gel Electrophoresis(Principle, technique and applications),SDS – PAGE(Principle, technique and applications),Immunoelectrophoresis(Principle, technique and applications),Centrifugation(Introduction, types of centrifugation and Rotor types),Ultra centrifugation(Working, applications and its types.)
UNIT – IV
(LECTURE HOURS: 10)
COLORIMETRY - Introduction (colour and absorption),Beer - Lambert's law(Principle & Laws),Working of a single cell photoelectric colorimeter (Principle instrumentation & applications), Spectrophotometry(Principle, Instrumentation and applications),Flourimetry(Principle, Instrumentation and applications)
UNIT – V
(LECTURE HOURS: 8)
ISOTOPES AND RADIOACTIVITY – Introduction(Tracer techniques),Radioactive decay and units of radio activity(Curie, Bequerel, specific activity),Detection and measurement of radio activity(GM counter, Scintillation counting, Autoradiography),Applications of radioisotopes, Biological and Medical sciences

Text Books :

Biophysical Chemistry | Edition:4 | Himalaya Pub. House | UpadhyayNath(2009)

Practical Biochemistry | Edition:3 | Tata McGraw-Hill Education | David Plummer(1988)

Reference Books :

Analytical Biochemistry | Edition:4 | Longman | David James Holme(1997)

Course Title : **INSTRUMENTATION TECHNIQUES (P)**	Course Code : 23P
Semester : **II**	Course Group : **DSC-III**
Teaching Scheme in Hrs (L:T:P) : **0:0:4**	Credits : **2**
Map Code : H (PRACTICAL - EXPERIMENTS)	Total Contact Hours: **60**
CIA : **40 Marks**	SEE : **60 Marks**
Programme: **BSC-BC**	

LIST OF EXPERIMENTS

UNIT - I

1. Determination of pH
2. Preparation of Buffers
3. Paper Chromatography – Circular
4. Thin Layer Chromatography.
5. Separation of compounds using centrifuge.
6. SDS-gel Electrophoresis – Demonstration
7. Estimation of Protein by FOLIN - CIOCALTEAU method
8. Estimation of Urea by DAM-TSC method
9. Industrial visit to learn techniques in radioactivity

Course Title	: **CELLULAR BIOCHEMISTRY(T)**	Course Code	: 23B
Semester	: **II**	Course Group	: **DSC-IV**
Teaching Scheme in Hrs (L:T:P) : **4:0:0**		Credits	: **4**
Map Code	: **C(THEORY CONCEPTS)**	Total Contact Hours	: **60**
CIA	: **25 Marks**	SEE	: **75 Marks**
Programme: **BSC-BC**			

OBJECTIVES :

CO1 Recall the history of cytology and draw the structure of cell organelles and locate its parts along with functions

CO2 Design the model of a cell.

CO3 Distinguish the structure of prokaryotic and eukaryotic cell.

CO4 Explain the organization of Genes and chromosomes, chromosome morphology and its aberrations

CO5 Distinguish the types and mechanism of mutations.

CO6 Compare and contrast the events of cell cycle and its regulation

UNIT - 1 (LECTURE HOURS: 20)

Cell biology

Cell membrane (Structure and functions- Fluid mosaic model, Unit membrane model),Membrane transport (Active and Passive transport-Endocytosis and Exocytosis-Pinocytosis and Phagocytosis),Cell structure (cytoplasm -structure – composition),Cellular organelles (Nucleus-Mitochondria-Golgi bodies-Lysosomes- Endoplasmic reticulum-Peroxisomes-Plastids-Vacuoles-Ribosomes),Cytoskeleton (structure and function)

UNIT - 2 (LECTURE HOURS: 16)

Cell division and cell growth

Cell division (Mitosis and Meiosis ,reductive division), Cell cycle (Phases of cell cycle -cell cycle regulation,cell cycle check points)

UNIT - 3 (LECTURE HOURS: 20)

Cell communication and signaling

Cell cell interaction (Cell communications - electric and chemical-signaling mechanisms - cell surface receptors), Basic aspects of intercellular communication (Intracrine, autocrine, paracrine, endocrine & neuronal, endocrine communications)

UNIT - 4 (LECTURE HOURS: 20)

Biochemical energetics

Biological oxidation(High energy compounds-Redox potential),ETC (electron transport chain-oxidative phosphorylation-inhibition of electron transport chain).

UNIT - 5 (LECTURE HOURS: 20)

Regulation of cell growth

Cell death (apoptosis-necrosis),Tumor (Types-causes and invasion-mutation-viral infection-tumor viruses- DNA and RNA viruses-life cycle of virus and its regulation-senescence-proliferation control)

Text Books :

Cell and Molecular Biology | Edition:8 | Lippincott Williams and Wilkins, Philadelphia | De Robertis, E.D.P. AND De Robertis, E.M.F. (2010) The Cell: A Molecular Approach | Edition:5 | Sunderland, Mass. Sinauer Associates, Inc. | Cooper, G.M AND Hausman, R.E(2009)

Reference Books :

Cell and Molecular Biology: Concepts and Experiments | Edition:6 | John | Karp, G(2010) Essential Cell Biology | Edition:4 | Garland Science | Bruce Alberts AND Dennis Bray (2013)

Course Title	: **CELLULAR BIOCHEMISTRY(P)**	Course Code	: 23Q
Semester	: **II**	Course Group	: **DSC-IV**
Teaching Scheme in Hrs (L:T:P) : **0:0:4**		Credits	: **4**
Map Code	: H (PRACTICAL - EXPERIMENTS)	Total Contact Hours	: **60**
CIA	: **25 Marks**	SEE	: **75 Marks**
Programme: **BSC-BC**			

List of Experiments

Unit - I

1. Microscopic view of prokaryotic cells using staining techniques. - Simple staining
2. Microscopic view of prokaryotic cells using staining techniques - Gram staining
3. Mitotic cell division by using - onion root tip
4. Extraction of protein - Total cellular protein
5. Separation of nucleic acid bases - By paper chromatography.
6. Preparation of cell culture media - Preparation of cell culture media

Cellular separation by using centrifugation technique. - Cellular separation by using centrifugation technique.

Course Title	: **ENZYMOLOGY**	CourseCode	: 33
Semester	: **III**	CourseGroup	:**DSC-V**
Teaching Scheme in Hrs (L:T:P) : **4:0:0**		Credits	: **6**
MapCode	:**C(THEORY CONCEPTS)**	TotalContact Hours: **60**	
CIA	: **25 Marks**	SEE	: **75Marks**
Programme: **BSC-BC- BIOCHEMISTRY**			

Course outcome: (Cos)

No.	Course Outcome (Cos): After completion of this course, the students will be able to	POs & PSOs	Cl. Ses	CL
CO1	Describe the Nomenclature and Classification of enzymes according to International Union of Biochemistry (IUB)	PSO 1	10	A
CO2	Illustrate the enzyme kinetics and enzyme inhibition in enzyme catalytic reaction.	PSO 2	10	R
CO3	Discuss the structure and functions of Coenzymes and role of coenzymes in various metabolic reaction.	PSO 2	10	U
CO4	Describe the methods of Immobilizations and its applications in various Industrial aspects.	PSO 3	10	U
CO5	Discuss the Biosensor, various types and its application in clinical aspects.	PSO3	4	R
CO6	Describe the role of enzymes in Medicine , Food and Textile industry.	PSO3	4	U

UNIT- I (Lecture Hours: 24)

ENZYME :INTRODUCTION AND CLASSIFICATION:

Enzyme: Introduction – (Properties and History) & Nomenclature - According to IUB system. Digit number, Suffix "ase" Classification - Six main classes, (Definition & suitable examples) Active site- (Introduction & Mode of action) - Salient features of active site residues. Binding sites and catalytic sites. Lock and Key model – (Definition, mechanism & diagrammatic presentation) Induced fit model – (Definition, mechanism & diagrammatic presentation)

UNIT –II(Lecture Hours: 24)

ENZYME KINETICS:

Steady state theory – (Introduction, Rate of formation of ES, Graph) Michaelis-Menton equation, Km - Michaelis constant.- (Introduction and Derivation.) LB Plot - LB Plot Graph. Hanes plot - Based on the MM equation. (Introduction & Derivation) Enzyme inhibition & factors affecting enzyme activity – (Introduction and Mechanism) Reversible inhibitors, Irreversible inhibitors. Competitive, Non-competitive & Uncompetitive inhibition – (Mechanism with examples) Effect of various factors affecting enzyme activity - Vital role in metabolic regulation. (Substrate, enzyme, temperature & PH, Saturation point, Vmax, Km, Optimum PH & Temperature)

UNIT –III (Lecture Hours: 24)

CO ENZYME :

Coenzyme :(Introduction and Properties) Nicotinamide coenzymes - NAD+ and NADP+- (Structure and Function) .Flavin nucleotides - FMN and FAD- (Structure and Function) TPP – Thiamine Pyro Phosphate- (Structure and Function). PP- Pyridoxal Phosphate- (Structure and function) Biotin- (Structure and Function) Folic acid- (Structure and Function) Isoenzymes- (Introduction and properties) Multienzyme complex – (Definition & examples) Pyruvate dehydrogenase – (Mechanism & reactions)

UNIT- IV(Lecture Hours: 24)

ENZYME IMMOBILIZATION

Enzyme Immobilization (Introduction – Definition.) Methods of immobilization – (Principle and Types) Adsorption, Covalent bonding, Cross linking. Encapsulation, Entrapment, Advantage of immobilization process – (Advantage in immobilization techniques in industry aspects) Applications of immobilized enzymes – (Components of analytical systems, continuously operated process)

UNIT – V (Lecture Hours:24)

ENZYME SENSOR

Enzyme Biosensor: Introduction – (Definition and Principle) Types and Applications - Colorimetric, Optical & immunosensor. (Principle and application) Enzyme in Industrial aspects – (Role in Food & Textile industry) Role of enzyme in medicine - Treatment of various diseases (Asparginase, Collagenase, Urokinase, Streptokinase) Food and drink industries – (Baking of bread, brewing industries.)Other industries – (Washing powders, Immobilized glutamate dehydrogenase linked to alcohol dehydrogenase) Role of enzymes in Free Radical Scavenging – (SOD, GSH Reductase, Catalase, Etc.)

Text Books :

T1 - Fundamentals of Enzymology | Edition:2 | Oxford Science Publications, Newyork. | Nicholas c. price, Lewis stevens 2010

T2 - Enzymes - Biochemistry, Biotechnology, Clinical chemistry. | Edition:3 | East west Press Pvt Ltd, New Delhi. | Trevor palmer. and Philip bonner (2014)

Reference Books :

R1 – Lehninger Principles of Biochemistry, David. L.Nelson, Michael M. Cox . Eight edition ,2021.

R2- Harper's Illustrated Biochemistry, Victor Rodwell, David Bender, Kathleen Botham and Peter Kennelly, Thirty First Edition -May-2018.

R2- Enzyme Chemistry: Impact and Applications, 3rd Edition by Colin J Suckling and Gibson Colin .L -2010

Course Title	: **ENZYMOLOGY**	Course Code : 43Q
Semester	: **III**	Course Group : **DSC-V**
Teaching Scheme in Hrs (L:T:P) : **0:0:4**		Credits : **2 Credits**
Map Code	:**H(PRACTICAL EXPERIMENTS)**	Total Contact Hours **60**
CIA	: **40 Marks**	SEE : **60 Marks**
Programme: **BSC-BC**		

List of experiments

Unit I

1.Determine the pH on the activity of Salivary Amylase

2. Determine the Temperature on the activity of Salivary Amylase

3. Determine the pH on the activity of Alkaline Phosphatse

4.Determine the Temperature on the activity of Alkaline Phosphatse

5. Determine the pH on the activity of Catalase

6Determine the Temperature on the activity of catalase

7 Determine the pH on the activity of Acid Phosphatase

8 Determine the Temperature on the activity Acid Phosphatse

9.Determine the SOD Enzyme activity

10.Determination of GSH Reductase activity

Course Title	: **INTERMEDIARY METABOLISM**	Course Code	:
Semester	: **III**	Course Group	: **DSC-VI**
Teaching Scheme in Hrs (L:T:P) : **4:4:0**		Credits	: **4 Credits**
Map Code	: **C(THEORY CONCEPTS)**	Total Contact Hours	: **60**
CIA	: **25 Marks**	SEE	: **75 Marks**
Programme: **BSC-BC**			

No.	Course Outcome	POs & PSOs	Cl. Ses	CL
CO1	Discuss the general design of metabolic pathways based on bioenergetic principle.	PSO 1	10	U
CO2	Describe the process involved in carbohydrate metabolism, Glycolysis, Glycogenesis & Glycogenolysis.	PSO 2	9	U & An
CO3	Understanding the mechanisms involved in Electron Transport Chain.	PSO 2	10	R & U
CO4	Illustrate the process of Biosynthesis of fatty acid oxidation in lipid metabolism	PSO 2	10	U & An
CO5	Describe the process involved in the metabolism of protein.	PSO 3	5	U & An
CO6	Describe the Synthesis & Degradation of Purine and Pyrimidine nucleotides.	PSO 2	4	U & An

Pedagogy
The teaching methodology is through lectures and PowerPoint presentation.

UNIT-I (LECTURE HOURS: 20)
Metabolism –(Metabolism- Concepts of anabolism and catabolism)
Carbohydrate metabolism -Glycolysis (Pathway and Energetics). TCA cycle – (Pathway and Energetics).Glycogenolysis-(Reactions of Glycogen phosphorylase, Glucan transferase and Glucose phosphatase).Glycogenesis –(Reactions of Glucokinase, Formation of UDPG glucose, Glycogen synthase). Gluconeogenesis- (Reactions of Transamination, Deamination, Propionate metabolism).HMP shunt – (Oxidative and non oxidative phase reactions).

UNIT-I I(LECTURE HOURS: 20)
Biological Oxidation –(Biological oxidation(Reactions, Redox potential, High energy compounds).Electron Transport Chain – (Electron carrier, sites of ATP production, inhibitors of ETC).Oxidative phosphorylation –(Structure of ATPase complex, Chemiosmotic theory, inhibitors).

UNIT-III (LECTURE HOURS: 18)

Lipid Metabolism - (Oxidation of fatty acids – alpha, beta and omega oxidation).
Biosynthesis of Saturated and Unsaturated fatty acids – (Reactions of Acetyl ACP, Fatty acid synthase)
Biosynthesis of Phospholipids – (Phosphotidyl choline, ethanolamine and serine).
Metabolism of Cholesterol – (Conversion of acetate to mevalonate to isoprene to squalene to cholesterol).

UNIT-IV(LECTURE HOURS: 18)

Protein Metabolism –(General reactions of amino acid - Deamination, Transamination, Decarboxylation).**Urea cycle** – (Reactions and intermediates of urea cycle).Catabolism of carbon skeleton of aminoacids- (Glycogenic and ketogenic).Integration of metabolism – (Interrelation between Carbohydrate, Fat and Protein metabolism).

UNIT-V (LECTURE HOURS: 20)

Nucleic acids (Introduction - Nucleosides & Nucleotides).**Metabolism of Purines (Biosynthesis of purine nucleotides Denovo synthesis** - Synthesis of purines AMP & GMP from ribose 5 phosphate).**Biosynthesis of purine nucleotides salvage pathways** – (Conversion of purines their nucleosides & their deoxyribonucleotides into mononucleotides).**Metabolism of pyrimidines – (Biosynthesis of pyrimidine nucleotides-** Denovo synthesis).**Biosynthesis of pyrimidine nucleotides-(salvage pathways** - Deoxyribonucleosides of uracil & cytosine are salvaged).

Text books:

1. Fundamentals of Biochemistry, 2017 J.L.Jain, S.Chand publications.
2. Principles of Biochemistry, 2011 Nelson, David.I and Cox, M.M.Macmillian worth, NY.
3. Textbook of Biochemistry, 1995 Lubert Stryer, 4th Edition, W.H.Freeman & Co. (New edition)
4. Biochemical Methods 2014, Sadasivam and A. Manickam, Second Edition. (New edition)
5. Laboratory Manual in Biochemistry 2013, J.Jayaraman

Reference books

1. Textbook of Biochemistry, Harper, Robert K.Murray, Daryl k.Graner, Peter A.Mayes Rodwell,2018, Rev edition.
2. Principles of Biochemistry, Zubay Geoffrey, McGraw publishers, 2017, 5th edition.
3. Textbook of Biochemistry, 2016 Lubert Stryer, 4thEdition, W.H.Freeman & co.

Course Title : **INTERMEDIARY METABOLISM**	Course Code :
Semester : **III**	Course Group : **DSC-VI**
Teaching Scheme in Hrs (L:T:P) : **0:0:4**	Credits : **2 Credits**
Map Code : H (THEORY TECHNOLOGY)	Total Contact Hours: **48**
CIA : **40 Marks**	SEE : **60 Marks**
Programme: **BSC-BC**	

1. Estimation of Total Carbohydrates by Anthrone method.
2. Estimation of Glycogen by Anthrone method.
3. Estimation of Iron by Wong's method.
4. Estimation of Hydrogen peroxide by colorimetric method.
5. Determination of Total cholesterol from blood sample by KIT method.
6. Extraction of lecithin from egg yolk.
7. Separation of Glycine, Methionine by TLC method.
8. Estimation of Urea by DAM – TSC method.
9. Separation of DNA by Agarose Gel Electrophoresis.
10. Estimation of RNA by Orcinol method.

Course Title : **MOLECULAR BIOLOGY**	Course Code :
Semester : **III**	Course Group : **DSE - I**
Teaching Scheme in Hrs (L:T) : **5:1**	Credits :4
Map Code: C(THEORY)	Total Contact Hours: 72
CIA: **25 Marks**	SEE # : **75 Marks**
Programme: **BSC-BC**	# - **Semester End Exam**

No	Course Outcome (Cos): After completion of this course, the students will be able to	Pos &PSOs	Cl.Ses	BLOOM'S TAXONOMY LEVEL
CO1	Explain the basic concepts of replication in DNA.	PO1& PS01	12	U
CO2	Explore the DNA repair mechanism and types of DNA damage.	PO1& PS01	12	R
CO3	Describe the use of Prokaryotic transcription and its regulation.	PO1& PS01	14	U
CO4	Explain about eukaryotic transcription and post transcriptional processing.	PO1& PS01	14	R
CO5	Understand the concepts of both prokaryotic and eukaryotic translation.	PO1& PS01	12	U
CO6	Explain about Genetic code and its clinical significance.	PO1& PS01	10	R

UNIT-I

REPLICATION

DNA Replication -Types of replication (Semiconservative, Conservative, Dispersive) Meselson and Stahl experiment (E.coli, heavy isotope, N^{15}, N^{14}). Replications in circular chromosomes - Plasmid replication (Initiation, Elongation,Termination). Rolling circle model (Initiation, helicase enzyme, Topoisomerase Single strand binding proteins, Elongation, Eukaryotes, Prokaryotes, Termination, ligase enzyme, circular plasmid molecule). Theta model (unwinding replication, Lagging strand, Leading strand). Replication of mitochondrial DNA (Nuclear DNA, mitochondrial DNA, Replication of mt- DNA with diagram).

DNA replication in prokaryotes (Initiation, Enzymes and proteins involved in replication -helicase enzyme, Topoisomerase, Single strand DNA binding Proteins, DNA polymerase IV, V, Elongation, DNA polymerase I, II, III, Leading strand, Ladding strand, Okazaki fragment, Termination, Terminus sequence). Inhibitors of replication (Novobiocin, Nalidixic acid, Ciprofloxacin, Etoposide and Adriamycin).

Eukaryotic replication – (Initiation, ORC, G1 phase, Pre – S phase, SPhase, Elongation, DNA polymerase alpha, epsilon, delta, Termination, Telomerase enzyme).

UNIT-II

DNA Repair and Recombination Mutations

DNA damage – (Dependent on various factors- cell type, age of the cell, extracellular environment,

sources of damage). Types of DNA damage (Types- oxidative damage, Hydrolytic damage, DNA strand breaks).DNA repair mechanism –DNA repair (Definition, Mechanism - Nucleotide excision repair- distort the DNA double helix). Base excision repair- (changes to DNA bases, Glycosylases DNA polymerase, DNA ligase). Mismatch repair (Mut S, Mut L, Mut H, Enzymes). Recombination repair (Homologous, Site- specific and Transposition). Double stranded break repair (Homologous,non-homologous). SOS response- (Rec- A Protein, Lex- A repressor, error – prone repair system). Recombination – Homologous recombination (Holliday model). Site specific recombination (Lysogenic cycle, integrative mechanism) .

UNIT-III

Prokaryotic transcription and regulation – Transcription (Definition, Gene structure, Promoter region, RNA coding sequence, Terminator region, Initiation, Elongation, Termination).

Termination of transcription - Rho dependent (Definition, type 1 terminator, Hair pin loop). Rho independent termination (Definition, type 2 terminator, RNA polymerase).

Regulation of transcription in prokaryotes – lac operon(Definition, operon model, lac Z, lac Y, lac a, positive and negative regulation). Arabinose operon (Three structural genes, enzymes arabinose model, positive and negative regulation). Trytophan operon (trp E, trp D, trpC, trp B and trp A, structure of trp operon, Negative control).

UNIT-IV

Eukaryotic transcription and regulation-(Eukaryotic gene control and RNA polymerases, regulatory sequence in eukaryotes, activators and repressors of transcription, transcriptional factors, Transcription initiation by RNA polymerase I, II and III, Elongation, RNA polymerase, Termination).Transcriptional regulation in eukaryotes –(Types- hormonal steroid hormone receptors, phosphorylation - Stat proteins). Post transcriptional processing –(Definition, mRNA, rRNA and tRNA, Alternative splicing, RNA editing).

UNIT-V

Translation and Genetic code - Genetic code (salient features of genetic code, Wobble hypothesis).Components of protein synthesis –(mRNA, ribosomes and tRNA).

Protein synthesis in bacteria and eukaryotes –(initiation, elongation, termination).Post-translational modifications (prokaryotes and eukaryotes). Inhibitors of protein synthesis-(Protein targeting - signal sequence hypothesis, targeting of proteins to different compartment of mitochondria, ER, plasma membrane, lysosomes, peroxisomes and chloroplast).Molecular basis of mutation- Types of mutation (missense, nonsense, silent, point and Frameshift mutation)

Text Books

1. Molecular biology of the Gene, James Watson, 7th Edition, 2017.
2. Principles of Molecular biology, VeeraBalaRastogi, 2nd Edition (Rev) 2016.
3. Freifelder's Essentials of Molecular biology, Malacinski, Jones and Bartlett, 4th Edition, 2015.
4. Molecular biology, W.H.Freeman and Co. Weaver, R.F. 2015.

Reference Books

1. Karp's Cell & Molecular biology , Gerald Karp, Janet Iwasa, Wallace Marshall, 9th Edition, 2019.
2. Molecular Cell Biology, Harvey Lodish, 8th Edition, 2018.
3. Molecular biology of the Gene, Watson, Steitz, Hopkins,Roberts, 4th Edition , 2016.

Course Title	: **PLANT AND MICROBIAL BIOCHEMISTRY**	Course Code	:
Semester	: **IV**	Course Group	: **DSC-VI**
Teaching Scheme in Hrs (L:T:P) : **4:0:0**		Credits	: **4 Credits**
Map Code	: **C(THEORY CONCEPTS)**	Total Contact Hours	: **48**
CIA	: **25 Marks**	SEE	: **75 Marks**
Programme: **BSC-BC**			

CO1: To increase your awareness and appreciation for plants in your environment, as well as to understand their diverse physiological functions.

CO2: Understand the mechanisms of nitrogen fixation and its importance in agricultural production and economics

CO3: To help you develop the knowledge and confidence to pursue advanced courses in plant biology, and to conduct your own plant physiology research.

CO4: Elucidate the growth and growth factors of micro-organisms

CO5: Provide knowledge about the metabolic pathways and helps to acquire knowledge about anaerobic respiration of microorganisms.

UNIT: 1

PHOTOSYNTHESIS AND TRANSPORT SYSTEM IN PLANT

PHOTOSYNTHESIS – Definition, Structure of Chloroplast, Pigments of Photosynthesis, Role of Carotenoids, Factors Affecting Photosynthesis

PHOTOSYNTHETIC APPARATUS - Photosystems I and II, their location; Hill reaction, Photosynthetic Electron Transport and Generation of NADPH & ATP, Cyclic and Non-cyclic photo phosphorylations, CAM cycle,C_3 and C_4 cycle.

TRANSPIRATION – Definition, Mechanisms of Stomatal Opening, Factors Affecting Transpiration.

UNIT: 2

NITROGEN METABOLISM IN PLANTS

NITROGEN FIXATION -Basic concepts, Potential scope in crop improvement, Nitrate and Ammonia assimilation.

NITROGEN CYCLE - Symbiotic and Non-symbiotic nitrogen fixation, Nitrate release of sulfur from organic compounds, nif genes.

AMMONIFICATION, NITRIFICATION AND DENITRIFICATION – Introduction.

UNIT : 3

PLANT TISSUE CULTURE AND REGULATORS

GERMINATION -Seed Germination , Concept of Totipotency

***INVITRO* CULTURE** - types of *in vitro* culture – Meristem culture, Organ culture, Protoplast culture and Protoplast fusion, Embryo culture and Embryo rescue, Initiation and maintenance of *in vitro* cultures (callus and organ cultures). Embryogenesis and Organogenesis, Micropropagation, Application of organ culture for Secondary Metabolite Production.

GROWTH REGULATORS – Auxins, Gibberellins, Cytokinins, Abscicic acid, Ethylene, Structure, Synthesis and Function of growth regulators.

UNIT: 4

MICROBIAL GROWTH AND ITS FACTORS

MICROBIAL GROWTH: Definition of growth, balanced and unbalanced growth, growth curve, growth-generation time, specific growth rate, batch and continuous culture.

FACTORS INFLUENCING MICROBIAL GROWTH: Temperature pH-classification based on pH ranges and adaptations, solutes and water activity, oxygen concentration, radiation and pressure.

UNIT: 5

MICROBIAL METABOLISM AND ANAEROBIC RESPIRATION

MICROBIAL METABOLISM

Metabolism, EMP, HMP shunt, TCA cycle

ANAEROBIC RESPIRATION:

Compounds involved in anaerobic respiration, fermentation, fermentation of alcohol, acid fermentation and lactic acid fermentation.

References:

1. Fundamentals of plant physiology, V.K. Jain (2004) edition :11th ,S.Chand &Company Ltd
2. Buchanan, B.B., Gruissem,W. and Jones, R.L., (2002); Biochemistry and Molecular Biology of Plants; ISBN: 978-0-943088-39-6; American Society of Plant Physiologists, 2nd Indian Reprint (2007), I.K. International Pvt. Ltd. N. Delhi.

3. Lincoln Taiz, Eduardo Zeiger, (2010); Plant Physiology: International Edition (5thEdition); ISBN-13: 978-0123849861, Elsevier Academic Press Publication, USA
4. Sathyanarayana, B.N (2007); Plant Tissue Culture : Practices and New Experimental Protocols; I.K.International Pvt. Ltd.
5. Microbiology, Pelczar J RKrieg R(1986) edition 1,McGraw Hill Book Company.
6.Prescott's Microbiology ,Joanne Willey (2013) ,edition 7 , McGraw Hill Book Company.

Course Title	: **PLANT AND MICROBIAL BIOCHEMISTRY**	Course Code	:
Semester	: **IV**	Course Group	: **DSC-VI**
Teaching Scheme in Hrs (L:T:P) : **0:0:4**		Credits	: **4 Credits**
Map Code	: **C(THEORY CONCEPTS)**	Total Contact Hours	: **48**
CIA	: **25 Marks**	SEE	: **75 Marks**
Programme: **BSC-BC**			

1. Determination of microbial growth – Turbidity method
2. Isolation and purification of bacteria – serial dilution method
3. Enumeration of bacteria from soil, water and air
4. Plating techniques- Spread plate, pour plate and streak plate culture and media preparation
5. Principles of tissue culture and media preparation
6. Green synthesis of Silver Nanoparticles.
7. Estimation of chlorophyll content in plants

Course Title	: **CLINICAL BIOCHEMISTRY**	Course Code	:
Semester	: **IV**	Course Group	: **DSC-VI**
Teaching Scheme in Hrs (L:T:P) : **4:0:0**		Credits	: **4 Credits**
Map Code	: **C(THEORY CONCEPTS)**	Total Contact Hours	: **48**
CIA	: **25 Marks**	SEE	: **75 Marks**
Programme: **BSC-BC**			

OBJECTIVES :

CO1: Understanding the pathophysiology and of the most prevalent diseases.

CO2 Discuss the fundamental biochemistry knowledge related to health

CO3 Evaluate the abnormalities which commonly occur in the clinical field

CO4: Discuss the fundamental biochemistry knowledge related to lipid metabolism

CO5; To understand the basic functional test

UNIT I

Basic concepts of clinical Biochemistry

Specimen collection and processing (blood ,urine and feaces), anti-coagulant and preservatives for blood and urine. Transport of specimens)Hematology (Total and differential counting of leukocytes). RBC counting. Prothrombin time and hematocrit Types of anaemias, hemophilias.

Practical1. Separation of serum and plasma from blood2. Estimation of haemeogloblin concentration in blood

UNIT II

DISORDERS OF CARBOHYDRATE METABOLISM

Homeostatsis(Regulation of blood sugar) Diabetes mellitus and Diabetes insipidus (hypoglycemia, hyperglycemia fasting blood glucose and post pandrial glucose level). Ketonuria, ketosis.Galactosemia (causes, symptoms and treatment) Glycosuria (types of glycosuria) Glycogen storage disease (introduction, types, clinical manifestation, symptoms and treatment)

Practicals;Estimation of Glucose by anthrone method 2. Estimation of Glycogen by anthrone method

UNIT III

DISORDERS OF AMINOACIDS AND NUCLEIC ACID METABOLISM

Phenyl ketonuria Cystinuria, alkaptonuria, and tyrosinemia (Etiology and clinical manifestation) Maple syrup urine disease (MSUD) (Etiology and clinical manifestation and treatment) Hartnup disease (Etiology and clinical manifestation and treatment) Fanconi's syndrome, (Etiology and clinical manifestation and treatment) Albinism,(Etiology and clinical manifestation)

DISORDER OF PURINE METABOLISM (Hypo and Hyperuricemia (Etiology and clinical manifestation) Gout (types clinical manifestation and treatment). DISORDER OF PYRIMINDINE METABOLISM Orotic acid uria (Etiology and clinical manifestation and treatment)

Practicals.Estimation of urea by TSC DAM method method 2.Estimation of RNA by orcinol method

UNIT IV

Diseses related to lipid metabolism:

Disorder associated with lipoproteins Hyperlipoprotenimea & hypo protein lipoprotenimea(Introdcution, clinical manifestation and treatment)

Atherosclerosis(Introdcution, clinical manifestation and treatment) Fatty liver(Introdcution, clinical manifestation and treatment) Lipid storage disease Taysach's disease (Introdcution, clinical manifestation and treatment) Niemann - Pickk diseases(Introdcution, clinical manifestation and treatment)

Practical

Estimation of the total amount of lipids by colorimetry method 2.Estimation of triglyceride

UNIT V

Liver Function tests

(PT, jaundice-types, clinical features and test based on bile pigments level in blood and urine, plasma changes) Gastric function tests

(Collection of gastric contents, examination of gastric residium, FTM, stimulation tests, tubeless gastric analysis) Renal function tests

(Clearance tests-urea, creatinine, inulin, PAH test, concentration and dilution tests).

Reference book

1.M.N. Chatterjee & Ranashinde, Text Book of Medical Biochemistry. Jaypee Brothers Medical Publisher (P) Ltd. 6th edition (2006).

2. Carl A. Burtis, Edward R. Ashwood and David E. Bruns (eds), Tietz Textbook of Clinical Chemistry and Molecular Diagnosis. 5thedition, 2012.

3. Thomas M. Devlin, Biochemistry with clinical correlation. John Wiley & Sons. 7thEd, 2010.

4.Allan Gaw, Michael J. Murphy, Rajeev Srivastava, Robert A. Cowan, Denis St. J. O'Reilly, Clinical Biochemistry, 5th edition, 2013. 3. Graham Basten, Introduction to Clinical Biochemistry, Interpreting Blood Results. Book Boon. 2 nd edition, 2011.

Course Title	: **CLINICAL BIOCHEMISTRY**	Course Code	:
Semester	: **IV**	Course Group	: **DSC-VI**
Teaching Scheme in Hrs (L:T:P) : **0:0:4**		Credits	: **4 Credits**
Map Code	: **C(THEORY CONCEPTS)**	Total Contact Hours	: **48**
CIA	: **25 Marks**	SEE	: **75 Marks**
Programme: **BSC-BC**			

Separation of serum and plasma from blood

Estimation of haemeogloblin concentration in blood

Estimation of Glucose by anthrone method

Estimation of Glycogen by anthrone method

Estimation of urea by TSC DAM method method.

Estimation of RNA by orcinol method

Estimation of the total amount of lipids by colorimetry method

Estimation of triglyceride

Course Title	: **CLINICAL RESEARCH**	Course Code	:
Semester	: **IV**	Course Group	: **DSE-II**
Teaching Scheme in Hrs (L:T:P) : **4:0:0**		Credits	: **4 Credits**
Map Code	: **D(THEORY CONCEPTS)**	Total Contact Hours	: **48**
CIA	: **25 Marks**	SEE	: **75 Marks**
Programme: **BSC-BC**			

CO1 - To understand the basic concept of Clinical research
CO2 - To remember the drug development process specially the phases of clinical trials
CO3 - To learn the students on conceptualizing, designing, conducting, managing and reporting
CO4 - To understand the ethical requirement for conducting clinical trials
CO5 - To know how to protect the rights, safety and wellbeing of trial subjects

UNIT-I
INTRODUCTION TO CLINICAL RESEARCH:
Historical Perspective
Nuremberg Code, Thalidomide study, Nazis Trials, Tuskegee Syphilis Study, The Belmont Report
The declaration of Helsinki
Origin and Principles of International Conference on Harmonization - Good Clinical Practice (ICH-GCP) guidelines
Definition
Types and and Design of clinical trials –
Prevention trials, diagnostic trials, treatment trials.
Randomized trials and uncontrolled trials, Crossover and factorial designs, Equivalence, non-inferiority and superiority trials
UNIT-II
PHASES OF CLINICAL TRIALS- Phase 1, Phase 2, Phase 3, Phase 4
PRINCIPLES OF CONTROLLED CLINICAL TRIALS- Clinical trial design (observational and interventional) protocol, consent in clinical trials, placebo, bias and methods to prevent bias
UNIT-III
CLINICAL RESEARCH MANAGEMENT
Clinical data management (CDM)- handling of data/ information, clinical trial management systems, Data safety monitoring board and Committees
Clinical Trial Monitoring- various types of monitoring plans and monitoring visits, Investigators, Study Coordinator, Sponsor, Monitor, Contract Research Organization
Project management Documentation, Monitoring, Audits and Inspections
UNIT-IV
ETHICS IN CLINICAL RESEARCH
Developing clinical trial protocols
Institutional Review Board/ Independent Ethics committee-formation and working procedures
Declaration of Helsinki and Informed consent-process and procedures
HIPAA- A new requirement to clinical study process.
Pharmacovigilance-safety monitoring in clinical trials.
UNIT-V
Regulations Governing Clinical Trials
ICH –GCP guidelines
Clinical Research regulations in India – CDSCO guidelines
Clinical trial application requirements in India- IND, ANDA, AADA and NDA
USFDA regulations to conduct drug studies

Clinical Research regulations in UK – Medicines and Healthcare Products Regulatory Agency (MHRA)

Clinical Research regulations in Europe (EMEA)

REFERENCES

1. Handbook of clinical research. Julia Lloyd and Ann Raven Ed. Churchill Livingstone c.

2. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.

3. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.

4. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A. Rozovsky and Rodney K. Adams

5. Clinical trial of drugs and biopharmaceuticals | Edition:- | CRC Press | CHI-JEN LEELUCIA H LEE(2006)

Course Title	: **BIOCHEMICAL PHARMACOLOGY**	Course Code	:
Semester	: **V**	Course Group	: **DSC-IX**
Teaching Scheme in Hrs (L:T:P) : **4:0:0**		Credits	: **4 Credits**
Map Code	: **C(THEORY CONCEPTS)**	Total Contact Hours	: **48**
CIA	: **25 Marks**	SEE	: **75 Marks**
Programme: **BSC-BC**			

No.	Course Outcome	POs & PSOs	Cl. Ses	CL
CO1	To understand the basic concepts of pharmacology	PSO 1	600	U
CO2	To explain the principle of absorption, distribution, metabolism and excretion of drugs	PSO 2	600	Ap
CO3	To understand the mode of action of a drug, and the method by which it can be synthesized	PSO 2	600	Ap
CO4	To remember the causes of disease and effects of existing drugs and development of new modes of treatment.	PSO 2	480	R
CO5	To understand the mechanism of drug abuse	PSO 1	600	R

UNIT - I

DRUGS

Introduction to drugs: Pharmacodynamics, Pharmacokinetics, Pharmacognosy, Pharmacy, The nature of drugs: stimulants, depressants, painkillers and hallucinogens Sources of drugs - Plants, Animals, Mineral, Synthetic, Semi-synthetic sources, Microbiological sources, Genetic engineering. (rDNA technology) Routes of drug administration - Oral, Injections, (Subcutaneous, Intramuscular, Intradermal, Intravenous, Intra-arterial, Intrathecal, Intraperitoneal) Subcutaneous, Transmucosal) SubcutaneousCell surface receptors - Ion channels, G protein coupled receptors, Tyrosine kinases. Drug receptor interaction - Agonist, Antagonist, Inverse agonist, partial agonist.

UNIT - II

ADME

Absorption - Passive Diffusion, (Facilitated passive diffusion of lipid soluble substances) Acitve transport (water soluble substances), pinocytosis (fluid or particles are engulfed by a cell). Distribution - Plasma,(blood and tissue binding proteins, pH, and perfusion) Interstitial fluid compartment, transcellular fluid compartment, cellular fluid compartment (Volume of Distribution). Metabolism – (Site of action, cytochrome P450) Phase I – (Oxidation, reduction and hydrolysis Mixed function oxidases - Epoxidation, hydroxylation, O, N and S-Dealkylation, N-Dealkylation). Phase II. – (Sulphation, methylation, Aminoacid conjugation and glutathione conjugation).

Elimination - Renal system (Passive glomerular filtration and Active Tubular secretion).

UNIT - III (LECTURE HOURS: 20)

CHEMOTHERAPY

Introduction - Definition and history. Antibacterial - Sulphonamides, Penicillin, Streptomycin, tetracycline. (source, structure, mechanism of action, therapeutic uses and adverse effects) Antiviral – Hydroxychloroquine and Ivermectin (source, structure, mechanism of action, therapeutic uses and adverse effects) Antimalarial - Life cycle of malaria,Quinine and chloroquine(source, structure, mechanism of action, therapeutic uses and adverse effects) Anti-Tuberculosis - Isonicotinic acid hydrazide and Rifampicin (source, structure, mechanism of action, therapeutic uses and adverse effects) Anticancer - Cyclophosphamide and methotrexate.(source, structure, mechanism of action, therapeutic uses and adverse effects)

UNIT - IV

DRUGS ACTING ON VARIOUS DISEASES

Central nervous system - Introduction, Structure and mode of action of barbiturates and salicylates. Cardiovascular system - Introduction, Structure and mode of action of Cardiac glycosides. Hepatic diseases (Liver enzymes and fatty liver) Renal diseases (Kidney stones)

UNIT - V

DRUGS OF PLANT ORIGIN

Primary and Secondary metabolites -Drug Dependence and Abuse Types – (Psychic dependence and physical dependence), Factors which facilitate abuse - Availability of drugs, peer group pressure, socioculture Principles of Treatment - Hospitalization, drug therapy, substitution therapy.

Text Books :

Pharmaceutical Pharmacology | Edition:4 | New age International publishers | S C Metha AshutoshKar, (2011)

Pharmolocology and Pharmacotherapeutics | Edition:23 | Prakasam Pvt. Ltd, Mumbai | BhandarkarS.D AND SatoskarR.S(2013)

Reference Books :

Essentials of Medical Pharmacology | Edition:Seventh Edition | Jay Pee Brothers Medical Publishers, New Delhi. | Tripathi,K.D(2010)

Pharmacology | Edition:5 | Lippincott Williams & Wilkins publishers | ChampeP.C AND HarveyR.A AND MycekM.J(2010)

Course Title	: **BIOCHEMICAL PHARMACOLOGY (P)**	Course Code	: 53P
Semester	: **I**	Course Group	: **DSC-IX**
Teaching Scheme in Hrs (L:T:P) : **0:0:4**		Credits	: **2**
Map Code : H (PRACTICAL - EXPERIMENTS)		Total Contact Hours: **48**	
CIA	: **40 Marks**	SEE	: **60 Marks**
Programme: **BSC-BC**			

List of Experiments:

1. Study of different routes of drugs
2. Collection of blood samples
3. Free radical scavenging activity –
   a. DPPH
   b. ABTS
4. Gram staining and simple staining
5. Antimicrobial activity
6. Estimation of SGOT
7. Estimation of SGPT
8. Phytochemical screening
9. Estimation of Phenols

Course Title	: **IMMUNOLOGY**	Course Code	: 53B
Semester	: **V**	Course Group	: **DSC-IX**
Teaching Scheme in Hrs (L:T:P) : **4:0:0**		Credits	: **4 Credits**
Map Code	: **C(THEORY CONCEPTS)**	Total Contact Hours	: **60**
CIA	: **25 Marks**	SEE	: **75 Marks**
Programme: **BSC-BC**			

CO1 To understand the concept immune system for protection against diseases
CO2 To remember the antigen and antibody structure, types, function and immunological reactions.
CO3 To apply immune techniques to understand know the measurement of antigen and antibody interaction .
CO4 To explain the different types of hypersensitivity and various immunological disorders .
CO5 To understand the significance of different vaccines .
CO6 To study the important organs transplantation and its impact of rejection

UNIT-I (LECTURE HOURS: 20)

Immunology
Introduction to Immunology (Definition and general principles of Immunology),Innate immunity and Acquired immunity (Physiological, genetic, anatomic and inflammatory Live and attenuated vaccines, Active and Passive), Antibody mediated immune response (Primary and secondary immune response),Cell mediated immune response (Lymphocytes),Primary lymphoid organs (Thymus and Bone Marrow), Secondary lymphoid organs (Spleen, Lymph node),Cells of immune system (RBC,WBC, NK CELLS),Structure and function (Neutrophils, eosinophils, basophils, macrophages and phagocytes)

UNIT-II (LECTURE HOURS: 20)
Antigen
Introduction (Definition and Types Properties,Specificity, cross reactivity, antigenicity, immunogenecity Chemical nature Epitope, haptens, adjuvant, super antigen Introduction (Definition and properties) Structure and function (Light Chain, Heavy Chain, Hinge region, Disulphide bonds), Class and subclass (Ig G, Ig A, Ig M, Ig E & Ig D), Clonal selection theory (Response of B cells to antigen)
antigen- antibody reactions (Primary, Secondary and Tertiary - Precipitation and agglutination experiments).
complement system Introduction (Definition and mechanism of formation),Complement pathway (Components and pathway)
UNIT-III (LECTURE HOURS: 20)
Measurement of antigen and antibody combination
Introduction (Introduction of diffusion and agglutination methods) , Immunodiffusion (Types Radial immuno diffusion, double immuno diffusion). Immuno electrophoresis (Principles and techniques), agglutination (Types Slide and Table agglutination), Widal test (Method)
immunological test Application RIA, ELISA, monoclonal antibodies
UNIT-IV (LECTURE HOURS: 20)
Allergy and hypersensitivity
Types I & II (Mechanism and clinical manifestation),Types III & IV (Mechanism and clinical manifestation)
immunological disorders Autoimmune diseases (Rheumatoid Arthritis and Myasthenia Gravis),Immuno-deficiency disease (AIDS)
UNIT-V (LECTURE HOURS: 16)
Transplantation immunology

Introduction (Allograft rejection and Graft vs Host diseases), Allograft rejection (Mechanism of graft rejection), Rejection to tumors (tumors rejection)
Vaccination Types of immunization (Active and Passive immunization), Types of vaccines (Recombinanat DNA vaccines and Edible vaccine), Effects (Benefits and adverse effects of vaccination)
Text Books :
Immunology | Edition:2 | Lippincott Williams & Wilkins | Melvold, Roger AND Doan, Thao AND Viselli, Susan(2012)
Kuby Immunology | Edition:8 | W.H. Freeman Publishers | Jenni Punt AND Judy Owen AND Patricia Jones AND Sharon Stranford(2019)
Reference Books :
Immunology | Edition:4 | Elsevier publishers | David B RothIvan Roitt AND David Male AND Jonathan Brostoff(2012)

Course Title : **IMMUNOLOGY**	Course Code :
Semester : **V**	Course Group : **DSC-IX**
Teaching Scheme in Hrs (L:T:P) : **0:0:4**	Credits : **4 Credits**
Map Code : **C(THEORY CONCEPTS)**	Total Contact Hours : **48**
CIA : **25 Marks**	SEE : **75 Marks**
Programme: **BSC-BC**	

Separation of serum and plasma from blood sample

Estimation of WBC

ASO latex test

RA test

Rocket immunoelectrophoresis

Widal test

Estimation of uric acid

ELISA test

Visit to vaccination center

Course Title	:**ClinicalData Analytics**	Course Code	:
Semester	: V	Course Group	:
Teaching Scheme in Hrs (L:T:P) : 4:0:0		Credits	:4 Credits
Map Code	:Theory	Total Contact Hours: 48	
CIA	: 25 Marks	SEE	: 75 Marks
Programme: B.Sc Biochemistry		# - Semester End Exam	

Course Title	:**Data Analytics**	Course Code	:
Semester	: V	Course Group	:
Teaching Scheme in Hrs (L:T:P) : 0:0:4		Credits	:2 Credits
Map Code	:Practical	Total Contact Hours: 48	
CIA	: 40 Marks	SEE	: 60 Marks
Programme: B.Sc Biochemistry		# - Semester End Exam	

No.	Course Outcome	POs & PSOs	Cl. Ses	CL
CO1	Interpret data to inform business decisions	PO1, PSO1 & PSO4	10L + 10P	U
CO2	Recognize trends, detect outliers, and summarize data sets	PO1, PSO1 & PSO4	10L+10P	Ap
CO3	Analyze relationships between variables	PO1, PSO1 & PSO4	5L+5P	Ap
CO4	Develop and test hypotheses	PO1, PSO1 & PSO4	4L + 4P	Ap
CO5	Craft sound survey questions and draw conclusions from population samples	PO1, PSO1 & PSO4	10L+10P	Ap
CO6	Implement regression analysis and other analytical techniques in Excel	PO1, PSO1 & PSO4	9L+9P	Ap

UNIT : I (LECTURE HOURS: 10 + PRACTICAL HOURS:10 = 20)				
TOPIC(S)	**SUB TOPIC(S)**	**MINUTES**	**KEY POINT(S)**	**HOURS**
Describing and Summarizing Data	Introduction	120	Analyzing Box office Revenues	2
	Visualizing Data	120	Recognizing patterns, Histograms, Outliers	2
	Descriptive Statistics	180	Central values for data, conditional means, percentiles, variability, Descriptive statistics in excel, coefficient of variation.	3
	Relationships Between Two Variables	180	Scatter plots, correlation, hidden variables, time series	3
	Hands on Practice	600	Practice Problems	10

UNIT :II (LECTURE HOURS: 10+ PRACTICAL HOURS:10 = 20)				
Sampling and Estimation	Introduction	60	Sampling at Amazon	1
	Creating Representative and UnbiasedSamples	120	Samples Vs Population, Sample size, Avoiding Bias	2
	The Normal Distribution	120	Rules of thumb, The Normal function NORM.DIST, The Normal function NORM.INV, The central limit theorem	2
	Confidence Intervals	180	Estimating the population mean, Large samples, small samples, Choosing a sample size, Estimating the population proportion,	3
	Amazon's Inventory Sampling	120	Amazon's inventory sampling	2
	Hands on Practice	600	Practice Problems	10

UNIT :III (LECTURE HOURS: 9+ PRACTICAL HOURS:9 = 18)				
Hypothesis Testing	Introduction	120	Amazon's use of Hypothesis Testing	2
	Designing and Performing	240	Developing Hypothesis, Constructing a range of	4

	HypothesisTests		likely sample means, using p-values, Type I and Type II Errors, One sided testing, Comparing two populations	
	Improving the Customer Experience	180	The shopping cart A/B test, The arrow A/B test, The magazine A/B test	3
	Hands on Practice	540	Practice Problems	9
UNIT :IV (LECTURE HOURS: 10+ PRACTICAL HOURS:10= 20)				
Single Variable Linear Regression	Introduction	60	Regression at Disney Studios	1
	Regression Line	60	Visualizing the Relationship, The best fit line, The structure of the Regression line	1
	Forecasting	120	Point Forecasts, Prediction intervals	2
	Interpreting the regression output	120	Quantifying predictive power, testing for a significant relationship, R-square vs p-value, Residual analysis	2
	Performing Regression Analysis	120	Regression Analysis in excel, Using dummy variables	2
	Forecasting Home Video Units	120	The Disney Studio Model, Just a starting point	2
	Hands on Practice	600	Practice Problems	10
UNIT :V (LECTURE HOURS: 9+ PRACTICAL HOURS:9= 18)				
Multiple Regression	Introduction	60	Multiple Regression at Caesars	1
	Multiple Regression equation	60	Single Vs Multiple Regression, Interpreting the multiple regression equation, forecasting	1
	Adapting concepts from single regression	60	Adjusted R-square, Residual Analysis, Testing for Significance of Variables,	1
	Performing Multiple Regression Analysis	120	Multiple Regression Analysis in Excel	2
	New Concepts in Multiple Regression	120	MutiCollinearity, Dummy variables, lagged variables	2

	The Caesars Staffing Problem	120	Developing the model, Analyzing the results, Improving the model	2
	Hands on Practice	540	Practical Problems	9

REFERENCES:

1.Open Intro Statistics (Third Edition) by David M Diez , Christopher D Barr, Mine Cetinkaya - Rund | Edition:3 | Open Intro Statistics | Christopher D Barr AND David M Diez AND Mine Cetinkaya (2017)

2.An Introduction to Statistical Learning with Applications | Edition:1 | Springer | Daniela Witten AND Gareth James AND Robert Tibshirani AND Trevor Hastie(2013)

3.Business Analytics | Edition: | Harvard Business School | Janice Hammond(2017)

Course Title	:INDUSTRIAL BIOCHEMISTRY	CourseCode	: *
Semester	: **V**	CourseGroup	: **SEC – G2 –B**
Teaching Scheme in Hrs (L:T:P) : **4:0:0**		Credits	: **4 Credits**
Map Code: **C (THEORY - CONCEPTS)**		Total Contact Hours :**60**	
CIA	: **25 Marks**	SEE#	: **75 Marks**
Programme	: **B.SC., BC**		**# - Semester End Exam**

No.	**Course Outcome(Cos):** **After completion of this course, the students will be able to**	**POs & PSOs**	**Cl. Ses**	**CL**
CO1	Understand fermentation process used in the Industrial production of various products	PO1 & PSO3	12	U
CO2	Describe the biochemical changes in nutrients during preservation.	PO1 & PSO3	12	U
CO3	Illustratethe applications of enzymes in *various Industries*	PO1 & PSO3	12	U
CO4	Develop skills of performing basic biochemical tests in Environmental aspects	PO1 & PSO3	12	U
CO5	Extend the knowledge on patents	PO1 & PSO3	12	R

UNIT I (Lectuer Hours: 12)

Introduction to fermentation technology:

Isolation and screening of industrially important microbes-, Inoculum preparation, strain improvement for better yield. Fermentation-Submerged and solid state fermentation, Fermentor design, Downstream processing.

Industrial production of alcohol, alcoholic beverages and bioactive compounds – Wine, Beer and Diary Industry.Industrial Production of Lactic acid, Citric acid, Penicillin and streptomycin.

UNIT II:(Lectuer Hours: 12)

Biochemistry of Food Spoilage

Factors causing food spoilage - Food Preservation General principles of food preservation Preservation by use of high and low temperatures, drying, radiations, chemical preservatives, inert gases, mechanical preservation techniques (vacuum packaging, tetra packs).

Adulteration& Determination of shelf –Food Adulteration – Common food adulterants, their harmful effects and physical and chemical methods for their detection. Milk adulteration and adulteration in edible oils. Class I and II preservatives.

Food safety regulations

Role of ISI, Agmark, FDA & Food Safety and Standards Authority of India (FSSAI), Food and Agricultural Organization (FAO) in food industry.

UNIT III:(Lectuer Hours: 12)

Enzyme- Production Amylase; Production of Amylase; Microbial Enzyme- cellulase, Cellulose-Producing Microorganisms, Fermentation Production of Cellulase; Microbial Enzyme- Pectinase, Microbial enzyme- Protease;

Application, Advantages, Disadvantages; Mechanism of Action; Production of Vitamin B_{12}, Synthesis and Industrial Production; Riboflavin.

UNIT IV1:(Lectuer Hours: 12)

Environmental biochemistry

Bioremediation: Introduction and types of bioremediations, bioremediation of surface soil and sludge, bioremediation of subsurface material, In situ and Ex-situ technologies, Phytoremediation. Chemical toxicology: Biochemical effects of heavy metals (Pb, As, Hg, Cd), pesticides, insecticides, herbicides, weedicides, larvicides. Biomining and bioleaching.

Wastewater treatment – BOD, COD, aerobic, anaerobic, suspended and attached growth systems.

UNIT V(Lectuer Hours: 12)

Intellecutalpropert right

IPR: and Scope of IPR, Recent developments in Registration of inventions and protections of IPR, WIPO and its role, World Trade Organization regimes, GATT agreement and its impact on agriculture and biotechnology. WTO and Agreement on Agriculture (AoA). **Trade Related Aspects of Intellectual Property Rights (TRIPS).** History of IPRs. Categories of IPRs- Copyrights, Patents, Trademark, Geographical Indications. Industrial Designs,. Recent amendments in Indian acts and regulations related to IPR. Patent filing-opposition-retrieval. Recent developments, advances in IPR.

Reference books

1. Peter stanbuy, Allan Whitaker, stephen j. Hall. Principles of Fermentation third Edition 2016.
2. Food Processing: Principles and Applications" by J Scott Smith and Y H Hui 2019. Second edition
3. Biotechnology of Microbial Enzymes: Production, Biocatalysis and IndustrialApplications 1st Edition, Kindle Edition by Goutam Brahmachari (Author), Arnold L Demain (Editor), Jose L Adrio (Editor) 2016
4. Textbook of Environmental Biochemistry 1 January 2018 by Harender K. Gaur (Author)
5. Indian Patent Law (English, Paperback, Kalyan C. Kankanala)Publisher: OXFORD UNIVERSITY PRESS-NEW DELHI ISBN: 9780198089605, 0198089600 Edition: 2012

Course Title	: **HEALTH MANAGEMENT**	CourseCode	:
Semester	:**V**	CourseGroup	: **EDC**
Teaching Scheme in Hrs (L:T:P) : **5:1:0**		Credits	: **6Credits**
Map Code	: **C (THEORY CONCEPTS)**	Total Contact Hours :	**90**
CIA	: **25 Marks**	SEE#	: **75 Marks**
Programme	: **B.SC., BIOCHEMISTRY**	# - **Semester End Exam**	

No	**Course Outcome (COs): After completion of this course, the students will be able to**	**Pos &PSOs**	**Cl.Ses**	**BLOOM'S TAXONOMY LEVEL**
CO 1	Understandtheequityinhealth,toreducehealthriskandtopromotelifestyle.	PO1&PS01	18	U
CO 2	Explaintheimpactondiabetesinourcommunity	PO1&PS01	18	U
CO 3	Summarize the pathology and prevention of cardiovascular diseases.	PO1&PS01	18	U
CO 4	Interprettheformationofkidneystonesandtoovercomethrough diet.	PO1&PS01	18	U
CO 5	Analyzeprivatesectorparticipationintheprovisionofhealthcarepolicy	PO1&PS01	18	U

UNIT I (LECTURE HOURS: 18)

Health

Concept of health - Definition, Quality of life, and Hygiene.

Food factors - For human being and their requirements Calorific value of food - Values of different nutrients.

Obesity related diseases - Definition and classification, genetic and environmental factor leading to obesity & Management of obesity

UNIT II (LECTURE HOURS: 18)

Diabetes

Diabetes - Definition,

Types of diabetes - IDDM, NIDDM, Gestational Diabetes and blood sugar level

Insulin and glucagon - Definition, effect of hormone levels in diabetes

Etiology and pathogenecity - Occurance and symptoms Management of diabetes - Diet and medicine

UNIT III (LECTURE HOURS: 18)

Cardiovascular disease

Cardiovascular disease - Normal level of cholesterol and lipoprotein

Cardiac arrest and myocardial infraction - Signs, symptoms and risk factors

Management of heart disease - Diet, medicine and excersice

UNIT IV (LECTURE HOURS: 18)

Renal Disease
Kidney stones - Diet and prevention
Food habits - food habits and preventive measures
Cancer - Definition and types

UNIT V (LECTURE HOURS: 18)
Health Insurance
Health Insurance - Individual mediclaim policy Domicilary hospitalization - Procedures **Cancer** - Cancer insurance
Group mediclaim policy - Rules and regulations of family mediclaim policy

Text Books :
Practical clinical biochemistry
Varley, Harold; Gowenlock, Alan H; McMurray, Janet R; McLauchlan, Donald M; Varley, Harold. | Edition:-5 | - 2015

Reference Books :
Clinical chemistry-Principles and techniques | Edition:- 5| - | Michael L. Bishop -(2013)
Clinical laboratory diagnosis | Edition:-12 | - | Richard A. McPherson - (2016)

Course Title : **GENETIC ENGINEERING**	Course Code : 63B
Semester : **VI**	Course Group : **DSC - XII**
Teaching Scheme in Hrs (L:T) : **4:0:4**	Credits :4
Map Code: C(THEORY)	Total Contact Hours: 72
CIA: **25 Marks**	SEE # : **75 Marks**
Programme: **BSC-BC**	# - **Semester End Exam**

No	Course Outcome (Cos): After completion of this course, the students will be able to	Pos &PSOs	Cl.Ses	BLOOM'S TAXONOMY LEVEL
CO1	Learn the basic techniques and experiments to explain the genetic material and to its understand the structure, organization, types and functions.	PO1& PS01	12	U
CO2	Understand the functions of several vectors and the replication of DNA	PO1& PS01	12	R
CO3	Analyze the various enzymes which manipulate the range of DNA	PO1& PS01	14	U
CO4	Manipulate the Protein Synthesis and regulation of genes.	PO1& PS01	14	R
CO5	Understand the basic need of Genomics and Proteomics and to analyze the transformation of Genes.	PO1& PS01	12	U
CO6	Analyze the changes occur in DNA base pairing and to study about the repair mechanism.	PO1& PS01	10	R

UNIT – I(LECTURE HOURS: 24)

Chemical Basis of Heredity:

DNA as genetic material, Experiments of Griffith - Avery, Mc Cleod; Mc Carthy and Harshey Chase.

RNA as genetic material- Experiment of Fraenkel and Singer.

Nucleic acids:

DNA structure and types

RNA types and structure

Ribozymes

Genome organisation and Fine structure of the Gene : .

Prokaryotic genome:- Chromosomal and plasmid

Eukaryotic genome:- Chromosomal and organellar

Fine structure of the Gene: Cistron, muton and recon
Practical
UNIT – II(LECTURE HOURS: 24)
The range of DNA manipulative enzymes
DNA polymerase, Polynuceotide kinase - Functions
T4 DNA ligase - Joining DNA molecules
Terminal deoxynucleotidyl I transferase - Functions
Reverse transcriptase and Topoisomerase - Functions
Restriction endonucleases Type I, II & III - Characteristics of Type II Restriction endonuclease, nomenclature, restriction sites
DNA Replication:
DNA Replication in prokaryotes and rolling circle model
DNA Replication in eukaryotes
Practical
UNIT – III(LECTURE HOURS: 24)
Gene Expression:
Genetic code: Brief account.
Protein synthesis in prokaryotes and eukaryotes.
Transcription ("rho" dependent and "rho" independent termination)
Post Transcriptional modifications
Translation
Regulation of Gene expression:-
Inducible operons – Galactose
Repressible operon – Tryptophan

Practical
UNIT – IV(LECTURE HOURS: 24)
Bacterial Genetics :
Transformation,
Transduction-Generalized and specialized:
Conjugation: F factor mediated, Hfr and Sexduction.
Introduction to Genomics and Proteomics
Practical
UNIT – V(LECTURE HOURS: 24)
Transposable elements :
Maize and Drosophila
Mutations:
Introduction and Types of Gene mutations - Base substitution,
Frame shift mutation (insertion, deletion, missense, nonsense mutation).
Mutagens - Physical and chemical.
Reverse mutation in bacteria.
DNA repair mechanism (Mismatch repair photoreactivation, excision and SOS repair)
Beneficial and harmful effects of mutations.
Vectors
Practical

Text Books :
T1-Gene Cloning by T.A.Brown | Edition:5 | BlackWell Publishers, London | T.A.Brown(2006)
T2-Principles of Gene ManipulationEdition | Edition:3 | Blackwell Scientific Publication | S.B.Primrose AND R.W.Old (2006)
T3-Biotechnology | Edition:3 | Book and Allied Kolkata | U Sathyanarayan (2005)
T4-From Genes to Clones | Edition:2 | Panima Publishers | E.L.Winnecker(2003)
T5-Genes VI | Edition:3 | Oxford University Press | B.Lewin(2000)

T6-Recombinant DNA technology and molecular cloning | Edition:2 | Scientific American Publication Black well publica | Kary B. Mullis (1996)
T7-Immunology | Edition:5 | WH Freeman andcompany NY | Richard AGold boy AND Thomas JKindt(2003)
Reference Books :
R1-Molecular Cloning | Edition:3 | Cold Spring Harbour laboratory | KaarenAJanssen AND NinaIrwin(2001)

Course Title : **GENETIC ENGINEERING**	Course Code : 63Q
Semester : VI	Course Group : **DSC-XII**
Teaching Scheme in Hrs (L:T:P) : **0:0:4**	Credits : **2 Credits**
Map Code :	Total Contact Hours: **60**
CIA : **40 Marks**	SEE : **60 Marks**
Programme: **BSC-BC**	

List of Experiments

1. Mitotic division in onion root tip.
2. Isolation of plasmid DNA from plant leaves
3. Isolation of genomic DNA from plant leaves
4. Quantification of DNA using spectrophotometric method
5. Transformation of bacteria using CaCl2 heat shock method
6. Resolution and molecular weight estimation of fragmented DNA using agarose gel electrophoresis
7. DNA Denaturation
8. RNA Denaturation

Course Title : **Human Physiology**	Course Code : 63A
Semester : **VI**	Course Group : **DSC - XI**
Teaching Scheme in Hrs (L:T) : **4:0:4**	Credits :4
Map Code: C(THEORY)	Total Contact Hours: 72
CIA: **25 Marks**	SEE # : **75 Marks**
Programme: **BSC-BC**	# - **Semester End Exam**

No	Course Outcome (Cos): After completion of this course, the students will be able to	Pos &PSOs	Cl.Ses	BLOOM'S TAXONOMY LEVEL
CO1	Recognize functions of blood and variety of terms specific to human body and health.	PO1& PS01	12	U
CO2	Analyze and describe the structure and functions of human anatomy and physiology including respiratory system, digestive system, circulatory system.	PO1& PS01	12	R
CO3	To understand which elements in the various signaling pathways represent candidate drug targets for treatment of various diseases.	PO1& PS01	14	U
CO4	To explain about activation ,transport, metabolism and degradation along with importance of hormones.	PO1& PS01	14	R
CO5	Contribute to society by imparting physical understanding to health problems.	PO1& PS01	12	U
CO6	Aid to apply a wide knowledge about human mechanism in clinical level.	PO1& PS01	10	R

UNIT-1 (LECTURE HOURS: 12)
DIGESTIVE SYSTEM
ANATOMY OF THE DIGESTIVE SYSTEM - Structural features of Intestinal organs, Parts of the digestive system
SALIVARY, GASTRIC AND BILIARY SECRETIONS - Composition, properties, Mechanism and functions
MECHANISM OF HCl SECRETIONS - Secretion of pepsinogen and HCl
INTESTINAL HORMONES - Gastro Intestinal hormones and its secretions
DIGESTION , SECRETION, AND ABSORPTION IN THE SMALL INTESTINE - Digestion and absorption of carbohydrates, lipids and proteins.
ACTIVITY
1 - 1. Make a chart preparation on Digestive system of human.
2 - Animation on the anatomy of Digestive System
UNIT-2 (LECTURE HOURS: 12)
BODY FLUIDS
EXTRACELLULAR FLUID-PLASMA - Definition ,composition and function
EXTRACELLULAR FLUID-BLOOD - Definition ,composition and functions
OSMOLARITY OF THE BODY FLUIDS - Ionic composition, electrolytes, body buffers.
BLOOD CELLS - WBC, RBC AND PLATELETS - Introduction and functions
BLOOD GROUPS AND BLOOD COAGULATION - ABO & Rh factor - Mechanism of blood

coagulation
INTERSTITIAL FLUID AND TRANSCELLULAR FLUID - Lymph and its fuction
ACTIVITY
1 - Blood - Separation of plasma & serum.
2 - Microscopic observation- WBC, RBC, Platelets.
UNIT-3 (LECTURE HOURS: 12)
CIRCULATORY & RESPIRATORY SYSTEM
CIRCULATION - Structure of Heart and Blood vessels
CARDIAC CYCLES - Cardiac factors controlling Blood pressure, electrocardiogram
FUNCTIONS OF HEART - Functions of heart in Blood circulation
RESPIRATION - Anatomy, and physiology of Respiration, pulmonary surfactant
EXCHANGE OF GASES - Exchange of between lung and blood and between blood and tissues
FUNCTION OF LUNG - Role of lung in acid-base balance.
ACTIVITY
1 - Make a chart preparation on Respiratory system
2 - Display a model of Heart
UNIT-4 (LECTURE HOURS: 12)
NERVOUS SYSTEM
CENTRAL NERVOUS SYSTEM - General organization
FUNCTIONAL UNITS- NEURON - Structure and its function
RESTING AND ACTION POTENTIAL - Conduction of nerve impulses
SYNAPTIC TRANSMISSION. -
BRAIN - Chemical composition, metabolism, metabolic adaptation
NEUROTRANSMITTERS - Introduction, types and functions
BIOCHEMICAL ASPECTS - Learning and memory
ENKEPHALINS AND ENDORPHINS - Introduction, Receptor mechanism and functions
ACTIVITY
1 - Animation on the Nerve transmission - Mechanism.
2 - Chart prepa-ration on Neurotransmitters
UNIT-5 (LECTURE HOURS: 12)
EXCRETORY SYSTEM
KIDNEY - Structure and functions of kidney
NEPHRON - Structure & composition
MECHANISM OF URINE FORMATION - Glomerular filteration
RENAL FUNCTION - Tubular reabsorption and tubular secretions
MICTURITION - Urinary Infection
RENAL REGULATION - Acid - Base Balance, Endocrine role of Kidney-ADH
MUSCLE - Structure & Functions
MUSCLE CONTRACTION - Mechanism and theories
ACTIVITY
1 - Structure of Nephron - chart preparation
2 - Display a model of Kidney

Text Books :
T1 Medical Physiology | Edition:5 | JP | Dr.SembulingamL AND SembulingamPrema(2012)
T2 Medical Physiology | Edition:11 | Arun printers | ChatterjeeCC(2003)
Reference Books :
R1 Endocrinology | Edition:1 | MJP | Prakash S. Lohar(2005)
R2 Molecular cell biology | Edition:6 | W.H.freeman | LodishHarvey(2007)

Course Title : **Human Physiology**	Course Code : 63P
Semester : VI	Course Group : **DSC-XI**
Teaching Scheme in Hrs (L:T:P) : **0:0:4**	Credits : **2 Credits**
Map Code :	Total Contact Hours: **60**
CIA : **40 Marks**	SEE : **60 Marks**
Programme: **BSC-BC**	

List of Experiments:

1. Estimation of Bilirubin by KIT method.
2. Estimation of Glucose by OT method.
3. Estimation of Protein by Lowry's method.
4. Collection of Blood – Separation of Serum and Plasma
5. Determination of Bleeding Time.
6. Determination of Clotting Time.
7. Preparation of Bicarbonate Buffer.
8. Estimation of Cholesterol by Zak's Method.
9. Estimation of Hemoglobin by Darbkin's/ Sahil's Method.
10. Determination of Sodium by Tritimetry Method and flamephotometer.
11. Estimation of Potassium in bloodbyFlame Photometry.
12. Analysis of urine sample
13. Different methods of specimen collection.

Course Title : **Clinical Lab Technology**	Course Code :
Semester : **VI**	Course Group : **DSE - IV**
Teaching Scheme in Hrs (L:T) : **4:0:4**	Credits :4
Map Code: C(THEORY)	Total Contact Hours: 72
CIA: **25 Marks**	SEE # : **75 Marks**
Programme: **BSC-BC**	# - **Semester End Exam**

No	Course Outcome (Cos): After completion of this course, the students will be able to	Pos &PSOs	Cl.Ses	BLOOM'S TAXONOMY LEVEL
CO1	Perform basic clinical laboratory procedures using appropriate laboratory techniques and instrumentation in accordance with current laboratory safety protocol.	PO1& PS01	12	U
CO2	Calculate and properly report laboratory data.	PO1& PS01	12	R
CO3	Interpret laboratory results in accordance to laboratory protocol	PO1& PS01	14	U
CO4	Operate and maintain laboratory equipment, utilizing appropriate quality control and safety procedures.	PO1& PS01	14	R
CO5	Recognize and participate in activities which will provide current knowledge and upgrading of skills in laboratory medicine.	PO1& PS01	12	U
CO6	Evaluate clinical laboratory data and relate that data to various disease processes.	PO1& PS01	5	R
CO7	Employ interpersonal communication skills in relaying laboratory test information and when interacting with patients, lab personnel and other health care professionals.	PO1& PS01	5	R & An

UNIT – I(LECTURE HOURS: 12)

GENERAL METHODOLOGY

Method of collection transport , packing and storing ofspecimens, Routine stores used in the laboratory,the concept of pre analytical, analytical and post analytical..Preparations of solutions Laboratory glassware and its uses. Concept of universal precautions, biohazard. Handling of waste , waste segregation and management including disposal, Laboratory accidents, prevention , first aid. Aseptic techniques,sterilization, and disinfection. Different types of blood samples. Anticoagulants, mechanism of action and uses.

UNIT-II(LECTURE HOURS: 12)

CLINICAL PATHOLOGY

Introduction to clinical pathology, Collection, transport, preservation and processing of various clinical specimens, Urine examination- collection and preservation, Physical, chemical and microscopicexamination for abnormal constituents, Examination of Body fluids, Examination of

Cerebrospinal fluid (CSF), Sputum examination, Examination of feces

UNIT-III(LECTURE HOURS: 12)

HEMATOLOGY

Introduction to haematology, Normal constituents of Blood, their structure and functionsCollection of Blood samples, Various anticoagulants used in Haematology, Haemoglobin estimation, different methods and normal values, Packed cell volume, Erythrocyte sedimentation rate, NormalHaemostasis,Bleeding time. Clotting time, prothrombin time, Activated partial Thromboplastin timeWBC- morphology, production, functions, normal count, differential count, variation,variation Immunity (in brief) Platelets- origin, morphology, normal count, functionPlatelet plug, bleeding disorder

UNIT- IV(LECTURE HOURS: 12)

CELL COUNT

Basics of hemocytometer,Counting chambers-Different types of counting chambers-RBC pipette -WBC pipette -Basics of differential count for WBC using flow cytometerMicroscope- Parts of microscope, working of microscope, types of microscope- Phase contrast, inverted microscope, fluorescent microscope.

UNIT – V(LECTURE HOURS: 12)

BLOOD BANK

Introduction blood banking, Blood group system,Blood group-ABO & Rh system, Rh incompatibility blood typing, cross matching, hazardsof mismatched blood transfusion Collection and processing of blood for transfusion, Compatibility testing, Blood transfusion reactions

Reference Books :

1. Practical Haematology - Dacie and Lewis
2. Clinical Diagnosis by Laboratory Methods – Todd and Sanford
3. Medical Laboratory technology 6th edition by RamnikSood.
4. Varley’s Practical Clinical Biochemistry, 4th, 5th and 6th editions
5. Voet D and Voet JG (2001) Biochemistry, 3rd Edition, John Wiley & Sons, New York.
6. Zubey G (1998) Biochemistry, 4th Edition, WMC Brown Publishers, USA.

Course Title : **Clinical Lab Technology**	Course Code :
Semester : **VI**	Course Group : **DSE - IV**
Teaching Scheme in Hrs (L:T) : **5:1**	Credits :4
Map Code: Practical	Total Contact Hours: 72
CIA: **25 Marks**	SEE # : **75 Marks**
Programme: **BSC-BC**	**# - Semester End Exam**

Practical

List of Experiments:

1. Estimation of blood Glucose
2. Estimation of Blood Urea
3. Estimation of Creatinine
4. Estimation of serum Albumin
5. Estimation of serum Cholesterol
6. Urine analysis- Physical, Chemical, Microscopic
7. Urine quantitative and qualitative analysis: Random and 24 hours
8. Analysis of normal and abnormal urine
9. Blood grouping and Rh typing,RBC Count and WBC Count
10. Hb estimation , packed cell volume (PCV), Erythrocyte Sedimentation rate (ESR)
11. Bleeding time and Clotting time