HAJEE KARUTHA ROWTHAR HOWDIA COLLEGE

(An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai)

Re-Accredited with "A" Grade by NAAC

UTHAMAPALAYAM – 625533

DEPARTMENT OF BIOCHEMISTRY

Bachelor of Science – Biochemistry
Syllabus
(Academic year 2014-2015 Onwards)

HAJEEE KARUTHA ROWTHER HOWDIA COLLEGE (AUTONOMOUS)
UTHAMAPALAYAM - 625533

B. Sc BIOCHEMISTRY (Semester) (Choice based credit system)
Program scheme & scheme of Examinations and Syllabus
(Effective from the academic year 2013-2014 onwards)

OBJECTIVES OF THE COURSE:

1. To enable the students to understand the importance & the role of biochemistry in Human life.
2. To acquire skills in the field of oriented, application oriented and job oriented biochemistry and related fields.
3. Study of skill based subject can various skills in the field of biochemistry which will enable the students to get job like mushroom technology & vermi culture.
4. Visit of various research institutes by the student will create a sound of knowledge in the field of Biochemistry & Biotechnology.
5. Study of Biochemistry & Biotechnology and visit of industry helps for linking of colleges with industry

ELIGIBILITY:

A pass in +2 examination conducted by the board of higher secondary education, Government of Tamil Nadu with Science is one of the subject or any other examination accepted by the syndicate as equivalent.

DURATION OF THE COURSE:

The students who are joining the Degree shall undergo a study period of Three Academic years- Six semesters.

SUBJECTS OF STUDY:

Medium of Instruction: English

Part – I	-	Tamil
Part – II	-	English
Part – III	-	i) Core subjects – Biochemistry ii) Allied subjects
Part – I V	-	i) Non-major Subjects ii) Skill based subjects iii) Environmental studies iv) Value Education
Part – V	-	Extension activities

EVALUATION:

Theory:	Internal	- 25 marks
	External	- 75 marks
	Total	- 100 marks
Practical:	Internal	- 40 marks
	External	- 60 marks
	Total	- 100 marks

EXTERNAL EXAMINATION: 75 MARKS

The pattern of External examination Question paper will be as follows:

Time: 3 Hours **Max. Marks: 75**

Section –A: 10x1=10 marks

Question numbers 1 to 10 – Answer all questions. (Multiple choice)

Two Questions from each unit

Four choices in each Question

Section –B: 5x7=35 marks

Question numbers 11 to 15

Answer all questions. (Choosing either A or B)

One Questions from each unit

11 A or 11 B

12 A or 12 B

13 A or 13 B

14 A or 14 B

15 A or 15 B

Section –C: 3x10=30 marks

Question numbers 16 to 20

Answer any 3 out of 5.

One Questions from each unit

INTERNAL EXAMINATIONS : 25 MARKS

1. Two Tests to be conducted - 15 marks (average of 2 test to be taken)
2. Group discussion / Seminar / Quiz - 5 marks
3. Two Assignments - 5 marks (average of 2 to be taken)
4. Third test may be allowed for absence of any one of the two test

Practical Examination:

Internal - 40 marks (observation note – 10 and model exams- 30)

External - 60 marks

Total - 100 marks

Passing minimum is 40%

Eligibility for the Degree:

A candidate shall be declared as passed the program if he/she scored a minimum of 40% marks (Both internal and external) in each course. Minimum required mark in external is 27 marks.

SEMESTER - I

S. No	PART	CODE	TITLE OF THE COURSE	CREDITS	HOURS
1	I	14UTAL11	Tamil / Other languages	3	6
2	II	14UENL11	English	3	6
3	III	14UBCC11	**Core paper -1** Biomolecules	3	3
4		14UBCC2P	**Corepractical-1**	-	3
		14UCHA11	**Allied Subject-I** Ancillary Chemistry- 1	4	4
		14UCHA2P	**Inorganic quantitative analysis**	-	2
5	IV	14UBCS11	**Skill based subject-1** Biostatistics	2	2
6		14UBCS12	**Skill based subject-2** Nutrition	2	2
7	IV	14UBCN11	**Non major elective-1** Health and human disease	2	2
			TOTAL	**19**	**30**

SEMESTER - II

S. No	PART	CODE	TITLE OF THE COURSE	CREDITS	HOURS
1	I	14UTAL21	Tamil / Other languages	3	6
2	II	14UENL21	English	3	6
3	III	14UBCC21	**Core paper -2** Biochemical techniques	4	4
4		14UBCC2P	**Corepractical-1**	2	2
5		14UCHA21	**Allied Subject-I** Ancillary Chemistry- 2	4	4
6		14UCHA2P	**Inorganic quantitative analysis**	1	2
7		14UBCS21	**Skill based subject-3** Medical Lab Technology	2	2
8		14UBCS22	**Skill based subject-4** Pharmacology	2	2
9	V	14UBCN21	**Non major elective-2** Herbal Medicine	2	2
			TOTAL	**23**	**30**

SEMESTER - III

S. No	PART	CODE	TITLE OF THE COURSE	CREDITS	HOURS
1	I	14UTAL31	Tamil / Other languages	3	6
2	II	14UENL31	English	3	6
3	III	14UBCC31	**Core paper -4** Enzymes	4	4
4		14UBCC4P	**Core practical-II**	-	2
5		14UCHA31	**Allied Subject-I** Ancillary Chemistry- 3	4	4
6		14UCHA4P	**Organic substance analysis**	-	2
7		14UMBA31	**Allied Subject-II** Biology-1	4	4
8		14UMBA4P	**Ancillary Biology practical-1**	-	2
			TOTAL	**18**	**30**

SEMESTER - IV

S. No	PART	CODE	TITLE OF THE COURSE	CREDITS	HOURS
1	I	14UTAL41	Tamil / Other languages	3	6
2	II	14UENL41	English	3	6
3	III	14UBCC41	**Core paper -5** Metabolism	4	4
4		14UBCC4P	**Core practical-II**	2	2
5		14UCHA41	**Allied Subject-I** Ancillary Chemistry- 3	4	4
6		14UCHA4P	**Organic substance analysis**	1	2
7		14UMBA41	**Allied Subject-II** Biology-2	4	4
8		13UMBA4P	**Ancillary Biology practical-1**	1	2
			TOTAL	**22**	**30**

SEMESTER – V

S. No	PART	CODE	TITLE OF THE COURSE	CREDITS	HOURS
1	III	14UBCC51	**Core paper -6** Molecular Biology	4	4
2		14UBCC52	**Core paper -7** Microbiology	4	4
3		14UBCC53	**Core paper-8** Immunology	4	4
4		14UBCC6P	**Core practical-III**	-	4
5		14UBCC6Q	**Core practical-IV**	-	4
6		14UMBA41	**Allied Subject-II** Biology-3	4	4
7		14UMBA4P	**Ancillary Biology practical-2**	-	2
8	V	14UEVS51	Environmental studies	2	2
9	IV	14UBCS51	**Skill based subject-5** Clinical diagnostics	2	2
			TOTAL	**20**	**30**

SEMESTER – VI

S. No	PART	CODE	TITLE OF THE COURSE	CREDITS	HOURS
1	III	14UBCC61	**Core paper -9** Biotechnology	3	3
2		14UBCC62	**Core paper -10** Plant Biochemistry	3	3
3		14UBCC63	**Core paper-11** Clinical biochemistry	3	3
4		14UBCC64	**Core paper-12** Food Technology	3	3
4		14UBCC6P	**Core practical-II**	8	4
5		14UBCC6Q	**Core practical-IV**	7	4
6		14UMBA41	**Allied Subject-II** Biology-3	4	4
7		14UMBA4P	**Ancillary Biology practical-2**	1	2
8	IV	14UBCS61	**Skill based subject-4** Bioinformatics	2	2
9		14UVED61	Value Education	2	2
9	V	14UEAC61	**Extensive activities**	1	-
			TOTAL	**37**	**30**

Semester	No of papers	Credits	Total marks
I	7	19	700
II	8	24	800
III	6	19	600
IV	8	24	800
V	5	20	500
VI	9	34	900
Grand total	43	140	4300

SEMESTER – I

Course	**: B. Sc Biochemistry**	**Subject code**	**: 14UBCC11**
Semester	**: I**	**No. of Hrs allotted**	**: 4**
Paper	**: Core Subject - I**	**No. of Credits**	**: 4**

BIOMOLECULES

Unit –I

Structure of Carbohydrates and polysaccharides: occurrence and general importance of carbohydrates – Basic structure of glucose, its isomer and linkages – Biologically important disaccharides like lactose, maltose and sucrose. Polysaccharides – energy storage polysaccharides, starch and glycogen – structural polysaccharide – cellulose.

Unit – II

Protein Structure and functions: common amino acids of proteins – physical properties of amino acids – solubility, electrical properties, fundamental role of proteins in life composition of proteins – general properties of proteins- Rudimentary treatment of structure, classification on the basis of biological functions.

Unit – III

Lipids: fatty acids – classification of some naturally occurring fatty acids saturated fatty acids, unsaturated fatty acids, branched chain fatty acids, hydroxyl, keto derivatives and cyclic fatty acids – Physical properties of fatty acids – polymorphism, solubility, boiling point, absorption, petrochemical properties of fatty acids – salt detergents and wetting agents, esters – reactions of unsaturated fatty acids – hydrogenation, halogenations and oxidation. Fats – Chemical composition, Physical and chemical properties of fats – Waxes – Phospholipids – Classification – non phospholipids – steroids.

Unit – IV

Chemistry of Nucleic acids: Fundamental role of nucleic acids in life processes – DNA and RNA – Structure of bases nucleotides and nucleosides – bonds linking the various bases, primary, secondary and three – dimensional structures.

Unit – V

Vitamins: Historical development to the discovery of vitamins – Vitamin A,D,E, and K Water soluble vitamins – Vitamin B complex.

Reference:

1. Biochemistry, Lehninger, A.L. Nelson, Cox
2. Biochemistry, Lubert stryer et al., Fifth Edition, W>H> Freeman and company, New York, 2003.
3. Outlines of Biochemistry E.E. Conn and stump, Fourth edition, Wiley Eastern Limited, 1989.
4. Fundamentals of Biochemistry by J.L. Jain.
5. Biochemistry, Donald Voet & Judith Voet, Wiley International Edition, 2004.

Course	**: B. Sc Biochemistry**	**Subject code**	**: 14UCHA11**
Semester	**: I**	**No. of Hrs allotted**	**: 4**
Paper	**: Ancillary Chemistry Subject - I**	**No. of Credits**	**: 4**

ORGANIC, INORGANIC AND PHYSICAL CHEMISTRY

Unit - I

a) HYDROGEN: Isotopes of hydrogen-preparation, properties and uses of heavy hydrogen- ortho and para hydrogen-hydrides-definition-classification-examples.

b) Oxides: Definition-classification-examples.

c) Water: Hardness of water-types of hardness-removal of hardness – removal of hardness – industrial implications of hardness in water-estimation by EDTA method –units of hardness of water.

d) Hydrogen peroxide: Manufacture, properties, structure and uses – estimation by Permanganimetry method - strength of hydrogen peroxide.

Unit - II

a) Detection and estimation of nitrogen and halogen in organic compounds – molecular formula –structural formula – calculation of empirical formula and molecular formula from percentage composition.

b) Nature of valency of carbon in organic compounds – tetrahedral arrangement of valency of carbon – bond breaking and bond forming in organic reaction – hemolytic cleavage – heterolytic cleavage – reaction intermediates – formation, stability and reactions of carbocation, carbanion and free radicals.

c) Nucleophiles – **Electrophiles**: Definition, types and examples – specific reaction involving these.

d) Types of reaction: Substitution – addition – elimination - rearrangement and polymerization – illustration with examples.

Unit - III

a) Gaseous state: Postulates of kinetic theory of gases – derivation of expression for pressure for an ideal gas on the basis of kinetic theory – deducing the basic gas laws.

b) Deviation of real gases from ideal behavior – reasons for deviation – derivation of van der walls equation – behavior of real gases on the basis of van der walls equation.

c) Average, root mean square and most probable velocities – (equations only- no derivation) – relationship between these different velocities.

Unit - IV

a) Bonding: V.B Theory – postulates of V.B Theory – application to the formation of simple molecules like H_2 and O_2 – overlap of atomic orbitals – s-s, s-p and p-p overlap – principle of hybridization – sp, sp^2 and sp^3 hybridization – VSEPR theory.

b) M.O Theory: Formation of M.O's – bonding, anti-bonding and non-bonding M.O's – M.O diagram for H_2, He and F_2.

Unit - V

Colloids

a) Colloidal state of matter – various types – classification.

b) Sols – dialysis – electro-osmosis – electrophoresis – stability of colloids – protective action – Hardy-schulze law – gold number.

c) Emulsion: Types of emulsion – emulsifiers with examples.

d) Gels: Classification, preparation.

e) Application of colloids.

BOOKS RECOMMENDED:

1. Essential of physical chemistry: Arun Bhal, B.S. Bhal, G.D. Tuli (revised edition, S.Chand,2010)
2. Principles of physical chemistry: Puri, Sharma, Pathania (revised edition, Vishal pub.,2010)
3. Modern Inorganic chemistry: R.D Madan (Revised edition, S.Chand,2010)
4. A Text book of organic chemistry: Arun Bhal, B.S. Bhal, G.D. Tuli (revised edition, S. Chand, 2010).

Course	**: B. Sc Biochemistry**	**Subject code**	**: 14UBCS11**
Semester	**: I**	**No. of Hrs allotted**	**: 2**
Paper	**: Skill Based Subject - I**	**No. of Credits**	**: 2**

BIOSTATISTICS

Unit – I

Introduction: Basis of Statistics – Definition Statistical Methods – kinds of Biological Data Collection organization and Representation of Data.

1. **Collection of Data:** Types of Data: primary Data: Secondary Data – Methods of Collecting Data.
2. Sampling and sampling Designs – Meaning and definitions – Random and Non random sampling.
3. **Editing the Data:** Definition for editing, Problems of Accuracy, Problems of approximation and errors,
4. **Classification of Data:** Meaning, Definition, Objectives of classification of Data.
    a. Ungrouped raw data – continuous – discrete variation.
    b. Univariate frequency distribution, continuous frequency distribution, discrete frequency distribution.
    c. Cumulative frequency distribution.

Unit - II

a. Tabulation: Meaning and definition – of parts of table – advantages

b. Representation of the Data:

Diagrammatic Representation: simple bar diagram, Rectangles, squares, circles or Pie diagram – Graphic Representation: Histogram, Frequency – Polygon frequency curve or O give curve.

c. Measures of Central Tendency

Explanation, Types of average: 1. Arithmetic mean 2. Median 3. Mode Explanation Problems related to: ungrouped data. Simple grouped data: Continuous, Discrete series.

d. Measures of Dispersion

Explanation, types of dispersion: 1 Range, 2 Mean deviation 3 Standard deviation and Variance, Problems related to the above mentioned dispersion taking ungrouped data.

Unit - III

Measures of Symmetry:

Explanation and definition, Explanation or skewness, Kurtosis of type's moments, tests of skewness, Measures of Skewness, Measures of Kurtoss (Problems not necessary)

Unit - IV

Probability:

Definition and Explanation:

1. Theorem and probability: Addition theorem and multiplication theorem.
2. Types of theoretical distribution: Binomial distribution (simple problems, Poisson distribution and Normal distribution (explanation problems not necessary).

Unit - V

Correlation and Regression:

Correlation Explanation:

1. Types of Correlation: Positive and negative correlation – simple partial and multiple correlation – linear and non – linear correlation.

2. A method of studying correlation using Karl Pearson's co – efficient of correlation (simple problems related to correlation)

Regression analysis:

Explanation: Regression line – Regression equation: regression equation of X on Y, regression equation of Y on X.

References:

1. Statistical methods – S.P. Gupta
2. Biostatistics – A foundation for analysis in health science – Danial
3. Biostatistics – Analysis, Jerrold H. Zar, Fourth edition, Pearson Education, 2004
4. Research Methodology – R.C. Kothari – 2004.

Course	**: B. Sc Biochemistry**	**Subject code**	**: 14UBCS12**
Semester	**: I**	**No. of Hrs allotted**	**: 2**
Paper	**: Skill Based Subject - II**	**No. of Credits**	**: 2**

NUTRITION

Unit – I

Food groups, good habits, food fads and fallacies, changing food habits. Carbohydrates: Kinds, Functions, and food sources – Fates: Kinds, Functions, food sources, essential fatty acids and cholesterol.

Unit – II

Proteins: Kinds, functions, food sources, complete and incomplete proteins – Energy: Basal metabolism, measurement of BMR, factors affecting BMR, regulation of body temperature, energy needs, total energy requirement and energy value of foods.

Unit – III

Protein nutritional Nitrogen balance. Quality of food proteins and requirements, Protein nutrition abnormalities, protein deficiency disorder PEM – Balanced died formulation Assessment of nutritional status.

Unit – IV

Nutrition at various stages of growth and development – Diets for infants, children, adolescents, pregnant women, lactating mothers and older persons.

Unit – V

Nutritional challenges of the future: Food production and food storages, future foods new protein foods.

References

1. Principles of Nutrition Determination Dietetics – Dr. M.Swaminathan
2. Advanced textbook on food and Nutrition – Vol –I & II, - Dr.M.Swami Nathan, Second edition.
3. Normal and Therapeutic Nutrition – Corine Robinson

Course	**: B. Sc Biochemistry**	**Subject code**	**: 14UBCN11**
Semester	**: I**	**No. of Hrs allotted**	**: 2**
Paper	**: Non Major Elective - I**	**No. of Credits**	**: 2**

HEALTH AND HUMAN DISEASES

Unit – I

Introduction – Importance of being healthy – nutrition – exercise causes of disease – environment – age – living conditions – life style – obesity – BMI.

Unit –II

Diseases – causes – symptoms – treatment of heart diseases jaundice – cancer.

Unit – III

AIDS – Nosocomical diseases – traveling disease – children and old age diseases – T.B. leprosy – Dengue – Bird Flu.

Unit – IV

Diseases prevention – healthy habits, disease prevention awareness – vaccination – immunization schedule.

Unit – V

First aid measures – Accident care – Bleeding and wound care – Fractures and dislocations – electrical shock – burns – breathing emergency – Allergies – Pregnancy care.

References:

- Microbiology-Alcamo
- Biochemistry – Thomas Devlin.
- Fundamentals of Biochemistry – A.C. Deb.
- Clinical biochemistry – Chatterjee.
- Kavanagh James. “Emergency First Aid” Waterford Publisher.
- Kathleen handal. “The American Red Cross First Aid and safety Handbook”

SEMESTER - II

Course	**: B. Sc Biochemistry**	**Subject code**	**: 14UBCC21**
Semester	**: II**	**No. of Hrs allotted**	**: 4**
Paper	**: Core Subject - II**	**No. of Credits**	**: 4**

BIOCHEMICAL TECHNIQUES

Unit – I

Chromatographic Techniques: Column, Paper and Thin layer Chromatography, Adsorption Partition, Ion exchange, Gas chromatography and HPLC, GCMS, HPTLC, Gel Filtration, Dialysis.

Unit II

Electrophoresis Techniques – Principles – Instrumentation, Application of different types of Electrophoresis – Agarose, SDS PAGE. Principles and application of PCR.

Unit – III

Centrifugation Techniques – Theory, relation between RPM and g – Differential centrifugation other types – Different centrifuges. Measurement of Gases: Manometer. Microscopy light phase contract, fluorescent and electron microscopy, SEM, TEM.

Unit – IV

a. **Colorimetry Techniques:** Light spectrum and its wavelength regions Complementary colors. Molar Extinction co – efficient. Beer Lambert's law and its application.
b. **Radio isotopic Techniques:** Radioactivity, Elementary units, Deduction and citification – Auto radiography, fluorography, isotopic tracer technique, Isotope dilution method – Application – Safety Measures.

Unit – V

Spectroscopic techniques: Introduction, X – ray Spectroscopy, UV and visible light Spectroscopy, infra red and Raman Spectroscopy, ESR, NMR, CD Spectroscopy, XRD.

References

1. Tools in Biochemistry. Terrance G. Cooper
2. SEPARATION METHODS IN Biochemistry. CJOR Morris and Maris
3. Spectroscopy in Biology and Chemistry. Sow Hsinchem and Siney YI
4. The use of radioactive isotopes in the life sciences. Chapman and Aecrey
5. Manometric and Biochemical techniques. Umbrit and Burris.
6. Practical Biochemistry, Wilson and Walker
7. Modern Experimental Biochemistry 3rd edition, Rodney Boyer, Pearson education, 2004.

Course	**: B. Sc Biochemistry**	**Subject code**	**: 14UCHA21**
Semester	**: II**	**No. of Hrs allotted**	**: 4**
Paper	**: Ancillary Chemistry Subject - II**	**No. of Credits**	**: 4**

ORGANIC, INORGANIC AND PHYSICAL CHEMISTRY

Unit - I

Nuclear chemistry:

a) Composition of the nucleus – nuclear forces – mass defect – binding energy – nuclear stability

b) Soddy's group displacement law – illustration – law of radioactive disintegration.

c) Nuclear fission: Definition – theories of fission – application of fission – the Principle of atom bomb.

d) Nuclear fusion: Definition – emission of energy – stellar energy – hydrogen bomb.

e) Application of radioactivity – In medicine, agriculture, industry and analytical fields – carbon dating.

Unit - II

a) Carbohydrates: Definition – classification – monosaccharide - properties and uses of glucose and fructose – configuration of glucose – Haworth structure – conversion of glucose to fructose and vice versa.

b) Disaccharides: Sucrose – manufacture – properties and uses – structure – distinction between sucrose, glucose and fructose.

c) Polysaccharides: Starch and cellulose (structure only) – α amylase – β amylase – difference between these two.

Unit - III

a) Stereo isomerism: Chiral centre – optical activity of compounds containing one or two chiral centers – R-S notation – diastereoisomers – racemisation - resolution.

b) Geometrical isomerism of maleic and fumeric acids – E-Z notation of geometrical isomers.

Unit - IV

a) Aromatic halogen compounds: Chlorobenzene, hexachlorobenzene – halogenations of toluene – preparation, properties and uses of benzoyl chloride, chlorotoluene – DDT – preparation and mode of application.

b) Mechanism of aliphatic substitution: S_N1, S_N2 – illustrations with examples – differences – Stayzeff – Hoffmann rules.

c) Organometallic compounds: Definition – preparation – synthetic application of Grignard reagent.

Unit V

a) Amino acids and proteins: Classification – synthesis – properties of amino acids – polypeptides – proteins – classification and biological functions.

b) Dyes: Definition – theory of colour and constitution – classification based on structure and application – preparation of methyl orange, bismark brown, malachite green – vat dye – indigo.

BOOKS RECOMMENDED:

1. Essential of physical chemistry: ArunBhal, B.S.Bhal, G.D.Tuli (revised edition, S.Chand,2010)
2. Principles of physical chemistry: Puri, Sharma, Pathania (revised edition, Vishal pub.,2010)
3. Modern Inorganic chemistry: R.D Madan (Revised edition, S.Chand,2010)
4. A Text book of organic chemistry: ArunBhal, B.S.Bhal, G.D.Tuli (revised edition, S.Chand, 2010).

Course	**: B. Sc Biochemistry**	**Subject code :**	**14UBCS21**
Semester	**: II**	**No. of Hrs allotted**	**: 2**
Paper	**: Skill Based Subject - III**	**No. of Credits**	**: 2**

MEDICAL LAB TECHNOLOGY

Unit – I

Blood of Urine analysis: Blood analysis – Collection and preservation of blood – anticoagulants – normal hematological values – prevention of clotting. Blood banking urine analysis – collection and preservation of urine. Macroscopic and microscopic examination of urine culture – chemical examinations of urinary calculi.

Unit – II

Mycology and Immunology: Mycology – Introduction to common fungal disease – Investigation of fungal infections Candiosis, Mycetomos, Cryptoccus.

Unit – III

Immunological Diagnosis: Immunology – Collection and preservation of serum – Measurement of Antibodies, Agglutinations reaction, widal test, serological tests for syphilis – VDRL slide flocculation test, ELISA.

Unit – IV

Molecular Biology Techniques: Plasmid Analysis – Polymerase chain reaction for detection of diseases – sample processing for DNA extraction – DNA finger printing.

Unit – V

Hematology and Blood Banking: Complete Haemogram – grouping & "Rh" typing – Blood Bank Setup – Blood collection screening storage, cross matching & Blood transfusing.

References:

1. Clinical chemistry – Teetz
2. Practical chemistry – varley
3. Medical lab technology – M. Muckerjee
4. Immunology – Roit
5. Molecular Laboratory techniques by – Godger
6. Medical Laboratory techniques by Godger
7. Hematology – Ramnik Sood

Course	**: B. Sc Biochemistry**	**Subject code :**	**14UBCS22**
Semester	**: II**	**No. of Hrs allotted**	**: 2**
Paper	**: Skill Based Subject - IV**	**No. of Credits**	**: 2**

PHARMACOLOGY

Unit – I

General Introduction to Pharmacology, principle and Concept of Pharmacology Drug classes – herbal drugs and allopathy drugs.

Unit – II

Drug metabolism – Drug absorption, transformation and elimination Chemical pathways of drug metabolism Phase I and II reactions. Microsomal and non-microsomal metabolism of drugs, role of cyt p450.

Unit – III

Herbs and nutrition, Herbs side effects, Herbal drugs for various diseases, herbal drug formulation, route of administration.

Unit - IV

Scientific evaluation drugs, Herbal drug formulation, route of administration & acute toxic on animals.

Unit - V

Safety & efficacy of drugs, Herbal drug formulation, route of administration & acute toxic on animals.

References:

Basic pharmacology – Henry, Hinter and Barbaroongle.

Pharmacological Microbiology – Hegho WB and Rusellael

Pharmacological Chemistry – Satoskar Vol I and II

Course	**: B. Sc Biochemistry**	**Subject code :**	**14UBCN21**
Semester	**: II**	**No. of Hrs allotted**	**: 2**
Paper	**: Non Major Elective - II**	**No. of Credits**	**: 2**

HERBAL MEDICINE

Unit – I

Introduction: Scope – Alternative systems of medicine – advantages – human system – herbals for human system – definition.

Unit – II

Secondary metabolites: Source – different types – action – medicinal plants – pharmacological action.

Unit – III

Herbal cultivation: Plant – types – Methodology – marketing – economic potential – pharmacological companies – manufacture – patency GATT – TRIPS – WTO.

Unit – IV

Herbal gardening: Types – methodologies – applications – home gardens – types – methodologies – Replication – home made remedies – herbal formulations – herbal physiotherapy.

Unit – V

Rant Propagation: Definition – types – grafting – endangered plants – need for conservation – techniques I – Tissue culture – requirements – techniques – Micro propagation.

References:

1. Biotechnology of Secondary metabolites – K.g. Ramawat, J.M. Murittion.
2. Indian medicinal plants Vol – I to Vol – V
   a. A compendium of 500 Species – Orient Longman
3. Introduction to spices, plantation crops, Medicinal aromatic plants – N.Kumar et. Al.

Course	**: B. Sc Biochemistry**	**Subject code :**	**14UBCC2P**
Semester	**: II**	**No. of Hrs allotted**	**: 2**
Paper	**: Major practical - I**	**No. of Credits**	**: 2**

QUALITATIVE ANALYSIS OF BIO - ORGANIC COMPOUNDS

1. **Qualitative analysis of bio – organic compounds**
   a. Analysis of Carbohydrates
   b. Analysis of amino acids
   c. Test for proteins
   d. Test for lipids – Test for cholesterol
   e. Qualitative tests for DNA and RNA
   f. Biochemical Preparation
   g. Starch from potato
   h. Lactose from milk
   i. Casein from milk
   j. Caffeine from coffee seeds
2. Use of PH meter for the preparation of buffer
3. Verification of Beer – Lambert's law using colorimeter
   i. Determining the concentration of any given colored compounds using standard graph.

Course	**: B. Sc Biochemistry**	**Subject code**	**: 14UCHA2P**
Semester	**: II**	**No. of Hrs allotted**	**: 2**
Paper	**: Ancillary Practical - I**	**No. of Credits**	**: 2**

INORGANIC QUANTITATIVE ANALYSIS

a. Acidimetry and Alkalimetry

1. Titration between a strong acid and strong base
2. Titration between a strong acid and weak base
3. Titration between a weak acid and strong base.

b. Permanganimetry

1. Titration between permanganate with oxalic acid, Ferrous sulphate and ferrous ammonium sulphate (Mohr's salt)

c. Iodometry

1. Titration of sodium thiosulphate with potassium permanganate and potassium dichromate.

SEMESTER – III

Course	**: B. Sc Biochemistry**	**Subject code :**	**14UBCC31**
Semester	**: III**	**No. of Hrs allotted**	**: 4**
Paper	**: Major Subject - III**	**No. of Credits**	**: 4**

ENZYMES & ENZYME TECHNOLOGY

Unit – I

Overview- Nomenclature and classification, function, isolation, purification and characterization of Enzymes.

Unit – II

Enzyme specificity – Enzyme reactions – oxidation and reduction, isomerisation, phosphorylation acetylation and methylation, dehydration, decarboxylation, transamination.

Unit-III

Enzyme substract complexes – Michaelis and Menten kinetics: Determination of Km and V_{max} – Line Weaver Burks plot – Factor influencing Enzyme reactions – Enzyme inhibition.

Unit – IV

Mechanism of Enzyme actions, Role of coenzymes in Enzyme reactions – Eg: Coenzyme A, NAD, FAD only – Zymogens.

Unit –V

A brief account of clinical and Industrial application of Enzymes – Enzyme immobilization and its application – Biosensors and their applications.

References:

1. Enymes – Nicholas Price.
2. Enzymes structure and Mechanism by Allan Fersht.
3. Biochemistry, Lehninger, A.L.Nelson, Cox
4. Biochemistry, Donald Voet & Judith Voet, International Edition

Course	**: B. Sc Biochemistry**	**Subject code**	**: 14UCHA31**
Semester	**: III**	**No. of Hrs allotted**	**: 4**
Paper	**: Ancillary Chemistry Subject - III**	**No. of Credits**	**: 4**

ORGANIC, INORGANIC AND PHYSICAL CHEMISTRY

Unit - I

a) Adsorption: Definition – differences between adsorption and absorption – adsorbate, adsorbent – physical adsorption – chemical adsorption – differences between these two types – factor influencing adsorption – adsorption isotherm – Langmuir isotherm (no derivation statement only) – adsorption of gases on solid surface.

Unit - II

a) Catalysis: Definition – different types of catalysis – acid-base catalysis – surface catalyzed reactions – definition and examples of auto catalyst – catalytic poisoning – promoters – enzyme catalysis – characteristics.

b) Polymers: Definition – classification of polymers – properties of polymers – addition and condensation polymerization reactions with examples – natural rubber – isoprene unit – vulcanization of rubber – preparation and applications of polystyrene, urea-formaldehyde resin, Teflon and buna-s rubber.

Unit - III

a) Photochemistry: Comparison of thermal and photochemical reactions – definition of photochemical reactions – laws of photochemistry – Grothu's- Draper law quantum efficiency – reasons for low and high quantum yield with examples – consequences of light absorption by atoms and molecules – Jablonski diagram – fluorescence – phosphorescence – photosensitization – chemiluminescence – bioluminescence – application of photo chemistry.

Unit - IV

a) Coordination compounds: Definition – nomenclature - definition of various terms involved in coordination chemistry – Werner's theory – EAN rule – VB theory (outline only) – Nickel carbonyls - chelates.

Unit - V

a)Petro chemicals: Crude oil – chemicals from crude oil – LPG-activation fuels used in Locomotives, trucks, ships and light commercial vehicle – knocking – TEL – Octane number – Synthetic petrol.

BOOKS RECOMMENDED:

1. Essential of physical chemistry: Arun Bhal, B.S. Bhal, G.D. Tuli (revised edition, S.Chand,2010)
2. Principles of physical chemistry: Puri, Sharma, Pathania (revised edition, Vishal pub.,2010)
3. Modern Inorganic chemistry: R.D Madan (Revised edition, S.Chand,2010)
4. A Text book of organic chemistry: Arun Bhal, B.S. Bhal, G.D. Tuli (revised edition, S. Chand, 2010).

Course	**: B. Sc Biochemistry**	**Subject code**	**: 14UMBA31**
Semester	**: III**	**No. of Hrs allotted**	**: 4**
Paper	**: Ancillary biology Subject - I**	**No. of Credits**	**: 4**

GENERAL BIOLOGY

Unit - I

Basis of classification - units of classification - Species, Genus, Family - Nomenclature-Binomial system. Bentham and hooker system of classification of plants.

Unit - II

Morphology, structure and reproduction of plants. Algae - General characters and classification- sargassum as an example. Fungi - General characters and classification - Yeast as an example. Bryophytes - General characters and classification - Funaria as an example.

Unit - III

Pteridophytes - selaginella, heterospory and seed habit. Gymnosperm – Pinus - economic uses of gymnosperm. Angiosperm - Monocot plant - Allium sp, Dicot plant- Tribulus terrestris.

Unit -IV

Human physiology - Structure and function of Digestive system - Respiratory system - circulatory system - Blood and their properties - Excretory system.

Unit - V

Muscular system - Nervous system - Endocrine glands - Reproductive system – Hormones - menstrual cycle.

References:

1. A.C Dutta, Botany for Degree students, Oxford university press.
2. W.T. Tailor and R.J. Wehe-General Biology, East West press pvt ltd.
3. E.L. Jordan and verma. Invertebrate Zollogy, S. Chandra &Co, New Delhi.
4. E.L. Jordan and verma.Chordate Zollogy, S. Chandra &Co, New Delhi.

SEMESTER - IV

Course	**: B. Sc Biochemistry**	**Subject code :**	**14UBCC41**
Semester	**: IV**	**No. of Hrs allotted**	**: 4**
Paper	**: Major Subject - IV**	**No. of Credits**	**: 4**

METABOLISM

Unit - I

Bioenergetics: High energy and Low energy phosphates: Electron Transport chain, Oxidative phosphorylation.

Unit - II

Metabolism of Carbohydrate: Glycolysis, TCA cycle, Energetic of TCA cycle, HMP shunt, Glyconeogenesis, Glycogenolysis Glycogenesis.

Unit - III

Metabolism of amino acid: A brief account of amino acid metabolism of Glycine, Cysteine, Proline, Homoserine, Phenylalanine only.

Unit - IV

Metabolism of lipid: Oxidation of fatty acid, Energetic f oxidation, Ketone body metabolism. Glycerol metabolism, Biosynthesis of TG, Phospholipids, Cholesterol metabolism

Unit - V

Metabolism of nitrogen containing compounds: Purine and Pyrimidine bases - Biosynthesis of purine, biosynthesis of DNA and RNA.

References:

1. Harper's Illustrated Biochemistry – 26th edition, Robert K. Murrary, Peter A.Meyes, Victor W. Rodwell. 2003.
2. Principles of Biochemistry- Albert L. Lehninger. 2003.
3. Bender, David, A. Amino acid Metabolism, Willey (1985),
4. Biochemistry by Devlin
5. Biochemistry, Donald voet & Judith Voet, Wiley International Edition, 2004.
6. Biochemistry, Lubert Stryer et al., Fifth edition, W.H. Freeman and company, New York, 2003.V.

Course	**: B. Sc Biochemistry**	**Subject code: 14UCHA41**	
Semester	**: IV**	**No. of Hrs allotted**	**: 4**
Paper	**: Ancillary Chemistry Subject - IV**	**No. of Credits**	**: 4**

ORGANIC, INORGANIC AND PHYSICAL CHEMISTRY

Unit - I

a) Hetero cyclic compounds: Preparation and reactions of furan, pyrrole, pyridine, quinoline, isoquinoline, uracil, thymine, adenine and guanine.

Unit – II

a) Alkaloids: Pharmacological properties and importance of the following alkaloids – nicotine, qunine, piperine and cocaine (structural elucidation not necessary).

b) Vitamins and antibiotics:

i) Classification and biological functions of vitamins A, B_6, B_{12}, C, D, E and K (structure elucidation not required).

ii) Classification and biological functions of antibiotics – pencillin, chloroamphenicol, streptomycin and tetracyclines.

Unit – III

Chemical kinetics: Reaction rate – order and molecularity of a reaction – zero order – first order. First order rate equation and half-life period – derivation. Examples of first order reactions – second order reactions – examples. Carbon dating – enzyme catalysis – Michaelis and menton mechanism – Lineweaver-Burk plot – Significance of K_m.

Unit – IV

Chromatographic techniques: Principle and application – partition and adsorption chromatography – thin layer chromatography – column chromatography – paper chromatography – gas-solid and gas-liquid chromatography.

Unit - V

Electro chemistry:

a) pH – Definition-simple calculation of pH from Molarity of acid and bases-common ion effect-and its application in analytical chemistry-buffer solution-definition-theory of buffer action-application.

b) Acid- base indicators-working range – commercial cells and batteries – primary and secondary cells-Weston – cadmium cell-lead storage cell- electroplating – principle and methods.

BOOKS RECOMMENDED:

1. Essential of physical chemistry: ArunBhal, B.S.Bhal, G.D.Tuli (revised edition, S.Chand,2010)
2. Principles of physical chemistry: Puri, Sharma, Pathania (revised edition, Vishal pub.,2010)
3. Modern Inorganic chemistry: R.D Madan (Revised edition, S.Chand,2010)
4. A Text book of organic chemistry: ArunBhal, B.S.Bhal, G.D.Tuli (revised edition, S.Chand, 2010).

Course	**: B. Sc Biochemistry**	**Subject code**	**: 14UMBA41**
Semester	**: IV**	**No. of Hrs allotted**	**: 4**
Paper	**: Ancillary biology Subject - I**	**No. of Credits**	**: 4**

CELL BIOLOGY

Unit - I

Cell structure - Prokaryotic and eukaryotic - Plant and Animal cell - Plasma membrane - chemistry and ultrastructure - Fluid mosaic model - Protoplasm-chemistry and organization - microtubules and microfilaments

Unit - II

Cytoplasmic organelles in Eukaryotes - ER, Golgi complex, lysosomes, Mitochondria, Chloroplast, Ribosomes, mesosomes

Unit - III

Nucleus-structure and functions, chromatin - Eu and Hetero chromatin, chemistry – chromosome – kinds - functions, nucleolus-structure – functions - mechanism of photosynthesis and generation of ATP.

Unit - IV

Cell cycle - mitosis and meiosis - interphase and division phase - Cell growth - normal and cancerous.

Unit - V

Microscopy – Types – Light - Electron and Phase contrast microscope structure and function.

References:

1. Albert, bray, D. Lewis, J. raff, M. Roberts. K and Watson, J.D-Molecular biology of the cell, New York, garland 1983

2. De Roberties E.D.P., F.A Saez and De Roberties E.M.F-cell biology, 1990.

3. K.V. Krishnamoorthy -methods in plant histochemistry, S. Viswanathan publications 1988.

4. P.S. Verma and V.K. Agarwal. Text book of cytology. S. Chand & Co., New Delhi 1995.

5. P.S. Verma and V.K. Agarwal. Text book of Cell Biology, Genetics, Evolution and Ecology. S. Chand & Co., New Delhi.

Course	**: B. Sc Biochemistry**	**Subject code :**	**14UBCC4P**
Semester	**: IV**	**No. of Hrs allotted**	**: 2**
Paper	**: Major Practical - II**	**No. of Credits**	**: 2**

MAJOR PRACTICAL - II

Analysis of Lipids

a. Determination of iodine number
b. Determination of specification number
c. Estimation of total cholesterol.

Analysis of Carbohydrates

i. Estimation of glucose by (any two methods)
    a. Phenol sulphuric acid method.
    b. Anthrone method.
    c. Benedict's method
    d. Copper reduction method.
ii. Estimation of pentose by Bial's method.
iii. Estimation of fructose by Seliwanoff's method.
iv. Estimation of reducing sugar in a fruit
v. Estimation of lactose in milk.

Analysis of Proteins

a. Protein determination – Lowry's method
b. Protein determination – Biuret method

Analysis of Vitamins

a. Determination of ascorbic acid (Colorimetric)

Course	**: B. Sc Biochemistry**	**Subject code**	**: 14UCHA4P**
Semester	**: IV**	**No. of Hrs allotted**	**: 2**
Paper	**: Ancillary Practical - II**	**No. of Credits**	**: 2**

ORGANIC SUBSTANCE ANALYSIS

Analysis of organic compound containing one / two functional groups and conformation by the preparation of a solid derivative / colour reactions – acids, phenols, aldehydes, esters, amines(primary, secondary and tertiary), amides, anilides, aliphatic diamide and monosaccharide.

Course	**: B. Sc Biochemistry**	**Subject code**	**: 14UMBA4P**
Semester	**: IV**	**No. of Hrs allotted**	**: 2**
Paper	**: Ancillary biology practical - I**	**No. of Credits**	**: 2**

Botany

1. Vegetative structure and reproductive structure in sargassum, yeast, funaria, seleginella and pinus (section cutting of sargassum and seleginella, pinus stem and needles)

2. Structure of monocot flower-*Allium cepa*

3. Structure of Dicot flower-*Tribulus terrestris*

Zoology

1. Cockroach-external and digestive system, reproductive system and nervous system.

2. Frog-External, digestive system, urogenital system and brain (spotters only).

3. Morphology of the representative for each phylum spotters only- Amoeba, Euglena, paramecium, Hydra, Planaria, Liverfluke, Teania, Ascaris, earthworm, Prawn, Pila, Starfish, Shark, Mugil, pigeon, rat.

4. Blood cells of man and blood vessels.

5. Study of mitosis by smear technique of *Allilum cepa* root.

6. Demonstration of Histochemical staining methods

7. Determination of blood groups & Rh factors.

8. Determination of haemoglobulin.

9. Blood cell counts

SEMESTER – V

Course	**: B. Sc Biochemistry**	**Subject code :**	**14UBCC51**
Semester	**: V**	**No. of Hrs allotted**	**: 4**
Paper	**: Major Subject - V**	**No. of Credits**	**: 4**

MOLECULAR BIOLOGY

Unit - I

Origin of Molecular Biology – Periodic origin of Biomolecules – Self-replicating Biomolecules Advantages of compartmentalization of Biomolecules.

Unit - II

Chemical basis of hereditary – Nucleic acid as the genetic material – Chromatin structure and composition.

Unit - III

Fundamentals of DNA Structure and its replication – DNA repair – Introduction Genetic code – molecular changes associated with Gene mutation.

Unit - IV

Transcription of RNA – Post transcriptional modification -Modulation of gene expression Concepts of Operons – Inducers and repressors – Lac operon only.

Unit - V

Translation Process – tRNA, rRNA, mRNA and their roles – Post translational regulation Ways of gene transfer, transformation, transduction, conjugation.

Reference

1. The Biochemistry of the Nucleic acids, 9th edition, 1981, R.L.P. Adams, R.H. Burdon, A.M. Camphell, D.P. Leader, R.M.S. Smith Chapman and Hall.
2. Freifelder, F.Physical Biochemistry: Applications to Biochemistry and Molecular Biology (2nd ed) Freeman (1982)
3. Molecular Biology – Freifelder.
   The cell & Molecular biology Geofrey M.Cooper, 2nd Edition.
4. Principles of Biochemistry, Abert Lehinger

Course	**: B. Sc Biochemistry**	**Subject code :**	**14UBCC52**
Semester	**: V**	**No. of Hrs allotted**	**: 4**
Paper	**: Major Subject - VI**	**No. of Credits**	**: 4**

MICROBIOLOGY

Unit – I

Organization and structure of microorganisms: General classification of microorganisms and their characteristics. Prokaryotic organization – cytoplasmic membrane and their functions – mesosomes. Cell Wall – gram positive and gram negative reactions, capsules and slime layers – Flagella and cilia – bacterial chromosomes, Plasmids, ribbosome's, reserved food endospore.

Unit – II

Bacterial nutrition : Growth and reproduction – atotrophic and heterotrophic nutrition – bacterial photosynthesis – Bacterial metabolism – Fermentation: homo fermentative and hetero fermentative types – Binary fission – other modes of reproduction – Conjugation – Transformation – Transduction – Sporulation – Kinetics of bacterial growth – normal growth curve.

Unit – III

Microscopy: Simple, compound microscope, light and dark field microscope, parts and their functions, resolving power, aperture, electron, phase contrast microscope and their applications.

Unit – IV

Applied microbiology: Food microbiology – food spoilage, food poisoning, food borne infection. Industrial microbiology – use of microbes in industries- ethanol, organic acid (lactic and citric), antibiotics (Penicillin and Streptomycin) production. Microorganism and milk – fermentation of milk, milk souring, proteolysis, alkali production, sweet curding, butyric acid fermentation.

Unit - V:

Medical Microbiology: Pathogenesis and prevention of air and water borne diseases – Typhoid, Cholera, Dysentry. Diarrhea, hepatits, amoebiosis, tuberculosis, pox diseases, diphtheria and poliomyelitis.

References:

1. Microbiology – A Human perspective, nester, Roberts, Nester
2. Microbiology, Pelezar, TATA McGraw Hill company
3. Microbiology, 6/e Prescott, Harley and Klein, Tata McGraw Hill Company 206.
4. The Microbial world, tanier, Prentice Hall
5. Microbiology, Tortora

Course	**: B. Sc Biochemistry**	**Subject code :**	**14UBCC53**
Semester	**: V**	**No. of Hrs allotted**	**: 4**
Paper	**: Major Subject - VII**	**No. of Credits**	**: 4**

IMMUNOLOGY

Unit – I

Definition: Immunity, host resistance, antigen, antibody, leucocytes etc., Principles of Innate and acquired immunity, Memory specificity – self/non self diversity – introduction to cells and organs of the immune system.

Unit – II

Types of immunoglobulins – Ig M, Ig G, Ig A, and Ig E – Structure of antibody molecule lg G only. The nature of antigens – immunogen and hapten – T dependent and independent antigens.

Unit – III

Antigen antibody interaction – agglutination – precipitation – immunodiffusion – immunoelectrophoresis – radioimmunoassay – immunofluorescence – complement fixation – ELISA – production of antisera – production of monoclonal antibodies.

Unit – IV

Blood group antigen – Rhesus – incompatibility – major histocompatibility complex – autoimmune disease – vaccines – immunodiagnostics.

Unit – V

Hyper sensitivity – types – mechanism – transplantation – graft rejection, tissue typing, immune suppression, tumor antigen, cancer immune therapy.

References:

1. Roitt – IH, 2005. Essential of Immunology, ELBS, Blackwell Scientific Publication.
2. Kuby, J.2004. Immunology V.Edition. W.H. Freeman and company. NY
3. Immunology – Tizard
4. Immunology – Eli Benjamin

Course	**: B. Sc Biochemistry**	**Subject code :**	**14UBCS51**
Semester	**: V**	**No. of Hrs allotted**	**: 2**
Paper	**: Skill Based Subject - V**	**No. of Credits**	**: 2**

CLINICAL DIAGNOSTICS

Unit – I

Tissue function tests of Liver, Kidney, and Pancreas, significance of tissue function test.

Unit – II

Clinical Hematology – abnormal hemoglobin, anemia's, disturbances in blood clotting mechanism.

Unit – III

Renal and Liver Transport – renal Glycouria, fanconi syndrome, Crigglar – Najjar disease, Gilbert's disease, Dubin – Johnson disease.

Unit – IV

Diagnostic Enzymology: Diagnostic uses of enzyme SGOT-SGPT-CPK-LDH.

Unit – V

Poisonous substances – Estimation of poisons. Oncology – Formation of Cancer, malignant and nonmalignant Tumors, Carcinogenic Substances.

References:

1. Hawk's Philogical Chemistry
2. Practical Clinical Biochemistry – Harold Varley, Fourth edition
3. Clinical Biochemistry – Tietz
4. Biochemistry – Chatterjee
5. Physiological basis for medical practice, Best & Taylor
6. Human Physiology, Guytons

Course	**: B. Sc Biochemistry**	**Subject code**	**: 14UMBA51**
Semester	**: V**	**No. of Hrs allotted**	**: 4**
Paper	**: Ancillary biology Subject - III**	**No. of Credits**	**: 4**

GENETICS AND BIOSTATISTICS

Unit - I

Mendelian Genetics - Mendel's works, experiments, observations and results - Mendel's laws – terms - Back cross, Test cross - complete and incomplete dominance - co dominance

Unit - II

Allelic interaction - Multiple Alleles - blood group inheritance-Rh factor - Multiple gene inheritance - genes and chromosomes-crossing over and linkage.

Unit - III

Biostatistics – Introduction - Data collection - Types of data – primary, secondary and tertiary data - sampling and sampling designs-random and non-random sampling.

Unit - IV

Representation of data - Diagrammatic - simple bar diagram, Pie diagram - graphical representation - Histogram, frequency curve, cumulative frequency curve - Measures of central tendency - Explanation - Types of average-Arithmetic mean – median – Mode - Continuous series - discrete series.

Unit – V

Measures of dispersion – Explanation – Types – range - Mean deviation - Standard deviation – Variance - correlation and regression.

References:

1. Principles of Genetics - edmund. W. Sinnot, Dunn, L.C
2. Molecular Biology - David Frifielder.
3. An introduction to Biostatistics.2005.N.Gurumani
4. Statistics. Pillai. R.S.N and bhagavathi 2003

SEMESTER – VI

Course	**: B. Sc Biochemistry**	**Subject code :**	**14UBCC61**
Semester	**: VI**	**No. of Hrs allotted**	**: 4**
Paper	**: Major Subject - VIII**	**No. of Credits**	**: 4**

BIOTECHNOLOGY

Unit – I

Genetic Engineering – Introduction to gene cloning, restriction enzymes and mode of action, Types of cloning vectors, plasmid, cosmid, m13 phage.

Unit – II

Plant Biotechnology – vector for gene transfer using Agrobacterium only, Transgenic plants, crop Improvement.

Unit – III

Animal Biotechnology – Genetic engineering in animal's viral vector and Yeast. Vectors. Transgenic animals. Maintenance of animal cell culture, measurement of viability, cytoxicity, measurement of cell death apoptosis Embryonic, stem cell Application of animal cell culture.

Unit – IV

Microbial biotechnology; Bioprocess, Basic principles of microbial growth, types, design and operation of fermentors, oil spill clean by microbes, Biodegradable plastics.

Unit – V

Production of Novel proteins – Insulin – Interferon's vaccines – Gene therapy – Treatment of Various human disorders.

References:

1. Biotechnology by P.K. Gupta
2. Principles of Biochemistry by Lehinger & Cox.
3. Biotechnology by Satyanarayana.

Course	**: B. Sc Biochemistry**	**Subject code :**	**14UBCC62**
Semester	**: V**	**No. of Hrs allotted**	**: 4**
Paper	**: Major Subject - IX**	**No. of Credits**	**: 4**

PLANT BIOCHEMISTRY

Unit – I

Introduction: Occurrence, classification, structure and function of naturally occurring pigments, Carotenoids, flavones, flavonols and chlorophylls.

Unit – II

Photosynthesis: Photosynthetic apparatus and photosynthesis pigments, Light and dark reactions of photosynthesis, C3, C4 and CAM plants – factors affecting photosynthesis, photorespiration.

Unit – III

Plant Nutrition: Essential mineral nutrients – function, effects of toxicity and deficiency, N_2 cycle, N_2 fixation – symbiotic and asymbiotic Nitrogen Fixation – Nitrogenase, nitrate assimilation – surlphur as a mineral nutrient, sulphate assimilation.

Unit – IV

Plant growth regulators: Normal growth hormones – Auxins, GA, Cytokinins, Ethylene and ABA – Synthetic growth hormones.

Unit – V

Plant tissue culture: Importance of plant tissue culture, Basic requirements formulation of medium, culture of plant tissues, Applications.

References:

a. Plant Biochemistry by Devlin and Witham
b. Plant Biochemistry by Ross and Salisburry
c. Plant Biochemistry by Bonner and Vamer, 3rd edition, acadmic press.
d. Plant physiology by Hopkins
e. Plant physiology, Noggle Fritz

Course	**: B. Sc Biochemistry**	**Subject code :**	**14UBCC63**
Semester	**: VI**	**No. of Hrs allotted**	**: 4**
Paper	**: Major Subject - X**	**No. of Credits**	**: 4**

CLINICAL BIOCHEMISTRY

Unit – I

Introduction – Scope of clinical biochemistry – Development of clinical bio – chemistry Laboratory investigation in Clinical Biochemistry – Evaluation of laboratory test – Normal range system of international units – Techniques used in clinical assays.

Unit – II

Disorders of Carbohydrate metabolism: Sugar level in normal blood Hypo and Hyperglycemia, glycosuria, obesity and Galactosemia Glucose tolerance test – Inborn errors of carbohydrate metabolism

Unit – III

Disorders of lipid metabolism: hypo and hyper Lipoproteinemia, disorders of Triglycerides, Phospholipids and Cholesterol metabolism – Inborn errors of lipid metabolism.

Unit – IV

Disorders of amino acid protein metabolism: amino acid metabolism in starvation – disorders of Plasma proteins, urea, Uric acid, Creatinine, ammonia, Uremia, Urecemia and Porphyria Inborn errors of amino acid metabolism.

Unit – V

Disorders of Nucleic acid metabolism: Purine and Pyrimidine metabolism – Gout, LNS, Orotin aciduria Xanthinuria

Reference:

1. Physiological Chemistry – Hawk's
2. Practial Clinical Biochemistry – Harold Varley, Fourth edition.
3. Clinical Biochemistry – Tietz.
4. Biochemistry – Chatterjee
5. Phyiological basis for medical practice, Best & Tayior
6. Human Physiology, Guyton

Course	**: B. Sc Biochemistry**	**Subject code :**	**14UBCC64**
Semester	**: VI**	**No. of Hrs allotted**	**: 4**
Paper	**: Major Subject - XI**	**No. of Credits**	**: 4**

FOOD TECHNOLOGY

Unit – I

Single cell protein: Sources of SCPs, Nutritive value of SCPs, conception of SCPs, Production of SCP by genetic engineering. Application of SCP.

Unit – II

Mushroom Technology: Mushroom and its types introduction a mushroom cultures methodology significance of mushrooms.

Unit – III

Microbial production of fermentation: Introduction production of amino acids, alcohols, organic acids process of vegetables – fruit processing – citrus juices, apple juices, slices, grapes juices and raisins, squashes, Jams, ketchups. Polysaccharrides, antibiotic production, alcoholic beverages.

Unit – IV

Dairy chemistry: Composition of milk, physical properties of milk, milk clothing enzymes, frozen Dairy Products.

Unit – V

Animal food processing: Aging – tendering, freezing, storage fish, preservation and processing, Dehydrated egg powders, frozen egg, egg storage.

References:

1. Introduction of Food Science and Technology – Text book by George F. Stewart
2. Food Technology: An introduction book by Anita Tull.
3. Food Processing Technology- Text book by P. Fellows

Course	**: B. Sc Biochemistry**	**Subject code**	**: 14UMBA61**
Semester	**: VI**	**No. of Hrs allotted**	**: 4**
Paper	**: Ancillary biology Subject - IV**	**No. of Credits**	**: 4**

ENVIRONMENTAL BIOLOGY

Unit - I

Environmental biology and its relevance to human civilization - environmental factors - Physical, chemical and biological – and their influence in living system-population explosion and its consequences - Deforestation and its consequences.

Unit - II

Ecosystem and flow energy and nutrients - Concept of ecosystem, biosphere and types of ecosystem - biotic and abiotic factors - primary and secondary productivity - food chain and food web - ecological pyramids-biogeochemical cycles.

Unit - III

Resource and conservation - Natural resources - aquatic and terrestrial resources-renewable and non - renewable energy (introduction) - Aquatic resources - sewage treatment - fish culture and management - Terrestrial resources - Agriculture-soil fertility and nitrogen fixation - biofertilizer.

Unit - IV

Environmental pollution and management - Types of pollution - Air, Water, Soil and Noise - sources, effect and control measures - environmental pollution management and environmental education.

Unit - V

Population biology - Population parameters and their estimation - life table - reproductive effort - evolution of demographic traits - population growth models - species interaction and competition – population – regulation - density dependent and independent.

References:

1. Dasmann, R., environmental Conservation - II Ed.

2. J. Kormondy, Concepts of Ecology - II Ed.

3. Odum, E.P. Fundamentals of Ecology - 1980.

4. Ehrlich, P.R., J.P. Holdreh and R.W. Kolm, Man and Ecosphere, 1989.

5. Verma. P.S and V.K Agarwal., environmental Biology, S. Chand & Co., New Delhi, 1995.

Course	**: B. Sc Biochemistry**	**Subject code :**	**14UBCS61**
Semester	**: VI**	**No. of Hrs allotted**	**: 2**
Paper	**: Major Subject - VI**	**No. of Credits**	**: 2**

BIOINFORMATICS

Unit – I

Internet basics – Browsing – Web – pictures – Video links – search tips and tricks – On line journals – literature database Pubmed, Medline, Electronic Journals – Agricola.

Unit – II

Computing: Basic codes, Computer networking and computer analysis, brief introduction on Data Base Management System (DBMS).

Unit – III

Information networks: Internet, Web, HTTP, HTML and VRLS EMB net, NCBI and mm library.

Unit – IV

Homology and diversity – evolutionary basis of sequence alignment – searching for similarity.

Unit – V

Sequence analysis: Sequence databases, biological databases and protein & nucleic acid sequence analysis. GCG – Genetic Computation Group – Wisconsin packages specializing in DNA analysis, internet packages BLAST & FASTA.

References:

1. Attwood, T.K and Parry – Smith D.J. Introduction to Bioinformatics, Pearson Education private Ltd., Singapore 2002.
2. Gribshow, Sequence Analysis, University Press 2000.
3. Introduction to Bioinformatics 2002. S. Sundarajan & R. Balaji. Himalaya Publishing House, Mumbai.
4. Bioinformatics 2003. D.R. West Head. J.H. Parish and R.M Twyman. VIVA Books Pvt, Ltd Chennai.
5. Bioinformatics – a beginners guide, Jean – Michel Claverie, Wiley, 2004.

Course	**: B. Sc Biochemistry**	**Subject code :**	**14UBCC6P**
Semester	**: VI**	**No. of Hrs allotted**	**: 2**
Paper	**: Major Practical Subject - III**	**No. of Credits**	**: 2**

MAJOR PRACTICALS - III

1. **Introductory, collection of blood and urine specimen.**
2. **Blood Analysis:**
    a. Analysis of Blood sugar – Copper reduction method
    b. Analysis of Blood cholesterol – Ferric chloride method
    c. Analysis of Blood urea – Urease method
    d. Analysis of Blood uric acid – Molybdate method
    e. Analysis of Blood Creatinine – Picric acid method
    f. Serum phosphorus
    g. Estimation of hemoglobin
3. **Urine analysis**
    a. Normal & Abnormal Analysis of Urine
    b. Collection & Preservation of urine Sample
4. **Estimation of any two enzymes**
    a. LDH
    b. Acid phosphates
    c. Alkaline phosphates
    d. SGOT
    e. SGPT
    f. Amylase
    g. Urease

Course	**: B. Sc Biochemistry**	**Subject code :**	**14UBCC6Q**
Semester	**: VI**	**No. of Hrs allotted**	**: 2**
Paper	**: Major Practical Subject - IV**	**No. of Credits**	**: 2**

MAJOR PRACTICAL – IV

1. Cleaning of glass wares & Sterilization techniques
2. Preparation of simple culture media
3. Selection of suitable culture medium
4. Gram's staining, motility – Hanging drop
5. Isolation of microbes – serial dilution, streak plate technique
6. ES – Erythrocyte Sedimentation rate
7. RBC. WBC court
8. Enumeration of *E. coli* in milk and ice cream
9. Water Quality analysis
10. Haemagglutination

Demonstration only

1. SDS PAGE,
2. Agarose gel electrophoresis,
3. Immunodiffusion
4. Disk diffusion method (Antibiotic resistance)
5. Plasmid DNA Isolation
6. Plant DNA Isolation
7. Restriction DNA Digestion

Course	**: B. Sc Biochemistry**	**Subject code**	**: 13UMBA6P**
Semester	**: VI**	**No. of Hrs allotted**	**: 2**
Paper	**: Ancillary biology practical - II**	**No. of Credits**	**: 2**

1. Survey of mandolin traits in man.
2. Law of probability.
3. Determination of blood group and Rh factor.
4. Determination of haemoglobulin
5. Blood cell counts.
6. Estimation of dissolved Oxygen in different water samples.
7. Estimation of salinity in different water samples.
8. Estimation of alkalinity in different water samples.
9. Soil testing for pH, alkalinity, nitrate and phosphates.
10. Problems in Measures of central tendencies-Mean, median and Mode.
11. Problems in Measures of dispersion-Standard deviation.