

PONDICHERRY UNIVERSITY
(A CENTRAL UNIVERSITY)



B.Sc. Biochemistry
(CBCS)

REGULATIONS & SYLLABUS

2017-2018 ONWARDS

ADMISSION PROCESS

Selection of students to B. Sc. Biochemistry Programs is based on merit (12th mark) and follows the Government reservation policy.

CURRICULUM GOALS/OBJECTIVES

The curriculum of this Department incorporates classical to recent concepts within different areas of each subject offered, and updates syllabus with periodic revision exercises, ensured by the Board of Studies and ratified through the School Board. The curriculum is made with a view to impart fundamental knowledge in the field of Biochemistry. The theory and practical sessions augment their ability to understand the implications of the scientific and technical approaches involved in this domain of knowledge, enabling to mold them into prospective skillful scientific workforce for the future.

EVALUATION

The student assessment followed in this department is as per the regulations notified by the Office of the Controller of Exams, Pondicherry University.

All subjects in the UG program carry an Internal assessment component. Students are expected to secure 25 % in the internal evaluation and 75% in end Semester external evaluation modes. Each teacher is expected to organize continuous assessment modes for each course assigned to him/her. The internal assessment is categorized into 15 marks for internal assessment tests/Term papers/Quizzes and 5 marks for Seminars/Assignment/Presentation/Write ups/Viva, and 5 marks for attendance. A failed student who fulfils the required attendance 75% shall have a minimum 40% in internal assessment for being permitted to register for the end semester exam. Students who have failed due to insufficient attendance (below 75%) and / or less than 40% in internal assessment marks should repeat the course as when it is offered.

GRADING

Letter grades shall be used to assess the performance of students in each course by converting final marks (out of 100) into grades. In case of fractions the marks shall be rounded off to next integer. The following shall be used to convert marks into awarding grades:

Range of Marks	Letter Grade	Grade Point
96-100	O	10
86-95	A+	09
76-85	A	08
66-75	B+	07
56-65	B	06
46-55	C	05
40-45	P	04
Below 40	F	00
Lack of attendance	FA	00

The SGPA shall also be calculated by taking all courses taken by the student in the semester and CGPA shall also be calculated by taking all the courses taken by the student in all the semesters.

CGPA	Class
9.00 – 10.00	First Class with Distinction (should not have failed in any course)
7.00 – 8.99	First Class
5.50 – 6.99	Second Class
4.00 – 5.49	Pass

The Grade card shall be issued to the students containing grades obtained by the student in the previous semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA).

COMPUTATION OF SGPA AND CGPA

Following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) shall be followed:

The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$\text{SGPA (S}_i\text{)} = \Sigma (\text{C}_i \times \text{G}_i) / \Sigma \text{C}_i$$

where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.

The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

$$\text{CGPA} = \Sigma (\text{C}_i \times \text{S}_i) / \Sigma \text{C}_i$$

where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

ILLUSTRATION OF COMPUTATION OF SGPA AND CGPA AND FORMAT FOR TRANSCRIPTS

Computation of SGPA and CGPA

Illustration 1 for calculation of SGPA

The illustration is for a student who has taken six courses of given credits in a semester and performance is given in grade letter which carry certain grade point.

Course	Credit	Grade letter	Grade point	Credit Point Credit x Grade
Course 1	3	A	08	3x08 = 24
Course 2	4	B+	07	4x07 = 28
Course 3	3	B	06	3x06 = 18
Course 4	3	O	10	3x10 = 30
Course 5	3	C	05	3x05 = 15
Course 6	4	B	06	4x06 = 24
	20			139

$$SGPA = 139/20 = 6.95$$

Illustration 2 for calculation of SGPA

A student registered for 6 (six) courses in a semester. At the end of the semester the student got A grade in a 4 credit course , A grade in 2 credit course B+ in a 3 credit course another B+ in a 3 credit course, B in a 3 credit course and F grade in a 3 credit course. Calculation of SGPA of this student is:

$$SGPA = (8 \times 4 + 8 \times 2 + 7 \times 3 + 7 \times 3 + 6 \times 3 + 0 \times 3) / (4 + 2 + 3 + 3 + 3 + 3) = (32 + 16 + 21 + 21 + 18 + 0) / 18 = 108 / 18 = 6.00 \text{ Out of } 10.00.$$

SGPA of the student is 6.00.

Illustration for calculation of CGPA (Example)

The illustration is for calculation of CGPA of a student who studied six semesters in a UG program.

Semester	Credits	SGPA
Semester 1	20	6.95
Semester 2	22	7.80
Semester 3	18	5.65
Semester 4	21	6.04
Semester 5	19	7.21
Semester 6	20	7.85
Total = 120		

CGPA =

$(20 \times 6.95 + 22 \times 7.80 + 18 \times 5.65 + 21 \times 6.04 + 19 \times 7.21 + 20 \times 7.85)$ divided by 120	$= 139.00 + 171.60 + 101.70 + 126.84 + 136.99 + 157.00 = 833.13/120 = 6.94275$ Rounded off to 6.94
--	---

CGPA = 6.94. The student has passed in the program and is placed in 2nd Class.

B.Sc. Biochemistry

CBCS - Course Structure 2017– 2018 onwards

Course (Theory) / (Practical)	Subject Code	Subject	Credits	Page
FIRST SEMESTER				
MIL-1	LTAM 111	Language-I	3	
ENGLISH-1	ENGL 112	English-I	3	
DSC-1A(T)	BBCT 111	Biological Science-I	4	1
DSC-2A(T)	BBCT 112	Cell Biology	4	2
DSE-1(T)	CHET 113	Chemistry-I	4	3
AECC-I	PADM 113	Public Administration	2	
DSC-1A(P)	BBCP 111	Lab in Biological Science-I	2	4
DSC-2A(P)	BBCP 112	Lab in Cell Biology	2	4
DSE-1(P)	CHEP 113	Lab in Chemistry-I	1	4
SECOND SEMESTER				
MIL-2	LTAM 121	Language-II	3	
ENGLISH-2	ENGL 122	English-II	3	
DSC-1B(T)	BBCT 121	Biological Science-II	4	5
DSC-2B(T)	BBCT 122	Biomolecules	4	6
DSE-2(T)	CHET 123	Chemistry-II	4	7
AECC –II	ENVS 123	Environmental Studies	2	
DSC-1B(P)	BBCP 121	Lab in Biological Science-II	2	8
DSC-2B(P)	BBCP 122	Lab in Biomolecules	2	8
DSE-2(P)	CHEP 123	Lab in Chemistry-II	1	8
THIRD SEMESTER				
MIL-3	LTAM 231	Language-III	3	
ENGLISH-3	ENGL 232	English-III	3	
DSC-1C(T)	BBCT 231	Intermediary Metabolism-I	4	9
DSC-2C(T)	BBCT 232	Human physiology & Nutrition	4	10
SEC-1(T)	BMBT 233	Basic Microbiology	2	11
DSC-1C(P)	BBCP 231	Lab in Intermediary Metabolism-I	2	12
DSC-2C(P)	BBCP 232	Lab in Human physiology & Nutrition	2	12
SEC-1(P)	BMBP 233	Lab in Basic Microbiology	1	12

B.Sc. Biochemistry

Course Structure 2017 – 2018 Onwards

FOURTH SEMESTER				
Course	Subject code	Subject	credits	Page
MIL-4	LTAM 241	Language-IV	3	
ENGLISH-4	ENGL 242	English-IV	3	
DSC-1D(T)	BBCT 241	Intermediary Metabolism-II	4	13
DSC-2D(T)	BBCT 242	Analytical Biochemistry	4	14
SEC-2(T)	CABT 243	Computer application in Biology	2	15
DSC-1D(P)	BBCP 241	Lab in Intermediary Metabolism-II	2	16
DSC-2D(P)	BBCP 242	Lab in Analytical Biochemistry	2	16
SEC-2(P)	CABP 243	Lab in Computer application in Biology	1	16
FIFTH SEMESTER				
DSC-1E(T)	BBCT 351	Clinical Biochemistry	4	17
DSE-3(T)	MOLT 352	Molecular Biology	4	18
DSE-4	ENDO 353	Endocrinology	4	19
SEC-3	BCHP 354	Biochemical Pharmacology	3	20
GE-1	EBIO 355	Environmental Biology	3	21
DSC-1E(P)	BBCP 351	Lab in Clinical Biochemistry	2	22
DSE-3(P)	MOLP 352	Lab in Molecular Biology	1	22
SIXTH SEMESTER				
DSC-1F(T)	BBCT 361	Basic Immunology	4	23
DSE-5(T)	BBTT 362	Basic Biotechnology	4	24
DSE-6	GENT 363	Genetics	4	25
SEC-4	BIOS 364	Biostatistics	3	26
GE-2	BIOI 365	Bioinformatics	3	27
DSC-1F(P)	BBCP 361	Lab in Basic Immunology	2	28
DSE-5(P)	BBTP 362	Lab in Basic Biotechnology	1	28

**Ability Enhancement (AECC)
and
Skill Enhancement Course (SEC)
Courses offered by the
Department of Biochemistry
for other UG programmes**

2017– 2018 onwards

Course	Subject Code	Subject	Credits	Page
AECC-I	BCNT 114	Basic concepts in Nutrition	2	29
SEC 1	LSDT 233	Life style Disorders	2	30

FIRST SEMESTER

BIOLOGICAL SCIENCE-I

Subject code - BBCT 111

(DSC - 6 credits)

UNIT I (10 hrs)

Introduction to Plant and Animal Sciences: General classification of plants and animals - concepts of species – overview of kingdom – Animalia and Plantae - General characteristics of each group up to class level with an example.

UNIT II (7 hrs)

Structure and functions of plant tissues: Parenchyma, collenchyma, sclerenchyma, secretory ducts and laticiferous tubules, different types of xylem and phloem.

UNIT III (10 hrs)

Nutrition & Transport in Plants: Grouping of organisms according to their energy and carbon sources; Importance of photosynthesis and photosynthetic pigments.

Mineral nutrients - Macronutrients: nitrogen, phosphorus & potassium; Micronutrients: magnesium, manganese, iron, zinc, sulphur.

Plant-water relations: Movement of water through flowering plant; Transpiration and stomatal mechanism; Ascent of water in xylem and organic solutes in phloem.

UNIT IV (8 hrs)

Structure and function of animal tissues: Connective tissue: fibrous and cellular basis of connective tissue; Muscle tissue: smooth, striated and cardiac muscle; Nervous tissue: structure and types of neurons.

UNIT V (10 hrs)

Nutrition & Transport in Animals: Different types of heterotrophic nutrition; Feeding mechanisms in a range of animals; Digestion and absorption of carbohydrates, protein and fats in various regions of the alimentary canal in human; General characteristics of a blood vessels and vascular system in human; Composition of blood and clotting mechanism.

Text Book:

1. Taylor. D. J, Green. N. P. O. & Stout. G. W. Biological Science, 3rd ed. Cambridge University Press, 1998.

Suggested Reading:

1. Scott freeman. Biological Science, 2nd ed, Patience Hall, 2004.
2. Sylvia S. Madder. Biology, 5thed, Brown Publishers, 1996.

CELL BIOLOGY

Subject code – BBCT 112

(DSC - 6 credits)

UNIT I

(7 hrs)

Introduction to Cell Biology: Historical aspects - cell theory, protoplasm theory and organizational theory; Broad classification of cell types: prokaryotic cell and eukaryotic cells and their characteristics; Compartments and division of labours; Ultra structure of cell: virus, microbial, plant and animal cells.

UNIT II

(8 hrs)

Cell wall and Cell membrane: Structure and functions - Bacterial cell wall and plant cell wall; Plasma membrane: membrane models, composition; Types of junction; Transport mechanisms: Uniport, antiport, facilitated active mechanisms, ion channels, exocytosis, endocytosis, pinocytosis and phagocytosis; Cytoskeleton structure: microtubules, microfilaments; Basic aspects of intercellular communication; autocrine, paracrine, endocrine & neuronal.

UNIT III

(12 hrs)

Cell organelles: Structure and functions – Endoplasmic reticulum: rough endoplasmic reticulum and smooth endoplasmic reticulum; Golgi apparatus, Lysosomes, Microbodies: peroxisomes and glyoxisomes, Mitochondria: organization of respiratory chain, Chloroplasts – photophosphorylation, Vacuoles, Ribosomes, Centriole and Basal bodies.

UNIT IV

(8 hrs)

The Nucleus: Structure of nucleus, nuclear pore complex, internal organization of nucleus – chromosome and higher order chromatin structure, functional domain within the nucleus, nuclear matrix, the nucleolus; Cell cycle – cell division (mitosis and meiosis), checkpoints in cell cycle.

UNIT V

(10 hrs)

Microscopy: Principles and application – light microscopy, phase contrast microscopy, dark field microscopy, fluorescent microscopy and electron microscopy (Transmission Electron Microscopy, Scanning Electron Microscopy, Scanning Tunneling Microscopy).

Text Book:

1. De Robertis and De Robertis. Cell and Molecular Biology, Lea and Febiger, 8th ed. 2000.

Suggested Reading:

1. Cooper, G. M., Cell- A Molecular Approach, 2nd ed, Oxford University Press, 2000.
2. Alberts *et al.* Molecular Biology of the Cell, 4th ed. Garland Publishing Inc., 2002.

CHEMISTRY-I

Subject code - CHET 113

(DSE - 5 credits)

(8 hrs)

1. Intermolecular forces - Vanderwall and London forces. Liquid state theory and properties of liquids, liquid-crystal formation and applications. Solid state- forces in solids- covalent, ionic, metallic, and Vanderwall's, Lattice energy.

(10 hrs)

2. Theory of semi-conductors and its application. Bond properties- types of hybridization, bond length, bond order, bond strength. Resonance energy- resonance strength of multiple bonded species Carbon Monoxide, Nitrous Oxide, phenol, benzaldehyde, aniline.

(10 hrs)

3. Covalent bond- Orbital Overlap- hybridization, geometry of organic molecules- methane, ethylene, acetylene, benzene. Electron displacement effects, inductive, resonance, hyperconjugative and steric effects-their effect on properties of compounds. Stereoisomerism-Optical isomerism-optical activity, lactic acid, tartaric acid, racemization, resolution.

(10 hrs)

4. Aromatic compounds-electrophilic substitution in benzene, mechanism of nitration, halogenation, Alkylation and Acylation. Preparation, properties and uses of Naphthalene, Furan, Thiophene, Pyrrole, Pyridine, Chloroform and Carbon Tetrachloride.

(7 hrs)

5. Keto-enol tautomerism. Geometric isomerization, maleic acid and fumaric acid. Rotation around single bond proffered ratios, conformers of ethane, propane, n-butane and cyclohexane. Axial and equatorial bonds.

Text books:

1. P. W. Atkins Physical Chemistry, 6thed, 1998.
2. Wade, L.G. Organic Chemistry, Pearson Education, 5thed, 2003.
3. M. Ladd. Introduction to Physical Chemistry, Cambridge, 1998.

LIST OF PRACTICALS

FIRST SEMESTER

Biological Science –I: Subject code – BBCP 111

1. Study of morphological characteristics of plants.
2. Examination of cross sections of stem, root, leaf of dicots and monocots.
3. Effect of CO₂ concentration on photosynthesis in Hydrilla.
4. Transpiration index: measurement of transpiration by cobalt chloride method in dry and moist conditions.
5. Observation of stomata in dicot leaf.
6. Study of histological slides of various animal tissues:
Epithelial Tissue- Columnar Epithelium, Squamous Epithelium; Connective Tissue - adipose tissue, Cartilage tissue; Muscle, cardiac muscle, skeletal muscle, smooth muscle; Blood Vessels - arteries, veins.

Cell biology: Subject code – BBCP 112

1. Study of parts of Light & compound microscope.
2. Micrometry.
3. Examination of prokaryotic and eukaryotic cell.
4. Study of salivary gland chromosomes.
5. Study of different stages of Mitosis in Onion root tip squash preparation.

Chemistry-I: Subject code - CHEP 113

1. Estimation of sodium hydroxide using sodium carbonate standard.
2. Estimation of hydrochloric acid using oxalic acid standard.
3. Estimation of borax using sodium carbonate standard.
4. Estimation of ferrous sulphate using Mohrs salt standard.
5. Estimation of oxalic acid using ferrous sulphate standard.
6. Preparation of the following inorganic compounds: ferrous ammonium sulphate, manganous sulphate, sodium thiosulphate.

SECOND SEMESTER

BIOLOGICAL SCIENCE-II

Subject code – BBCT 121

(DSC - 6 credits)

UNIT I

(7 hrs)

Homeostasis: Control systems in biology, Temperature regulation - ectothermic and endothermic animals, Osmoregulation - nitrogen and urea excretion, water conservation, Control of blood pH.

UNIT II

(8 hrs)

Growth and Reproduction: Measuring growth, patterns of growth, growth and development in flowering plants. Basic about growth regulators: Auxin, Gibberellins, Cytokinins, Abscisic acid, Ethylene; Photoperiodism.

Reproduction in plants: Asexual and sexual reproduction in plants, Pollination and fertilization, artificial propagation of plants; Reproduction in animals: male and female reproductive system with reference to humans.

UNIT III

(10 hrs)

Basic concepts of developmental biology: Cell fate and commitment, Maintenance of differentiation, patterns formation, morphogenesis, Outline of cleavage, blastulation, and gastrulation, Fate of ecto, endo and mesoderm.

UNIT IV

(12hrs)

Coordination & Control in animals & plants: Parts of the Nervous System - central, peripheral & autonomic; Reflex action – importance of reflexes; Sympathetic & Parasympathetic NS; CSF.

Plant movements: Tropisms, Taxes, kinesis.

UNIT V

(8 hrs)

Evolution: Theories of the origin of life, natural selection, modern views of evolution, human evolution, paleontology, comparative anatomy, embryology; Selection: artificial and natural selection; concept of species, speciation and intraspecific speciation.

Text books:

1. Taylor. D. J, Green. N. P. O. & Stout. G. W. Biological Science. 3rd ed. Cambridge University Press, 1998.
2. Biological Science, Volume 1: The Cell, Genetics, & Development 5th Rev ed Edition (English, Paperback, Scott Freeman Lizabeth Allison Michael Black Kim Quillin Jon Monroe Greg Podgorski).

Suggested Reading:

1. Scott Freeman. Biological Science, 2nd ed, Patience Hall, 2004
2. Sylvia S. Madder, Biology. 5thed, Brown Publishers, 1996.

BIOMOLECULES

Subject code – BBCT 122

(DSC - 6 credits)

UNIT I

(10 hrs)

Carbohydrates: Chemistry, Classification, Monosaccharide: glucose, fructose, mannose, galactose; Stereoisomer, Epimers, Benedict's reaction, osazone, glycosides, amino sugars, deoxysugar; Disaccharides: sucrose, lactose, maltose; Polysaccharides: starch, glycogen; Mucopolysaccharides and glycoprotein.

UNIT II

(8 hrs)

Proteins and Amino acids: Classification of proteins, properties, specialized proteins: hemoglobin, collagen, elastin, and keratin. Classification of amino acids and properties; Peptide bond; Structure of protein: primary, secondary, tertiary and quaternary structures, Ramachandran plot; Properties: isoelectric pH, zwitterions, and precipitation reactions.

UNIT III

(10 hrs)

Lipids: Classification, Fatty acids: saturated, unsaturated and essential fatty acid; Physical and chemical properties: rancidity, saponification number, iodine number, acid number & Reichert-meissel number; Triacylglycerol, Phospholipids and Cholesterol.

UNIT IV

(10 hrs)

Nucleic acids: Chemistry of purine & pyrimidine, nucleosides, nucleotides; Structure and properties of DNA; Types of DNA & RNA - structure and functions of mRNA, tRNA, rRNA.

UNIT V

(7 hrs)

Vitamins & Minerals: Introduction, chemistry, properties and functions of fat and water soluble vitamins; Introduction: major, minor and trace elements.

Text Book:

1. Harper's Biochemistry. 25thed. Editors Murray R.K., Granner, D.K., Mayes, P.A., Rodwell, V.W., McGraw Hill, 2000
2. Biochemistry, 5thed. Editors Berg, J. M., Tymoczko, J. L. and Stryer, L., Freeman, 2002
3. Biochemistry, 4thed. Editors Zubay, G.L., McGraw-Hill, Boston, 1998

CHEMISTRY-II

Subject code – CHET 123

(DSE - 5 credits)

(10 hrs)

1. Co-ordination chemistry – definition of terms, classification of ligands, nomenclature. Chelation – examples, chelate effect explanation. Werner's theory- conductivity and precipitation studies. Sedgwick's theory- Effective atomic number concept. Pauling's theory- postulates, applications to octahedral, square, planar and tetrahedral complexes.

(7 hrs)

2. Biological role of Hemoglobin and Chlorophyll. EDTA and its applications. Environmental chemistry- Green House Effect, global warming, Ozone depletion, BOD and COD – importance, rainwater harvesting-needs, methods, advantage. Pollution – types, strategies in its control.

(10 hrs)

3. Carbohydrates-classification, preparation and properties of Glucose, Fructose and Sucrose. Discussion of ring structure and mutarotation. Properties of starch and cellulose. Interconversion of Glucose and Fructose. Amino-acids classification, preparation and properties of Glycine and Alanine, preparation of peptides by Bergman method. Classification of proteins according to composition, function and shape. Protein denaturation.

(8 hrs)

4. Dyes and Drugs-Azo dyes-congo Red, Triphenylmethans, Malachite Green, Food colours. Sulpha drugs–sulphonamides and sulpha pyrimidine, preparation and uses. Antibiotics-penicillin and Chloromycetin-source, structure and uses. Vitamins- source and structure of vitamin A, B, C, D, E and F (structural elucidation not required).

(10 hrs)

5. Electrochemistry- Kohlrausch law-measurement of conductance , pH determination, conductometric titrations, hydrolysis of salts, derivation of Kh. Galvanic cells, EMF standard electrode potentials, reference electrodes, electrochemical series and its application, electroplating and its application. Corrosion-methods of prevention. Bioenergetics-Chemical kinetics-order of reaction (zero and first order), half-life period. Chemical equilibrium-basic idea.

Text books:

1. P. W. Atkins Physical Chemistry, 6th edition, 1998.
2. Wade, L.G, Organic Chemistry, Pearson Education, 5th edition, 2003.
3. M. Ladd, introduction to Physical Chemistry, Cambridge, 1998.

LIST OF PRACTICALS

SECOND SEMESTER

Biological Science-II: Subject code - BBCP 121

1. Preservation of embryo.
2. Transverse sectioning, staining and temporary mounting of root.
3. Transverse sectioning, staining and temporary mounting of leaf.
4. Transverse sectioning, staining and temporary mounting of stem.
5. RBC fragility test.

Biomolecules: Subject code - BBCP 122

1. Preparation of molar and normal solutions.
2. Qualitative analysis of protein.
3. Qualitative analysis of amino acids - glycine, tyrosine, arginine, glutamic acid.
4. Qualitative analysis of carbohydrates- glucose, fructose, sucrose, lactose, starch.
5. Qualitative analysis of lipids.
6. Qualitative analysis of nucleic acid (Bial's test).

Chemistry-II: Subject code - CHEP 123

1. Detection of elements –nitrogen, sulphur and halogens.
2. Preliminary test and detection of carbohydrate, urea, benzamide and aromatic amines.
3. Detection of anions: carbonate, sulphide, sulphate, fluoride, chloride, bromide, nitrate, oxalate, phosphate.
4. Reaction of aldehyde (aromatic), ketone (aliphatic and aromatic), carbohydrate, carboxylic acid (mono-and dicarboxylic-), phenol, aromatic primary amine, amide and diamide.
5. Systematic analysis of organic compounds containing one functional group and characterization by confirmatory tests or derivatives.

THIRD SEMESTER

INTERMEDIARY METABOLISM-I

Subject code - BBCT 231

(DSC - 6 credits)

UNIT I

(10 hrs)

Enzymes: Characteristics of enzymes, nomenclature and classification, active site, & units of enzyme activity; Coenzymes – Structure and function, metallo-enzymes and metal activated enzymes; Isoenzymes, abzymes, ribozymes. Proteolytic enzymes: endopeptidase and exopeptidase; Multienzyme complex: Pyruvate dehydrogenase and fatty acid synthase.

UNIT II

(9 hrs)

Enzyme kinetics: Factors affecting enzyme activity, Derivation of Michaelis Menton equation, Line weaver Burk Plot; Mechanism of enzyme action, Lock and key Model, Induced fit theory; Enzyme specificity, Allosteric enzymes, Inhibition: Reversible, Irreversible, allosteric and feedback.

UNIT III

(10 hrs)

Heme Metabolism: Chemistry of porphyrins, Biosynthesis and degradation of heme, Bile pigments formation.

UNIT IV

(8 hrs)

Nucleic acid Metabolism: Nucleosides and nucleotides, Synthesis of purine and pyrimidine: *de nova* and salvage pathway; Degradation of purine and pyrimidine.

UNIT V

(8 hrs)

Biological role of minerals: Na, K, Cl, I, Fe, Cu, Mg, Ca, P.

TEXT BOOKS:

- i) Principles of Biochemistry – A.L. Lehninger, CBS Publishers and Distributors, Shahadra, Delhi, 1998.
- ii) Essentials of Biochemistry – U. Sathyanarayanan, Books and Allied (P) Ltd. 8/1, Chintamani Das lane, Kolkata, 2004.

HUMAN PHYSIOLOGY AND NUTRITION
Subject code – BBCT 232 **(DSC - 6 credits)**

UNIT I **(8 hrs)**

Respiratory system: Structure and functions of lung, Mechanism of pulmonary ventilation - exchange of gases between lung and blood and between blood and cells - transport of gases in tissues.

UNIT II **(10hrs)**

Cardiovascular system: Structure and functions of heart, conductive system of heart, origin and conduction of heart beat; Cardiac cycle, electrocardiogram (ECG).

UNIT III **(10hrs)**

Muscle physiology: Ultra-structure and chemical composition of skeletal muscle, sliding filament theory, physico-chemical changes during muscle contraction.

Nerve Physiology: Concept of nerve and nerve cells, Transmission of nerve impulse, Action potential, neurotransmitters; Synaptic conduction: neuromuscular synapse, adrenergic and cholinergic neurotransmission.

UNIT IV **(7hrs)**

Excretory system: Structure and functions of kidney and Nephron; Composition and formation of urine; Fluid and electrolyte balance, Acid-base dynamics.

UNIT V **(10hrs)**

Nutrition and Energy supply: Calorific value of foods; Respiratory Quotient, BMR and SDA, factors affecting BMR, Significance of BMR and SDA; Nutritional importance of carbohydrates, proteins, lipids, minerals and vitamins; Fiber in the diet.

TEXT BOOKS

- 1) Plant physiology: Verma and Agarwal, S. Chand & Co. New Delhi.
- 2) Human Physiology- Ross and Wilson, Churchill Livingstone Medical Division of Pearson Professional Ltd. 1998.
- 3) Nutrition –Swaminathan Volume I and II

BASIC MICROBIOLOGY

Subject code – BMBT 233

(SEC - 3 credits)

UNIT I (10 hrs)

Introduction: Definition, Scope and History of Microbiology; Differences between the prokaryotic and eukaryotic microorganisms; Basic understanding of classification of Bacteria, Viruses, Algae, Fungi and Protozoa.

UNIT II (5 hrs)

Distribution of Microorganisms:

- a) In soil – distribution of bacteria, molds, yeast and protozoa.
- b) In Water – Quality of drinking water, Bacteriological examination of water, Total bacterial count for E. coli; Purification of water: filtration, sedimentation and addition of chemicals.

UNIT III (5 hrs)

- a) Microorganism in air, air borne diseases.
- b) Microorganisms in milk and milk products. Preservation of milk, milk borne diseases.

UNIT IV (5 hrs)

Microbial growth, growth rate, doubling time, exponential growth phases, factors affecting growth – nutrient factors (C, O, N, P, S trace elements) and non-nutrients (temperature, hydrostatic pressure, pH, osmotic strength) for the microorganism.

UNIT V (5 hrs)

- a) Principles and methods of Sterilization and disinfection.
- b) Antibiotics.

TEXT BOOKS

- i) Microbiology – M.J. Pelzar, Jr. Et al. McGraw Hill
- ii) Text book of Microbiology-Ananathanarayanan and Panikar Orient Long.
- iii) Microbiology-Lansing M. Prescott IV edition, McGraw-Hill.

LIST OF PRACTICALS

THIRD SEMESTER

Intermediary Metabolism-I: Subject code – BBCP 231

1. Preparation of starch from potatoes.
2. Preparation of casein from milk.
3. Preparation of ovalbumin from egg.
4. Preparation of lactalbumin from milk.
5. Estimation of amylase by iodometric method.
6. Effect of temperature on enzyme activity.
7. Effect of pH on enzyme activity.

Human Physiology & Nutrition: Subject code – BBCP232

1. Determination of blood pressure.
2. Determination of hemoglobin.
3. RBC count.
4. WBC count.
5. Analysis of food.

Basic Microbiology: Subject code – BMBP 233

1. Sterilization techniques.
2. Identification of Bacterial cells.
3. Identification of Fungal cells.
4. Pure culture technique- Streak, Pour Plate and Serial dilution.
5. Methylene blue reductase test (MBRT).
6. Simple Staining.
7. Gram Staining.

INTERMEDIARY METABOLISM-II

Subject code – BBCT 241

(DSC - 6 credits)

UNIT I (12 hrs)

Carbohydrate metabolism: Glycolysis and energetics, Oxidation of pyruvate to acetyl coA, TCA cycle and energetics, HMP shunt, Uronic acid pathway, Gluconeogenesis, Glycogenesis, Glycogenolysis, Cori cycle, Glucose–alanine cycle, Utilization of lactose and fructose.

UNIT II (10 hrs)

Lipid Metabolism: Fatty acid biosynthesis and catabolism; Biosynthesis of Triacylglycerol and phospholipids; Cholesterol-metabolism, synthesis, transport, degradation and excretion; Fatty acid oxidation - Beta oxidation; Ketone bodies: formation, utilization and excretion; Transport forms of lipid; VLDL, LDL, HDL and Chylomicrons.

UNIT III (8 hrs)

Amino acid metabolism: Amino acid pool, glycolytic and ketogenic amino acids; Biosynthesis and catabolism of tyrosine and lysine; Transamination, deamination and decarboxylation; Metabolism of ammonia, Urea cycle.

UNIT IV (8 hrs)

Oxidative Phosphorylation and Electron transport: Organization and role of respiratory chain in energy capture, Inhibitors of respiratory chain. Mitochondrial transport systems: malate and glycerophosphate shuttles.

UNIT V (7 hrs)

Integration of Metabolism: Overview of integration of major metabolic pathways of energy metabolism; Major organs involved in metabolism; Metabolism in starvation.

TEXT BOOKS:

1. Principles of Biochemistry- A.L. Lehninger, CBS Publishers and Distributors, Shahadra, Delhi, 1998.
2. Essentials of Biochemistry- U. Sathyanarayanan, Books and Allied (P) Ltd. 8/1, Chintamani Das lane, Kolkata, 2004.
3. ENZYMES: Biochemistry, Biotechnology, Clinical Chemistry, 2/E by Trevor Palmer (Author), Philip Bonner (Author).

ANALYTICAL BIOCHEMISTRY

Subject code – BBCT 242

(DSC - 6 credits)

UNIT I

(9 hrs)

Centrifugation Techniques: Theory - Clinical, High speed and Ultracentrifuge - analytical and preparative; Centrifuge rotors: vertical, fixed angle, swinging bucket; Subcellular fractionation by differential centrifugation.

UNIT II

(9 hrs)

Chromatographic Techniques: Partition- Adsorption-Ion Exchange- Molecular sieve and Affinity chromatography; Principles of Gas Liquid chromatography and High Performance Liquid Chromatography.

UNIT III

(9 hrs)

Electrophoretic Techniques: Principle and applications of Paper, Starch, Agarose, Polyacrylamide, Cellulose Acetate and Immunoelectrophoresis; Southern, Northern, Western Blots; Concepts and application of PCR.

UNIT IV

(9 hrs)

Colorimetry and Spectrometry: Beer Lambert's law, Transmittance, Absorbance, Optical density; Types of Spectroscopy: UV & Visible - Principle, instrumentation & application.

UNIT V

(9 hrs)

Radioactive techniques: Types of radiation- Units of radioactivity- Radioisotopes, Half-life- Radioactivity measurement; GM and Scintillation Counters; Radioactive hazards - Uses and safety measures; Pulse labeling technique, Autoradiography.

TEXT BOOKS:

- i) Biophysical chemistry- Principles and techniques- Upadhyay, Upadyay and Nath Himalaya publication house Mumbai.
- ii) Physical chemistry- Puri and Sharma, Pathania Vishal Publication and Co., Jalandhar.

COMPUTER APPLICATIONS IN BIOLOGY

Subject code – CABT 243

(SEC - 3 credits)

UNIT I

(6 hrs)

Fundamentals of Computers: Block diagram of computer (input and output devices), Generations, Advantages and limitations of Computers; Basics of operating system: DOS, Windows NT & XP, UNIX and Application Software.

UNIT II

(6 hrs)

Communication Technology: Networking- LAN, WAN & MAN - Internet & Intranet - Data transfer, storage & retrieval via network- Email, DNS, WEB servers and browsers.

UNIT III

(6 hrs)

Fundamentals of database: Database models (Hierarchical, Network, Relational, Object-Oriented Models), RDBMS, Database System applications and Security.

UNIT IV

(6 hrs)

Introduction to M.S. office package: word- creating a new document - templates and wizards- scientific data representation and basic calculations with EXCEL- Creating Tables and databases using Access - interactive presentations using Power Point.

UNIT V

(6 hrs)

Basics of Biological databases: Types of data held in biological databases - Literature Databases and searches – Pub med Central – Medline – OMIM – SCOPUS – Science direct - Elsevier.

TEXT BOOKS:

1. Fundamentals of Computers- Pradeep K. Sinha, Priti Sinha
2. Principles of database systems- Jeffery O. Ullman

LIST OF PRACTICALS

FOURTH SEMESTER

Intermediary Metabolism-II: Subject code – BBCP 241

1. Preparation of acetate buffer.
2. Determination of acid number.
3. Paper chromatography- Separation of amino acids.
4. Thin layer chromatography- Separation of amino acids.
5. Agarose gel electrophoresis.
6. Separation of serum and plasma from blood.

Analytical Biochemistry: Subject code – BBCP 242

1. Preparation of cleaning agents.
2. Calibration of pipette and standard flask.
3. Calibration of pH meter.
4. Verification of Beer's Law.
5. Estimation of unknown concentration using colorimeter.
6. Column chromatography - Separation of plant pigments.

Computer applications in biology: Subject code – CABP 243

1. Creating a word document with Mail merge option.
2. Representing Biological data in graphs and charts using EXCEL.
3. Database and front- end development with ACCESS.
4. Searching scientific articles using keyword search.
5. Searches with OMIM database using medical terms.

**FIFTH SEMESTER
CLINICAL BIOCHEMISTRY**

Subject code – BBCT 351

(DSC - 6 credits)

UNIT I

(8 hrs)

Approaches to clinical biochemistry: Concepts of accuracy, precision, sensitivity and reproducibility; Quality control, fixation of normal range. Collection and processing of blood and urine samples, Anticoagulants, Preservative for blood and urine, Transport of biological samples.

UNIT II

(9 hrs)

Disorders of Carbohydrate metabolism: Introduction - Normal, fasting and post prandial level, maintenance of blood glucose concentration-hypo and hyperglycemia, renal threshold value. Diabetes Mellitus: types, clinical features, metabolic defects, complications, GTT, galactosemia, fructosuria, glycogen storage diseases.

UNIT III

(9 hrs)

Diseases in protein metabolism: Introduction - Clinical significance and variation of plasma and serum protein; Clinical features of phenylketonuria, alkaptonuria, albinism and tyrosinosis; Disorders in urea cycle.

Clinical significance of non-protein nitrogen: urea, uric acid and creatinine - Normal and abnormal levels; clinical importance of clearance determination

UNIT IV

(9 hrs)

Disorders in lipid metabolism: Introduction, hyper triacylglyceridemia, hypo and hyperlipoproteinemia; Atherosclerosis - clinical features and complications; Lipid storage disease, fatty liver.

Disorders in nucleic acid metabolism: Gout-types, aetiology and clinical features.

UNIT V

(9 hrs)

Liver function tests: Detoxification and excretory functions, protein changes in liver disease; Differential diagnosis of Jaundice: Hemolytic hepatic and obstructive Jaundice, Un-conjugated and conjugated bilirubin, bile pigment levels in blood and urine.

Gastric function test: Fractional test meal analysis and its interpretation; GI hormones: gastrin, secretin, CCK and gastric inhibitory peptide.

TEXT BOOKS:

1. Practical Clinical Biochemistry- Harold Varley, Fifth edition, CBS Publication and Distributors, New Delhi.
2. Medical Biochemistry- Dr. M.N. Chatterjee III Edition, 1998 JAYPEE BROTHERS, Medica publishers (p) LTD, New Delhi.
3. Essentials of Medical Physiology 7th Edition 2016 by K Sembulingam Prema Sembulingam.
4. Textbook of Biochemistry for Medical Students by Vasudevan DM.

MOLECULAR BIOLOGY

Subject code – MOLT 352

(DSE - 5 credits)

UNIT I (9 hrs)

History: Identification of DNA as genetic material, Experiments of Griffith, Avery, McLeod and McCarty, Hershey and Chase, Lederberg and Tatum; Chemical nature and types of DNA and RNA; Chromosomal organization in prokaryotes and Eukaryotes; Gene and gene concept: cistron, muton, and recon.

UNIT II (9 hrs)

Replication in Prokaryotes: Semi conservative replication - Enzymes and proteins involved in replication - Replication of plasmids and mitochondrial DNA.

UNIT III (9 hrs)

Transcription in prokaryotes: RNA polymerases, promoters, enhancers, silencers, transcription factors; Structure of mRNA in prokaryotes and eukaryotes, Post transcriptional processing in eukaryotes; Genetic code, characteristics of genetic code, wobble hypothesis, central dogma, reverse transcription.

UNIT IV (9 hrs)

Translation in prokaryotes: Mechanism of translation - amino acid activation, initiation, elongation, and termination; Posttranslational processing, modification in eukaryotes; Inhibition of protein synthesis by antibiotics.

UNIT (9 hrs)

Gene expression: Regulation of gene expression in prokaryotes - positive Vs negative control: lac, trp operon; Transposons, Gene regulation in eukaryotes, Enzyme induction and repression, Positive control of gene expression by steroid hormones.

TEXT BOOKS:

1. Molecular Biology- David Friefelder, Narosa publication- house pvt. Ltd. 22 Dayaganj, Prakash Deep, Medical Association Road, New Delhi.
2. Principles of Biochemistry- A.L. Lehninger, CBS publishers and distributors, Shahadra, Delhi, 1998.
3. A Textbook of Biochemistry: Molecular and Clinical Aspects. 2nd ed. SciTech Publ., Chennai. 2007 by Dr. S. Nagini

ENDOCRINOLOGY

Subject code – ENDO 353

(DSE - 4 credits)

UNIT I (9 hrs)

Introduction to Endocrinology: Historical perspective, comparative endocrinology, concept of homeostasis - feedback systems, hormones and homeostasis, endocrine glands and their hormones, general classes of chemical messengers, basic mechanism of hormones action.

UNIT II (7 hrs)

Hypothalamus: Hormones, control of hypothalamic - hypophysial hormone secretion. Pituitary gland: anatomy, hormones and their biological actions and disorders.

UNIT III (10 hrs)

Thyroid gland: Structure and functions, thyroid hormones, biosynthesis and biological actions, hypo and hyperthyroidism.

Parathyroid gland: Structure and functions - Parathyroid hormone: Calcitonin, and Calcitriol - biological actions; Regulation of Calcium and Phosphorus metabolism; Hypo and hyper parathyroidism.

UNIT IV (9 hrs)

Pancreas: Endocrine parts of pancreas; Hormones: glucagon, insulin and somatostatin - synthesis, regulation, secretion, biological actions and disorders.

Adrenal gland: Adrenal cortex – glucocorticoids, mineralocorticoids; Adrenal medulla – epinephrine, norepinephrine.

UNIT-V (10 hrs)

Testis: Structure, cell types, spermatogenesis, steroidogenesis, endocrine control of testicular function, biological actions of androgens and its disorders.

Ovaries: Structure, cell types, ovarian cycle, ovarian steroid hormones, physiological roles of ovarian steroid hormones and disorders.

TEXT BOOKS:

1. Medical Biochemistry- Dr. M.N. Chatterjee III Edition, 1998 JAYPEE BROTHERS, Medica publishers (p) LTD, New Delhi.
2. Human physiology- Guyton and Hall, Prism books (p) LTD, Bangalore.
3. Harper's Biochemistry - Harper

BIOCHEMICAL PHARMACOLOGY

Subject code – BCPH 354

(SEC - 3 credits)

UNIT I (10 hrs)

Importance of Biochemistry and pharmacy: Metabolites and anti-metabolites; Drugs - Classification of drugs, routes of drug administration, absorption and distribution of drugs, factors influencing drug absorption.

UNIT II (5 hrs)

Drugs: Receptor interaction, involvement of binding forces in drug receptor interaction, drug action not mediated by receptors; Drug metabolism, role of cytochrome P₄₅₀.

UNIT III (5 hrs)

Adverse responses and side effects of drugs: Allergy, drug intolerance, drug addiction, drug abuses and their biological effects.

UNIT IV (5 hrs)

Drugs and pharmaceuticals from marine organisms: Marine lipids, marine flavourants and flavonoids.

UNIT V (5 hrs)

Natural products: Alkaloids - cocaine, nicotine, quinine, atropine; Terpenoids - terpenoid, menthol, d-limonene; Flavonoids – anthocyanin; Aloe vera - Sources, preparation and uses; Jatropha - Sources, preparation and uses.

TEXT BOOKS:

1. Text book of pharmacology and pharmacotherapeutics by R.S. Satoskar, S.D. Bandarkar Aina Pure.

ENVIRONMENTAL BIOLOGY

Subject code – EBIO 355

(GEC - 3 credits)

UNIT I

(6 hrs)

Environment: Definition - atmosphere, hydrosphere, and lithosphere; Abiotic and biotic factors: Abiotic factors - essential elements and limiting factors, Biotic factors - interspecific and intraspecific interactions.

UNIT II

(6 hrs)

Ecosystem: Structure and functions of ecosystem - Ecological pyramids - Food chain and Food web- Energy flow in the ecosystem; Aquatic and terrestrial ecosystem; Biological succession - Types, general process of succession, Influence on succession, community evolution.

UNIT III

(6 hrs)

Ecosystem Diversity: Forest, grassland, wetlands, coastal, marine, mangroove and desert ecosystem - Factors influencing ecosystem diversity and conservation measures.

UNIT-IV

(6 hrs)

Natural Resources: Concepts and classification of natural resources- renewable and non-renewable resources- resource management- Recycling.

UNIT-V

(6 hrs)

Environmental Pollution: Concept and classification - Air, water, soil, radiation and noise pollution- Toxins- their effects on ecosystem and their control - Pollution control and environmental protection.

TEXT BOOKS:

1. Odum E.P. Fundamentals of Ecology, saunders publication; Indian edition, Nataraj Publications Dehradun, 1998.
2. Verma, P.S. and Agarwal, V.K. Concept of ecology (Environmental Biology), S. Chand & Co. Ltd., New Delhi 2004.

LIST OF PRACTICALS

FIFTH SEMESTER

Clinical Biochemistry: Subject code – BBCP 351

1. Blood glucose analysis.
2. Blood urea analysis.
3. Serum creatinine estimation.
4. Serum uric acid estimation.
5. Serum cholesterol estimation.
6. Serum bilirubin estimation.
7. Estimation of total protein.
8. Determination of A/G ratio.
9. Urine analysis.

Molecular Biology: Subject code – MOLP 352

1. Isolation of microbial DNA.
2. Isolation of animal DNA.
3. Isolation of plant DNA.
4. Isolation of plasmid DNA.
5. Agarose gel electrophoresis.
6. SDS PAGE (demonstration).
7. Estimation of RNA by Orcinol method.

SIXTH SEMESTER

BASIC IMMUNOLOGY

Subject code – BBCT 361

(DSC - 6 credits)

UNIT I (10 hrs)

Overview and historical perspective of Immunology: Immunity, Types: innate and acquired - active, passive, natural and artificial immunity. Overview of immune system, Cells of the immune system and functions, Organs of the immune systems and functions - primary and secondary lymphoid organs.

UNIT II (10 hrs)

Antigens: Nature and types of antigens, specificity, epitope, haptens, adjuvants, immunogenicity, factors affecting immunogenicity.

Antibodies: Immunoglobulins-Structure, Classes and functions; Antigens-antibody reactions - Agglutination, precipitation, complement fixation, neutralization; Immunofluorescence.

UNIT III (8 hrs)

Humoral and cell-mediated immunity: Th, Tc, Ts and B lymphocyte function; Primary and secondary immune responses, Memory cells; Polyclonal and monoclonal antibody generation and its applications.

UNIT IV (8 hrs)

Immunodiagnostic technique: Single radial Immunodiffusion, Double Immunodiffusion, Immunoelectrophoresis, Rocket electrophoresis, Haemagglutination, bacterial agglutination, ELISA, RIA.

UNIT V (9 hrs)

Hypersensitivity reactions: Type I, II, III and IV, Allergy and inflammation; Fundamentals of autoimmune disorders, Immunodeficiency and Immune suppression disease.

Transplantation Immunology: graft acceptance and rejection.

TEXT BOOKS:

1. Textbook of Immunology- Chakkaravarthy, Tata McGraw Hill publishing Company, Ltd (2004)
2. Essentials of Immunology- I. Roitt, Blackwell Science, 2005

BASIC BIOTECHNOLOGY

Subject code – BBTT 362

(DSE - 5 credits)

UNIT I (9 hrs)

Introduction to genetic engineering: Basic steps of gene cloning, Enzymes used in genetic engineering, Restriction enzymes - types, target sites, nomenclature, DNA polymerase, ribonuclease, ligases, alkaline phosphatases, reverse transcriptase.

UNIT II (9 hrs)

Cloning vectors: Plasmid vectors, bacteriophage, phagemid, cosmids, yeast vectors and plant vectors; Gene transfer techniques - microinjection, electroporation and gene gun bombardment.

UNIT III (9 hrs)

Genomic and DNA libraries: Selection and screening of recombinants; Isolation and purification of cellular and plasmid DNA, methods for labeling nucleic acids and probes, somatic cell hybrids, in situ hybridization.

Amplification of DNA by PCR: Technique and applications, analysis of DNA, RNA and proteins by blotting techniques.

UNIT IV (9 hrs)

Plant genetic engineering: Transgenic plants - Agrobacterium mediated gene transfer and protoplast fusion - somaclonal variation - Applications of transgenic plants.

UNIT V (9 hrs)

Animal genetic engineering: Transgenic animals: Production of recombinant insulin, and vaccines. RAPD, RFLP and its applications, DNA fingerprinting, foot printing, gene therapy.

TEXT BOOKS:

1. Principles of gene manipulation, old and primrose, Blackwell Science.
2. Textbook of Biotechnology- R.C. Dubey, S. Chand and Company Ltd, New Delhi-04.

GENETICS

Subject code – GENT 363

(DSE - 4 credits)

UNIT I (10 hrs)

Introduction: A brief overview of the modern history of genetics; Mendelism and the chromosomal theory - Mendel's experiments, segregation, dominance, independent assortment; Epistasis; Multiple alleles; one gene-one enzyme hypothesis. Inheritance - Sex linked inheritance and extra chromosomal inheritance.

UNIT II (9 hrs)

Cytogenetics: Normal human karyotype, sex chromosomes and sex determination patterns, dosage compensation. Sex linkage-X Linkage in Drosophila, sex limited and sex influenced traits, Genetic mapping.

UNIT III (8 hrs)

Linkage: Types of linkage and theories of linkage, coupling and repulsion, factors affecting linkage, Non disjunction: types in man, syndromes.

UNIT IV (9 hrs)

Changes in chromosome number and structure: Monoploidy, euploidy, and polyploidy; Mutations - Point mutation: transversion, transition, deletion, missense, nonsense and frame shift; Chromosomal aberrations, crossing over, and significance of mutation.

UNIT V (9 hrs)

Population genetics: Gene pool, allele frequency, genotype frequency, and Hardy-Weinberg equation; Variation, Mutation, Mechanisms of speciation, factors producing changes in populations.

TEXT BOOKS:

1. Genetics- Verma and Agarwal, S. Chand and company Ltd, Ram Nagar, New Delhi.
2. Genetics- Sambamurthy. Nasoa publishing house, 1999, New Delhi.

BIOSTATISTICS

Subject code – BIOS 364

(SEC - 3 credits)

UNIT I (6 hrs)

Nature and scope of statistical methods and their limitations: Collection of sample - Classification, Types and methods of data collection- tabulation of data and representation of data - diagrammatic representation (histogram, frequency, polygon and Ogives).

UNIT II (6 hrs)

Measures of central tendency: Mean, Median, Mode, Harmonic mean, geometric mean - merits and demerits.

UNIT III (6 hrs)

- a) **Measurements of dispersion:** Range, Variance, Standard deviation, Quartile deviation, Lorenz curve, Coefficient of variation.
- b) **Skewness:** classification of skewness, Karl Pearson's coefficient of skewness; Kurtosis.

UNIT IV (6 hrs)

Correlation: Types and method of correlation, coefficient of correlation, scatter diagram, Regression, Regression analysis.

UNIT V (6 hrs)

Test of significance (student t-test), F-test, Chi-square, ANOVA (one-way)

TEXT BOOKS:

1. Statistical Methods, Sultan chand& sons-S,P. Gupta, V.K. Kapor, New Delhi-2002
2. Introduction to Biostatistics- P.S.S. SundarRao.

BIOINFORMATICS

Subject code – BIOI 365

(GEC - 3 credits)

UNIT I (6 hrs)

Introduction to Bioinformatics: Scope and applications - biological sequence structure - deficit - genome projects – status - sequence analysis - homology and analogy.

UNIT II (6 hrs)

Biological Databases: Nucleotide sequence databases – Gene bank, EMBL, DDBJ; Protein sequence databases - Swissprot, PIR, TrEMBL; Protein Structure databases - PDB, CATH, SCOP- Information retrieval - Different search criteria.

UNIT III (6 hrs)

Molecular Sequence analysis: Introduction - sequence manipulation - sequence analysis software (DNASIS, Gene scan) - Sequence comparison (Pairwise, Multiple Sequence). Evolutionary analysis-clustering methods - phylogenetic analysis

UNIT IV (6 hrs)

Biological Structure databases: (NDB, PDB) - Structure File format - Structure obtainment- Visualization with RasMol, Swiss PDB viewer.

UNIT V (6 hrs)

Introduction of presently available biological software programs: BLAST, FASTA, CLUSTALW, MEGA.

TEXT BOOKS:

1. Introduction to Bioinformatics - Arthur M.Lesk (2002), Oxford University Press.
2. Basic Bioinformatics, Ignacimuthu, S, Narosa Publishing House Pvt. Ltd.

LIST OF PRACTICALS

SIXTH SEMESTER

Basic Immunology: Subject code – BBCP 361

1. Blood grouping.
2. Identification of Immune cells of blood smears.
3. Single Immunodiffusion.
4. Double Immunodiffusion.
5. Immunoelectrophoresis.

Basic Biotechnology: Subject code– BBTP 362

1. Isolation of DNA from mammalian tissue.
2. Restriction digestion analysis.
3. Ligation.
4. Immobilization of cells.
5. Antifungal activity.
6. Antimicrobial activity.
7. Estimation of DNA by diphenolamine method.
8. Recovery of DNA by low melting temperature agarose gel method.

BASIC CONCEPTS IN NUTRITION
Course - AECC I

Subject code - BCIN 114

Credits-2

UNIT I **(5 hrs)**

Introductions to Nutrition: Basic concepts of nutrition and health; Role of food in the maintenance of good health; Definition of Health, Nutrition and Malnutrition.

UNIT II **(5 hrs)**

Requirement: Minimum Nutritional Requirement and RDA - Formulation of RDA and Dietary Guidelines

Energy in Human Nutrition: Idea of energy and its unit, Energy balance, Assessment of energy requirements - Deficiency and Excess, Determination of energy in food, BMR and its regulation, SDA.

UNIT III **(5 hrs)**

Concepts of Calorie: Nutrients in food and food supplying them; Carbohydrates, Protein, Fat, Vitamins and Minerals - Source, functions and requirements and deficiency.

UNIT IV **(5 hrs)**

Basic food groups and study of different foods: Food pyramids - Nutritional allowances - Nutrition during preschool, school, adolescence, adulthood and old age.

UNIT V **(5 hrs)**

Energy requirements: Energy requirement during rest, different physical activities. Diet related health disorders - Alcohol, drugs, food poisoning, allergy, anorexia, bulimia, etc.

Text books and References

1. Dietetics by B Srilakshmi , 2014, 7th Edition, Publisher: New Age International Private Limited.
2. Principles of Nutrition & Dietetics, Swaminathan M, ISBN-13: 5551234022792, 2001, the Bangalore Printing
3. ASSOCHAM Study on Preventive Healthcare. 2009

LIFESTYLE DISORDERS

Course – SEC-I

Subject code – LSDO 233

Credits-2

UNIT I (5 hrs)

Introduction: Definition of health, lifestyle disorders, types and contributory factors of lifestyle disorders, impact of lifestyle factors on physical & mental health of the people.

UNIT II (5 hrs)

Lifestyle disorders: Eating, physical, mental and occupational lifestyle disorders; Causes - food, physical & mental habits and its consequences, Symptoms and Prevention of lifestyle disorders in children, adult and old age diseases.

UNIT III (5 hrs)

Lifestyle disorders in India: Cardiovascular disease – hypertension, heart attack and stroke; Asthma, chronic liver disease, chronic obstructive pulmonary diseases (COPD), nephritis diabetes and osteoporosis; Cancer, Alzheimer's disease and Obesity.

UNIT IV (5 hrs)

Growth monitoring and promotion: Growth & factors affecting growth and development; Importance of Nutrition for ensuring adequate development, management of diet related to lifestyle disorders.

UNIT V (5 hrs)

Strategies and approaches in lifestyle disorders: Prevention of disease by means of diet and lifestyle changes; Lifestyle choices and personal wellness.

Text books and References

1. Guide to Prevention of Lifestyle Diseases by M. Kumar and R. Kumar, 2003, DEER & DEEP publications, New Delhi.
2. Dietetics by B Srilakshmi , 2014, 7th Edition, Publisher: New Age International Private Limited.
3. Principles of Nutrition & Dietetics by Swaminathan M, ISBN-13: 5551234022792, 2001.
4. Preventing non communicable diseases in the workplace through diet and physical activity: WHO/World Economic Forum report of a joint event. 2008.
5. ASSOCHAM Study on Preventive Healthcare. 2009.
7. The effect of diet on risk of cancer by Key TJ, Allen NE, Spencer EA. Lancet. 2002; 360: 86 – 8.
9. Metabolic Syndrome and Related Disorders by Anoop Misra, Lokesh Khurana. doi:10.1089/met.2009.0024.