Semester: II

Year	I	Course Code: 21BSC2C2ZOO2L	Credits	04
Sem.	2	Course Title: Biochemistry and Physiology	Hours	56

Unit No.	Course Content	Hours
Unit I	**Structure and Function of Biomolecules:** • Structure and Biological importance of carbohydrates (Monosaccharides, Disaccharides, Polysaccharides and Glycoconjugates). • Lipids (saturated and unsaturated Fatty acids, Tri-acylglycerols, Phospho lipids, Glycolipids and Steroids) **Structure, Classification and General Properties of α-amino acids;** Essential and non-essential amino acids, Levels of organization in proteins; Simple and conjugate proteins. **Metabolism of Carbohydrates and Lipids** • Metabolism of Carbohydrates: glycolysis, citricacid cycle, gluconeogenesis, • phosphate pentose pathway Glycogenolysis and Glycogenesis Lipids- Biosynthesis of palmiticacid; Ketogenesis, • β-oxidation and omega -oxidation of saturated fatty acids with even and odd number of carbonatoms	14
Unit II	**Metabolism of Carbohydrates and Lipids** • Metabolism of Carbohydrates: glycolysis, citricacid cycle, gluconeogenesis, • phosphate pentose pathway Glycogenolysis and Glycogenesis Lipids- Biosynthesis of palmiticacid; Ketogenesis, • β-oxidation and omega -oxidation of saturated fatty acids with even and odd number of carbonatoms **Metabolism of Proteins and Nucleotides** • Catabolism of amino acids: Transamination, Deamination, Ureacycle, Nucleotides and vitamins Peptide linkages	14
Unit III	**Digestion and Respiration in humans** • Structural organization and functions of gastrointestinal tract and associated glands. • Mechanical and chemical digestion of food; Absorptions of carbohydrates, lipids, proteins, water, minerals and vitamins; Physiology of trachea and Lung. • Mechanism of respiration, Pulmonary	14

	ventilation; Respiratory volumes and capacities; Transport of oxygen and carbon dioxide in blood, Respiratory pigments, Dissociation curves and the factors influencing it; **Circulation and Excretion in humans** • Components of blood and their functions; hemopoiesis • Blood clotting: Blood clotting system, Blood groups: Rh-factor, ABO and MN • Structure of mammalian heart • Cardiac cycle; Cardiac output and its regulation, Electrocardiogram, Blood pressure and its regulation Structure of kidney and its functional unit; Mechanism of urine formation	
Unit IV	**Nervous System and Endocrinology in humans** • Structure of neuron, resting membrane potential(RMP) • Origin of action potential and its propagation across the myelinated and unmyelinated nerve fibers. Types of synapse Endocrine glands - pineal, pituitary, thyroid, parathyroid, pancreas and adrenal **Muscular System in humans** Histology of different types of muscle; Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction; Characteristics of muscle twitch; Motor unit, summation and tetanus.	14

Suggested Readings

1. Nelson & Cox: Leininger‘s Principles of Biochemistry: McMillan (2000)
2. Zubay et al: Principles of Biochemistry: WCB (1995)
3. Voet & Voet: Biochemistry Vols l & 2: Wiley (2004)
4. Murray et al: Harper‘s Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford University Press
5. Guyton, A.C. & Hall, J.E. Textbook of Medical Physiology, Xl Edition, Hercourt Asia PTE Ltd. /W.B.Saunders Company. (2006).
6. Tortora, G.J. &Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley& sons (2006).
7. Christopher D. Moyes, Patricia M. Schulte. Principles of Animal Physiology. 3rd Edition, Pearson Education (2016).
8. Hill, Richard W., et al. Anima l physiology. Vol. 2. Sunderland, MA: Sinauer Associates, (2004).
9. Chatterjee CC Human Physiology Volume l & 2, 11th edition, CBS Publishers (20 I 6).

Semester II: Zoology Course Lab Content

Course Title/Code: Biochemistry and Physiology	Course Credits: **2**
Course Code: 21BSC2C2ZOO2P	L-T-P per week: 0-0-4
Total Contact Hours**: 56**	Duration of ESA: 4 Hours
Formative AssessmentMarks: **15**	Summative AssessmentMarks:**35**

Course Outcomes (COs):

- At the end of the course the student should be able to understand: Basic structure of biomolecules through model making.
- Develop the skills to identify different types of blood cells.
- Enhance basic laboratory skill like keen observation, analysis and discussion. Learn the functional attributes of biomolecules in animal body.
- Know uniqueness of enzymes in animal body and their importance through enzyme kinetics.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs)

Course Outcomes (COs) / Program	**CC P1**	**CC P2**	**CC**	**CC**	**CC**	**CC**	**CC**	**CC**	**CC**	**CC**	**CC**
I Core competency		X									
II Critical thinking		X									
III Analytical reasoning		X									
IV Research skills		X									
V Team work		X									

Note: Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course.Mark ‗X' in the intersection cell if a course outcome addresses a particular program outcome.

Course Content

List of labs to be	Hours
1. Preparation of models of nitrogenous bases- nucleosides and nucleotides. 2. Preparation of models of amino acids and dipeptides. 3. Preparation of models of DNA and RNA. 4. Qualitative analysis of Carbohydrates, Proteins and Lipids. 5. Qualitative analysis of Nitrogenous wastes – Ammonia, Urea and Uric acid. 6. Separation of amino acids or proteins by paper chromatography.	20
7. Determination of the activity of enzyme (Urease)-Effect of [S] and determination of -Km and Vmax. 8. Determination of the activity of enzyme (Urease) - Effect of temperature and time.	15
10. Estimation of Hemoglobin in human blood using Sahli'shaemoglobinometer. 11. Counting of RBC in blood using Hemocytometer. 12. Counting of WBC in blood using Hemocytometer. 13. Differential staining of human blood corpuscles using Leishman stain. 14. Recording of blood glucose level by using glucometer.	15
Virtual Labs (Suggestive sites) https://www.vlab.co.in https://zoologysan.blogspot.com www.vlab.iitb.ac.in/vlab https://vlab.amrita.edu https://sites.dartmouth.edu www.onlinelabs.in	06

Text Books

1. Nelson & Cox: Lehininger's Principles of Biochemistry: McMillan (2000)
2. Zubay et al: Principles of Biochemistry: WCB (1995)
3. Voet&Voet: Biochemistry Vols l & 2: Wiley (2004)
4. Murray et al: Harper's Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford University Press
5. Guyton, A.C. & Hall, J.E. Textbook of Medical Physiology, Xl Edition, Hercourt Asia PTE Ltd. /W.B.Saunders Company. (2006).
6. Tortora, G.J. &Grabowski, S. Principles of Anatomy & Physiology. XI Edition John

Wiley & sons (2006).
7. Christopher D. Moyes, Patricia M. Schulte. Principles of Animal Physiology. 3rd Edition, Pearson Education (2016).
8. Hill, Richard W., et al. Anima l physiology. Vol. 2. Sunderland, MA: Sinauer Associates, (2004).
9. Chatterjee CC Human Physiology Volume l & 2, 11th edition, CBS Publishers (20I6).

Web References: Mammalian Physiology– www.biopac.com

Pedagogy: Lectures, Presentations, videos, Virtual Labs, Assignments, Tests, Individual or group Field oriented Project Report on or visit to a research institute.

TOPICS RECOMMENDED FOR SEMINAR/PROJECT REPORT

1. Biochemical pathways, their evolutionary background and regulation.
2. Blood groups and their importance.
3. Vital enzymes for human body.
4. Essential and nonessential amino acids.
5. Important body lipids.
6. Significance of animal proteins.
7. Role of carbohydrates in animal body.
8. Nature of proteins and nurture of animal body.
9. Role of lipids in structural and functional organization of body.

Pedagogy: Practical Examination formet

Question	**content**	**Marks**
I	Qualitative test/Separation	09
II	Quantitative test/Differential count	09
III	Estimation/Counting	09
IV	Vivo	03
V	Record Book	05
	Total	**35**

OPEN-ELECTIVE SYLLABUS:

Year	I	**Course Code:** 21BSC2O2ZOO2 **Course Title: Parasitology**	**Credits**	03
Sem	II		**Hours**	42

Unit No.	**Course Content**	**Hours**
Unit I	**1. General Concepts** • Introduction, Parasites, parasitoids, host, zoonosis • Origin and evolution of parasites • Basic concept of Parasitism, symbiosis, phoresis, commensalisms and mutualism • Host-parasite interactions and adaptations • Life cycle of human parasites • Occurance, mode of infection and prophylaxis **2. Parasitic Platyhelminthes** Study of morphology, life cycle, pathogenicity, prophylaxis and control measures of • *Fasciolopsisbuski* • *Schistosomahaematobium* • *Taeniasolium* • *Hymenolepis nana* **3. Parasitic Protists** Study of morphology, life cycle, pathogenicity, prophylaxis and control *measures* of • *Entamoeba histolytica* • *Giardia intestinalis* • *Trypanosomagambiense* *Plasmodium vivax*	14
Unit II	**4.Parasitic Nematodes** Study of morphology, life cycle, pathogenicity, prophylaxis and control measures of • *Ascarislumbricoides* • *Ancylostomaduodenale* • *Wuchereriabancrofti* • *Trichinellaspiralis* • Nematode plant interaction ; Gall formation **5. Parasitic Arthropods** Biology, importance and control of • Ticks (Soft tick *Ornithodoros*, Hard tick *Ixodes*) • Mites (*Sarcoptes*) • Lice (*Pediculus*) • Flea (*Xenopsylla*) • Bug (*Cimex*) • Parasitoid (Beetles) **6. Parasitic Vertebrates** • Cookicutter Shark • Hood Mocking bird and	14

	Vampire bat and their parasitic behavior and effect on host	
Unit III	**7.Molecular diagnosis & clinical parasitology** • General concept of molecular diagnosis for parasitic infection • Advantages and disadvantages of molecular diagnosis • Fundamental techniques used in molecular diagnosis of endoparasites • Immunoassay or serological techniques for laboratory diagnosis of endoparasites on the basis of marker molecules like G.intestinalis, B. coli, E. histolytica, L. donovani, Malarial parasite using • ELISA, RIA • Counter Current Immunoelectrophoresis (CCI) Complement Fixation Test (CFT) PCR, DNA, RNA probe	14

Suggested Readings:

1. Arora, D. R and Arora, B. (2001) Medical Parasitology. II Edition. CBS Publications and Distributors.
2. E.R. Noble and G.A. Noble (1982) Parasitology: The biology of animal parasites. V Edition, Lea&Febiger.
3. Ahmed, N., Dawson, M., Smith, C. and Wood, Ed. (2007) Biology of Disease. Taylor and Francis Group.
4. Parija, S. C. Textbook of medical parasitology, protozoology & helminthology (Text and colour Atlas), II Edition, All India Publishers & Distributers, Medical Books Publishers, Chennai, Delhi.
5 Meyer, Olsen & Schmidt's Essentials of Parasitology, Murray, D. Dailey, W.C. Brown Publishers.
5. K. D. Chatterjee (2009). Parasitology: Protozoology and Helminthology. XIII Edition, CBS Publishers & Distributors (P) Ltd.
6. Gunn, A. and Pitt, S.J. (2012). Parasitology: an Integrated Approach. Wiley Blackwell.
7. Noble, E. R. and G.A.Noble (1982) Parasitology: The biology of animal parasites. V th Edition, Lea &Febiger.
8. Paniker, C.K.J., Ghosh, S. [Ed} (2013). Paniker‘s Text Book of Medical Parasitology. Jaypee, New Delhi.
9. Parija,S.C. Text book of medical parasitology,protozoology&helminthology (Textand color Atlas),II Edition, All India Publishers & Distributers, Medical Books Publishers, Chennai, Delhi.
10. Roberts, L.S and Janovy, J. (2009). Smith & Robert‘s Foundation of Parasitology. 8th. Edn. McGraw Bogitsh, B. J. and Cheng, T. C. (2000). Human Parasitology. 2nd Ed. Academic Press, New York.
11. Chandler, A. C. and Read. C. P. (1961). Introduction to Parasitology, 10th ed. John Wiley and Sons Inc.
12. Cheng, T. C. (1986). General Parasitology. 2nd ed. Academic Press, Inc. Orlando.U.S.A.
13. Schmidt, G. D. (1989). Essentials of Parasitology. Wm. C. Brown Publishers (Indian print1990, Universal Book Stall).
14. John Hyde (1996) Molecular Parasitology Open University Press.

Pedagogy: Chalk and Talk, PPT, Group discussion, Seminar, Interaction, virtual lab, Lab visit.