

**JAYARAJ ANNAPACKIAM COLLEGE  
FOR WOMEN (AUTONOMOUS)**

**A Unit of the Sisters of St. Anne of Tiruchirappalli**

**Accredited with 'A' Grade (3<sup>rd</sup> Cycle) by NAAC**

**DST FIST Supported College**

**Affiliated to Mother Teresa Women's University,**

**Kodaikanal**

**PERIYAKULAM – 625 601, THENI DT.  
TAMIL NADU.**



**ACADEMIC COUNCIL**

**DEPARTMENT OF ZOOLOGY**

**09.09.2020**

## P.G. AND RESEARCH CENTRE OF ZOOLOGY

### P.G. PROGRAMME OUTCOMES

PO. NO.	UPON COMPLETION OF THIS PROGRAMME THE STUDENTS WILL BE ABLE TO
1.	Endow with in-depth knowledge, analyze and apply the understanding of their discipline for the betterment of self and society.
2.	Synthesize ideas from various disciplines, enhance the interdisciplinary knowledge and extend it for research.
3.	Gain confidence and skills to communicate orally/ verbally in research platforms and state a clear research finding.
4.	Develop problem solving and computational skills and gain confidence to appear for the competitive examinations.
5.	Enhance knowledge regarding research by accumulating practical knowledge in specific areas of research.
6.	Achieve idealistic goals and enrich the values to tackle the societal challenges.

### P.G. PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PO MAPPED
1.	Develop deeper understanding of key concepts of biology at biochemical, molecular and cellular level, physiology and reproduction at organism level, and ecological impact on animal behavior.	PO - 1, PO - 6
2.	Acquire theoretical basis and practical skills in the use of basic tools, technologies and methods common to different disciplines of life sciences.	PO - 2, PO - 3, PO - 6
3.	Develop skill to operate instruments applying the knowledge of Physics & Chemistry and handle biological data efficiently such as to collect, record, analyse and interpret the hypothesis.	PO - 2, PO - 3
4.	Enhance knowledge regarding research by accumulating practical knowledge in specific areas of research.	PO - 1, PO - 5
5.	Prepare for competitive exams at National level and exhibit their potential in teaching and lecture.	PO - 4, PO - 6

**PG COURSE PATTERN (2020 - 2023) (UGC/ TANSCH/ MTU)**

<b>Sem.</b>	<b>Code</b>	<b>Title of the Course</b>	<b>Hours</b>	<b>Credit</b>
I	20PZO1C01	Biological Chemistry	6	5
	20PZO1C02	Cell and Molecular Biology	6	5
	20PZO1C03	Genetics	6	5
	20PZO1P01	Biological Chemistry, Cell and Molecular Biology and Genetics - Lab	6	4
	20PZO1E1A/ 20PZO1E1B/ 20PZO1E1C	Functional Morphology of Invertebrates and Chordates / Parasitology / Medical Entomology	6	4
		<b>Total</b>	<b>30</b>	<b>23</b>
II	20PZO2C04	Developmental Biology	6	5
	20PZO2C05	Environmental Biology	6	5
	20PZO2P02	Developmental Biology, Environmental Biology and Medical Lab Technology - Lab	6	5
	20PZO2E2A/ 20PZO2E2B/ 20PZO2E2C	Medical Lab Technology / Nanobiology / General Endocrinology	6	4
	20PZO2GE1	IDC - Human Physiology	4	3
	20PSE2S01	Soft Skills	2	1
		<b>Total</b>	<b>30</b>	<b>23</b>
III	20PZO3C06	Physiology	6	5
	20PZO3C07	Biotechnology	6	5
	20PZO3P03	Physiology and Biotechnology -Lab	6	5
	20PZO3E3A/ 20PZO3E3B/ 20PZO3E3C	Research Methodology / General and Applied Entomology / Industrial Zoology	6	4
	20PZO3GE2	IDC - Human Health Care	4	3
	20PSE3H02	Human Rights & Duties	2	1
	20PZO3IN1	Internship	-	2*
		<b>Total</b>	<b>30</b>	<b>23+2*</b>
IV	20PZO4C08	Immunology	6	5
	20PZO4C09	Applied Microbiology	6	5
	20PZO4P04	Immunology and Applied Microbiology - Lab	6	5
	20PZO4R01	Project	12	6
	20PZO4SM1	MOOC'S	-	1*
	20PZO4S01	Comprehensive Examination	-	2*
		<b>Total</b>	<b>30</b>	<b>21+3*</b>
		<b>Total for All Semesters</b>	<b>120</b>	<b>90 + 5*</b>

**Internship for at least 10 days after II semester i.e. during the Semester Holidays - Extra Credits**

## CONTINUOUS INTERNAL ASSESSMENT COMPONENT (CIA)

### THEORY:

Component	Marks	Marks
Internal Test I	40	Converted to 25
Internal Test II	40	
Seminar	10	
Term Paper	5	
Attendance	5	
<b>Total</b>	<b>100</b>	<b>25</b>

## CONTINUOUS INTERNAL ASSESSMENT COMPONENT (CIA)

**Practical: 40 Marks**

### PASSING MINIMUM

Semester Examination	
Theory	50% out of 75 Marks (i.e. 37.5 Marks)
Practical	50% out of 60 Marks (i.e. 30 Marks)

### PROJECT WORK

The ratio of marks for Internal and External Examination is 50:50.

### THE INTERNAL COMPONENTS OF PROJECT

Components	Marks
First Review	10
Second Review	10
Final Review (Internal Viva Voce)	30
<b>Total</b>	<b>50</b>

### External Valuation of Project Work

Components	Marks
Project	25
External Viva Voce	25
<b>Total</b>	<b>50</b>

**Internship Component can be decided by the respective Dept.**

**INTERNAL QUESTION PATTERN**

**(Maximum Marks-40)**

**Part - A**

10 Questions × 1Mark = 10 Marks

**Part - B**

2 Questions × 5 Marks = 10 Marks

(Internal Choice and One Question from Each Unit)

**Part - C**

2 Questions × 10 Marks = 20 Marks

(Open Choice, Two Questions out of Three)

**EXTERNAL QUESTION PATTERN**

**(Maximum Marks-75)**

**Part - A**

10 Questions × 1Mark = 10 Marks

(Two Questions from each Unit)

**Part - B**

5 Questions × 5 Marks = 25 Marks

(Internal Choice and one set of Question from each Unit)

**Part - C**

5 Questions × 8 Marks = 40 Marks

(Open Choice Five Questions out of Seven

Atleast One Question from each Unit)

## BIOLOGICAL CHEMISTRY

Semester: I

Code : 20PZO1C01

COURSE OUTCOMES:

Hours: 6

Credits: 5

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO - 1	Comprehend the energy source, chemical bonds and understand the importance of acid base balance.	PSO - 1, PSO - 5	K, C, An
CO - 2	Describe the structure, classification and functions of Biomolecules.	PSO - 1, PSO - 5	K, An
CO - 3	Illustrate the metabolic pathways of Biomolecules.	PSO - 2, PSO - 5	K, S, C
CO - 4	Attain practical knowledge on Biotechnical instruments.	PSO - 2, PSO - 3, PSO - 5	K, An, A
CO - 5	Apply their knowledge and practical skills independently in research activity.	PSO - 2, PSO - 3, PSO - 4	A, S, E

### RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester: I		BIOLOGICAL CHEMISTRY										Hours: 6
Code : 20PZO1C01												Credits: 5
Course Outcomes	Programme Outcomes (PO)						Programme Specific Outcomes (PSO)					Mean Score of CO's
	1	2	3	4	5	6	1	2	3	4	5	
CO - 1	4	4	3	4	4	3	4	4	3	3	4	3.64
CO - 2	4	3	4	4	3	3	4	3	3	2	3	3.27
CO - 3	4	4	3	3	4	3	4	4	3	3	4	3.55
CO - 4	4	3	2	3	4	3	4	5	3	3	3	3.36
CO - 5	4	3	4	4	4	3	3	4	4	4	4	3.73
<b>Overall Mean Score</b>											<b>3.51</b>	

**Result:** The Score for this Course is 3.51 (High Relationship)

**Note:**

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

**Values Scaling:**

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$
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## UNIT I

**Chemical Foundations of Biology:** Structure of atoms, molecules and chemical bonds. Stabilizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.), High-energy phosphate compounds: introduction, phosphate group transfers. Water - physical properties. pH scale, pH measurements, pH maintenance. Buffer - buffer capacity, action of biological buffers. pK, Titration curves of strong and weak acid base combinations, Acid-base balance. Electrolytic dissociation into cations and anions - Henderson Hasselbach's equation. **(18 Hours)**

## UNIT II

**Chemistry and Metabolism of Carbohydrate and Lipid:** Composition, structure, Classification and functions of Carbohydrates and lipid. Metabolism of carbohydrate - glycogenesis, glycogenolysis, glycolysis, Krebs cycle, HMP pathway, gluconeogenesis, and glyoxylate pathway. Metabolism of lipid  $\beta$  - oxidation of fatty acids (Palmitic acid), ketosis, biosynthesis of fatty acid (Palmitic acid), triglycerides and cholesterol. **(18 Hours)**

## UNIT III

**Chemistry and Metabolism of Protein:** Amino acids: Composition, Structure, classification, essential amino acids, glycogenic and ketogenic amino acids. Levels of structure in protein architecture (structural organization - primary (peptide bond), secondary ( $\alpha$  and  $\beta$ ), tertiary (myoglobin) and quaternary (haemoglobin structure). Metabolism of amino acids - Amino acid break down pathways, Transamination of amino acids, the ping pong bi bi mechanism of transamination, the urea cycle, the degradation pathways of individual amino acids. **(18 Hours)**

## UNIT IV

**Enzymes and Metabolism of Nucleic acid:** Enzymes: Types of Enzymes, mechanism of enzyme action, enzyme kinetics, enzyme inhibitors, coenzymes. Metabolism of nucleic acids - Metabolic routes and pathways of nucleotides - purine synthesis, Utilization of dietary nucleotides, purine degradation, Synthesis of pyrimidines, degradation of pyrimidines. **(18 Hours)**

## UNIT V

**Bioinstrumentation:** Molecular analysis using UV/visible, fluorescence, circular dichroism, NMR and ESR spectroscopy. Molecular structure determination using X-ray diffraction, Molecular analysis using light scattering, different types of mass spectrometry and surface plasma resonance methods. Principles and working mechanism of Electrophoresis and Ultracentrifugation (Velocity and buoyant). **(18 Hours)**

### **BOOKS FOR REFERENCE:**

1. Nitin Jain, Jain, J.L. & Sunjay Jain (2014). Fundamentals of Biochemistry. S. Chand & Co. Ltd., New Delhi.
2. Satyanarayana, U. & Chakrapani, U. (2013). Biochemistry (4<sup>th</sup> ed.). Elsevier, India.
3. Vasudevan, D. M., Sree Kumari, S. & Kannan Vaidyanathan (2013). Text Book of Biochemistry for Medical Students (7<sup>th</sup> ed.). Jaypee Brothers Medical Publishers Pvt. Limited, New Delhi.
4. Chatterjee, M.N. & Rana Shinde (2012). Text Book of Medical Biochemistry (8<sup>th</sup> ed.). Jaypee Brothers Medical Publishers Pvt. Limited, New Delhi.
5. Jeremy M. Berg, John L. Tymoczko & Lubert Stryer (2006). Biochemistry (6<sup>th</sup> ed.). Freeman & Co. Publishers, San Francisco.
6. Ambika Shanmugam (2012). Fundamentals of Biochemistry for Medical Students (7<sup>th</sup> ed.). Published by Wolters Kluwer, India.
7. Rodney F Boyer., (2009). Modern Experimental Biochemistry (3<sup>rd</sup> ed.). Published by Darling Kindersley (India), Pvt., Ltd, South Asia.
8. David.L.Nelson and Michael.M.Cox (2008). Lehninger's Principles of Biochemistry (4<sup>th</sup> ed.). W.H. Freeman and CO., New York.
9. Veerakumari L., (2006). Bio Instrumentation. MJP Publishers, Chennai.
10. Lehninger, A. L., Nelson, D. K., and Cox, M. M. (1993). Principles of Biochemistry. CBS Publishers and distributors, New Delhi.
11. Stryer, L. (1988). Biochemistry. W. H. Freeman and Company, New York.



## CELL AND MOLECULAR BIOLOGY

Semester: I

Hours: 6

Code : 20PZO1C02

Credits: 5

### COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO - 1	Provide firm intellectual and basic knowledge on the structure and functions of biomembranes and relate the mechanisms of cell to cell signaling.	PSO - 1	K, S
CO - 2	Compare different types of transporters and its functions and explain the cell cycle and its regulation.	PSO - 1, PSO - 2	K, An, Ap
CO - 3	Restate and interpret the processes and significance of proteins synthesis and regulation of gene at the transcriptional and post transcriptional modification.	PSO - 1, PSO - 3, PSO - 5	K, C, An, S
CO - 4	Illustrate the structural organization of gene and control of gene expression.	PSO - 1, PSO - 5	K, An, C
CO - 5	Comprehend transcriptional regulation in prokaryotes and eukaryotes, gene silencing and genetic imprinting mechanisms.	PSO - 1, PSO - 3, PSO - 5	K, C, An

### RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester: I		CELL AND MOLECULAR BIOLOGY										Hours: 6
Code : 20PZO1C02												Credits: 5
Course Outcomes	Programme Outcomes (PO)						Programme Specific Outcomes (PSO)					Mean Score of CO's
	1	2	3	4	5	6	1	2	3	4	5	
CO - 1	4	2	3	3	4	3	5	4	3	3	4	3.45
CO - 2	4	3	2	3	4	3	5	5	3	2	3	3.36
CO - 3	4	3	3	4	4	2	4	4	3	3	4	3.45
CO - 4	4	4	3	4	3	3	4	5	3	3	4	3.64
CO - 5	3	3	2	4	3	2	4	3	3	3	4	3.09
<b>Overall Mean Score</b>											<b>3.40</b>	

**Result:** The Score for this Course is 3.40 (High Relationship)

**Note:**

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

**Values Scaling:**

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$
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## UNIT I

**Cell Transport and Signaling Across Cell:** Plasma Membrane -Transport across membranes, Active and Passive transport. Facilitated transport Cell junctions, Tight junctions, Desmosomes, Gap junction - connexin. Extracellular matrix - Collagen and non- collagen components. Cell and cell matrix interaction. Calcium dependent and Calcium independent homophilic. Cell Signaling -Extra cellular signaling, signaling molecules and their receptors. Functions of cell surface receptors. Pathways of intracellular signal transduction- G protein coupled receptors - Cyclic AMP pathways - Receptor Tyrosine Kinases (RTKs) - Ras, Raf and MAP kinase pathway - second messengers - signaling from plasma membrane to nucleus. **(18 Hours)**

## UNIT II

**Structure & Functions of Cell Organelles:** Mitochondria- Structure, semi-autonomous nature, endosymbiotic hypothesis, Mitochondrial Respiratory Chain, Chemiosmotic hypothesis. Cytoskeleton -Structure and functions, microtubules, microfilaments and intermediate filaments. Nucleus - Structure of nucleus, nuclear envelope, nuclear pore complex, and nucleolus. Chromatin - Euchromatin and Hetrochromatin and packaging (nucleosome). Nuclear Transport -Import and Export of protein, export of different RNAs. Structure and functions - endoplasmic reticulum, Golgi apparatus, lysosomes. Biology of ageing, role of anti-oxidants and free radicals. **(18 Hours)**

## UNIT III

**Chemical Nature of Genetic Materials:** Nucleic Acids - Salient features of DNA and RNA, Watson and Crick model of DNA, DNA Replication in prokaryotes and eukaryotes, mechanism of DNA replication, Semi-conservative, bidirectional and semi-discontinuous replication, RNA priming, Replication of circular and linear ds-DNA, replication of telomeres. Transcription - RNA polymerase and transcription, mechanism of transcription in prokaryotes and eukaryotes, Post transcriptional modifications and processing of eukaryotic RNA, Concept of introns and exons, Transcription factors. **(18 Hours)**

## UNIT IV

**Translation, Processing and Transport:** Genetic code, Translation in prokaryotes - Ribosome structure and assembly in prokaryotes, fidelity of protein synthesis, aminoacyl tRNA synthetases and charging of tRNA, Inhibitors of translation. Post translational modifications. Protein - Protein trafficking - sorting: Secretary and endocytic pathway - transport from endoplasmic reticulum to Golgi

- Anterograde and retrograde transport - transport to lysosome - exocytosis - endocytosis. Membrane protein and secretory proteins. **(18 Hours)**

#### **UNIT V**

**Gene Regulation:** Gene Regulation - Transcription regulation in prokaryotes: Principles of transcriptional regulation with examples from lac operon and trp operon, Transcription regulation in eukaryotes: Activators, repressors, enhancers, silencer elements, Gene silencing, Genetic imprinting. DNA repair mechanisms - Pyrimidine dimerization and mismatch repair. Regulatory RNAs - Ribo-switches, RNA interference, miRNA, siRNA. **(18 Hours)**

#### **BOOKS FOR REFERENCE:**

1. De Robertis, E.D.P. (2011). Cell and Molecular Biology (8<sup>th</sup> ed.). New York: Lippincott.
2. Ajoy Paul, (2007). Text Book of Cell and Molecular Biology. Books and Allied (P) Ltd. Kolkata.
3. Kapoor, V.C. (2001). Practice of Animal Taxonomy (5<sup>th</sup> ed.). Oxford and IBH Publishing Co. Pvt. Ltd New Delhi.
4. Lodish, H. & Berk, A. (2016). Molecular Cell Biology (8<sup>th</sup> ed.). W.H. Freeman and Company Limited Publication, New York.
5. Gupta, P.K. (2014). Cell and Molecular Biology (4<sup>th</sup> ed.). Rastogi Publication, New Delhi.
6. Geoffrey M. Cooper & Robert E. Hausman (2013). The cell: A Molecular Approach (6<sup>th</sup> ed.). Sinauer Associates Publication, Massachusetts, USA.
7. Alberts B., Johnson. A., Lewis, J., Raff, M., Roberts, K. and Watter, P. (2008). Molecular Biology of the Cell (5<sup>th</sup> ed.). Garland Science Publication, New York.

## GENETICS

Semester: I

Hours: 6

Code : 20PZO1C03

Credits: 5

### COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO - 1	Explicate the principles of genetics with respect to inheritance.	PSO - 1, PSO - 2	K, C, Ap
CO - 2	Illustrate the mechanism of linkage and crossing over.	PSO - 1, PSO - 5	K, Ap, E
CO - 3	Interpret the various extra chromosomal inheritances.	PSO - 2	K, Ap
CO - 4	Discuss the importance of sex linked genes.	PSO - 3	K, C
CO - 5	Analyze the need for genetic counseling.	PSO - 4	An, Ap

### RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester: I		GENETICS										Hours: 6
Code : 20PZO1C03												Credits: 5
Course Outcomes	Programme Outcomes (PO)						Programme Specific Outcomes (PSO)					Mean Score of CO's
	1	2	3	4	5	6	1	2	3	4	5	
CO - 1	4	3	3	4	4	3	5	4	3	3	3	3.55
CO - 2	4	3	3	4	4	3	5	4	3	3	3	3.55
CO - 3	4	3	3	4	3	2	4	3	4	3	4	3.36
CO - 4	4	3	3	4	3	3	4	4	3	3	4	3.45
CO - 5	4	3	2	4	3	4	4	3	3	4	4	3.45
<b>Overall Mean Score</b>											<b>3.47</b>	

**Result:** The Score for this Course is 3.47 (High Relationship)

#### Note:

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

#### Values Scaling:

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$
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## **UNIT I**

**Mendelian Principles and Genic Interaction:** Inheritance of one gene and two gene (Monohybrid and Dihybrid) - back cross and test cross, Mendelian laws, Concept of genes: Complementary genes, Supplementary genes, Epistasis, Duplicate genes, Lethal genes. Extensions of Mendelian principles - Theory of inheritance, Complete, incomplete and codominance. Pleiotropy, genomic imprinting, penetrance and expressivity, phenocopy, Polygenic Inheritance Multiple alleles: Rh factor in man. **(18 Hours)**

## **UNIT II**

**Linkage and Crossing Over:** Linkage - kinds, theories of linkage, linkage groups. Crossing Over - mechanism, theories of crossing over, significance of crossing over. Gene mapping methods: Linkage maps, mapping with molecular markers, cytological evidence (Stern's experiment and tetrad analysis). Chromosome map: two point and three point cross - problems to be solved in construction of chromosome map. Sex determination - primary and secondary non disjunction in Drosophila. Syndromes in man: Stiff -person syndrome, multiple endocrine neoplasia syndromes, Blue man syndrome, Irritable male syndrome. **(18 Hours)**

## **UNIT III**

Extra chromosomal inheritance, Microbial genetics: Methods of genetic transfer - Bacterial transformation, conjugation and transduction. Mutation: Chromosomal mutation - changes in structure and number, aneuploidy and euploidy, Gene mutation - mutagens. DNA repair mechanisms. **(18 Hours)**

## **UNIT IV**

**Human Genetics:** Autosomes and Allosomes - Human karyotype and ideogram. Simple mendelian traits in men. Twins - types, development and application. Inborn errors of metabolism. Sex - Linked genes and their inheritance, X - linked genes, holandric genes. Pedigree analysis and Human genome project. **(18 Hours)**

## **UNIT V**

**Population Genetics:** Hardy Weinberg equilibrium - calculation of gene frequency - factors affecting gene frequency - selection, Structural and numerical alternation of chromosomes - mutation, genetic drift and migration. Inbreeding and out breeding and heterosis. Eugenics, eugenics and euphenics. Genetic prognosis - genetic counseling. **(18 Hours)**

**BOOKS FOR REFERENCE:**

1. Verma P.S. and Agarwal, V.K. (2009). Genetics. Reviseded. S. Chand & Co. New Delhi.
2. Peter Snustad, D. and Micheal J. Simmons (2010). Principles of Genetics (2<sup>nd</sup> ed.). USA: John Wiley and Sons.
3. Chatterjee, S. (2009) Genetics. APH publishing Corporation, New Delhi.
4. Singh, B.D. (2008). Fundamentals of genetics (4<sup>th</sup> ed.). Kalyani Publishers, Ludhiana.
5. Gardner, Simmons, Snustad (2006). Principles of Genetics (8<sup>th</sup> ed.). John Wiley & Sons, USA.
6. Ahluwalia, K.B. (2009). Genetics (2<sup>nd</sup> ed.). New Age International. New Delhi.

**BIOLOGICAL CHEMISTRY, CELL AND MOLECULAR BIOLOGY AND GENETICS - LAB**

Semester: I

Hours: 6

Code : 20PZO1P01

Credits: 4

**COURSE OUTCOMES:**

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO - 1	Demonstrate the working principles and applications of biochemical instruments.	PSO - 1, PSO - 2, PSO - 3	K, Ap, E
CO - 2	Impart comprehensive knowledge on the methodology for qualitative analysis of biomolecules.	PSO - 2, PSO - 3	K, C
CO - 3	Learn the skills pertaining to cell biology, genetics and biochemistry through experimental analysis.	PSO - 2, PSO - 3	K, An, S
CO - 4	Analyze the variations in cell types and significance of various cells.	PSO - 2, PSO - 4	K, An, E
CO - 5	Provide a deeper meaning and conceptual frame work to heredity.	PSO - 2	C, Ap

**RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES**

Semester: I		BIOLOGICAL CHEMISTRY, CELL AND MOLECULAR BIOLOGY AND GENETICS - LAB										Hours: 6
Code : 20PZO1P01												Credits: 4
Course Outcomes	Programme Outcomes (PO)						Programme Specific Outcomes (PSO)					Mean Score of CO's
	1	2	3	4	5	6	1	2	3	4	5	
CO - 1	4	4	4	4	4	3	4	4	4	4	3	3.81
CO - 2	4	3	3	4	4	3	4	4	4	3	4	3.64
CO - 3	4	3	4	4	3	2	4	3	4	4	4	3.55
CO - 4	4	4	3	4	3	3	4	3	3	4	4	3.55
CO - 5	4	3	3	4	3	4	4	4	3	3	4	3.55
<b>Overall Mean Score for COs</b>											<b>3.62</b>	

**Result:** The Score for this Course is 3.62 (High Relationship)

**Note:**

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

**Values Scaling:**

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$
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**Biological chemistry:**

1. Determination of pH of different samples using pH meter.
2. Preparation of buffers: Acetate, Phosphate and Tris buffers.
3. Quantitative estimation of carbohydrate in liver / muscle.
4. Quantitative estimation of protein in liver / muscle.
5. Estimation of protease activity on substrates.
6. Determination of saponification value of fats.
7. Estimation of iodine value in edible oils.
8. Estimation of ascorbic acid by titrimetric method.
9. Separation of lipids by TLC - Demo.
10. Determination of salivary amylase activity in relation to temperature.
11. Chromatographic separation of amino acids.
12. Instruments:

Colorimeter, pH Meter, Centrifuge, Chromatogram, Electrophoretic unit.

**Cell and Molecular Biology:**

1. Preparation of squamous epithelial cells.
2. Preparation of human blood smears.
3. Preparation of cockroach haemolymph smears.
4. Observation of striated muscle fibre from the coxal muscle of cockroach.
5. Observation of adipocytes from the fat body of cockroach.
6. Mitotic cell division in onion root tip.
7. Meiotic cell division in grasshopper testis.
8. Giant chromosome in Chironomous larva.
9. Barr-body identification.
10. Extraction and isolation of DNA from animal tissue.
11. Spotters - Observation of different types of tissues and cell organelles,

Gel electrophoresis, PCR, t - RNA, Lac Operon.

**Genetics:**

1. Preparation and maintenance of culture of Drosophila and observation of mutant forms.
2. Study of human syndromes in local areas.
3. Mendelian traits and pedigree analysis in man.
4. Dermatoglyphic data (finger print) of the class population.
5. Hardy - Weinberg law - Calculation of ABO, MN blood grouping and PTC tasters.
6. Study of random genetic drift in small populations (using beads).



## FUNCTIONAL MORPHOLOGY OF INVERTEBRATES AND CHORDATES

Semester: I

Hours: 6

Code : 20PZO1E1A

Credits: 4

### COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO - 1	Identify and categorize levels of structural organization of invertebrates.	PSO - 1, PSO - 5	K, Ap
CO - 2	Classify and identify the relationships among invertebrates and chordates.	PSO - 2, PSO - 5	Ap, C
CO - 3	Acquire an in-depth knowledge on functional anatomy of invertebrates.	PSO - 1, PSO - 4	K, C
CO - 4	Compare the functional anatomy of various systems of vertebrates.	PSO - 1, PSO - 4	An, C
CO - 5	Develop holistic appreciation on the relationships in animals.	PSO - 1, PSO - 2, PSO - 5	Ap, E

### RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester: I		FUNCTIONAL MORPHOLOGY OF INVERTEBRATES AND CHORDATES										Hours: 6
Code : 20PZO1E1A												Credits: 4
Course Outcomes	Programme Outcomes (PO)						Programme Specific Outcomes (PSO)					Mean Score of CO's
	1	2	3	4	5	6	1	2	3	4	5	
CO - 1	4	4	3	4	3	2	5	4	2	3	4	3.55
CO - 2	4	3	3	4	4	2	5	4	2	3	4	3.45
CO - 3	4	3	3	4	3	2	4	3	2	3	4	3.18
CO - 4	4	3	3	4	3	3	4	4	2	3	4	3.36
CO - 5	4	3	2	4	3	4	4	3	2	4	4	3.45
<b>Overall Mean Score</b>											<b>3.40</b>	

**Result:** The Score for this Course is 3.11 (High Relationship)

**Note:**

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

**Values Scaling:**

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$
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## **UNIT I**

**Principles of Taxonomy and Classification:** Binomial, Trinomial nomenclature. Symmetry and its significance in animal organization. Coelom -Acoelomate, Pseudocoelomate, Coelomate groups (Schizocoel, Enterocoel, Mesenchyme) - Significance. Metamerism, Pseudometamerism, Cyclo metamerism, Corm theory, Embryological theory - Significance. Classification: Grouping of invertebrates into phyla, distinctive characters of phyla with one example each. Classification and salient features of prochordates and chordates upto classes with one example each. **(18 Hours)**

## **UNIT II**

**Functional Anatomy of Invertebrates:** Locomotion - Annelids, Molluscs and Echinoderms. Nutrition - Filter feeding in Polychaetes, Molluscs and Prochordates. Respiration - Gills, book lungs, trachea in Arthropods and Molluscs. Circulation - Circulation in Arthropods and Molluscs. Excretion - Different types of excretory organs in invertebrates and their structure and function. **(18 Hours)**

## **UNIT III**

**Functional Anatomy of Invertebrates:** Nervous System in Coelenterates, Annelids, Arthropods and Molluscs. Chemical Co-ordination - Endocrine glands in Crustaceans and Insects, Pheromones and Allelochemicals. Sexual and Asexual reproduction in invertebrates. Larval forms and their phylogenic significance. **(18 Hours)**

## **UNIT IV**

**Functional Anatomy of Vertebrates:** Integumentary System ,Exoskeletal structures and their modifications. Digestive System- Alimentary canal and associated glands. Respiratory System- Gill respiration in cyclostomes and fishes, Pulmonary respiration in tetrapods ( Pisces, Aves and Mammals). Comparative anatomy of chordates- axial and appendicular skeleton, heart and aortic arches and urinogenital system. **(18 Hours)**

## **UNIT V**

**Neurosensory :** Nervous System - Brain, spinal cord, cranial nerves, spinal nerves and visceral nerves. Autonomic nervous systems - Sympathetic and Parasympathetic. Sense organs in vertebrates - Photoreceptors and Mechanoreceptors - their structure and functions. **(18 Hours)**

**BOOKS FOR REFERENCE:**

1. Kapoor, V.C. (2001). Practice of Animal Taxonomy (5<sup>th</sup> ed.). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Vasantika kashyap (1997). Life of Invertebrates. Vikas Publishing House Pvt. Ltd., New Delhi.
3. Jordan, E.L. & Verma, P.S. (2001). Invertebrate Zoology. S. Chand and Company Ltd., New Delhi.
4. Jordan, E.L. and Verma, P.S. (2014). Chordate Zoology. S. Chand and Company Ltd., New Delhi.
5. Barrington, E.J.W. (1979). Invertebrate structure and functions (2<sup>nd</sup> ed.). ELBS and Nelson, London.
6. Romer, A.S. (1979). Hyman's Comparative Vertebrate Anatomy (3<sup>rd</sup> ed.) The University of Chicago Press, London.
7. Young, J.Z. (1950). Life of Vertebrates, Clarendon Press, Oxford, London.
8. Jollie, M. (1962). Chordate morphology, Reinholt publishing corporation, New York.

## PARASITOLOGY

Semester: I

Hours: 6

Code : 20PZO1E1B

Credits: 4

### COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO - 1	Comprehend different kinds of parasites, sources, mode of transmission of parasitic infection and Parasitic adaptation.	PSO - 1, PSO - 2, PSO - 5	K, C
CO - 2	Enlist the disease causing protozoan parasites.	PSO - 2, PSO - 5	K, An, E
CO - 3	Describe the morphology and life cycle of helminth Parasites.	PSO - 5	K, C, S
CO - 4	Elucidate parasitic Vectors and their life cycle.	PSO - 1, PSO - 5	K, C, An
CO - 5	Analyse and examine the blood, stool, urine, sputum and biopsy material for parasites.	PSO - 2, PSO - 3, PSO - 5	K, Ap, An, S, E

### RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester: I		PARASITOLOGY										Hours: 6
Code : 20PZO1E1B												Credits: 4
Course Outcomes	Programme Outcomes (PO)						Programme Specific Outcomes (PSO)					Mean Score of CO's
	1	2	3	4	5	6	1	2	3	4	5	
CO - 1	4	2	4	3	3	4	5	3	2	3	4	3.36
CO - 2	4	2	4	3	3	4	5	3	2	3	4	3.36
CO - 3	4	2	4	3	3	4	4	3	2	3	4	3.27
CO - 4	4	2	4	3	3	4	4	3	2	3	4	3.27
CO - 5	4	3	4	3	4	4	4	3	2	4	4	3.55
<b>Overall Mean Score</b>												<b>3.36</b>

**Result:** The Score for this Course is 3.36 (High Relationship)

**Note:**

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

**Values Scaling:**

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$
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## UNIT I

**Over View of Parasitism:** Parasitism - Definitions, Hyperparasitism. Types of Host - regular hosts, irregular hosts, intermediate hosts. Parasites - Endoparasite, Ectoparasite, Obligate parasites, Facultative parasites, Accidental or Incidental parasite, Oioxenous, Stenoxenous and Euryxenous Parasite, Sources of parasitic infection, mode of transmission, parasitic adaptation. (18 Hours)

## UNIT II

**Protozoan Parasites:** Classification of protozoan parasites, Morphology, Pathogenesis, Clinical features, Diagnosis, Treatment and prophylaxis of protozoan parasites - Entamoeba, Giardia, Trypanosoma, Leishmania, Plasmodium vivax, Balantidium. (18 Hours)

## UNIT III

**Helminth Parasites:** Classification of helminth parasites, Morphology, pathogenesis, Clinical features, Diagnosis , Treatment and prophylaxis of helminth parasites - Schistosoma haematobium, Taenia saginata, Trichuris trichiura, Ancylostoma duodenale, Enterobius vermicularis, Wuchereria bancrofti and Dracunculus medinensis. (18 Hours)

## UNIT IV

**Insect Vectors:** Brief account of various insect vectors and their life cycle (Mosquitoes - Anopheles, Aedes and Culex; vectors of Leishmania, Trypanosoma, Blood fluke). (18 Hours)

## UNIT V

**Diagnostic Methods in Parasitology:** Collection and preservation of specimens for parasitological examination, transport of specimens. Microscopical examination of blood, stool, urine, sputum and biopsy material for parasites. General rules for microscopical examination. Examination of blood parasites - Thick and thin smears for malarial and filarial parasites. (18 Hours)

**BOOKS FOR REFERENCE:**

1. Jayaram Paniker, C.K. (2017). Textbook of Medical Parasitology (8<sup>th</sup> Ed.). Jaypee Brothers, Medical Publishers (P) LTD, New Delhi.
2. Chatterjee, K.D. (2009). Parasitology. (13<sup>th</sup> Ed.). Chatterjee Medical Publishers, Calcutta.
3. Rajesh Karyakarte and Ajit Damle (2008). Medical Parasitology (2<sup>nd</sup> Ed.). Books and Allied (P) Ltd, Kolkata.
4. Ichhpujani R.L. and Rajesh Bhatia (2002). Medical Parasitology. Jaypee Printers, New Delhi.
5. Patvaik, B.D. (2001). Parasitic Insects. Dominant Publishers and Distributors, Delhi.
6. Subah, C.P. (2001). Textbook of Medical Parasitology. All India publishers and Distributors, Chennai.
7. Kochhar S.K. (2004). A Text Book of Parasitology. Dominant Publishers and Distributors, New Delhi.
8. Veer Singh Rathore and Yogesh Singh Sengar (2005). Diagnosis parasitology. Pointer Publishers, Jaipur.
9. PrakashMalhotra (2008). Applied Parasitology. Adhyayan Publishers and Distributors, New Delhi.

## MEDICAL ENTOMOLOGY

Semester: I

Hours: 6

Code : 20PZO1E1C

Credits: 4

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO - 1	Acquire knowledge on fundamentals of entomology.	PSO - 1, PSO - 4	K, C, Ap
CO - 2	Understand the general characters, life cycle and epidemiology of arthropod vectors.	PSO - 1, PSO - 3	K, An, E
CO - 3	Analyse the vector - host - pathogen relationships in arthropod-borne diseases.	PSO - 2, PSO - 4	An, S, E
CO - 4	Design appropriate vector control measures.	PSO - 1, PSO - 3, PSO - 5	K, C, Ap, An
CO - 5	Apply the knowledge of entomology in forensic science.	PSO - 1, PSO - 4, PSO - 5	K, An, Ap, E

### RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester: I		MEDICAL ENTOMOLOGY										Hours: 6
Code : 20PZO1E1C												Credits: 4
Course Outcomes	Programme Outcomes (PO)						Programme Specific Outcomes (PSO)					Mean Score of CO's
	1	2	3	4	5	6	1	2	3	4	5	
CO - 1	4	2	3	4	3	4	4	3	2	3	4	3.27
CO - 2	4	2	3	4	3	4	4	3	2	3	4	3.27
CO - 3	4	2	3	4	3	4	4	3	2	3	4	3.27
CO - 4	4	2	3	4	3	4	4	3	2	3	4	3.27
CO - 5	4	3	3	4	3	4	4	3	2	3	4	3.36
<b>Overall Mean Score</b>												<b>3.29</b>

**Result:** The Score for this Course is 3.29 (High Relationship)

**Note:**

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

**Values Scaling:**

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$
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## **UNIT I**

**Overview of Entomology:** Fundamentals and scope of medical entomology, Classification of Class Insecta with special emphasis to medically important Arthropods. Insect Morphology: Exoskeleton, head, thorax and abdomen. Insect Development: Growth, Development and Metamorphosis. Significance of insects to human importance. **(18 Hours)**

## **UNIT II**

**Human Parasitic Insects:** Life cycle and epidemiology of lice, fleas, mosquitoes, house fly, tsetse fly, sandfly, eye fly and bedbugs. **(18 Hours)**

## **UNIT III**

**Insect borne Diseases of Man:** Common vector insects and their identification: Hard and soft tick, trombiculid mite, itch mite. Mechanism of transmission of Typhus, yellow fever, dengue fever, encephalites, plague, leishmaniasis, sleeping sickness, malaria, filaria, onchocerciasis. **(18 Hours)**

## **UNIT IV**

**Venoms, allergens and Vector Management:** Insect venoms, Blister and urticaria -inducing insects. Allergy caused by household pests - Cockroaches, crickets, ants, wasps, cloth moths, silver fish, carpet beetles, furniture beetles and booklice. Vector Control and management: Insecticides - uses and consequences, Use of biocontrol agents and biopesticides - bacillus and predatory fishes. Immunity to human parasites, defense mechanisms, Insect allergenicity.

**(18 Hours)**

## **UNIT V**

**Forensic Entomology:** Forensic entomology of human and wildlife, Arthropods of forensic importance, Insect succession on corpse and its relationship to determining time of death. National programmes related to vector borne diseases -malaria - N.M.E.P., N.M.C.P - filarial - N.F.C.P. - N.F.E.P. Health education programme on dengue. **(18 Hours)**



### **BOOKS FOR REFERENCE:**

1. Patton, W.S. and Cragg, F.W. (1981). A Text Book of Medical Entomology. International Books and Periodicals Supply Service, New Delhi.
2. Walter Scott Patton and Francis William Cragg, (2008). A textbook of Medical Entomology. Kessinger Publishing Pvt. Ltd., Montana, USA.
3. Bruce F. Eldridge and John D. Edman, (2004). Medical Entomology - A textbook of public health and veterinary probes caused by Arthropods. Kluwer Academic Publishers, Netherlands.
4. Lance A. Durden, (2002). Medical and Veterinary Entomology (3<sup>rd</sup> ed.). Academic Press, Cambridge.
5. Rathinaswamy, T.K. (1986). Medical Entomology. S.Viswanathan and Co., Madras.
6. Service, M.W. (2004). Medical Entomology for Students (3<sup>rd</sup> ed.). Cambridge University Press, United Kingdom.
7. Fenemore, P.G. and Alkaprakash, (1992). Applied Entomology. Wiley Eastern Ltd., Delhi.
8. Alford, (1999). A textbook of Agricultural Entomology. Blackwell Science Ltd., Oxford, Malden.
9. Srivastava, A. (1993). Textbook of Applied Entomology. Vol. I & II (2nd ed.) Kalyani Publisher, Ludhiana.
10. Imms, (1977). A General Text Book of Entomology. 2 Vols. Asia Publishing House. University of London, New York.
11. Pedigo, (1989). Entomology and Pest Management. Prentice Hall, New Delhi.
12. Dhaliwal and Arora, (1994). Trends in Agricultural Insect Pest Management. Commonwealth Publ., New Delhi.

## DEVELOPMENTAL BIOLOGY

Semester: II

Hours: 6

Code : 20PZO2C04

Credits: 5

### COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO - 1	Comprehend the basic stages of developmental biology, process of gametogenesis and fertilization.	PSO - 1, PSO - 2,	K, C
CO - 2	Analyse the events of early developmental stages.	PSO-1, PSO - 2	An, C
CO - 3	Apply the knowledge of developmental biology in laboratory condition.	PSO - 1, PSO-2, PSO-3	An, Ap
CO - 4	Evaluate the reproductive cycle in human.	PSO - 1, PSO-2, PSO-4	K, E
CO - 5	Apply the skills of developmental biology for the betterment of human race.	PSO-2, PSO-4, PSO - 5	An, Ap

### RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester: II		DEVELOPMENTAL BIOLOGY										Hours: 6
Code : 20PZO2C04												Credits: 5
Course Outcomes	Programme Outcomes (PO)						Programme Specific Outcomes (PSO)					Mean Score of CO's
	1	2	3	4	5	6	1	2	3	4	5	
CO - 1	4	3	4	4	3	4	4	3	2	3	5	3.45
CO - 2	4	3	3	4	3	4	4	3	2	2	4	3.27
CO - 3	4	3	3	4	3	4	4	4	2	3	4	3.45
CO - 4	4	3	3	4	3	4	4	3	2	2	4	3.27
CO - 5	4	3	3	4	3	4	4	4	2	3	4	3.45
<b>Overall Mean Score</b>												<b>3.38</b>

**Result:** The Score for this Course is 3.38 (High Relationship)

#### Note:

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

#### Values Scaling:

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$
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## **UNIT I**

**Gametogenesis and Fertilization:** Scope of Developmental Biology, theories - germ plasm theory, recapitulation theory, organizer theory, mosaic theory, gradient theory and regulative theory. Origin of primordial germ cells in Invertebrates and Chordates. Fertilization - sperm attraction, acrosome reaction, fusion of egg and sperm, theories of egg activation, types of fertilization, factors affecting fertilization. **(20 Hours)**

## **UNIT II**

**Early Developmental Stages:** Cleavage - patterns, types, physiology and factors affecting cleavage. Morphogenetic movements, fate map of frog, chick and human. Study of development in frog and chick. Role of genes and chemical changes during gastrulation. Organogenesis - Development of heart, eye and brain in human. **(20 Hours)**

## **UNIT III**

**Interaction, development and Differentiation:** Nucleo - cytoplasmic interaction, nuclear transplantation, gradients, embryonic induction, regeneration. Metamorphosis in insects and amphibians. Molecular basis of differentiation, immunological studies of embryonic differentiation. **(18 Hours)**

## **UNIT IV**

**Human Development:** Structure of Male and female reproductive organs, menstrual cycle, PMT, gestation period, hormonal control of ovulation, pregnancy, parturition and lactation. Abnormal pregnancy - multiple pregnancy, missed abortion, ectopic pregnancy, abortion and still birth. Teratogenesis and congenital defects - heart diseases, sickle cell diseases, neural tube defects, orofacial clefts, limb defects, abdominal wall defects, spina bifida, marfan syndrome, amniotic bands syndrome and osteogenesis imperfecta. **(16 Hours)**

## **UNIT V**

**Medical Implications of Developmental Biology:** Infertility. Defects in reproductive organ - ovarian cysts, fibroid, endometrial thickening and mullerian anomalies. ART (Assisted Reproductive Technology). Stem cells and therapeutic cloning. **(16 Hours)**

**BOOKS FOR REFERENCE:**

1. Gilbert, B. F. (2006). *Developmental Biology* (8<sup>th</sup> Ed.). Sinaur Associates Inc Publishers, Sunderland, Massachusetts, USA.
2. Mohan P. Arora. (2002). *Embryology*. Himalaya Publication House, Mumbai.
3. Verma. P. S. and Agarwal V. K. (2003). *Chordate Embryology*, S. Chand and Company Ltd, New Delhi.
4. Werner A. Muller. (2005). *Developmental biology*. Springer (India) Private Ltd, New Delhi.
5. Leon W. Browder., Carol A. Erickson and William R. Jeffery S. (1991). *Developmental Biology* (3<sup>rd</sup> Ed.). Saunders College Publishing, Florida.
6. Balinsky, B. J. (2012). *An Introduction to Embryology* (5<sup>th</sup> Ed.). Cengage Learning India.
7. Subramanian, T. (2005). *Developmental biology*, Narosa publishing house, New Delhi.
8. Carlson, Bruce, M., (2009). *Human Embryology and Developmental Biology*. Elsevier, Philadelphia.

## ENVIRONMENTAL BIOLOGY

**Semester: II**

**Hours: 6**

**Code : 20PZO2C05**

**Credits: 5**

### COURSE OUT COMES

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO - 1	Discuss the concepts of ecosystem, and understand how flora and fauna are adapted to the habitat.	PSO - 1, PSO - 2	K, E
CO - 2	Discuss the concepts of community ecology and population ecology.	PSO - 1, PSO - 5	K, C
CO - 3	Identify and compare renewable and non-renewable energy resources, their conservation and better management.	PSO - 2, PSO - 5	C, Ap
CO - 4	Assess the current research practice and methodologies in the field of disaster management.	PSO - 3	K, Ap, An
CO - 5	Analyse the causes and consequences of pollution and address the pollution Problems.	PSO - 4, PSO - 5	K, Ap

### RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester: II		ENVIRONMENTAL BIOLOGY										Hours: 6
Code : 20PZO2C05												Credits: 5
Course Outcomes	Programme Outcomes (PO)						Programme Specific Outcomes (PSO)					Mean Score of CO's
	1	2	3	4	5	6	1	2	3	4	5	
CO - 1	4	3	4	4	3	3	4	3	2	3	5	3.45
CO - 2	4	3	3	4	3	4	4	3	2	2	4	3.27
CO - 3	4	3	3	4	3	3	4	4	2	3	4	3.36
CO - 4	4	3	3	4	3	4	4	3	2	2	4	3.27
CO - 5	4	3	3	4	3	4	4	4	2	3	4	3.45
<b>Overall Mean Score</b>												<b>3.36</b>

**Result:** The Score for this Course is 3.36 (High Relationship)

**Note:**

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

**Values Scaling:**

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$
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## **UNIT I**

**The Environment, Habitat and Ecosystem:** Review on physical environment; biotic environment, biotic and abiotic interactions. Climatic factors (climate, precipitation, temperature, light, oxygen, carbon dioxide and pH). Biogeochemical cycles: water cycle, carbon cycle, nitrogen cycle, sulphur cycle and phosphorous cycle. Habitat ecology: freshwater, marine, estuarine, mangrove, coral, reef and terrestrial. Ecosystem: Concepts of ecosystem - structure and functions. Energy flow - single channel energy model, Y - shaped energy flow models. Primary production, secondary production, measurement of primary and secondary productivity. **(18 Hours)**

## **UNIT II**

**Population, community and Pollution:** Population ecology - structure and regulation, growth form, population fluctuations, population regulation. Life table - diagrammatic and conventional life tables, Life history strategies. Community: Concept, basic terms, community structure, composition and stratification. Ecological niche, Ecotone and Edge effect, Ecotype. Ecological succession: types, general process, Concept of climax. Pollution: sources, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution, nuclear hazards. Species interactions (symbiosis, commensalism, parasitism and competition). **(18 Hours)**

## **UNIT III**

**Biodiversity and Conservation Biology:** Biodiversity: Definition, characterization, levels, types and values. Mega diversity countries, Diversity hotspot, IUCN categories of threatened species, biodiversity and sustainable development, gene banks, cryopreservation and DNA bar coding. Conservation Biology: Principles of conservation major approaches to management, Indian case studies on conservation /management strategy (Project tiger, Biosphere reserves). Natural resource ecology: Concept and classification of resource, mineral resource, land resource, forest resource, water resource, energy resource (conventional and non-conventional). **(18 Hours)**

## **UNIT IV**

**Disaster management:** Definition, factors and Significance, Difference between Hazard and Disaster. Natural disasters - Earthquakes, Volcanic Eruption, Landslides, Snow Avalanches, Floods and Flash Floods, Cyclones, Tsunami and Droughts. Man Made Disasters - Fires and Forest Fires. Nuclear, Biological and Chemical disasters, Road accident. **(18 Hours)**

## UNIT V

**Applied Ecology:** Waste management: solid, liquid and gaseous wastes. e-wastes. Remote sensing: Techniques involved - aerial photograph, satellite images - thermal, infrared, radar images, ecological applications - resource exploration, pollution monitoring, environmental impact assessment, eco restoration, predicting natural hazards. Space travel: life support system in space vehicle, Exobiology - space ecosystem. Urbanization: problems due to urbanization. Occupational health hazards, rain water harvesting. Pollution control board - Central and State government NGO, International environmental policy, Earth summit and world summit. **(18 Hours)**

### BOOKS FOR REFERENCE:

1. Eugene P. Odum, Murray Barrick, Gary W. Barret. (2005). Fundamentals of Ecology (5<sup>th</sup> Ed.). Brooks/Cole Publishers, UK.
2. Begon and Mortimer (1992). Population Ecology. UBS Publishers, Delhi.
3. Kormondy, Edward, J. (1994). Concept of Ecology. Prentice Hall of India Pvt. Ltd., Delhi.
4. Sharma, P.D. (1999). Ecology and Environment. Rastogi Publications, Meerut.
5. Dash, M.L. (1996). Fundamentals of Ecology. Tata McGraw Hill Publishing Company Ltd., New Delhi.
6. Trivedi, P.C. and Sharma, K.C. (2003). Biodiversity Conservation. Avishekar Publishers, Jaipur.
7. Trivedi, R.N. (1993). Textbook of Environmental Sciences. Anmol Publications Pvt. Ltd., New Delhi.
8. Shukla, S.K. and Srivastava, P.R. (1992). Water Pollution and Toxicology. Common - Wealth Publishers. New Delhi.
9. Subramanian, M.A. (2004). Toxicology: Principles and methods. MJP Publishers, Chennai.
10. Verma, P.S. and Agarwal V. K. (1986). Principles of Ecology. S. Chand & Co. Pvt. Ltd., New Delhi.

**DEVELOPMENTAL BIOLOGY, ENVIRONMENTAL BIOLOGY AND MEDICAL LAB  
TECHNOLOGY - LAB**

**Semester: II**

**Hours: 6**

**Code : 20PZO2P02**

**Credits: 5**

**COURSE OUTCOMES:**

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO - 1	Acquire skill in mounting chick blastoderm and observe the stages of chick embryo.	PSO-1, PSO-2, PSO - 4	K, An
CO - 2	Apply skill in identifying the developmental stages of frog.	PSO - 1, PSO - 4	K, Ap
CO - 3	Analyze and report the quality of water.	PSO-1, PSO-3, PSO-5	An, S
CO - 4	Estimate primary and secondary productivity.	PSO - 2 , PSO - 4	K, An, Ap
CO - 5	Investigate the clinical samples in medical laboratory technology.	PSO - 1, PSO - 3	K, An, Ap,

**RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES  
AND PROGRAMME SPECIFIC OUTCOMES**

Semester: II		DEVELOPMENTAL BIOLOGY, ENVIRONMENTAL BIOLOGY AND MEDICAL LAB TECHNOLOGY - LAB										Hours: 6
Code : 20PZO2P02												Credits: 5
Course Outcomes	Programme Outcomes (PO)						Programme Specific Outcomes (PSO)					Mean Score of CO's
	1	2	3	4	5	6	1	2	3	4	5	
CO - 1	4	3	4	3	4	3	4	3	3	3	4	3.45
CO - 2	3	3	3	4	4	3	4	5	3	3	4	3.36
CO - 3	4	5	3	2	4	3	4	5	3	3	4	3.63
CO - 4	3	5	3	4	4	4	4	5	3	3	4	3.81
CO - 5	3	4	3	4	3	3	4	5	3	3	4	3.54
<b>Overall Mean Score</b>											<b>3.56</b>	

**Result:** The Score for this Course is 3.11 (High Relationship)

**Note:**

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

**Values Scaling:**

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$
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**Developmental biology:**

1. Study of mosquito life cycle.
2. Mounting of chick blastoderm.
3. Microscopic examination of frog spermatozoa and ova.
4. Study of life cycle of frog up to froglet stage.
5. Regeneration in earthworm and tadpole.
6. Role of thyroxine on the metamorphosis of tadpole.

**7. Spotters:**

- a. T.S of testis and ovary of frog and mammal.
- b. Observation of cleavage, blastula, gastrula of frog - slides.
- c. Observation of 24, 48, 72 and 96 hour's chick embryo.
- d. Observation of sperm and egg of mammal.
- e. Observation of any two congenital abnormalities - chart.
- f. Early stages of development in chick - cleavage, blastula and gastrula.
- g. Late stage of development in chick embryo - Organogenesis.

**Environmental biology:**

1. Estimation of BOD, pH, COD of given water Samples.
2. Assessment of air pollution and CO<sub>2</sub> level at various sites.
3. Estimation of primary productivity of aquatic macrophytes - light and dark bottle method.
4. Estimation of primary productivity of terrestrial plants - harvest method.
5. Estimation of secondary productivity - Biomass production in grasshopper.
6. Collection and mounting of phyto and zoo planktons.
7. Phytoremediation with plants for dye industry effluents.
8. Estimation of LC50 value using fish/mosquito larva model.

**Medical Lab Technology:**

1. Determination of Bleeding time, clotting time.
2. Estimation of Haemoglobin concentration.
3. Estimation of Erythrocyte Sedimentation Rate.
4. Estimation of Packed Cell Volume.
5. Differential count.
6. Total count: Leucocytes and Erythrocytes
7. Blood grouping.
8. Estimation of Blood sugar, cholesterol, urea and creatinine
9. Urine Analysis: Urine sugar, albumin, bile salt and bile pigment.
10. Microscopic examination of crystals and cast.
11. Pregnancy test.
12. Visit to various clinics and hospitals.

## MEDICAL LAB TECHNOLOGY

Semester: II

Hours: 6

Code : 20PZO2E2A

Credits: 4

### COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO - 1	Comprehend the medical devices and biomedical instruments.	PSO - 1, PSO - 5	K, Ap, An
CO - 2	Develop lab skills to handle clinical samples and become entrepreneur.	PSO - 1, PSO - 5	K, An, Ap
CO - 3	Explicate the clinical chemistry.	PSO-1,PSO-3, PSO - 5	K, S, An
CO - 4	Analyse and report the sample urine, stool and sputum.	PSO - 1, PSO - 5	K, An
CO - 5	Analyse and understand the Causative organisms, mode of transmission, clinical symptoms and laboratory diagnosis of bacterial and viral diseases.	PSO - 1, PSO - 3, PSO - 5	K, An, S

### RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester: II		MEDICAL LAB TECHNOLOGY										Hours: 6
Code : 20PZO2E2A												Credits: 4
Course Outcomes	Programme Outcomes (PO)						Programme Specific Outcomes (PSO)					Mean Score of CO's
	1	2	3	4	5	6	1	2	3	4	5	
CO - 1	4	4	4	4	4	4	3	3	3	5	5	3.90
CO - 2	3	4	3	3	3	3	3	3	3	5	4	3.36
CO - 3	4	3	3	3	4	3	3	3	3	5	5	3.54
CO - 4	3	3	3	3	4	3	3	3	3	5	4	3.36
CO - 5	4	3	3	3	3	3	3	3	3	5	4	3.36
<b>Overall Mean Score</b>												<b>3.50</b>

**Result:** The Score for this Course is 3.50 (High Relationship)

#### Note:

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

#### Values Scaling:

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$
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## **UNIT I**

**Biomedical Devices and Biomedical Instruments:** Laboratory safety measures. Medical devices: Light Microscope and phase contrast microscope, Sphygmomanometer, Thermometer, Haemometer, Hemocytometer, Urinometer, Electrocardiography (ECG), Electroencephalography (EEG), Electromyography (EMG), Light Amplification by Stimulated Emission of Electromagnetic Radiation (LASER) in Medicine. **(18 Hours)**

## **UNIT II**

**Haematological Test:** Routine Haematological test - Bleeding Time (BT), Clotting Time (CT), Haemoglobin Concentration (Hb), Erythrocyte Sedimentation Rate (ESR), Haematocrit (PCV), Cell Study: Counting of Cells - Differential count (DC) and Total Count (TC), Cell indices - Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH) and Mean Corpuscular Haemoglobin Concentration (MCHC). Blood grouping and Rh typing. **(21 Hours)**

## **UNIT III**

**Clinical Biochemistry:** Clinical Biochemistry -Enzymes-linked immunosorbent assay (ELISA), Western Blot, Venereal Disease Research Laboratory Test (VDRL), Rheumatoid arthritis, Immunologic test for pregnancy, blood glucose, blood urea, blood uric acid, blood creatinine and blood cholesterol. **(15 Hours)**

## **UNIT IV**

**Analysis of Urine, Stool and Sputum:** Analysis of Urine: Physical properties of Urine - Colour, volume, specific gravity, odour and pH. Chemical composition of Urine - urine sugar, albumin, bile salts and bile pigments, Microscopic examination of organized and unorganized sediments. Analysis of stool: Macroscopic examination - colour, form consistency and odour. Microscopic examination of ova and cyst. Analysis of Sputum: Macroscopic examination - Colour and consistency of sputum, microscopic and biochemical examination of sputum - Gram stain and Acid-Fast Bacilli (AFB). **(21 Hours)**

## **UNIT V**

**Bacterial and Viral Diseases:** Laboratory diagnosis, Causative organisms, mode of transmission and clinical symptoms of Bacterial diseases - Tuberculosis, Leprosy, Typhoid, Syphilis and Tetanus and Viral diseases - COVID-19, Chikungunya, HIV, Jaundice and Dengue fever. **(15 Hours)**

### **BOOKS FOR REFERENCE:**

1. Isidro Aquilar and Herminia Galbes, (1999). Encyclopedia of Health and Education for the family. Education and Health Library, Published under the title of Encyclopedia familiarria, Amor Y sexo.
2. Kanai L., Mukherjee, (2005). Volume 1, A Procedure Manual for Medical Laboratory Technology. Routine diagnostic test. Tata McGraw-Hill Publishing Company Ltd., New Delhi.
3. Kanai L., Mukherjee, (2005). Volume 2, A Procedure Manual for Medical Laboratory Technology. Routine diagnostic test. Tata McGraw-Hill Publishing Company Ltd., New Delhi.
4. Kanai L., Mukherjee, (2008). Volume 3, A Procedure Manual for Medical Laboratory Technology. Routine diagnostic test. Tata McGraw-Hill Publishing Company Ltd., New Delhi.
5. Philip Evans., (1993). The family Medical books for reference Book the essential Guide to Health and Medicine. Published by Little Brown under the Black cat imprint, London.
6. Neeraja Sankaran., (2001). Volume 4, Microbes and People. Publication by Coe Library stacks.
7. Gabriel Virella, (1987). Microbiology and Infectious Diseases. B. I. Waverly Pvt. Ltd.

## NANOBIOLOGY

Semester: II

Hours: 6

Code : 20PZO2E2B

Credits: 4

### COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO - 1	Develop a broad fundamental knowledge on nanoparticles.	PSO - 1	K, C
CO - 2	Apply the knowledge in synthesis and Characterization of Nanoparticles.	PSO-3, PSO-4, PSO-5	K, S, Ap, E
CO - 3	Comprehend on Biosensors and bio signaling.	PSO-2, PSO-4, PSO-5	K, Ap, An
CO - 4	Demonstrate Nanotechnology in Biomedical Applications.	PSO-4, PSO-5	K, Ap, An
CO - 5	Apply Nanotechnology in Pollution Control.	PSO-2, PSO-3, PSO-5	K, Ap, An, S

### RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester: II		NANOBIOLOGY										Hours: 6
Code : 20PZO2E2B												Credits: 4
Course Outcomes	Programme Outcomes (PO)						Programme Specific Outcomes (PSO)					Mean Score of CO's
	1	2	3	4	5	6	1	2	3	4	5	
CO - 1	4	3	3	4	3	2	4	4	3	3	4	3.09
CO - 2	4	4	3	3	3	3	3	5	3	2	5	3.45
CO - 3	3	4	3	4	3	3	4	4	3	4	4	3.54
CO - 4	4	4	3	2	3	2	4	5	2	3	5	3.36
CO - 5	3	2	3	3	3	3	4	5	3	4	5	3.45
<b>Overall Mean Score</b>												<b>3.38</b>

**Result:** The Score for this Course is 3.38 (High Relationship)

**Note:**

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

**Values Scaling:**

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$
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## UNIT I

**Introduction to Nanoscience and Basic Concepts:** Interaction of surface molecules and its chemical and physical properties, Nanoprocesses in nature - lotus effect, colour patterns in butterflies, adhesive pads in lizards. Different types of nanoparticles - metallic nanoparticles - Gold / silver, titanium based, non metallic nanoparticles - carbon and silicon based. **(18 Hours)**

## UNIT II

**Synthesis and Characterization of Nanoparticles:** Solid state, vapour state and solution based (Green synthesis, mechanical ball milling, sol gel process, chemical vapor deposition). Characterization of nanoparticles - spectroscopic methods (UV-visible, FTIR, Raman spectroscopy, NMR), microscopic (AFM, Scanning and Transmission Electron Microscopy STEM), Structural (XRD), EDAX.

**(18 Hours)**

## UNIT III

**Biosensors:** Classes of biosensors - methods of biological signalling-methods of signal transduction - cantilever based biosensors - carbon nanotube based sensors - methods to prepare CNTs-based sensors and biosensors - application of CNTs-based electrochemical sensors and biosensors - biological and electrochemical fictionalization of carbon nanotubes. **(18 Hours)**

## UNIT IV

**Biomedical Applications of Nanoparticles:** Drug carriers - liposomes, nanoshells, micelles, dendrimers and hydrogels, fictionalization of nanomaterials and targeted drug delivery, imaging technique, quantum dots and magnetic nanoparticles, Implants: orthopaedic and vascular. **(18 Hours)**

## UNIT V

**Application of Nanotechnology in Pollution Abatement:** Photocatalyst oxidation ( $\text{TiO}_2$  based nanoparticles), reduction (iron based nanoparticle), absorption (nanoclay), encapsulation (dendrimers), nanofiltration (nanosieve membranes), nanosensors,  $\text{CO}_2$  capture, adsorption of toxic gases. **(18 Hours)**

### **BOOKS FOR REFERENCE:**

1. Janos. H. Fendler (Ed) (1998). Nanoparticles and Nanostructured Films: Preparation, Characterization and Applications. Wiley, VCH.
2. Williams, D. B. and Carte, C. B. (1996). Transmission Electron Microscopy - A text Book of Materials Science. Plenum Press, N. Y.
3. Challa Kumar, (2006). Nanomaterials for Medical Diagnosis and Therapy. Wiley, VCH.
4. Harvey Lodish, Arnold Berk (2008). Molecular Cell Biology. W.H. Freeman & Co, New York.
5. Geoffrey, M. Cooper, Robert, E. Hausman (2007). The Cell - A Molecular Approach. ASM Press, Washington.
6. Challa Kumar, (Ed) (2006). Biological and Pharmaceutical Nanomaterials. Wiley, VCH Verlag, Weinheim.
7. Challa, S.S.R. Kumar, (2007). Nanomaterials for Biosensors. Wiley, VCH, Verlag, Weinheim.
8. Challa, S.S.R. Kumar, (2006). Nanosystem Characterization Tools in the Life Science. Wiley-VCH, Verlag, Weinheim.
9. Arben Merkoci (2009). Biosensing using Nanomaterials. Wiley Publication, New Jersey.
10. Challa Kumar (2010). Semiconductor Nanomaterials. Wiley-VCH.

## GENERAL ENDOCRINOLOGY

Semester: II

Hours: 6

Code : 20PZO2E2C

Credits: 4

### COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO - 1	Comprehend the neurohormones and neurosecretions.	PSO - 1	K, S
CO - 2	Elucidate the cytology, chemistry, biosynthesis of thyroid and parathyroid glands.	PSO - 5	K, An, S
CO - 3	Explicate the histology, cytology of hormones and their functions.	PSO - 1, PSO - 3	K, An, S
CO - 4	Elucidate the endocrinology of ovary and testis.	PSO - 2, PSO - 5	K, An, Ap
CO - 5	Learn endocrinology in invertebrates.	PSO-1, PSO-3, PSO-5	K, An

### RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester: II		GENERAL ENDOCRINOLOGY										Hours: 6
Code : 20PZO2E2C												Credits: 4
Course Outcomes	Programme Outcomes (PO)						Programme Specific Outcomes (PSO)					Mean Score of CO's
	1	2	3	4	5	6	1	2	3	4	5	
CO - 1	4	3	3	3	3	3	4	4	3	3	4	3.36
CO - 2	3	4	3	4	3	3	4	3	3	2	4	3.27
CO - 3	4	4	3	4	3	3	4	3	3	2	4	3.36
CO - 4	3	3	3	4	3	3	4	3	3	2	4	3.18
CO - 5	4	4	3	3	3	2	4	3	3	2	4	3.18
<b>Overall Mean Score</b>												<b>3.27</b>

**Result:** The Score for this Course is 3.27 (High Relationship)

#### Note:

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

#### Values Scaling:

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$
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## **UNIT I**

**General Introduction to Endocrinology:** Historical background, Scope of endocrinology, Organization of endocrine system in Vertebrates and Invertebrates, Concept of neurosecretion. Endocrinology in vertebrates: Pituitary gland - Anatomy and Histology, Adeno hypophysis - Cytology and Histology of Hormones and their functions. Par intermedia: integrated function of dermal chromatophores in colour change. Neuro hypophysis: Biological actions of neuro hypophysial hormone. **(18 Hours)**

## **UNIT II**

**Thyroid Gland:** History and Cytology, Chemistry and Biosynthesis of thyroxin, Control of thyroid secretion, Para thyroid: Anatomy, Histology, Chemistry and functions of para thyroid hormones. **(18 Hours)**

## **UNIT III**

**Adrenal Cortex and Inter Renal Glands:** Histology and cytology of Hormones and their functions, Control of Secretions, Adrenal medulla: Histology and Cytology, Bio synthesis and physiology of medullary hormones, Pancreas: Histology and morphology control and function of hormones. Endocrinology of gastro intestinal hormones, Endocrinal disorders. **(18 Hours)**

## **UNIT IV**

**Endocrinology of Ovary and Testis:** Endocrinology of Ovary, Histopathology- Ovarian hormones and their functions, Pituitary control over ovarian functions, Endocrinology of Testis: Histopathology of testis, Hormones of testis and functions pituitary control of testis. **(18 Hours)**

## **UNIT V**

**Endocrinology in Invertebrates:** Endocrine mechanism in lower groups: Coelenterata, Turbellaria, Annelida and Mollusca. Endocrine mechanism with special reference to crustacean, insects and of other arthropods, Hormonal control of development and moulting, Hormones of invertebrates and their applications as pesticides in recent developments. **(18 Hours)**

## **BOOKS FOR REFERENCE:**

1. Howard A. Bern, (1966). A text book of Comparative endocrinology. Gorbman Aubrey Gorbman, New York, California.
2. Robert H. William W.B. (1968), Text book of endocrinology. 4<sup>th</sup> edition, Saundar company, Philadelphia, London, Toronto.
3. Turner, C.D. (1971). General Endocrinology, Pub- Saunders Toppan.
4. Nussey, S.S., and Whitehead, S.A. (2001) Enocrinology: An Integrated Approach, Oxford: BIOS Scientific Publishers.
5. Hadley, M.E., and Levine J.E. (2007) Endocrinology. 6<sup>th</sup> edition, Pearson Prentice-Hall, New Jersey.

## HUMAN PHYSIOLOGY

Semester: II

Hours: 4

Code : 20PZO2GE1

Credits: 3

### COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO - 1	Impart knowledge on nutrition, structure and functions of digestive system and its associated disorders.	PSO - 1, PSO - 4	K, C
CO - 2	Explain the structure of heart, blood grouping and its related diseases.	PSO - 1, PSO - 3	K, C, Ap, An
CO - 3	Analyze the transport of respiratory gases and its issues.	PSO - 1, PSO - 3	K, An, Ap
CO - 4	Attain knowledge on mechanism of neuromuscular physiology.	PSO - 1, PSO - 5	K, Ap, An
CO - 5	Analyse regulation of urine formation and various assisted reproductive technologies.	PSO - 1	K, Ap, E

### RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester: II		HUMAN PHYSIOLOGY										Hours: 4
Code : 20PZO2GE1												Credits: 3
Course Outcomes	Programme Outcomes (PO)						Programme Specific Outcomes (PSO)					Mean Score of CO's
	1	2	3	4	5	6	1	2	3	4	5	
CO - 1	4	3	3	4	2	4	4	3	3	3	5	3.45
CO - 2	3	4	3	4	3	4	3	4	3	2	5	3.45
CO - 3	4	3	3	3	3	3	4	3	3	3	5	3.36
CO - 4	4	4	3	4	2	2	4	4	2	3	5	3.36
CO - 5	4	3	3	5	3	3	4	4	3	3	5	3.63
<b>Overall Mean Score</b>												<b>3.45</b>

**Result:** The Score for this Course is 3.45 (High Relationship)

#### Note:

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

#### Values Scaling:

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$
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## UNIT I

**Nutrition and Gastrointestinal Physiology:** Nutritional requirements for normal adult - carbohydrates, proteins, fats, minerals and vitamins, calorific values and daily requirements. Balanced diet, Malnutrition, Energy balance and BMR. Digestion - Functional anatomy of the digestive system (human Digestion and absorption of nutrients- carbohydrates, fats and proteins), Gastro intestinal disorders - Gall stones, liver cirrhosis, gastritis, peptic ulcer and appendicitis.

**(12 Hours)**

## UNIT II

**Cardiovascular Physiology:** Functional anatomy of human heart, Components and functions of blood, blood grouping, heartbeat, cardiac cycle and ECG - its principles and significance. sphygmomanometer, Heart diseases (Atherosclerosis and coronary thrombosis).

**(12 Hours)**

## UNIT III

**Respiratory Physiology:** Structure of lungs- Transport of carbon dioxide and oxygen in blood and tissues, respiratory quotient (RQ), factors affecting gaseous transport. Respiratory problems - bronchial asthma, pneumonia and pulmonary tuberculosis.

**(12 Hours)**

## UNIT IV

**Neuromuscular Physiology:** Structure of neuron, Synaptic transmission of impulses. Structure and mechanism of photo and phonoreceptors. Eye diseases- Myopia, Hypermetropia, eye allergies, diabetic retinopathy. Osteosclerosis and middle ear infection. Ultrastructure of skeletal muscle and mechanism of muscle contractions.

**(12 Hours)**

## UNIT V

**Urinogenital Physiology:** Structure and function of Kidney and nephron. Mechanism of urine formation in brief. Renal disorders - nephritis, renal calculi, Dialysis. Menstrual cycle and contraception. Pregnancy, gestation and Parturition. Factors of Infertility, Artificial insemination, surrogate motherhood, IVF, test tube baby.

**(12 Hours)**

### **BOOKS FOR REFERENCE:**

1. Tortora, G.J. and Derrickson, B.H. (2009). Principles of Anatomy and Physiology (12th edition) John Wiley and Sons, Inc.
2. Widmaier, E.P., Raff, H. and Strang, K.T. (2008) Vander's Human Physiology (9th edition) McGraw Hill.
3. Guyton, A.C. and Hall, J.E. (2011) Textbook of Medical Physiology (12th edition) Harcourt Asia Pvt. Ltd/ W.B. Saunders Company.
4. Marieb, E. (1998) Human Anatomy and Physiology (4th edition) Addison-Wesley.
5. Kesar, S. and Vashisht, N. (2007) Experimental Physiology, Heritage Publishers.
6. Dee Unglaub Silverthorn, (2015) Human Physiology: An integrated Approach, VII edition, Pearson Education limited, Edinburgh gate, England.
7. Sawant, K.C. (2011). Human Physiology. New Delhi: Wisdom Press/ Dominant Publishers and Distributors Pvt Ltd.
8. Sarada Subrahmanyam and Madhavankutty, K. (2001). Text Book of Human Physiology (6<sup>th</sup> ed.). New Delhi: S. Chand and Company Ltd.

## SOFT SKILLS

Semester: II

Hours: 2

Code : 20PSE2S01

Credit: 1

### COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO - 1	Develop their social, interpersonal, cognitive, ethical, professional, reading and communication skills	PSO-1	K
CO - 2	Increase their self-esteem and confidence.	PSO-2,4	Ap
CO - 3	Achieve their short and long term goals.	PSO-3	Sy
CO - 4	Prepare and formulate their resumes wisely.	PSO-4	Ap
CO - 5	Face the mock group discussions and interviews with a challenge and choose their right career.	PSO-5	Ap

### RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester: II		SOFT SKILLS										Hours: 2
Code : 20PSE2S01												Credit: 1
Course Outcomes	Programme Outcomes (PO)						Programme Specific Outcomes (PSO)					Mean Score of CO's
	1	2	3	4	5	6	1	2	3	4	5	
CO1	4	4	4	4	4	5	4	4	4	4	5	4.18
CO2	4	4	4	4	4	5	4	4	4	4	5	4.18
CO3	4	4	4	4	4	5	4	4	4	4	5	4.18
CO4	4	4	4	4	4	5	4	4	4	4	5	4.18
CO5	4	4	4	4	4	5	4	4	4	4	5	4.18
<b>Overall Mean Score</b>												<b>4.18</b>

**Result:** The Score for this Course is 4.18 (High Relationship)

**Note:**

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

**Values Scaling:**

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$
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## **UNIT I: SOFT SKILLS**

Introduction - Soft skills - Importance of soft skills - Selling your soft skills - Attributes regarded as soft skills - Soft skills - Social - Soft skills - Thinking - Soft skills - Negotiating - Exhibiting your soft skills - Identifying your soft skills - Improving your soft skills - will formal training enhance your soft skills - Soft Skills training - Train yourself - Top 60 soft skills - Practicing soft skills - Measuring attitude. (6 Hours)

## **UNIT II: CAREER PLANNING**

Benefits of career planning - Guidelines for choosing a career - Myths about choosing a career - Tips for successful career planning - Developing career goals - Final thoughts on career planning - Things one should know while starting career and during his/her career. (6 Hours)

## **UNIT III: ART OF LISTENING AND SPEAKING**

Two ears, one mouth - Active listening - Kinds of Listening, Common - poor listening habits - Advantages of listening - Listening Tips. Special features of Communication - Process - Channels of Communication - Net Work - Barriers - Tips for effective communication and Powerful presentation - Art of public speaking - Public Speaking tips - Over coming fear of public speaking. (6 Hours)

## **UNIT IV: ART OF READING AND WRITING**

Good readers - Benefits - Types - Tips - The SQ3R Technique - Different stages of reading - Rates of Reading - Determining a student's reading rate - Increasing reading rate - Problems with reading - Effective reader - Importance of writing - Creative writing - Writing tips - Drawbacks of written communication. (6 Hours)

## **UNIT V: PREPARING CV / RESUME**

Meaning - Difference among Bio-data, CV and Resume - The terms - The purpose of CV writing - Types of resumes - Interesting facts about resume - CV writing tips - CV/Resume preparation - the dos - CV/Resume preparation - the don'ts - Resume check up - Design of a CV - Entry level resume - The content of the resume - Electronic resume tips - References - Power words - Common resume blunders - Key skills that can be mentioned in the resume - Cover letters - Cover letter tips. (6 Hours)

## **COURSE BOOK:**

- ❖ Dr. K. Alex, Soft Skills, Chand & Company Pvt. Ltd., New Delhi.

**REFERENCE BOOK:**

1. Dr. T. Jeya Sudha & Mr. M.R. Wajida Begum : Soft Skills/Communication Skills, New Century Book House (P) Ltd., Chennai.
2. S. Hariharen, N. Sundararajan & S.P. Shanmuga Priya : Soft Skills, MJP Publishers, Chennai.

**CONTINUOUS INTERNAL ASSESSMENT COMPONENT (CIA)****THEORY:**

<b>COMPONENT</b>	<b>MARKS</b>
Internal test I	40
Internal test II	40
Seminar	10
Term Paper	5
Attendance	5
<b>Total</b>	<b>100</b>

**CONTINUOUS INTERNAL ASSESSMENT COMPONENT (CIA)****Passing Minimum: 50% out of 100****INTERNAL QUESTION PATTERN****(Maximum Marks-40)****Part - A**

10 Questions × 1Mark = 10 Marks

**Part - B**

2 Questions × 5 Marks = 10 Marks

(Internal Choice and One Question from Each Unit)

**Part - C**

2 Questions × 10 Marks = 20 Marks

(Open Choice, Two Questions out of Three)