

**KONGUNADU ARTS AND SCIENCE COLLEGE  
(AUTONOMOUS)**

Re - accredited by NAAC with "A+" Grade 3.43 CGPA out of 4 (4<sup>th</sup> Cycle)  
**College of Excellence (UGC)**

**COIMBATORE – 641029,**

**TAMILNADU, INDIA.**



**SCHEME AND SYLLABUS FOR**

**PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY**

**CURRICULUM AND SCHEME OF EXAMINATIONS (CBCS)**

**(2020 - 2021 and onwards)**

## **VISION AND MISSION OF THE COLLEGE**

### **Vision:**

Developing the total personality of every student in a holistic way by adhering to the principles of Swami Vivekananda and Mahatma Gandhi.

### **Mission:**

- Imparting holistic and man-making education with emphasis on character, culture and value - moral and ethical.
- Designing the curriculum and offering courses that transform the students into value added skilled human resources.
- Constantly updating academic and management practices towards total quality management and promotion of quality in all spheres.
- Extending the best student support services by making them comprehensive and by evolving a curriculum relevant to student community and society at large.
- Taking steps to make education affordable and accessible by extending scholarships to the meritorious and economically disadvantaged students.
- Molding the teachers in such a way that they become the role models in promoting Higher Education.

**KONGUNADU ARTS AND SCIENCE COLLEGE  
(AUTONOMOUS)**

Re - accredited by NAAC with "A+" Grade 3.43 CGPA out of 4 (4<sup>th</sup> Cycle)  
College of Excellence (UGC)

**COIMBATORE – 641029, TAMIL NADU, INDIA.**

**PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY-**

**VISION & MISSION**

**Vision:**

To identify local and global issues that need intervention by a biochemist and to develop intelligent strategies and Biochemical approaches towards problem- solving.

**Mission:**

- To provide opportunities to get hands- on experience in Research-oriented education in Biochemistry.
- To provide Entrepreneurship in Biochemistry related areas.
- To give a broad based knowledge in concepts and principles of biochemistry.

**KONGUNADU ARTS AND SCIENCE COLLEGE  
(AUTONOMOUS)**

Re - accredited by NAAC with "A+" Grade 3.43 CGPA out of 4 (4<sup>th</sup> Cycle)  
College of Excellence (UGC)

**COIMBATORE – 641029, TAMIL NADU, INDIA.**

**PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY**

**PG PROGRAMME OUTCOMES**

**PO1:** To presume, question and evaluate, solve problems, integrate knowledge and widen perspective.

**PO2:** To understand that communication comprises attentiveness and listening, reading and comprehension, to communicate and collect information through oral and written formats.

**PO3:** To apply contemporary research methods, skills and techniques in a scientific discipline.

**PO4:** To reveal empathetic social concern and national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

**PO5:** To understand the issues of environmental contexts and sustainable development and to engage in independent and life-long learning.

**KONGUNADU ARTS AND SCIENCE COLLEGE  
(AUTONOMOUS)**

Re - accredited by NAAC with "A+" Grade 3.43 CGPA out of 4 (4<sup>th</sup> Cycle)  
College of Excellence (UGC)

**COIMBATORE – 641029, TAMIL NADU, INDIA.**

**PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY**

**PROGRAMME SPECIFIC OUTCOMES**

**PSO1:** Understanding of structure and metabolism of macromolecules, regulation and disorders of metabolic pathways.

**PSO2:** Investigate the impact of science in society and plan to pursue research

**PSO3:** Gain proficiency in laboratory techniques in both biochemistry and molecular biology and be able to apply the scientific method to the processes of experimentation and Hypothesis testing.

**PSO4:** Understand the application of biochemistry in clinical laboratory.

**PSO5:** Acquire thorough knowledge in biochemical techniques, immunology, physiology, molecular biology, genetic engineering and biotechnology.

**PBC 1**

**KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)**

Re - accredited by NAAC with "A+" Grade 3.43 CGPA out of 4 (4<sup>th</sup> Cycle)

College of Excellence (UGC)

**COIMBATORE – 641029, TAMIL NADU, INDIA.**

**Course Name: M.Sc. Biochemistry**

**Curriculum and Scheme of Examination under CBCS**

**(Applicable for the Students Admitted during the Academic Year 2020-2021)**

Semester	Subject code/ Question paper code	Title of the paper	Instruction hours/cycle	Exam Marks			Duration of Exam (Hrs)	Credits
				CIA	ESE	Total		
I	20PBC101	C.P.1 Biomolecules	5	25	75	100	3	4
	20PBC102	C.P.2 Bioanalytical Techniques	5	25	75	100	3	4
	20PBC103	C.P.3 Enzymes and Enzyme Technology	5	25	75	100	3	4
	20PBC104	C.P.4 Cell Biology	5	25	75	100	3	4
	20PBC1CL	C.Pr.1 Lab in Biomolecules, Bioinstrumentation, Enzymology and Cell Biology	5	40	60	100	6	4
	20PBC1E1	E.P.1 Major Elective- I	5	25	75	100	3	5
<b>Total Hours</b>			<b>30</b>	<b>165</b>	<b>435</b>	<b>600</b>		<b>25</b>
II	20PBC205	C.P.5 Plant Biochemistry and Biotechnology	5	25	75	100	3	4
	20PBC206	C.P.6 Intermediary Metabolism	5	25	75	100	3	4
	20PBC207	C.P.7 Genetics and Molecular Biology	5	25	75	100	3	4
	20PBC208	C.P.8 Drug Biochemistry	5	25	75	100	3	4
	20PBC2CM	C.Pr.2 Lab in Plant Biochemistry, Microbiology, Genetics and Molecular Biology	5	40	60	100	5	4
		20PBC2E2	E.P.2 Major Elective- II	5	25	75	100	3
<b>Total Hours</b>			<b>30</b>	<b>165</b>	<b>435</b>	<b>600</b>		<b>25</b>
III	20PBC309	C.P.9 Immunology	7	25	75	100	3	5
	20PBC310	C.P.10 Biostatistics and Research Methodology	6	25	75	100	3	5
	20PBC311	C.P.11 Clinical Biochemistry	7	25	75	100	3	4
	20PBC3CN	C.Pr.3 Lab in Immunology, Genetic Engineering and Clinical Biochemistry	5	40	60	100	5	4
	20PBC3N1	E.P.1 Non-major Elective –I (On-line)	3	25	75	100	3	4
	20PBC3ST	Summer training*	-	-	-	-	-	-
	20PBC3X1	EDC-Nutritional Biochemistry	2	25	75	100	3	2
<b>Total Hours</b>			<b>30</b>	<b>165</b>	<b>435</b>	<b>600</b>		<b>24</b>
IV	20PBC412	C.P.12 Hormonal Biochemistry	5	25	75	100	3	4
	20PBC413	C.P.13 Genetic Engineering	5	25	75	100	3	5
	20PBC4N2	E.P.2 Non-major Elective –II (On-line)	5	25	75	100	3	4
	20PBC4Z1	Project and Viva-voce	15	20	80*	100	-	3
<b>Total Hours</b>			<b>30</b>	<b>95</b>	<b>305</b>	<b>400</b>		<b>16</b>
<b>GRAND TOTAL</b>			<b>120</b>	<b>590</b>	<b>1610</b>	<b>2200</b>		<b>90</b>
*Project record 120 marks + Viva-voce examination 40 marks								

## PBC 2

**Note:** \*The students shall undergo a Summer training for a minimum period of 30 days at the end of the second semester during summer vacation and submit the report in the third semester. The report will be evaluated for 100 marks along with the internal viva voce by the faculty members and HoD. According to their marks, the grades will be awarded as given below.

Marks (%)	Grade
85-100	O
70-84	D
60-69	A
50-59	B
40-49	C
<40	U (Reappear)

### ADVANCED LEARNERS COURSE UNDER SELF STUDY SCHEME (Optional)

20PBCOD1	Forensic Sciences
20PBCOD2	Nutraceuticals and Functional foods
20PBCOD3	Stem Cell Biology

### JOB ORIENTED COURSE

20PBCOJ1	Bio entrepreneurship
20PBCOJ2	Food safety and Quality control
20PBCOJ3	Clinical and therapeutic nutrition

### EXTRA DEPARTMENTAL COURSE

20PBC3X1	Nutritional Biochemistry
----------	--------------------------

### CERTIFICATE COURSE IN MEDICAL LABORATORY TECHNOLOGY

20PBC0F1	Paper I: Biochemistry
20PBC0F2	Paper II: Clinical Pathology and Microbiology-I
20PBC0F3	Practical I
20PBC0F4	On the Job training

### DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

20PBC0F5	Paper I: Anatomy, Physiology and Laboratory safety
20PBC0F6	Paper II: Clinical Pathology and Medical Microbiology II
20PBC0F7	Practical II
20PBC0F8	On the Job training

#### Tally Table:

Subjects	Total Marks	Total Credits
<b>Core Paper/Practical/Project (17)</b>	1700	70
<b>Major Elective (2)</b>	200	10
<b>Non – Major Elective (2)</b>	200	08
<b>Extra departmental Course</b>	100	02
<b>Grand Total</b>	2200	90

### PBC 3

**Note:** JOC, ALC are offered to the students admitted during the academic year 2020-21 and will be considered as extra credit courses

CBCS	-	Choice Based Credit System
C.P	-	Core Paper
C.Pr.	-	Core Practical
JOC	-	Job Oriented Course
ALC	-	Advanced Learners Course
EDC	-	Extra Departmental Course
CIA	-	Continuous Internal Assessment
ESE	-	End of Semester Examination

25 % CIA is applicable for all theory papers

40% CIA is applicable for all practical papers

#### **Major Elective Papers**

1. Nanobiotechnology
2. Microbiology
3. Bioinformatics
4. Bioethics, Biosafety and IPR

#### **Non – Major Elective Papers (On-line exam)**

1. Environmental Management
2. Competitive Sciences
3. Bioprocess Technology
4. Cancer Biology

Students must select two major electives and two non-major electives from the above list of papers.



<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBC101		<b>Title:</b> Core Paper 1 – Biomolecules		
Batch 2020-2021	Semester I	Hours / Week 5	Total Hours 75	Credits 4

### Course Objectives

1. To learn about the chemistry and structures of biomolecules
2. To know the properties of different biomolecules
3. To know the physiological functions of biomolecules

### Course Outcomes (CO)

K1-K4 CO1-CO4	The students recollect the classification and functions of biomolecules, grasp the scope of biological chemistry, know about execute of biomolecules in human health, analyse and study the chemical and biochemical properties of biomolecule and able to enter into drug design and pharmacogenetics field.
------------------	---

20PBC101

### Syllabus

#### Unit I

(15 Hours)

**Carbohydrates:** Structure, occurrence, properties and biological functions of Monosaccharides, Disaccharides, O-linked and N-linked oligosaccharides, Polysaccharides: Homoglycans: Structure, occurrence, properties and biological functions of chitin, starch and cellulose. Heteroglycans: Structure, occurrence, properties and biological functions of glycosaminoglycans. Structure and biological role of peptidoglycans, lipopolysaccharides and proteoglycans. Blood group substances.

#### Unit II

(15Hours)

**Amino acids:** Classification, structure and physical and chemical properties of amino acids (Ionization & Biuret reaction). Acid-base and UV-light absorption properties of amino acids. Non-protein amino acids. Aminoacid derivatives. Amino acid sequencing methods. Triplet codon.

#### Unit III

(15 Hours)

**Proteins:** Structural organization of protein: Primary structure. Determination of protein structure: Ramachandran plot. Polypeptide synthesis. Secondary structures –  $\alpha$ -helix,  $\beta$ -sheet and  $\beta$ -turns, Pauling and Corey model for fibrous proteins, Reverse turns and super secondary structures, Collagen triple helix. Tertiary structure –  $\alpha$  and  $\beta$  domains. Conformational properties of silk fibroin. Quarternary structure of proteins: Structure and functions of Myoglobin and haemoglobin.

**Unit IV****(15 Hours)**

**Lipids:** \***Classification**, structure, functions and properties of lipids. Fatty acids-saturated and unsaturated. Structure, properties and functions: Phospholipids (Cephalin, Lecithin and Sphingolipids) and glycolipids. Eicosanoids-structure and biological role of prostaglandins, thromboxanes and leucotrienes. Steroids: structure and functions of cholesterol. Lipoproteins-classification and composition. Amphipathic lipids-emulsions and liposomes.

**Unit V****(15 Hours)**

**Nucleic acids:** Structure of nucleic acids, DNA double helical structure – Watson and Crick model. A, B and Z DNA, Palindromes, Inverse repeats, cruciform and hairpins, Triple and quadruple structures. DNA sequencing procedures – Maxam Gilbert method and Sanger's Di deoxy chain termination method. Properties of DNA: UV absorption spectra, buoyant density, denaturation and renaturation, cot curves, DNA hybridization, DNA supercoiling and linking number. Chemical synthesis of DNA. Structure and biological functions of major forms of RNA: mRNA, r RNA and t RNA.

\* **denotes Self study**

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

**Text Books**

1. Nelson, David L. and Cox. (2017). Lehninger Principles of Biochemistry. 7<sup>th</sup> edition, W.H.Freeman and Co., NY
2. U.Sathayanarayana. (2017). Biochemistry. 5<sup>th</sup> edition, Books and allied (P) Ltd., India

**Reference Books.**

1. Voet, D, Voet, J.G. and Pratt, C.W. (2013). Principles of Biochemistry. 4<sup>th</sup> edition, John Wiley & Sons, New Delhi - 10002.
2. Garrette R.H and Grisham, C. M. (2013). Principles of Biochemistry. 5<sup>th</sup> edition, Saunders college publishers.
3. Eric E.Conn, P.K. Stumpf, G.Brueins and Ray H.Do, John. (2005). Outlines of Biochemistry. 5<sup>th</sup> edition. Wiley and sons, Singapore.
4. Moran, Horton, Scrimgeour, Perry & Rawn (2013). Principles of Biochemistry, 5<sup>th</sup> edition Pearson New International Edition, UK.

## MAPPING

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	S	S	M	H
<b>CO2</b>	M	H	H	S	M
<b>CO3</b>	S	M	S	H	H
<b>CO4</b>	S	H	S	M	H

S – Strong

H – High

M – Medium

L – Low

<b>Programme Code: 07</b>		<b>Programme Title: M.Sc Biochemistry</b>		
<b>Course Code: 20PBC102</b>		<b>Title: Core Paper 2 – Bioanalytical Techniques</b>		
Batch 2020-2021	Semester I	Hours / Week 5	Total Hours 75	Credits 4

### Course Objectives

1. To learn the principle and instrumentation of various separation techniques
2. To know the applications of various separation techniques in biological fields
3. To learn the concept of radioactivity and explore its role in various fields.

### Course Outcomes (CO)

K1- K4 CO1-CO4	The students recall the principle and applications of bioinstrumentation, discern the principle, Instrumentation of different types of bioanalytical techniques, discern about applying the instrumentation techniques of Centrifugation, Electrophoresis and Chromatography in various research fields, the knowledge and practice concerning modern analytical instrumentation and students can able to enter into large scale industries.
-------------------	--

20PBC102

### Syllabus

#### Unit I

(15 Hours)

**Chromatography:** Principle, technique and applications of paper, TLC, HPTLC, column, ion-exchange, affinity, gel-filtration chromatography. Principle, instrumentation and applications of GLC and HPLC. Principle and applications of GC-MS, HPLC-MS, LC-MS/MS, Reverse phase chromatography and FPTLC.

#### Unit II

(15 Hours)

**Electrophoresis:** Principle, technique and applications of paper, Agarose gel, SDS-PAGE, 2D-PAGE electrophoresis, Immunoelectrophoresis. Isoelectric focusing technique and application. Principle, instrumentation, technique and applications of capillary electrophoresis and pulse-field gel electrophoresis.

(15 Hours)

#### Unit III

**Spectroscopy:** Principle, technique, instrumentation and applications of UV-Visible, FTIR spectroscopy, spectro-fluorimetry, molecular luminescence, atomic absorption spectrophotometry, Electron spin resonance (ESR), Nuclear Magnetic Resonance (NMR), Matrix assisted LASER desorption/ionization time of flight-mass spectroscopy (MALDI-TOF MS), X-ray crystallography, XRD. Ion selective electrodes.

**Unit IV****(15 Hours)**

**Centrifugation:** Types of rotors- swing bucket, fixed angle, vertical. Types of centrifuge: Micro centrifuge, High speed and Ultracentrifuges Principle, technique, instrumentation and applications of ultracentrifuge: preparative and analytical centrifugation, differential centrifugation, density gradient centrifugation, Rate zonal and isopycnic centrifugation. Methods of disrupting cells and tissues – homogenization and Fractionation.

**Unit V****(15 Hours)**

**Microscopy and Radioactivity:** Principles, instrumentation and applications of microscopy: Bright field, phase-contrast, fluorescence and confocal microscopy. Electron microscope – SEM and TEM. Radioactivity: nature, types of Radioactive decay, Units of radioactivity (Curie, Rutherford and Becquerel), detection and measurement of radioactivity by GM and scintillation counter. Autoradiography and its applications. Therapeutic application of radioisotopes and its safety measures. **\*Radio Immuno**

**Assay.****\* denotes Self study****Teaching Methods**

Powerpoint presentation/ Seminar/ Quiz/ Discussion/ Assignment/ Google Classroom/ Google Classroom

**Text Books**

1. Upadhyay, Upadhyay and Nath. (2012). Biophysical Chemistry – Principles and Techniques, 4<sup>th</sup> Revised edition, Himalaya Publishing House Pvt. Ltd.
2. Keith Wilson, John Walker. (2000). A biologist's guide to Principles and Techniques of Practical Biochemistry, 5<sup>th</sup> edition, Cambridge University Press, New York.

**Reference Books**

1. D.J. Homie and H. Peck. (2003). Analytical Biochemistry. 1<sup>st</sup> edition, Rastogic CBS Publisher.
2. Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch. (2008). Fundamentals of Analytical Chemistry. 4<sup>th</sup> edition, Barkha Nath Printers, India.
3. Keith Wilson and John Walker. (2011). Principles and Techniques of Biochemistry and Molecular Biology. 7<sup>th</sup> edition, Cambridge University Press, New York.
4. Chatwal, G and Anand, S. (2005). Instrumental methods of chemical analysis. Himalaya Publishing House
5. Wilson. K. and Walker. J. (2011), Principles and Techniques of Biochemistry and Molecular Biology, 7<sup>th</sup>ed, Cambridge University Press, New York.

**PBC 9**

**20PBC102**

**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	M	S	H	M
<b>CO2</b>	H	S	M	M	S
<b>CO3</b>	H	M	S	H	M
<b>CO4</b>	M	S	S	H	S

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

## PBC 10

20PBC103

<b>Programme Code: 07</b>		<b>Programme Title: M.Sc Biochemistry</b>		
<b>Course Code: 20PBC103</b>		<b>Title: Core Paper 3 – Enzymes and Enzyme Technology</b>		
Batch 2020-2021	Semester I	Hours / Week 5	Total Hours 75	Credits 4

### Course Objectives

1. To know the classification and properties of enzymes
2. To learn about the mechanism of enzyme action
3. To know the applications of enzymes in clinical and diagnostic fields

### Course Outcomes (CO)

K1-K4 CO1- CO4	The students remember the fundamentals of enzyme properties nomenclatures, characteristics and mechanisms, the different procedures involved in enzyme technology, the enzyme and their kinetics and also apply to this in the industry and other technological field and estimate enzyme technology for the commercialization purpose of biotechnological products
-------------------	---

20PBC103

### Syllabus

#### Unit I

(15 Hours)

**Enzymes:** Introduction, nomenclature and \***classification of enzymes**, Factors affecting enzyme activity. Unit of enzyme: Katal and IU. Measurement of enzyme activity: Active site- Definition, investigations of 3D structure of active site. Mechanism of enzyme action-Lock and key, induced fit model, enzyme modification by treatment with proteases, Isoenzymes-LDH, CPK and ALP.

#### Unit II

(15 Hours)

**Enzyme catalysis and regulation:** Acid base catalysis, covalent catalysis, Mechanisms of reaction catalyzed by enzyme lysozyme, chymotrypsin, carboxy peptidase A and ribonuclease. Metal activated enzymes and metallo enzyme. Enzyme regulation: feed forward stimulation, feedback inhibition and its types. Covalent modification of enzyme activities. Multienzyme complex and reactions: Structure and mechanism of action and regulation of pyruvate dehydrogenase complex.

**Unit III****(15 Hours)**

**Enzyme kinetics and Inhibition:** Kinetics of single substrate catalyzed reaction-MM equation and turnover number, LB plot, Eadie-Hofstee plot and Hanes plot. Importance of  $K_m$ ,  $V_{max}$  and MM equation. Allosteric enzymes- Cooperativity, Hill plot, K & V series of Enzyme. Bisubstrate reaction. Enzyme inhibition: Reversible inhibition-competitive, uncompetitive, noncompetitive, mixed, substrate and allosteric inhibition.

**Unit IV****(15 Hours)**

**Co-enzymes:** Prostatic group and cofactors. Structure, functions and mode of action of TPP in oxidative decarboxylation, FMN, FAD, NAD, NADP in redox reactions, PALP and PAMP in transamination, Co A in acetylation reactions, biotin in carboxylation, THF in one carbon transfer, cobalamine coenzymes-cyano, hydroxyl, methyl and deoxy adenosyl cobalamine- role in methyl group transfer and mutase reactions. Co-enzymic functions of vitamin C, lipoic acid and Co Q in metabolic reactions.

**Unit V****(15 Hours)**

**Enzymes application:** Industrial application of enzymes: Enzymes as analytical reagents, Enzymes used in molecular biology, Enzymes in Textile, Food and detergent industry. Enzymes used in diagnosis and various diseases. Immobilization techniques and applications: Adsorption, microencapsulation, entrapment, covalent and ionic bonding. Biosensors: Calorimetric, Potentiometric, Amperometric, immunosensors and optical biosensors. Ribozyme, abzyme.

\* denotes Self study

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

**Text Books**

1. Trevor Palmer. (2001). Enzymes: Biochemistry, Biotechnology and Clinical Chemistry. Horwood Chemical Science Series. Horwood Publishers.
2. Anil Kumar & Sarika Garg, (2015), Enzymes and Enzyme Technology, Viva books, New delhi.

**Reference Books**

1. Talwar. G.P (2012), Text book of biochemistry and Human Biology, 3<sup>rd</sup> edition, Prentice Hall of India Private Ltd, New Delhi.
2. Balasubramanian et al., (2015). Concepts in Biotechnology, Universities Press India Ltd.
3. EE. Conn and PK. Stumpf, G. Bruening and RY. Doi (2010), Outlines of biochemistry, 5<sup>th</sup> ed, John Wiley and Sons, New York, USA.
4. Robert J. Whitehurst, Maarten Van Oort. (2010). Enzymes in Food Technology. 2<sup>nd</sup> edition, John Wiley and Sons Ltd.
5. David L Nelson, Micheal M Cox. (2013). Lehninger's Principles of Biochemistry, 6<sup>th</sup> edition, Replika Press (P) Ltd, India.



6. Julio Polaina and Andrew P. (2007). Industrial Enzymes: Structure, Function and Applications (Springer). MacCabe (Editors).

**PBC 12**

**20PBC103**

**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	M	M	H	S
<b>CO2</b>	S	H	M	S	H
<b>CO3</b>	M	S	H	M	M
<b>CO4</b>	S	H	S	H	S

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBC104		<b>Title:</b> Core Paper 4 – Cell Biology		
Batch 2020-2021	Semester I	Hours / Week 5	Total Hours 75	Credits 4

### Course Objectives

1. To learn the models and functions of biological membrane
2. To learn about the structure and functions of cytoplasmic organelles
3. To learn the mechanism of membrane transport in cells

### Course Outcomes (CO)

K1-K4 CO1- CO4	The students will be able to elicit the basic concepts of cell biology , the knowledge of cell structure and function, apply the knowledge of cell biology to selected examples of changes or losses in cell function and to analyse the cell structure, cell signaling and cell functions.
-------------------	---

20PBC104

### Syllabus

#### Unit I

(15 Hours)

**Membrane structure and function:** Membrane bilayer Models, Fluid mosaic model- composition and functions. Membrane lipids- fluidity, Asymmetry phase transition, Liposome experiments. Membrane proteins - Types, Orientation, Mobility Experiments, flippases, proteins of RBC membrane, Bacteriorhodopsin, Porins-aquaporin. RBC ghosts, solubilisation of proteins, lipid anchored proteins. Cell surface carbohydrates- Lectins, selectins. Blood group antigens.

#### Unit II

(15 Hours)

**Endoplasmic reticulum:** history, occurrence, morphology, components, types, enzymes associated, functions and biogenesis. **Ribosomes:** history, occurrence, location, ultrastructure, chemical composition, biogenesis. Association and dissociation of ribosomal subunits, functions of ribosomes. **Golgi bodies:** history, origin, occurrence, morphology, polarity, compartmentalization, chemical composition and functions. **Centriole:** origin, occurrence, ultra structure and functions.

#### Unit III

(15 Hours)

**Nucleus:** occurrence, structure: nuclear envelope (nuclear transport, disassembly & reassembly, nuclear pores, pore complex, nucleocytoplasmic transport), nucleoplasm, nucleolus, nuclear

## PBC 14

20PBC104

reticulum (euchromatin, heterochromatin and functions) and its functions. Cell cycle, cell division, amitosis, mitosis, meiosis, salient features of meiosis, mechanism of crossing over. Chromosomes structure and its assembly.

### Unit IV

(15 Hours)

**Mitochondria:** history, ultrastructure, electron transport chain, mt DNA, mtRNA, ribosomes and protein synthesis in mitochondria. Semi-autonomous nature of mitochondria (symbiont hypothesis). Biogenesis, degeneration and functions of mitochondria. **Membrane transport:** Overview, Passive transport: osmosis, simple diffusion and facilitated diffusion; active transport:  $\text{Ca}^{2+}$  ATPase,  $\text{Na}^+\text{K}^+$ ATPase, Gastric  $\text{H}^+\text{K}^+$ ATPase. Ion concentration gradients. Bulk transport: exocytosis, phagocytosis and Receptor mediated endocytosis.

### Unit V

(15 Hours)

**Cytoskeleton:** Microfilaments–Actin-Structures, Assembly, Myosin. Microtubules-Organization and dynamics, Kinesin and dynein. Striated muscle -structure, excitation-contraction. **Cell signaling:** Cell-Cell signaling-Signaling molecules and their receptors: functions of cell surface receptors, pathways of intracellular signal transduction, second messengers-G-protein coupled receptors, neurotransmitters, receptor tyrosine kinases, Ras, MAP kinases. Signal transduction: cAMP, cGMP, phosphatidyl inositol,  $\text{Ca}^{2+}$ .

\* denotes Self study

### Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

### Text Books

1. Dr.Veer Bala Rastogi (2018).A Textbook of Cell Biology and Genetics. KNRN Publishers. Meerut.
2. P.S. Verma and V.K. Agarwal. (2014). Cell Biology, Genetics, Molecular biology, Evolution and Ecology, S. Chand and Company, New Delhi.

### Reference Books

1. Harvey Lodish, Arnold Berk *et al.*, (2007). Molecular Cell Biology. 6<sup>th</sup> edition, W H Freeman and Company, New York.
2. Garrette R.H and Grisham, C. M. (2013). Principles of Biochemistry. 5<sup>th</sup> edition, Saunders College Publishers.
3. Alberts *et al.*, (2014). Molecular biology of the cell. 6<sup>th</sup> edition, Garland Publishers.
4. David E Sadava. (2004). Cell Biology-Organelle structure and Function. Panima publishing Corporation, New Delhi.
5. G. Karp. (2001). Cell and Molecular Biology. 3<sup>rd</sup> edition, John Wiley & Sons publisher.
6. Geoffrey M.Cooper and Robert E. Hausman. (2009). The Cell: A Molecular Approach. 5<sup>th</sup> edition, ASM Press, Washington D.C.

**PBC 15**

**20PBC104**

**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	S	H	M	S
<b>CO2</b>	H	S	S	M	M
<b>CO3</b>	S	H	S	S	M
<b>CO4</b>	S	M	M	H	S

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

## PBC 16

20PBC1CL

<b>Programme Code: 07</b>		<b>Programme Title: M.Sc Biochemistry</b>		
<b>Course Code: 20PBC1CL</b>		<b>Title: Core Practical 1 – Lab in Biomolecules, Bioinstrumentation, Enzymology and Cell Biology</b>		
Batch	Semester	Hours / Week	Total Hours	Credits
2020-2021	I	5	75	4

### Course Objectives

1. To get practical experience in analyzing the biochemical metabolites in biological samples, bioinstrumentation, enzyme technology and cell biology techniques
2. To have hands on experience on chromatography, electrophoresis, enzyme and cell biology techniques
3. To develop familiarity with bioanalytical techniques and applications of enzyme and cell biology in research and industries

### Course Outcomes (CO)

K1-K4 CO1-CO4	The students will learn how to standardize various biomolecules, enzyme and cell biology, Conceive the amount of biomolecules, isolation, purification and determination of enzyme, preparation of buccal smears, apply the enzyme technology and cell biology skill in basic research projects, the principles of Biomolecules, enzyme and cell biology techniques to discovery novel drug development
------------------	---

20PBC1CL

### Biomolecules

1. Estimation of Starch in potato by Anthrone method.
2. Estimation of Fructose in Fruits by Seliwanoff's method.
3. Estimation of Glycogen in liver by Anthrone method.
4. Estimation of Ascorbic acid by 2,4 Dinitrophenyl hydrazine method.
5. Estimation of Total Free Aminoacids by Ninhydrin method
6. Estimation of Phospholipids from milk

7. Extraction of total carotenoids and estimation of  $\beta$ -Carotene
8. Separation of plant pigments by paper chromatography

**PBC 17**

**20PBC1CL**

9. Separation of amino acids by thin layer chromatography
10. PCR and Agarose gel electrophoresis (Demo)
11. Gel Documentation (Demo)
12. GC and HPLC (Demo)
13. Isolation of mitochondria and estimation of succinate dehydrogenase
14. Animal cell types (Demo)
15. Buccal smear – Identification of Barr body
16. Mitosis in onion root tip

### **Teaching Methods**

Demonstration/Video lectures/Laboratory visits/Institutional visits
---

**PBC 18**

**20PBC206**

**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	S	H	M	M
<b>CO2</b>	H	S	S	M	M
<b>CO3</b>	M	H	H	S	S
<b>CO4</b>	M	M	M	S	S

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

## PBC 19

20PBC205

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBC205		<b>Title:</b> Core Paper 5 – Plant Biochemistry and Biotechnology		
Batch 2020-2021	Semester I	Hours / Week 5	Total Hours 75	Credits 4

### Course Objectives

1. To learn the mechanism and importance of photosynthesis in plants
2. To learn the role of hormones in the growth metabolism of plants
3. To know the latest genetic engineering techniques for plant development

### Course Outcomes (CO)

K1-K4 CO1-CO4	The students recall the biosynthesis of primary and secondary metabolites, nitrogen metabolism involved in plants. Understand the concept of plant tissue culture and plant transformation techniques. know about the applications of phytoconstituents in development of new drug and can device new technologies involving plant biotechnology.
------------------	---

20PBC205

### Syllabus

#### Unit I

(15 Hours)

**Photo synthesis:** Overview, Pigments and factors affecting photosynthesis. Light reactions: Red drop and Emerson's enhancement effect, Hill's reaction, Arnons work, pigment systems I and II, photo oxidation of water, production of assimilatory powers, electron transport chain, cyclic and non-cyclic photophosphorylation. Dark reactions: C3, C4 and CAM pathway. Photorespiration.

#### Unit II

(15 Hours)

**Nitrogen metabolism:** Significance of nitrogen. Ammonification, nitrification, nitrate reduction, Physical and biological nitrogen fixation-symbiotic, non-symbiotic. Symbiotic nitrogen fixation in leguminous plants, biochemistry of nitrogen fixation, denitrification and nitrogen cycle.



## PBC 20

20PBC205

### Unit III

(15 Hours)

**Plant hormones:** Factors affecting the growth of plants, characteristics and classification of plant hormones. Chemistry, biosynthesis, physiological effects, applications of auxins, gibberellins, cytokinins, abscisic acid, ethylene.

### Unit IV

(15 Hours)

**Secondary metabolites and plant tissue culture:** Biosynthesis and functions of metabolites. Functions of alkaloids, phenolics, terpenoids, tannins and lignin. Applications of secondary metabolites. Structure and role of repellants and attractants. Plant tissue culture-Micropropagation, Callus induction, cell and protoplast culture, organogenesis and somatic embryogenesis. Haploid production-Anther, pollen, embryo and ovule culture and their applications. Applications of plant tissue culture. \***Somoclonal variation.** Shikimate pathway biosynthesis flow chart.

### Unit V

(15 Hours)

**Techniques for plant transformation:** Agrobacterium mediated gene transfer and its applications, Ti plasmid, the process of T-DNA transfer to plants: Mechanism. Agrobacterium mediated gene transfer in tobacco. Bt crops and golden rice production. Drought and herbicide resistance. Transformation methods: Particle bombardment, polyethyleneglycol (PEG) mediated transformation and electroporation. Validation of transformation – resistance genes, marker genes and transgene DNA.

\* **denotes Self study**

### Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

### Text Books

1. V.K. Jain. (2016). Fundamentals of Plant Physiology, 18<sup>th</sup> edition, S.Chand and Company Pvt.Ltd, New Delhi.
2. S.K. Verma and Mohit Verma. (2008). A Textbook of Plant Physiology, Biochemistry and Biotechnology. 2<sup>nd</sup> edition. S.Chand and Company Pvt.Ltd, New Delhi.

### Reference Books

1. Plant Biochemistry, Dey J.B. Harborne, (2000). Academic Press.
2. Adrian Slater, Nigel W. Scott, Mark R. (2008). Plant Biotechnology: The genetic manipulation of plants. Fowler Oxford University Press.
3. C. Neal Stewart. (2008). Plant Biotechnology and Genetics-Principles, Techniques and Applications. Jr. John Wiley and sons Publishers, UK.
4. William G. Hopkins. (2008). Introduction to Plant Physiology, 2<sup>nd</sup> edition, John Wiley and sons Publishers, UK.

5. Razdan M.K. (2003). An introduction to Plant Tissue culture. 2<sup>nd</sup> edition, Oxford & IBH Publishing Co, New Delhi.

6.

**PBC 21**

**20PBC205**

**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	M	S	H	S	M
<b>CO2</b>	H	S	M	M	M
<b>CO3</b>	M	H	M	S	S
<b>CO4</b>	S	M	S	H	M

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

## PBC 22

20PBC206

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBC206		<b>Title:</b> Core Paper 6 – Intermediary Metabolism		
Batch	Semester	Hours / Week	Total Hours	Credits
2020-2021	II	5	75	4

### Course Objectives

1. To learn the metabolism of various biomolecules in our system
2. To provide a basic understanding of the biochemical reactions of molecules
3. To study the interrelationship of various metabolic pathways

### Course Outcomes (CO)

K1-K4 CO1-CO4	The students remember commemorate the overall concept of cellular metabolism ,perceive the metabolism of biochemical pathways. execute the diseases associated with defective nucleotide biosynthesis and to analyze the role of fat in energy production and membrane synthesis
------------------	--

20PBC206

### Syllabus

#### Unit I

(15 Hours)

**Carbohydrate Metabolism and regulation:** An overview, energetics and regulation of glycolysis and gluconeogenesis. TCA cycle: steps: amphibolic nature of the Citric acid cycle-Anaplerotic mechanism. Electron transport chain and ATP production. Glycogen metabolism and its regulation. HMP shunt, Cori's cycle.

#### Unit II

(15 Hours)

**Lipid metabolism and regulation:** An overview of fatty acid metabolism. Oxidation of fatty acid: alpha, beta and omega. Biosynthesis of fatty acid. Regulation of fatty acid metabolism. Metabolism of Ketone bodies - Formation, Utilization, Excretion and significance. Metabolism of triacyl glycerol and phospholipids. Biosynthesis of cholesterol and its regulation. Metabolism of lipoproteins.

**Unit III**

**(15 Hours)**

**Amino acid metabolism and regulation:** Amino acid degradation: transamination, oxidative and non-oxidative deamination, decarboxylation. An overview on  $\gamma$ -glutamyl cycle. An overview: Methionine as methyl donor (SAM pathway). Urea cycle and its regulation. Catabolism of asparagine, glutamine, proline, cysteine and cysteine. Conversion of amino acids to Histamine, Serotonin, epinephrine and nor-epinephrine: Metabolism and function. Synthesis and regulation of pyruvate family, 3-Phosphoglycerate family and aspartate family of amino acids. Allosteric regulation of glutamine synthetase.

**Unit IV**

**(15 Hours)**

**Nucleic acid metabolism and regulation:** \*Fate of dietary nucleic acids, Purines and pyrimidines biosynthesis (both de novo and salvage pathways) and degradation. Regulation of purine biosynthesis: PRPP aminotransferases. Regulation of pyrimidine biosynthesis: Aspartate carbamoyl transferase. Regulation of deoxyribonucleotides by activators and inhibitors.

**Unit V**

**(15 Hours)**

**Integration of metabolism:** Interconversion of food stuffs. Metabolic profile of the liver, adipose tissue and brain. Altered metabolism in starvation. Compartmentalization of metabolic pathway in the cell. Metabolic fuels: definition. Caloric value of metabolic fuels, metabolic relationship of tissues in various nutritional and hormonal states.

**\*denotes Self study**

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

**Text Books**

1. Satyanarayana, U and Chakrapani, U. (2013). Biochemistry. 4<sup>th</sup> edition, Books and Allied Pvt. Ltd, Kolkata, 700 010.
2. Robert K. Murray, Daryl K. Granner and Victor W. Rodwell. (2008), Harper's Illustrated Biochemistry. 29<sup>th</sup> edition, McGraw Hill Companies, Inc. New Delhi.

**Reference Books**

1. Voet, D., Voet, J.G. and Pratt, C.W. (2013). Fundamentals of Biochemistry, Life at the Molecular Level. 4th edition, John Wiley & Sons, New Delhi, 110002
2. Garrette R.H and Grisham, C. M. (2012), Principles of Biochemistry. 5th edition, Saunders college publishers.
3. David L. Nelson, Micheal M. Cox. (2008). Lehninger's Principles of Biochemistry. Replika press (P) Ltd, India
4. Vasudevan D.M., Sreekumari S. and Kannan Vaidyanathan (2011). Text Book of Biochemistry for Medical Students, 6th ed., JAYPEE Brothers Medical Publishers Pvt. Ltd., New Delhi, 110002.

**PBC 24**

**20PBC206**

**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	S	S	M	S
<b>CO2</b>	S	H	M	S	M
<b>CO3</b>	M	S	H	S	S
<b>CO4</b>	H	S	S	M	H

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

## PBC 25

20PBC207

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBC207		<b>Title:</b> Core Paper 7 –Genetics and Molecular Biology		
Batch	Semester	Hours / Week	Total Hours	Credits
2020-2021	II	5	75	4

### Course Objectives

1. To understand the molecular organization of genes and chromosomes
2. To learn the process of DNA synthesis, repair and function
3. To learn the various molecular events occurring in DNA with proposed theories

### Course Outcomes (CO)

K1-K4 CO1-CO4	The students recognize about the basic concepts of gene , understand the different processes involved in replication, transcription and translation, integrate scientific and technological knowledge on the use of genetics and molecular biology for industrial products on the cell and process level and examine the molecular mechanisms behind DNA damage and repair
------------------	--

20PBC207

### Syllabus

#### Unit I

(15 Hours)

**Concept of gene:** Molecular structure of gene and chromosomes. Mendelian Principles: Mono and dihybrid cross. Incomplete Dominance, Overdominance, Codominance, Epistasis. Linkage and crossing over, Sex determination and Sex linkage in diploids. Polygenic inheritance. Chromosomal aberrations. Karyotyping. Human Genetic Diseases - Down's syndrome, Turner's syndrome, Klinefelter's syndrome.

#### Unit II

(15 Hours)

**Gene mutation and recombination:** Gene Mutation-Classification of mutations, DNA as a genetic material (Transformation, Conjugation and Transduction). Genetics of viruses: Lytic and Lysogenic life cycles of phages. Genetic Recombination (Homologous recombination-Holliday model). Modern concept of genes. Population genetics: Hardy-Weinberg law. Quantitative genetics and multifactorial interactions, causes of variation and artificial selection.

**Unit III**

**(15 Hours)**

**Replication:** Universal genetic code, \***Wobble hypothesis**, Degeneracy. Replication: Mechanism in Prokaryotes and eukaryotes, Theta and rolling circle model, Enzymology of replication. Replication of RNA genome-replicase and reverse transcriptase. Termination of replication-circular and linear replications.

**Unit IV**

**(15 Hours)**

**Transcription and Translation:** Prokaryotic and eukaryotic transcription. RNA processing and post-transcriptional modification. Regulatory sequences in protein coding genes. Transcription initiation by RNA polymerase I, II and III. Processing of eukaryotic pre mRNA, hnRNA proteins, RNA splicing, snRNA, spliceosome. RNA editing.

Translation-activation of aminoacids, initiation, elongation, termination in prokaryotes and eukaryotes. Translational proof-reading-Posttranslational processing of protein.

**Unit V**

**(15 Hours)**

**Regulation of transcription and translation:** Positive and negative control, Repressor and Inducer, concept of operon, lac-, ara-, trp operons. Catabolic repression, attenuation, anti- termination and methylation. Macromolecular transport across the nuclear envelope. Synthesis and targeting of peroxisomal proteins. Overview of secretory pathway. Translocation of secretory products across ER membrane.

\* **denotes Self study**

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

**Text Books**

1. P.S. Verma and V.K. Agarwal. (2014). Cell Biology, Genetics, Molecular biology, Evolution and Ecology. S. Chand and Company, New Delhi.
2. Lodish, D. *et al.*, (2007). Molecular Cell Biology. 6<sup>th</sup> edition, Scientific American Books, Inc.

**Reference Books**

1. De Robertis. (2001). Cell and Molecular Biology. 8<sup>th</sup> Edition, Dhanpat Rai Publisher.
2. Nalini Chandar, Susan Viselli. (2010). Lippincott Illustrated Reviews: Cell and Molecular Biology. LWW: North American Edition.
3. Robert Franklin Weaver. (2011). Molecular Biology. 5<sup>th</sup> edition, Mc-Graw Hill science.
4. Alberts *et al.*, (2014). Molecular Biology of the Cell. 6<sup>th</sup> edition, Garland Publishers.
5. Benjamin Lewin. (2007). Genes IX. 9<sup>th</sup> edition, Jones & Bartlett Learning.

## MAPPING

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	S	S	M	S
<b>CO2</b>	S	M	M	S	H
<b>CO3</b>	S	M	M	H	S
<b>CO4</b>	M	S	H	M	S

**S** – Strong**H** – High**M** – Medium**L** – Low



**PBC 28****20PBC208**

<b>Programme Code: 07</b>		<b>Programme Title: M.Sc Biochemistry</b>		
<b>Course Code: 20PBC208</b>		<b>Title: Core Paper 8 –Drug Biochemistry</b>		
Batch 2020-2021	Semester II	Hours / Week 5	Total Hours 75	Credits 4

**Course Objectives**

1. To learn the mechanism of drug action in various diseases
2. To learn about different drugs available for treatment
3. To learn about the designing mechanisms for drug development

**Course Outcomes (CO)**

K1- K4 CO1-CO4	The students will learn the concept of pharmacology, know the mechanism of action of drug inside the system, know about the drug discovery and drug design procedures and know about the treatment of various disorders using drug molecules
-------------------	--

**20PBC208****Syllabus****Unit I****(15 Hours)**

**Pharmacology:** Classification of drugs, sources and preparation; natural source, synthetic drugs, drug preparation: crude drug, pure drug compounds, pharmaceutical preparations. Routes of drug administration. Pharmacokinetics: Overview, drug absorption, drug distribution, drug biotransformation (role, formation and phases), drug excretion: quantitative pharmacokinetics, drug-plasma concentration curve, bioavailability, volume of distribution. Merits and demerits of liver ADME. Single dose pharmacokinetics, continuous and multiple dose kinetics, dosage calculations.

**Unit II****(15 Hours)**

**Pharmacodynamics:** Definition. Drug receptors: Types, classification, drug-receptor interaction (binding and affinity, signal transduction, efficacy, receptor regulation and drug tolerance). Dose-response relationships (gradal and quantal). Drug development and safety: Drug discovery and characterization, preclinical studies, clinical trials, drug

## PBC 29

20PBC208

Safety and efficacy laws, drug abuse prevention laws, Adverse effects of drugs, Factors affecting drug safety and efficacy. Antidepressant drugs: Overview and mechanism. Mechanism of action, therapeutic uses, kinetics and adverse effects of tricyclic antidepressants and monoamine oxidase inhibitors.

### Unit III

(15 Hours)

**Pharmacokinetics:** Mechanism of action, therapeutic uses, pharmacokinetics and adverse effects of Anti-inflammatory drugs -aspirin and colchicine, Anti-peptic ulcer drugs -H<sub>2</sub> receptor antagonists and inhibitors of H<sup>+</sup>K<sup>+</sup> ATP-ase pump. Antihypertensive drugs: Overview, mechanism of controlling blood pressure, treatment strategies. Action, therapeutic uses, kinetics, adverse effects of β-adreno receptor-blocking agents and ACE inhibitors.

### Unit IV

(15 Hours)

**Treatment of neurodegenerative diseases:** Overview, neurotransmission in CNS, synaptic potentials, overview and drugs used for Alzheimer disease and Parkinson disease. Mechanism of action, therapeutic uses, kinetics and adverse effects of Hypnotic drug (barbiturates). Anesthetics: patient factors in selection of anesthesia, induction, maintenance and recovery from anesthesia, features, potency, uptake, distribution, action and adverse effects of inhalation anesthetics. \***Intravenous and local anesthetics.**

### Unit V

(15 Hours)

**Anticancer drugs:** overview and principles of chemotherapy, treatment strategies, treatment regimens and scheduling, limitations of chemotherapy. Mechanism of action, therapeutic uses, pharmacokinetics and adverse effects of antimetabolites (Methotrexate and 5-fluorouracil), antibiotics (Dactinomycin and Bleomycin), alkylating agents (Cyclophosphamide), microtubule inhibitor (Vincristine and Vinblastine), steroid hormones (Estradiol and prednisolone) and their antagonist (Tamoxifen), monoclonal antibody (Rituximab) and interferons.

\* denotes Self study

### Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

### Text books:

1. Richard.D.Howland, Mary. J.Mycek. Lippincott William and Wilkins. (2006). Lippincott's illustrated reviews: pharmacology. 3<sup>rd</sup> edition, Wolters Kluwer health (India) Pvt. Ltd., New Delhi.
2. R.S.Satoskar, Nirmala N. Reje, S. D.Bhandarkar. (2011). Pharmacology and Pharmacotherapeutics. 22<sup>nd</sup> edition, Popular Prakashan Pvt. Ltd.

### Reference Books:

1. H L Sharma and K K Sharma. (2011). Principles of Pharmacology 2<sup>nd</sup>edn. Paras Medical Publisher, India.

**PBC 30**

**20PBC208**

2. George M. Brunner, Craig W. Stevans. (2011). Pharmacology. 3<sup>rd</sup> edition, Saunders, an imprint of Elsevier Inc.
3. James Ritter, Rod Flower, Graeme Henderson and Humphrey Rang (2011). Rang & Dale's Pharmacology. 7th Edition. Churchill Livingstone.

**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	M	S	M	S
<b>CO2</b>	S	M	S	H	L
<b>CO3</b>	H	S	M	S	M
<b>CO4</b>	S	H	M	M	H

4. **S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBC2CM		<b>Title:</b> Core Practical 2 –Lab in Plant Biochemistry, Genetics and Molecular Biology		
Batch	Semester	Hours / Week	Total Hours	Credits
2020-2021	II	5	75	4

### Course Objectives

1. To learn the techniques of plant tissue culture
2. To get an hands-on-training on molecular techniques
3. To implement the applications of plant tissue culture, microbes, genetics and molecular techniques in research and industries

### Course Outcomes (CO)

K1- K4 CO1-CO4	The students know about the principles of plant biochemistry, microbes, molecular biology and genetics techniques, gain the technical skills involved in plant tissue culture, counting cells, identification of gene and its expressions, develop and apply the modern technology of plant biochemistry, molecular biology and genetics in industries and research and examine the results obtained using plant biochemistry, sterilization techniques, molecular biology and genetics
-------------------	---

20PBC2CM

### Plant Biochemistry

1. Preparation of plant tissue culture media and sterilization\*
2. Initiation of callus culture\*
3. Estimation of chlorophyll
4. Estimation of flavonoids
5. Estimation of total phenols
6. Assessment of Superoxide Dismutase activity by NBT method.
7. Assessment of Catalase activity by Potassium dichromate.

8. Assessment of Glutathione peroxidase activity by DTNB method.

**PBC 32**

**20PBC2CM**

9. Assessment of Reduced Glutathione activity by DTNB method.

10. Assessment of Lipid peroxidation activity by TBA method

11. Isolation of Genomic DNA from onion and Agarose gel electrophoresis\*

12. Isolation of Plasmid DNA from bacteria\*

13. Extraction of total RNA \*

14. Estimation of DNA by Diphenylamine method

15. Estimation of RNA by Orcinol method

16. SDS-PAGE\*

17. Blotting techniques (any one)\*

18. Animal housekeeping, care, feed preparation and breeding of common laboratory animal-mice

19. Laboratory ethics (IAEC guidelines)

\*Denotes group experiments

**Teaching Methods**

Demonstration/Video lectures/Laboratory visits/Institutional visits

**PBC 33**

**20PBC2CM**

**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	H	M	M
<b>CO2</b>	H	S	M	H	M
<b>CO3</b>	M	H	H	S	S
<b>CO4</b>	H	M	M	S	H

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBC309		<b>Title:</b> Core Paper 9 – Immunology		
Batch 2020-2021	Semester III	Hours / Week 7	Total Hours 75	Credits 5

### Course Objectives

1. To learn about the various cells of immune system and their functions
2. To know about the specificity of antigen-antigen interaction and their possible mechanisms
3. To know the role of immunological cells in the treatment of different diseases

### Course Outcomes (CO)

K1- K4 CO1.CO4	The students can learn the types and functions of different immune cells, the mechanism of action of different immune cells and their resultant reaction responses, understand the underlying causes of inherited or autoimmune diseases and consequences and the new technologies involving immune cells in treating many diseases
-------------------	---

### Syllabus

#### Unit I

(15 Hours)

**Cells of the immune system:** Macrophages, B and T lymphocytes, Dendritic cells, Natural killer and Lymphokine activated killer cells, Eosinophils, Neutrophils and Mast cells. Organs of the immune system: Thymus, Bone marrow, Spleen, lymph nodes, MALT, GALT. Haemopoiesis and differentiation, lymphocyte trafficking. Antigen-biology, structure and functions of different classes of Immunoglobulin. Biology of Superantigens.

#### Unit II

(15 Hours)

**Antigen and antibody:** Antibody types and structural properties, characteristics of antigen. \***Antigen antibody reactions**, Applications of Immunological techniques, genetic control of immune response, effector mechanisms, MHC, antigen recognition and presentation, activation of B and T lymphocytes.

**Unit III****(15 Hours)**

**Humoral and cell mediated immunity:** Cell mediated Cytotoxicity: Mechanism of T cell and NK Cell mediated lysis, Antibody dependent cell mediated Cytotoxicity and macrophage mediated Cytotoxicity. Cytokines and their role in immune regulation, Biology of Complement system, Complement fixation test and assessment of immune complexes in tissues. Immune suppression and immune tolerance.

**Unit IV****(15 Hours)**

**Hyper sensitivity reactions:** Autoimmune disorders, Transplantation immunology-MLR, HLA Typing, Bone marrow transplantation, Organ transplants. Immunity to Infectious agents - Bacteria, Viruses, Malaria, and Helminthes. Tumor immunology, Tumor antigens, immune response to tumors, cancer immunotherapy, Vaccines. AIDS and other immunodeficiencies, Structure of HIV, envelope glycoproteins, destruction of T cells: immunologic symptoms of AIDS, AIDS vaccine.

**Unit V****(15 Hours)**

**Vaccine technology:** recombinant vaccines, Identification of B and T epitopes for vaccine development. *In situ* characterization of cells from tissues, Immunoscreening of Recombinant library, Hybridoma – Monoclonal Antibody production and applications; MAbs in diagnosis and therapy.

\* denotes Self study

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

**Text Books**

1. J.Kuby. (2018). Immunology. 10<sup>th</sup> edition, W.H. Freeman and Company, Newyork.
2. C.V.Rao. (2002). An Introduction to Immunology. Narosa Publishing House, Chennai.

**Reference Books**

1. Ivan M. Roitt and Peter J. Delves (2001) Essential Immunology, Blackwell Science Ltd. Oxford.
2. Stefan E. Kaufmann, Alan Sher and Rafi Ahmed (2002) Immunology of Infectious diseases , ASM Press, USA.



## MAPPING

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	S	S	M	H
<b>CO2</b>	M	H	H	S	M
<b>CO3</b>	S	M	S	H	H
<b>CO4</b>	S	H	S	M	H

**S** – Strong**H** – High**M** – Medium**L** – Low

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBC310		<b>Title:</b> Core Paper10-Biostatistics and Research Methodology		
Batch	Semester	Hours / Week	Total Hours	Credits
2020-2021	III	6	75	5

### Course Objectives

1. To learn the different methods of collecting data and processing
2. To know about the different statistical methods to interpret the collected statistical data
3. To know the concept of article writing, report writing and thesis making so on

### Course Outcomes (CO)

K1- K4 CO1-CO4	The students get an idea on choosing the appropriate method of collecting data, select the statistical method and process the collected data ,can device and standardize the statistical methods, well versed preparing a report, publishing an article and writing a project thesis
-------------------	--

### Syllabus

#### Unit I

(15 Hours)

**Research:** Definition, Introduction, objectives, motivation, types, approaches, significance. Research Methods versus Methodology. **Research process:** formulating the research problem, extensive literature survey, developing the hypothesis, preparing the research design, determining sample design, collecting the data, execution of the project, analysis of data, hypothesis testing, generalizations and interpretation, and preparation of the report or presentation of the results. Criteria of a good research. Problems encountered by researchers in India.

#### Unit II

(15 Hours)

**Research problem:** Selection, necessity and techniques (statement of the problem in a general way, understanding the nature of the problem, surveying the available literature, developing the ideas through discussions and rephrasing the research problem into a working proposition).

**Research design:** Introduction, necessity, features, concepts relating to research design, types of research design, basic principles of experimental design (Principle of Replication, Principle of Randomization and Principle of Local Control).

**Unit III****(15 Hours)**

**Methods of Data Collection: Collection of Primary Data:** Observation Method, Interview Method, questionnaire method (merits, demerits and main aspects), schedules, difference between questionnaire and schedules. Other methods of primary data collection (Warranty cards, Distributor or store audits, Pantry audits, Consumer panels, Use of mechanical devices, Projective techniques). **Collection of Secondary Data:** characteristics, Selection of appropriate method, Case Study method.

**Unit IV****(15 Hours)**

Classification and tabulation of data\*. Diagrammatic & graphic presentation of data. Problems involving arithmetic mean, median, mode, quartiles, deciles and percentiles. Standard deviation, Mean deviation and quartile deviation. **ANOVA:** Principle, technique, setting ANOVA table, short cut method, coding method (necessary illustrations) for one way ANOVA. Two way ANOVA: Principle, technique, setting ANOVA table (necessary illustrations). ANOVA in Latin-Square design (necessary illustrations). Student 't' test and chi square ( $\chi^2$ ) test.

**Unit V****(15 Hours)**

**Interpretation and Report Writing:** Introduction, Techniques and precautions in interpretation, Report writing – significance, different steps, layout, types (technical and popular), mechanics (with examples) and precautions. Publication in a scientific journal. Project proposal writing to funding agencies, Career opportunities in research.

\* denotes Self study

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom

**Text Books**

1. C.R.Kothari. Research Methodology: Methods and Techniques (2004). New Age International (P) limited. Publishers.
2. N.Gurumani (2015). Introduction to Biostatistics. MJP Publishers.
3. S.P.Gupta. (2009). Statistical Methods, 28<sup>th</sup> edition, Sultan Chand & Sons

**Reference Books**

1. Sundar Rao, Jesudian Richard. (2009). An Introduction to Bio-Statistics. 4<sup>th</sup> edition, Prentice-Hall of India Pvt.Ltd.
2. Naren Kr. Dutta (2002). Fundamentals Of Biostatistics: Practical Approach. Kanishka Publisher.
3. S.P.Gupta. (2016). Fundamentals of Statistics. 6<sup>th</sup> edition, Sultan Chand.

## MAPPING

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	S	S	M	H
<b>CO2</b>	M	H	H	S	M
<b>CO3</b>	S	M	S	H	H
<b>CO4</b>	S	H	S	M	H

**S** – Strong**H** – High**M** – Medium**L** – Low

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBC311		<b>Title:</b> Core Paper 11 – Clinical Biochemistry		
Batch 2020-2021	Semester III	Hours / Week 7	Total Hours	Credits 4

### Course Objectives

1. To learn the methodologies for the detection of abnormalities in blood
2. To learn the process of different sample collection and processing
3. To know about the markers in the various metabolic disorders like cancer
- 4.

### Course Outcomes (CO)

K1 -K4 CO1-CO4	The students will be knowing the important laboratory biochemical tests, introduced to methods of specimen collection and processing and analyzing the results, learn the role of enzymes in clinical diagnosis of diseases and know the diagnostic procedures for tumor development
-------------------	--

20PBC311

### Syllabus

#### Unit I

(15 Hours)

**Specimen collection and processing:** Collection of blood vein puncture, skin puncture, arterial puncture. **Collection of urine:** Timed urine specimens, urine preservatives. Microscopic examination of urine, normal and abnormal constitute of urine. Body fluids-CSF, gastric juice, ascitic fluid, synovial fluid and amniotic fluid: Composition, collection and analysis. Quality control – Computerization, data management, standard error and accuracy of the result.

#### Unit II

(15 Hours)

**Serology and hematology:** Introduction. Anti serum, anti sera raising, chick and snake venom antibody. Principle of agglutination and precipitation. C-reactive protein and pregnancy test, Rheumatoid arthritis (RA) test. ESR, Coagulation test, prothrombin test. WIDAL test, ELISA, chemiluminescence, CMIA, ECLIA, flow cytometry. **Hemoglobin:** Normal and abnormal Hb, Separation of hemoglobin by electrophoresis. Hemoglobinopathies and its types. Glycated Hb. Erythrocyte metabolic pathways, Disorder of erythrocyte metabolic pathways, Porphyrins and porphyrias.

#### Unit III

(15 Hours)

## PBC 41

### 20PBC311

**Clinical enzymology and endocrinology:** Factors affecting enzyme levels in blood. Principle, assay and clinical significance of liver markers: AST, ALT, gamma-glutamyl transferase, amylase and lipase. Cardiac markers: creatine kinase, CKMB, lactate dehydrogenase, troponin (I and T). Kidney markers – carbonic anhydrase, urea, creatinine and uric acid. Bone markers: ALP. Prostate marker: ACP. Clinical significance of steroid, protein and thyroid hormones.

#### Unit IV

(15 Hours)

**Organ function test and related disorders:** Jaundice, cirrhosis, hepatitis (HBV virus), fatty liver and gall stones. **Renal function test and related disorder:** Acute renal failure, glomerular disease, tubular diseases, analysis of urinary calculi. Gastric and pancreatic function test. Estimation of GFR and cystatin C in serum. Hyper and hypo lipoproteinemias and diagnostic test for lipoprotein disorders.

#### Unit V

(15 Hours)

**Free radicals in diseases:** Introduction, \***Types of free radicals.** Free radical induced lipid peroxidation and antioxidants (Enzymic: SOD, Catalase, Glutathione Peroxidase, Glutathione Reductase; Non Enzymic: Vitamin A, Ascorbic acid, Tocopherol, Reduced Glutathione).

\* **denotes Self study**

#### Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

#### Text Books

1. Ambika Shanmugam (2008), Fundamentals of Biochemistry for Medical Students, 7<sup>th</sup> edition
2. Stevans, C.D. (2016). Clinical Immunology and Serology: A Laboratory Perspective. 4<sup>th</sup> edition. F.A. Davis Company

#### Reference Books

1. Carl A. Burtis, Edward R. Ashwood, Norbert W. Tietz. (2012). Tietz Textbook of Clinical Chemistry and molecular diagnostics. 5th ed, Saunders college publishing, Harcourt Brace College Publishers, Philadelphia, Newyork, Tokyo.
2. Vasudevan D.M, Sreekumari S and Kannan Vaidyanathan, (2011), Text Book of Biochemistry for Medical Students,6th ed., Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi, 110002.
3. Thomas M. Devlin (2010) Textbook of Biochemistry with Clinical Correlations, 7th Edition, John Wiley & Sons, Inc, US.
4. Larry Jameson *et al.*, (2015). Harrison's Principles of internal medicine Vol. I and II. 14th edition, McGraw Hill Publishers

## MAPPING

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	S	S	M	H
<b>CO2</b>	M	H	H	S	M
<b>CO3</b>	S	M	S	H	H
<b>CO4</b>	S	H	S	M	H

**S** – Strong**H** – High**M** – Medium**L** – Low

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBC3CN		<b>Title:</b> Core Practical 3 – Lab in Immunology, Molecular techniques and Clinical Biochemistry		
Batch 2020-2021	Semester III	Hours / Week 5	Total Hours 75	Credits 4

### Course Objectives

1. To enhance the students to have practical experience on techniques in immunological tests
2. To learn the methods of estimation of clinical parameters
3. To have hands on experience in genetic engineering

### Course Outcomes (CO)

K1-K4 CO1-CO4	The students recall the basic principles involved in immunology, clinical biochemistry and genetic engineering, demonstrate the techniques involved in immunology, clinical biochemistry and genetic engineering, develop and apply the recent technology involved in diagnostic techniques of immunology, clinical biochemistry and genetic engineering and examine and analyze the results involved in immune techniques, clinical biochemistry and genetic engineering.
------------------	--

20PBC3CN

### Immunology

1. ELISA method
2. WIDAL test
3. Single radial immunodiffusion
4. Double immunodiffusion
5. Ouchterlory double diffusion
6. Immuno-electrophoresis
7. Rocket immuno-electrophoresis
8. Restriction digestion and ligation\*
9. cDNA synthesis\*
10. Bacterial transformation\*



**Estimation of the following parameters in urine**

11. Urea
12. Uric acid
13. Creatinine
14. Glucose by Benedicts method
15. Bilirubin
16. Sodium

**Estimation of the following parameters in blood**

17. Cell counting
18. Hemoglobin
19. Albumin protein ratio
20. Total cholesterol
21. Glucose by GOD/POD method
22. ALP – Fiske Subbarow method

\*Denotes group experiments

**Teaching Methods**

Demonstration/Video lectures/Laboratory visits/Institutional visits
---

**PBC 45**

**20PBC3CN**

**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	M	S	M	S
<b>CO2</b>	H	S	S	S	M
<b>CO3</b>	M	M	H	M	S
<b>CO4</b>	S	H	M	H	M

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBCX1		<b>Title:</b> EDC - Nutritional Biochemistry		
Batch 2020-2021	Semester 3	Hours / Week 2	Total Hours 30	Credits 2

### Course Objectives

1. To impart the knowledge on historical overview of nutrition, essential nutrients for metabolism
2. To provide an overview of the major macro and micronutrients relevant to human health
3. To discuss the scientific rationale for defining nutritional requirements in healthy individuals and populations, with reference to specific conditions such as pregnancy, lactation, and older age

### Course Outcomes (CO)

K1- K3 CO1-CO3	Assess the nutritional status of community in order to determine the type magnitude and distribution of malnutrition nomenclatures, characteristics and mechanisms. Describe the biochemical and physiological functions of the nutrients and their integrated role. Evaluate the therapeutic role of key nutrients in maintaining health.
-------------------	---

#### Unit I

(6 Hours)

**Introduction:** Nutrition – concepts - role of nutrition in maintaining health, basic food groups - energy yielding, body building and protective foods. Basic concepts of energy expenditure, unit of energy – Kcal - energy requirements of different categories of people - RQ of foods - Body Mass Index (BMI) - Basal Metabolic Rate (BMR) – determination and factors influencing

#### Unit II

(6 Hours)

**Nutritional significance of dietary components:** Physiological role and nutritional significance of carbohydrates, lipids, proteins, vitamins (water soluble and fat soluble) minerals and fiber, Dietary sources, Functions, Digestion, absorption and storage, metabolism of carbohydrates – lipids – proteins.

#### Unit III

(6 Hours)

**Nutritive value of proteins:** Essential amino acids, Biological values of Proteins (animal and plant proteins). Evaluation of proteins by nitrogen balance method-DC, BV, NPU and NAP of animal and plant proteins, single cell proteins, factors influencing protein requirements, Effect of excess protein intake

#### Unit IV

(6 Hours)

**Protein calorie malnutrition:** Protein malnutrition (Kwashiorkor) and under nutrition (marasmus) their preventive and curative measures – composition of balanced diet and RDA for infants, children, adolescent, adult male and female, pregnant, lactating women and geriatrics

**Unit V****(6 Hours)**

**Nutrition and body defenses:** Effect of drugs on food and nutrients, drug - nutrient interaction - nutritional therapy food preparation and management. Junk foods and processed foods and its effects, obesity. Role of diet and nutrition in the prevention and treatment of diseases – Diabetes mellitus, hypertension, infections, CVD, liver and kidney disorders.

**Teaching Methods**

PowerPoint presentation/Seminar/Quiz/Discussion/Assignment, Model preparation
---

**Text Books**

1. Srilakshmi, B. (2013) Nutrition Science Revised Fourth Edition, New Age International Publishers, New Delhi.
2. Paul, S. (2005) A Textbook of Bio-nutrition – Curing Diseases through Diet, First Edition, CBS Publishers and Distributors, New Delhi.
3. Swaminathan, M.(2004) Advanced Textbook of Food and Nutrition, Volume II, Second Edition, The Bangalore Printing and Publishing Co. Limited, India.

**Reference Books:**

1. Geissler, C. and Powers, H.(2010)Human Nutrition, Twelfth Edition, Churchill Livingstone, USA.
2. Brody, T. (2006) Nutritional Biochemistry, Second Edition, Academic Press, USA.
3. Eastwood, M. (2003) Principles of Human Nutrition, Second Edition, Wiley - Blackwell Science Ltd Publishers, USA

## MAPPING

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	S	H	S	M
<b>CO2</b>	H	S	H	M	M
<b>CO3</b>	M	H	H	H	H
<b>CO4</b>	M	S	M	S	M

**S** – Strong**H** – High**M** – Medium**L** – Low

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBC412		<b>Title:</b> Core Paper 12 – Hormonal Biochemistry		
Batch 2020-2021	Semester I	Hours / Week 5	Total Hours 75	Credits 4

### Course Objectives

1. To learn about the system of hormonal functioning in biological systems
2. To know the regulation and action of different hormones at different conditions
3. To get an in depth knowledge on diabetes mellitus

### Course Outcomes (CO)

K1- K4 CO1-CO4	The students know about the diverse group of hormones and their specific mechanism of action in the bodily metabolism, learn the regulatory functions of various hormones and their interrelationship in the endocrine disorders, acquire the pathophysiology, diagnosis, treatment and management of endocrine disorders, and made equipped with the hormonal concepts and disease predictions.
-------------------	--

20PBC413

### Syllabus

#### Unit I

(15 Hours)

**Principles of endocrinology:** Scope of Endocrinology, Nature of Hormones and its types, Receptor Families, Synthesis and Processing, Hormone Secretion, Transport, and Degradation. Hormone Action through Receptors – Membrane, Nuclear and Cytosolic Receptors. Functions of Hormones – Growth, Maintenance of Homeostasis and Reproduction. Hormonal Feedback Regulatory Systems - Paracrine and autocrine control, Hormonal Rhythms.

#### Unit II

(15 Hours)

**Hypothalamus and pituitary hormones:** Hypothalamic and pituitary axis hormones- Chemistry & biochemical functions; Hypothalamic releasing factors. Pituitary gland: hormones of the pituitary gland- Chemistry & biochemical functions - neurovascular hypothesis; pineal gland- hormones of the pineal gland- Chemistry & biochemical functions.

**Unit III****(15 Hours)**

**Pancreatic hormones:** Chemistry and biochemical functions. Parathyroid hormone: Calcitonin and its functions. Pancreatic hormone: Insulin, glucagon, somatostatin, pancreatic polypeptide-chemistry and biochemical functions.

**Unit IV****(15 Hours)**

**Adrenal gland:** Hormones of adrenal gland-chemistry and biochemical functions; FSH, TSH, Gastrointestinal hormones-cholecystokinin, Substance P, summary of the neuroendocrine control of GI; Neurohormones- the brain-renin-angiotensin and urotensin.

**Unit V****(15 Hours)**

**Reproductive endocrinology:** Male reproductive system: androgens: Source, synthesis, chemistry, metabolism, Physiological roles, mechanism of action and pathophysiology. Female reproductive system: Synthesis, physiological role and mechanism of action of ovarian steroid hormones. Neuroendocrine control of ovarian function, Pathophysiology. Endocrinology of pregnancy, parturition and lactation, Hormonal contraception, menopause and pathophysiology.

\* denotes Self study

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

**Text Books**

1. Mac E. Hadley (2009). Endocrinology. 4<sup>th</sup> edition. Prentice Hall International Inc
2. Harrison's Endocrinology, (2017). 4<sup>nd</sup> edition, Edited by J. Larry Jameson, The McGraw Hill Companies, Inc. USA.

**Reference Books**

1. A. Longstaff. (2002). Instant notes: Neuroscience. 1<sup>st</sup> Indian edition, BIOS Scientific Publishers Ltd, UK John E. Hall, Mario Vaz, Anura Kurpad, Tony Raj. (2016).
2. Guyton & Hall (2016). Textbook of Medical Physiology. 2<sup>nd</sup> South Asian edition, Elsevier publications.
3. Shlomo Melmed *et al.*, (2011). William's Textbook of endocrinology. 12<sup>th</sup> edition, Philadelphia: Elsevier/Saunders.

## MAPPING

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	S	S	M	H
<b>CO2</b>	M	H	H	S	M
<b>CO3</b>	S	M	S	H	H
<b>CO4</b>	S	H	S	M	H

**S** – Strong**H** – High**M** – Medium**L** – Low



<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBC413		<b>Title:</b> Core Paper 13 –Genetic Engineering		
Batch	Semester	Hours / Week	Total Hours	Credits
2020-2021	III	5	75	5

### Course Objectives

1. To learn the cloning strategies and genetic manipulation with devised technologies
2. To enable the students to learn the principle and application of genetic engineering
3. To implement and transmission of a genetic material at molecular and cellular levels.

### Course Outcomes (CO)

K1- K4 CO1-CO4	The students enshrine the principles of genetic engineering and the vectors used in cloning and expression, grasp the different cloning strategies and their expression, know about the implementation of genetic engineering for different purposes and investigate the different strategies of rDNA technology and resolve the problems encountered
-------------------	---

20PBC413

### Syllabus

#### Unit I

(15 Hours)

**Genetic engineering:** Introduction and its applications. Properties and applications of Restriction enzymes (Type I, Type II, Type III, Type IV and Type V), DNases, Polymerases, Modifying enzymes and Ligases. Linkers, Adaptors and Homopolymer tailing. Benefits of gene cloning. Isolation of nucleic acids, characterization and purification of plasmid, bacteriophage genomic DNA for cloning purpose

#### Unit II

(15 Hours)

**Cloning vectors:** Plasmids (pBR322 and pUC18), Phages (λ phage and M13 vectors), Phagemids (pBluescript, pGEM), Cosmids (pJB8) and Artificial Chromosomes (BAC and YAC). Plant and Animal viruses as vector, binary and shuttle vectors, expression vectors for prokaryotes and eukaryotes, expression cassettes.

**Unit III****(15 Hours)**

**cDNA libraries:** Construction of genomic and cDNA libraries, selection and screening of recombinants, probes types, synthesis and uses of probes. Blotting techniques (Southern, Northern and Western), PCR types and applications. Chromosome walking, jumping, DNA finger printing and foot printing. Screening with antibodies, rescreening and sub cloning

**Unit IV****(15 Hours)**

**Gene transfer methods in animal cells:** Microinjection, electroporation, particle bombardment gun, ultrasonication, liposome mediated and direct transfer. Restriction analysis of DNA, molecular markers: \***RFLP**, RAPD, VNTR, SSR, AFLP, STS, SCAR, SNP. Microarrays. Human genomic project and applications.

**Unit V****(15 Hours)**

**Application:** Transgenic animals as models in the prevention of human diseases like muscular dystrophy and anticancer therapy. Production of recombinant insulin, vaccines and growth hormone. Gene therapy: Stem cell gene therapy, Somatic cell gene therapy, Antisense RNA therapy, gene therapy for inherited diseases.

\* **denotes Self study**

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

**Text Books**

1. Twyman, B. Old and S. B. Primrose (2001). Principles of Gene Manipulation: An Introduction to Genetic Engineering, 6th ed., John Wiley and sons Publishers, UK.
2. Primrose *et al.*, (2001). Principles of gene manipulation. 6th edition, Blackwell Scientific Publishers.

**Reference Books**

1. T.A. Brown (2015), Gene Cloning and DNA analysis, 7th ed., Blackwell publishing Ltd, UK.
2. Bernard R. Glick, Jack J. Pasternak, Cheryl L. Patten (2010). Molecular Biotechnology: Principles and Applications of Recombinant DNA, 4th ed., ASM Press, USA
3. Winnacker, E.L. (2003). From Genes to Clones. Panima Publishing Corporation, New Delhi.
4. Old et al. (2001). Principles of Gene Manipulation, 6th Edition. Blackwell Science, London.

## MAPPING

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	S	H	S	M
<b>CO2</b>	H	S	H	M	M
<b>CO3</b>	M	H	H	H	H
<b>CO4</b>	M	S	M	S	M

**S** – Strong**H** – High**M** – Medium**L** – Low

## PBC 55

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> NA		<b>Title:</b> Major Elective: Nanobiotechnology		
Batch 2020-2021	Semester NA	Hours / Week 5	Total Hours 75	Credits 5

### Course Objectives

1. To get an idea about the application of nanotechnology in biological research
2. To learn the properties and functions of nanomaterials in biological systems
3. To learn the applications of nanomaterials in drug delivery and treatment

### Course Outcomes (CO)

K1- K4 CO1-CO4	The students will get an insight about the nanotechnology concepts the methods of nanoparticle synthesis ,learn the properties of nanoparticles and know the application of nanotechnology in biological research
-------------------	---

### Syllabus

#### Unit I

(15 Hours)

**Introduction to Nanotechnology:** Introduction to nano particles. Nanoscience and its importance. Definition: Nanotechnology - Nanobiotechnology - Nanomaterial - Nanocomposites - Classification of nanostructures – Top down and Bottom Up approach - Quantum dots - Bio-inspired nanomaterials.

#### Unit II

(15 Hours)

**Herbonanotechnology:** Physical synthesis - Ball Milling - Thermal evaporation - Chemical synthesis - Solgel Process - Hydro thermal Synthesis - Biological Synthesis – Plant, Microbial compound based synthesis

#### Unit III

(15 Hours)

**Properties of Nanomaterials:** Physical properties - Optical, Magnetic, Surface Plasmon resonance - Electrochemical Properties of Nanoscale Materials, Intramolecular bonding, Inter-molecular bonding, \***Nanocatalysis**, Self-assembly – DNA, Protein.

**Unit IV**

**(15 Hours)**

**Characterization methods:** UV - Visible Spectrophotometer, X-ray diffraction (XRD), Scanning Electron Microscope (SEM) Transmission, Electron Microscope (TEM), Fourier Transform InfraRed Spectrometer (FTIR), EDAX, Dynamic Light Scattering (DLS).

**Unit V**

**(15 Hours)**

**Applications of Nanoparticles:** Nanoparticles in waste water treatment, cancer therapy, Biosensors - DNA Microarrays - Cell Biochips - Nanoparticles for Bioimaging – Textile and pharma industries. Application in environment, agriculture and pesticide diagnosis. Nanorobotics. Military applications of Nanotechnology - Nanomaterials for food Applications. Diagnosis and nanoToxicity of Nanoparticles - Future Perspectives.

\* denotes Self study

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

**Text Books**

1. T.Pradeep. (2008). Nano: The Essentials: Understanding Nanoscience and Nanotechnology. Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. Robert W. Kelsall, Ian W. Hamley and Mark Geoghegan. (2005). Nanoscale Science and Technology. John Wiley & Sons, Ltd., UK.

**Reference Books**

1. Guozhong Gao. (2004). Nanostructures & Nanomaterials: Synthesis, Properties & Applications, Imperial College Press.
2. Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, Burkhard Raguse. (2005). Nanotechnology: Basic Science and Emerging Technologies. Overseas Press.
3. Vladimir P Torchilin. (2006). Nanoparticles as Drug carriers. Imperial College Press, USA.
4. M.Niemeyer, Chad A.Mirkin. (2004). Nanobiotechnology: Concepts, Applications and Perspectives. Wiley-VCH, Weinheim.

**PBC 57**

**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	L	M	M	M
<b>CO2</b>	S	M	H	S	H
<b>CO3</b>	H	S	M	M	S
<b>CO4</b>	S	M	S	S	M

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

## PBC 58

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> NA		<b>Title:</b> Major Elective – Microbiology		
Batch	Semester	Hours / Week	Total Hours	Credits
2020-2021	NA	5	75	5

### Course Objectives

1. To learn about the microbiological techniques for microbial studies
2. To learn the energy process taking place in microbes
3. To learn about the food poisoning and pathogenicity of microbes

### Course Outcomes (CO)

K1- K4 CO1-CO4	The students commemorate the general bacteriology and microbial techniques. Understand the basic microbial structure and function, implement the handling techniques and staining procedures in laboratory, and resolve the microbial techniques and its applications
-------------------	---

## Syllabus

### Unit I

(15 Hours)

**Morphology and Ultrastructure:** History of microbiology. Classification of microbes. Ultra structure and characteristics of fungi, algae and protozoa. Bacterial morphology and fine structure; cell wall, cell membrane, intra cytoplasmic structures and external structures-bacterial growth curve, synchronous growth, continuous culture. Factors affecting bacterial growth. Staining techniques-simple Differential Special staining techniques and negative staining.

### Unit II

(15 Hours)

**Microbiological techniques:** Culture techniques: Isolation of microbes from various sources, serial dilution techniques, pure culture techniques, Anaerobic culture methods-chemical and physical methods. Culture preservation techniques. Nutritional requirements: different kinds of media, composition of media-carbon sources, nitrogen sources, vitamin and growth factors, mineral, inducers, precursors and inhibitors. Sterilization methods. Anaerobic fermentation-Alcoholic fermentation, propionic acid fermentation, formic acid fermentation.

**Unit III**

**(15 Hours)**

**Food Microbiology:** Food poisoning – Food borne diseases- Bacterial and Non-Bacterial. Microbial quality and safety – Determining microorganisms in food culture, Microscopy and sampling methods-Chemical and immunological methods. Principles of food preservations: Asepsis, Preservation by use of High temperature, Low temperature, Canning, Drying, Radiation and Food additives.

**Unit IV**

**(15 Hours)**

**Medical Microbiology:** Infectious Diseases process-Diagnosis-Process of sample collection, transport and examinations of the specimens. Antibigram. Bacteriology: Morphology, cultural characteristics, pathogenicity and laboratory diagnosis of Gram positive organisms-*Staphylococcus aureus*, Mycoplasma; Gram negative organisms: *E.coli*.

**Unit V**

**(15 Hours)**

**Pathogenicity and Laboratory Diagnosis: \*Virology-Basic concepts of virology.** General properties of Human viruses, Approaches to viral diagnosis-Serological and Molecular techniques of viral infections-Hepatitis. Mycology: General properties and approaches to laboratory diagnosis. Mycosis-Superficial, Subcutaneous and Systemic infections-*Candida albicans*. Parasitology: Pathogenicity and laboratory diagnosis of *Plasmodium vivax*.

**\* denotes Self study**

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

**Text Books**

1. Prescott. (2003). Microbiology. 3<sup>rd</sup> edition, Magraw hill, Boston
2. Pelczar M.J., Ried, RD and Chan, ECS. (2000). Microbiology. 5<sup>th</sup> edition, Mc Graw Hill

**Reference Books**

1. Ananthanarayanan and Jayaram Paniker. (2005). Text Book of Microbiology. 6<sup>th</sup> edition Orient Longman, Hyderabad.
2. Standby and Wittaker. (2008). Principles of Fermentation Technology. 2<sup>nd</sup> edition.
3. Davis *et al.*, (2001). Microbiology. 4<sup>th</sup> edition, Lippincott Williams and Wilkins.



**PBC 60**  
**MAPPING**

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	M	S	S	H
<b>CO2</b>	S	H	S	H	H
<b>CO3</b>	M	S	M	H	S
<b>CO4</b>	H	M	H	S	M

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

## PBC 61

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> NA		<b>Title:</b> Major Elective: Bioinformatics		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	NA	5	75	5

### Course Objectives

1. To learn the role of computer programmes in studying the biological processes
2. To know about the different software's for data analysis
3. To learn about the methods of data retrieval from various databases

### Course Outcomes (CO)

K1- K4 CO1-CO4	The students will learn about the basics and beginning developments in computer usage, know the basics of bioinformatics, learn the different bioinformatics softwares, and learn the application of bioinformatics in biological science research
-------------------	--

### Syllabus

#### Unit I

(15 Hours)

**Bioinformatics:** Introduction, fields related to bioinformatics, objectives, scope, genome mapping as a source of bioinformatics. Applications of bioinformatics in various fields\*. Chronological history of events in bioinformatics. Role of computers in bioinformatics. Major categories of bioinformatics tools. Applications of programmes in bioinformatics.

#### Unit II

(15 Hours)

**Biological databases:** database, database management system and its advantages. Biological databases and information resources. Classification of biological databases: general databases, protein families & sequence motif database, signal sequence databases, protein –protein interaction databases, pathways databases, structural databases, SNPs database, histology database, standards, PUBMED, ENTREZ. Searching and retrieving data from databases- FASTA and BLAST. Linking databases with sequence retrieval systems (SRS). Advantages of SRS. OMIM, ExPASy, EMBL-Bank, ENSEMBL and its advantages.

## PBC 62

### Unit III

(15 Hours)

**Genomics:** gene, genome, genomics: genome mapping & genome projects, methods of gene sequence analysis: Genbank, Genbank assembly, genome annotation, genome similarity. Types of genomics: comparative, structural and functional genomics. Gene functions: analysis of gene expression, DNA microarray or DNA chip, serial analysis of gene expression.

### Unit IV

(15 Hours)

**Proteomics:** Introduction, methods of studying proteins: determining the post translationally modified proteins, determining the existence of proteins in complex mixtures, establishing protein-protein interactions. Protein structure classification: CATH, SCOP, DALI, FSSP, SSAP, protein structure bioinformatics resource. Protein structure prediction: ROSETTA, protein folding, protein folding disorders. Protein function prediction: automated protein function prediction, diversity in protein function.

### Unit V

(15 Hours)

**Human Genome Project:** Milestones, types of sequences in Human Genome Project, impact, potential benefits, ethical, legal and social issues. **Gene therapy:** Principles, current status of gene therapy research. Factors affecting gene therapy. Recent developments in gene therapy. **Drug designing:** Objectives, rational drug design, computer assisted drug design, drug development. **Pharmacogenomics:** prospects, uses, barriers to progress.

\* denotes Self study

### Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

### Text Books

1. Prakash S.Lohar (2009). Bioinformatics. MJP Publishers.
2. Jean-Michel Claverie and Cedric Notredame. (2012) Bioinformatics-A beginner's guide. 1<sup>st</sup> edition, Wiley- Dream Tech India Pvt. Ltd.

### Reference Books

1. David. W. Mount. (2001). Bioinformatics. CBS publishers and distributors.
2. D.R. Westhead, J. H. Parish and R. M. Twyman. (2002). Instant notes in bioinformatics. Oxford, UK.

**PBC 63**

**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	H	S	M	S
<b>CO2</b>	S	M	S	M	S
<b>CO3</b>	S	H	M	S	H
<b>CO4</b>	H	M	H	M	M

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> NA		<b>Title:</b> Major Elective - Bioethics, Biosafety and IPR		
Batch	Semester	Hours / Week	Total Hours	Credits
2020-2021	NA	5	75	5

### Course Objectives

1. To learn about the demerits of biotechnological applications in recent research
2. To know the ethical issues to be concerned in the course of biological research
3. To know about the intellectual property rights of individual researchers

### Course Outcomes (CO)

K1- K4 CO1-CO4	The students can know about the ethical issues of scientific research Learn the various regulations in biosafety and bioethics, make aware the intellectual property rights and move into secured and ethical way of research
-------------------	--

20PBC2E2

### Syllabus

#### Unit I

(15 Hours)

**Ethics/bioethics:** Introduction, framework for ethical decision making; biotechnology and ethics-benefits and risks of genetic engineering-ethical aspects of genetic testing-ethical aspects relating to use of genetic information-genetic engineering and biowarfare.

#### Unit II

(15 Hours)

**Ethical implications of cloning:** Reproductive cloning, therapeutic cloning; Ethical, legal and socioeconomic aspects of gene therapy, germ line, somatic, embryonic and adult stem cell research-GM crops and GMO's – biotechnology and biopiracy – ELSI of human genome project.

#### Unit III

(15 Hours)

**Biosafety:** Introduction, biosafety issues in biotechnology – risk assessment and risk Management – safety protocols: risk groups – biosafety levels – biosafety guidelines and regulations (National and International) – operation of biosafety guidelines and regulations – types of biosafety containment.

**PBC 65****Unit IV****(15 Hours)**

**Introduction to intellectual property and intellectual property rights:** types: patents, copy rights, Trade marks, design rights, geographical indications – importance of IPR - world intellectual Property rights organization (WIPO).

**Unit V****(15 Hours)**

**What can and what cannot be patented?:** Patenting life – legal protection of biotechnological Inventions – Patenting in India: **\*Indian patent act.**

**\* denotes Self study**

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

**Text Book**

1. Jose Cibelli, Robert P. lanza, Keith H. S. (2002). Principles of cloning,. Campbell, Michael D.West, Academic Press.
2. Sasson A. (2000). Biotechnologies in developing countries present and future, UNESCO Publishers

**Reference Books**

1. Singh, K. (2000). Intellectual Property Rights on Biotechnology. BCII, New Delhi. BAREACT, Indian Patent Act 1970 Acts & Rules, Universal Law Publishing Co. Pvt. Ltd.,
2. Kankanala C., (2007) Genetic Patent Law & Strategy, 1st Edition, Manupatra Information Solution Pvt. Ltd.,
3. Gurumani, N. Research Methodology (2006). For Biological Sciences . MJP Publishers, Chennai

**PBC 66**  
**MAPPING**

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	M	M	M	S
<b>CO2</b>	S	S	H	M	H
<b>CO3</b>	H	M	S	H	M
<b>CO4</b>	S	M	S	H	S

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

## PBC 67

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> NA		<b>Title:</b> Non Major Elective – Environmental Management		
Batch	Semester	Hours / Week	Total Hours	Credits
2020-2021	NA	5	75	5

### Course Objectives

1. To learn the various issues pertaining to the environment
2. To combat the environmental issues with efficient strategies
3. To assess the various existing environmental risk issues

### Course Outcomes (CO)

K1- K4 CO1-CO4	The students will learn about the subject of environmental management Learn the issues concerned with environmental management, analyse the various issues of importance, and can take a right decision on combating upcoming environmental issues
-------------------	---

### Syllabus

#### Unit I

(15 Hours)

**Concept and scope of Environmental Management:** Environmental Management of Resources - Water, forest, biological, mineral and agricultural; Environmental management of chemical, mining and manufacturing industries –petroleum, coal, cement, paper, fertilizer. Analysis and prediction of Environmental issues: Environmental Planning, Establishment of Health and Environmental standards, measuring Sustainable Development, Life Cycle Assessment, Material Flow Analysis, Environmental Auditing and Environmental Management Systems and Accounting for Eco-efficiency.

#### Unit II

(15 Hours)

**Principles of Risk Assessment:** Human Health Risk Assessments, Ecological Risk Assessment, Probabilistic Risk Assessments, Determination of acceptable risk based limits for Environmental chemicals and development of risk based remediation goals.

#### Unit III

(15 Hours)

**The role of Risk Assessment in Environmental Management decisions:** Evaluation of Human Health Risks Associated with airborne exposures to asbestos, a diagnostic



## PBC 68

human health risk assessment for a contaminated site problem and a risk based strategy for developing a corrective action, Response plan for petroleum – contaminated sites, Risk Management and Risk Communication.

### Unit IV

(15 Hours)

**Basic concepts of Environmental Economics:** International Trade and its Environmental Integrity, Ecolabelling, responsible care, design for the Environment and full-cost accounting for municipal solid waste management, Waste lands and their reclamation, Desertification and its control. Soil erosion, Formation and reclamation of user, alkaline and saline soil, Terra Preta [black carbon] soil in Amazon forests for sustainability in soil; Biochars for energy production and as mitigation measures for global warming and **\*soil rejuvenation.**

### Unit V

(15 Hours)

**Environmental Education and Communication:** Environmental Conflict Management, Sustainable development-concept, and growth of the idea, indicators of sustainability, Sustainability of Water Resources, Sustainable Management of Forests, Sustainability in Industry, Ecosystem Management: Coastal Environments, River and Inland Water Environments, Wetlands, Desert margins, Rural and Urban Environments. Current environmental issues in India – Case studies: Narmada Dam, There Dam, Almetti Dam.

\* denotes Self study

### Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

### Text Books

1. Sally L. Benjamin and David, A. Bullock. (2001). Practical Guide to Understanding Management and Reviewing Environmental Risk Assessment Reports. Lewis Publishers, Washington D.C
2. Mary K. Theodore, Louis Theodore (2009). Introduction to Environmental Management. 1<sup>st</sup> Edition.

### Reference Books

1. M.C. Dash (2019). Concepts of Environmental Management for Sustainable Development. Dreamtech Press.
2. Kart A, Frantzen. (2001). Risk based analysis for Environmental Managers. Lewis Publishers Washington D.C.

**PBC 69**

**MAPPING**

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	M	S	M	S
<b>CO2</b>	S	M	S	M	S
<b>CO3</b>	H	S	M	S	M
<b>CO4</b>	S	H	M	M	H

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

## PBC 69

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> NA		<b>Title:</b> Non Major Elective – Competitive Science		
Batch	Semester	Hours / Week	Total Hours	Credits
2020-2021	NA	5	75	5

### Course Objectives

1. To insist the various facts of life sciences in detail
2. To learn the various information regarding the biological processes
3. To expose the students to the online examination

### Course Outcomes (CO)

K1- K4 CO1-CO4	The students can learn the subjects in detail, get consolidated view of life science subjects, develop the analytical capability by learning the objective type questions and can undertake the competitive examinations will necessary preparation
-------------------	---

### Syllabus

#### Unit I

(15 Hours)

**Molecules and their Interaction relevant to Biology:** Structure of atoms, molecules and chemical bonds - Composition, structure and function of biomolecules - Stabilizing interactions - Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties) - Bioenergetics, glycolysis, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers - Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes - Conformation of proteins - Conformation of nucleic acids - Stability of proteins and nucleic acids - Metabolism of carbohydrates, lipids, amino acids nucleotides and **\*vitamins**.

#### Unit II

(15 Hours)

**Cellular Organization:** Membrane structure and function - Structural organization and function of intracellular organelles - Organization of genes and chromosomes - Cell division and cell cycle - Microbial Physiology. Fundamental Processes: DNA

## PBC 70

replication, repair and recombination - RNA synthesis and processing - Proteinsynthesis and processing - Control of gene expression at transcription and translation level.

### Unit III

(15 Hours)

**System Physiology –Plant:** Photosynthesis -Respiration and photorespiration – Nitrogen metabolism - Plant hormones – Sensory photobiology - Solute transport and photoassimilate translocation – Secondary metabolites - Stress physiology.

**System Physiology –Animal:** Blood and circulation - Cardiovascular System - Respiratory system - Nervous system - Sense organs - Excretory system - Thermoregulation -Stress and adaptation - Digestive system - Endocrinology and reproduction.

### Unit IV

(15 Hours)

**Cell Communication and Cell Signalling:** Host parasite interaction - Cell signalling - Cellular communication - Cancer - Innate and adaptive immune system. Methods in Biology: Molecular Biology and Recombinant DNA methods - Histochemical and Immunotechniques- Biophysical Methods - Statistical Methods - Radiolabelling techniques - Microscopic techniques - Electrophysiological methods - Methods in field biology.

### Unit V

(15 Hours)

**Applied Biology:** Microbial fermentation and production of small and macro molecules - Application of immunological principles, vaccines, diagnostics - Tissue and cell culture methods for plants and animals - Transgenic animals and plants, molecular approaches to diagnosis and strain identification - Genomics and its application to health and agriculture, including gene therapy - Bioresource and uses of biodiversity - Breeding in plants and animals, including marker – assisted selection - Bioremediation and phytoremediation-Biosensors.

\* denotes Self study

### Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

### Textbooks:

1. Kumar. (2016). Arihant Publications. 3<sup>rd</sup> edition.
2. Nithin Sharma (2020). Ace The Race: CSIR-UGC NET Life Sciences (JRF & LS) 2<sup>nd</sup> Edition.

**PBC 71**  
**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	M	H	S	M	S
<b>CO2</b>	S	S	M	H	M
<b>CO3</b>	M	M	S	S	H
<b>CO4</b>	S	S	M	S	M

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

## PBC 72

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> NA		<b>Title:</b> Non Major Elective – Bioprocess Technology		
Batch	Semester	Hours / Week	Total Hours	Credits
2020-2021	NA	5	75	5

### Course Objectives

1. To understand the basics of fermentation techniques
2. To learn the concepts of screening, optimization and maintenance of cultures
3. To provide the basics of bioprocess technology

### Course Outcomes (CO)

K1- K4 CO1-CO4	The students can remember the basics of bioreactors, understand of the various aspects of bioprocess techniques, employ in biotechnological industries and examine the fermentation process and its kinetics
-------------------	--

### Syllabus

#### Unit I

(15 Hours)

**Introduction: Basic principles\***, Historical development in fermentation, strain improvement and inoculum development. Types of fermentation: batch, fed batch and continuous. Isolation, screening, and maintenance of microbes for industrial process. Strain selection and improvement methods.

#### UNIT II

(15 Hours)

**Bioreactor:** Components design, parts and its functions. Types of bioreactors: CSTR, packed bed, batch, Air lift bioreactor, Bioreactors for immobilized cells, animal cells, waste water and effluent treatment. Specialized bioreactors: pulsed, fluidized and photobioreactors.

#### UNIT III

(15 Hours)

**Upstream processing:** Introduction, principles of microbial nutrition, Media formulation and optimization. Sterilization: Methods of sterilization- Batch and continuous sterilization. Air sterilization, design and air filters, aseptic operation of fermentor. Inocula development for Industrial fermentations. Scale up and scale down.

**UNIT IV**

**(15 Hours)**

**Transport phenomena:** Mass and heat transfer mechanism. Mass, heat and oxygen transfer coefficients. Rheological properties of a fermentation broth. Bioprocess monitoring and control: On-line and Off-line analysis. Monitoring variables: pH, temperature, DO<sub>2</sub>, agitation and foam level. PID control and computer aided control.

**UNIT V**

**(15 Hours)**

**Downstream processing:** Overview. Primary separation - Cells, Solid matter and foam-precipitation, filtration, centrifugation, cell disruptions (Mechanical, enzymatic and chemical). Product isolation - solvent extraction, adsorption, aqueous two-phase system and precipitations. Purification techniques: Chromatography (ion-exchange, gel-permeation and affinity), membrane separation (microfiltration, Ultrafiltration and reverse osmosis). Product recovery; product polishing (drying and crystallization).

\* denotes Self study

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

**Textbooks:**

1. El – Mans, E.M.T., and Bryce, C.F.A. (2002). Fermentation Microbiology and Biotechnology. Taylor & Francis group
2. Stanbury, P. F. & A. Whitaker. (2003). Principles of Fermentation Technology. Pergamann Press, Oxford.

**Reference books:**

1. M.L. Shuler and F. Kargi. (2003). Bioprocess engineering: Basic Concepts. Prentice Hall, Engelwood Cliffs.
2. W. Cruger & A. Cruger. (2003). A Textbook of Industrial Microbiology. Panima Pub. Corp., New Delhi.
3. R.K. Rajput. (2003). Heat and Mass Transfer in SI units. S Chand and Co. Ltd., New Delhi.

**PBC 74**  
**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	H	M	S	S
<b>CO2</b>	H	S	S	H	M
<b>CO3</b>	S	H	S	M	S
<b>CO4</b>	M	S	H	S	S

**S** – Strong

**H** – High

**M** – Medium

**L** – Low



## PBC 75

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> NA		<b>Title:</b> Non Major Elective – Cancer Biology		
Batch	Semester	Hours / Week	Total Hours	Credits
2020-2021	NA	5	75	5

### Course Objectives

1. To know the biology of cancer development
2. To know the features of various cancer types
3. To know about the mechanism of cancer cell cycle
4. To learn the screening and diagnosis methods for cancers
5. To learn the treatment strategies for various cancers

### Course Outcomes (CO)

K1- K4 CO1-CO4	To remember the basic knowledge on cancer development, understand the molecular mechanisms of cancer cell cycle, apply the techniques for diagnosis of various cancers and evaluate the role of different treatment strategies and its application
-------------------	--

### Syllabus

#### Unit I

(15 Hours)

**Cancer:** Introduction, Normal cells and tissues, Control of growth in normal Tissues, Tumour growth, the process of carcinogenesis\*, Genes involved in carcinogenesis, Factors influencing the development of cancers. **Risk factors for cancer:** Tobacco, infections, dietary-related factors, reproductive and hormonal factors, radiation, occupational carcinogens, medical carcinogens (non-radiation), environmental pollution, genetic predisposition, mutagens and mutational spectra in relation to cancer types.

#### Unit II

(15 Hours)

Epidemiology, Etiology, pathology, Clinical Features, Diagnosis and Evaluation, Management of breast, oral, cervical, gastric, lung and skin cancer. Role of tumour suppressor genes (Rb, p53, NF1, BRCA 1 & 2) in cancer prevention and the mechanism leading to loss of function.

#### Unit III

(15 Hours)

**Cancer cell cycle:** Introduction, cell cycle events in normal and neoplastic cells, restriction point control and its loss, initiation of DNA replication, completion of DNA replication, checkpoint responses to DNA damage in G1 and S phase, from G2 to mitotic metaphase, checkpoints controlling mitotic entry, centrosome duplication and the maintenance of ploidy, the metaphase–anaphase transition and exit from mitosis, cell cycle proteins as prognostic markers and drug targets.

**Unit IV**

**(15 Hours)**

**Screening of cancer:** Introduction, Types of screening tests, Safety and acceptability, Evaluation of screening (Evaluating the test, Potential biases, Randomized trials, Screening programmes), Types of screening test (Visual inspection, Palpation, Analysis of exfoliated cells, Imaging, Serum and urine markers, screening for and treatment of infections), Screening for specific cancers (Cervix cancer, Breast cancer, Colorectal cancer, Prostate cancer).

**Unit V**

**(15 Hours)**

**Local treatment of cancer:** Introduction, Skin cancers, Breast cancer, Lung cancer, Prostate cancer, Colorectal cancer. **Chemotherapy:** Mechanisms of action and resistance to traditional cytotoxic drugs, Therapeutic principles of traditional cytotoxic chemotherapy. **Radiotherapy.** **Immunotherapy of cancer:** Introduction, Specific Immunotherapy (Human tumour antigens & Genetically enhanced T cells), Non-specific immunotherapy (Immunotherapy with cytokines).

\* denotes Self study

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/GoogleClassroom
--

**Textbook:**

1. Introduction to the Cellular and Molecular Biology of Cancer. Margaret A. Knowles Peter J. Selby. Oxford University Press 2005, Fourth Edition

**Reference books:**

1. Franco Cavalli, Stan B. Kaye, Heine, H.Hansen, James O. Armitage, Martine J. Piccart-Gebhart (2009). Textbook of Medical Oncology. Fourth Edition. Informa Healthcare.
2. Raymond W. Ruddon (2007). Cancer Biology Fourth Edition, Oxford University Press.
3. Arthur B. Pardee. Gary S. Stein (2009). The Biology and Treatment of Cancer. Understanding Cancer by John Wiley & Sons, Inc.
4. Harvey Lodish, Arnold Berk *et al.*, (2007). Molecular Cell Biology. 6<sup>th</sup> edition, W H Freeman and Company, New York.

**PBC 77**

**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	S	S	M	S
<b>CO2</b>	M	H	M	H	M
<b>CO3</b>	S	M	S	M	H
<b>CO4</b>	S	H	M	H	M

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

**KONGUNADU ARTS AND SCIENCE COLLEGE  
(AUTONOMOUS)**

Re-accredited by NAAC with 'A' Grade Status – 3.64CGPA out of 4 (3<sup>rd</sup>Cycle)

College of Excellence (UGC)

**COIMBATORE – 641029, TAMIL NADU, INDIA.**

**QUESTION PAPER PATTERN FOR CIA & END OF SEMSTER EXAMINATION**

**M. Sc., BIOCHEMISTRY**

**1. THEORY**

Max Marks = 75

Time = 3.00 hrs

**SECTION - A** (10 x 1=10 marks)

Choose the correct answer type.

*Q.No. 1 to 10: Multiple choice type alone.*

Questions with four alternative (distracter) answers each (Two questions from each unit).

**SECTION - B** (5 x 5=25 marks)

Short answer questions

*Q.No. 11-15: Either (a) or (b) short note type (One question 'a' or 'b' from each unit)*

**SECTION - C** (5 x 8=40 marks)

Essay type of questions:

*Q.No. 16-20: Either (a) or (b) essay type (One question 'a' or 'b' from each unit)*

**2. BREAK UP OF INTERNAL MARKS (25 marks)**

**Internal marks (25) = CIA (out of 15) + Attendance (out of 5) +  
Assignment/Google Classroom (out of 5)**

**\*CIA marks (out of 15 marks) = I CIA marks + II CIA marks / 150 X 15**

## PBC 79

### 3. PRACTICALS – Question Pattern & Break-up of marks

#### END OF SEMESTER PRACTICAL EXAMINATION

*Max. Marks: 60*

*Duration: 3hrs*

<b>I. Major</b>	(One question)	(1 x 20 = 20)
<b>II. Minor</b>	(One question)	(1 x 10 = 10)
<b>III. Spotters</b>		(3 x 5 = 15)
Examine, identify and critically comment on the spotters A, B, C, D and E.		
<b>IV. Viva</b>		(05)
<b>V. Record / Observation*</b>		(10)

*\*Record for ESE; Observation for CIA exam.*

#### INTERNAL - PRACTICAL MARKS

From Model Practical Examination	-	25
Observation	-	10
Attendance	-	5
<b>Total</b>	-	<b>40</b>

**PBC 80**

**PROJECT VIVA-VOCE EXAMINATION**

**Maximum marks: 100**

**Continuous Internal Assessment (CIA)**

Project review I & II	– 15 marks
Regularity	– 5 marks
Total	–20 marks

**End of Semester Examination (ESE)**

Project report	– 60 marks
Viva-voce	– 20 marks
Total	– 80 marks

=====

CIA	– 20 marks
ESE	– 80 marks
Total	– 100 marks

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBCOD1		<b>Title:</b> ALC – Forensic Science		
Batch 2019-2020	Semester NA	Hours / Week NA	Total Hours NA	Credits 4

### Course Objectives

1. To deals with the forensic aspects like legal procedures and types of trauma.
2. To prop up and develops regulation in forensic science
3. To give students with a sound basis in forensic science

### Course Outcomes (CO)

K1- K4 CO1-CO4	The students will use the basic concepts of forensic science, understand of identification procedures employed under forensics science, apply the fingerprint analysis and interpretations in research fields and examine and analyze the results involved in fingerprinting technique
-------------------	--

20PBCOD1

## Syllabus

### Unit I

**Crime scene management and investigation:** Collection, preservation, packing and forwarding of physical and trace evidences for analysis. Legal and court procedure related to expert testimony. Consumer Protection Act: rights and liabilities of doctors, medical indemnity insurance; human rights and violation; duties of medical practitioners to victims of torture; Human organ transplantation Act.

### Unit II

**Identification of the living and the dead:** Forensic thanatology; death; causes of death; mechanism and manner of death; changes after death; artifacts; medico legal death investigation; exhumation. Examination and identification of hair, semen, saliva, urine, faecal matter and milk. DNA fingerprinting and HLA typing.

### Unit III

**Physical analysis:** Soil, glass, paints, lacquers, cement, inks, paper, tool and tyre marks

shoe prints. Forensic examination of vehicles in cases of accident. Identification of individualization from foot prints and teeth.

#### Unit IV

**Injuries:** Mechanical injuries; injuries due to electricity, lightning and radiation; train and road traffic accidents; firearm and explosion injuries; medico legal aspects of wounds. General aspects; patho-physiology and classification; mechanical asphyxia; hanging; strangulation; drowning; smothering, choking, garroting, burking, yoking.

#### Unit V

**Medico legal aspects:** Medico legal aspects of wounds. Post mortem examination and changes, asphyxia death, sexual offences, infanticide, forensic psychiatry and lye detection. History, classification, search, lifting and examination of fingerprints. Various methods for the development of latent fingerprints, **\*Crime records and computerization.**

**\* denotes Self study**

#### Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

#### Text Books

1. Narayanareddy K. S. (2007). The Essentials of Forensic Medicine & Toxicology. 26<sup>th</sup> edition, K. Sugana Devi publishers, Hyderabad.
2. Basu, R. (2009). Fundamentals of forensic medicine and toxicology. 2<sup>nd</sup> Edition, Books and Allied (P) Ltd. Kolkata.

#### Reference Books

1. Pillay V.V. (2009). Text book of Forensic Medicine, Paras Publication. Hyderabad.
2. JB Mukherjee's. (2007). Forensic Medicine and Toxicology-Volume I and II (combined)-edited by Karmakar, 3<sup>rd</sup> edition.
3. R. Saferstein. (2004). Criminalistics. 8<sup>th</sup> edition, Prentice Hall, New Jersey.



**PBC 83**

**20PBCOD1**

**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	S	M	M	S
<b>CO2</b>	S	H	M	S	H
<b>CO3</b>	H	S	S	M	H
<b>CO4</b>	M	S	H	M	M

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme Code: 07</b>		<b>Programme Title: M.Sc Biochemistry</b>		
<b>Course Code: 20PBCOD2</b>		<b>Title: ALC – Nutraceuticals and Functional Foods</b>		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	NA	NA	NA	4

### Course Objectives

1. To learn the concept of nutraceuticals and functional foods
2. To know the available biochemical compounds in our system
3. To prepare functional foods from nutraceutical compounds

### Course Outcomes (CO)

K1- K4 CO1-CO4	The students will learn the complete history of nutraceuticals, learn the different nutraceuticals, learn the formulation methods of functional foods and learn the role of functional foods in disease prevention and management
-------------------	---

20PBCOD2

### Syllabus

#### Unit I

**Introduction to Nutraceuticals as Science:** Nutraceutical- Definition, Classification - Dietary supplements, Functional foods, Historical perspective, scope & future prospects. Applied aspects of the Nutraceutical Science. Sources of Nutraceuticals. Relation of Nutraceutical Science with other Sciences: Medicine, Human physiology, genetics, food technology, **\*chemistry and nutrition (brief description).**

#### Unit II

**Classification, Properties and structure of various Nutraceuticals:** Alkaloids, Terpenoids, Glycosides, Natural phenols, Isoprenoid derivatives, Glucosamine, Octacosanol, flavonoids, carotenoids, polyunsaturated fatty acids, lecithin, choline and spingolipids, Lycopene, Carnitine, Melatonin and Ornithine alpha ketoglutarate as neutraceuticals. Use of proanthocyanidins, grape products, flaxseed oil as Nutraceuticals.

### Unit III

**Nutraceuticals of plant and animal origin:** Plant metabolites - Functions, sources - Alkaloids, phenols, Terpenoids. Applications with specific examples with reference to skin, hair, eye, bone, muscle, heart, brain, liver, kidney, general health and stimulants. Concept of cosmoceuticals and aquaceuticals. Animal metabolites – Functions, Sources - chitin, chitosan, glucosamine, chondroitin sulphate and other polysaccharides of animal origin. Uses and applications in preventive medicine and treatment.

### Unit IV

**Functional Foods:** Definition. Applications of herbs to functional foods. Concept of free radicals and antioxidants; Nutritive and Non-nutritive food components with potential health effects. Soy proteins and soy isoflavones in human health; Role of nuts in cardiovascular disease prevention. Functional foods from wheat and rice and their health effects. Role of Dietary fibers in disease prevention. Vegetables, Cereals, milk and dairy products as Functional foods. Health effects of common beans, Capsicum annum, mustards, Ginseng, garlic, citrus fruits, fish oils, and sea foods.

### Unit V

**Food as remedies:** Nutraceuticals bridging the gap between food and drug, Nutraceuticals in treatment for cognitive decline, Nutraceutical remedies for common disorders like Arthritis, Bronchitis, circulatory problems, hypoglycemia, Nephrological disorders, Liver disorders, Osteoporosis, Psoriasis and Ulcers etc. Brief idea about some Nutraceutical rich supplements e.g. Bee pollen, Caffeine, Green tea, Lecithin, Mushroom extract, Chlorophyll, Kelp, Spirulina and  $\beta$ -carotene.

\* denotes Self study

### Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

### Text Books:

1. Swaminathan M. (2014). Essentials of Food and Nutrition. 2<sup>nd</sup> edition. Bappco.
2. C. Gopalan, B. V. Rama Sastri & S.C. Balasubramanian, (Reprinted 2007, 2011) Nutritive Value Of Indian Foods (NVIF),

### Reference Books:

1. Todd and others. Clinical Diagnosis and Management. 17<sup>th</sup> edition, W.B.Saunders, Philadelphia.
2. Clinical dietetics and nutrition 2001 4th Edition, Oxford Univ Press.
3. Sizer, F. & Whitney, E. (2000). Nutrition-Concepts & Controversies. 8<sup>th</sup> edition, Wadsworth Thomson Learning.

## MAPPING

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	M	H	S	S
<b>CO2</b>	M	S	S	M	M
<b>CO3</b>	S	H	M	S	H
<b>CO4</b>	M	S	H	H	S

S – Strong

H – High

M – Medium

L – Low

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBCOD3		<b>Title:</b> ALC –Stem Cell Biology		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	NA	NA	NA	4

### Course Objectives

1. To learn about the technology of stem cells preparation
2. To learn the properties of stem cells
3. To prepare stem cells for gene therapy

### Course Outcomes (CO)

K1- K4	The students will recall the different types of stem cells and its applications Understand the importance of gene therapy in various diseases, implement the stem cell in therapies and examine the molecular concepts of stem cell
CO1-CO4	

20PBCOD3

## Syllabus

### Unit I

**Introduction and Scope of stem cells:** Definitions, Concepts of stem cells, differentiation, maturation, proliferation, pluripotency, self maintenance and selfrenewal, significations in measuring stem cells, preservation and storage protocols

### Unit II

**Types of stem cells:** Intestinal stem cells, Mammary stem cells, Skeletal muscle stem cell, keratinocyte stem cells of cornea, skin and hair follicles, tumor stem cells. Factors influencing proliferation and differentiation of stem cells. Role of hormone in differentiation.

### Unit III

**Embryonic stem cells:** Blastocyst, inner cell mass, Culturing of ES cells in lab, laboratory tests to identify ES cells, stimulation ES cells for differentiation, properties of ES cells, human ES cells, Monkey and Mouse ES cells.

#### Unit IV

**Application of stem cell:** Identification, Manipulating differentiation pathways, stem cell therapy vs cell protection, stem cell in cellular assays for screening, stem cell based drug discovery platforms, drug screening and toxicology, stem cell banking.

#### Unit V

**Gene therapy:** Genetically engineered stem cells, stem cells and animal cloning, transgenic animals and stem cells, Therapeutic applications, Parkinson's disease, Neurological disorder, limb amputation, heart disease, spinal cord injuries, diabetes, burns. Matching the stem cell with transplant recipient, HLA typing Alzheimer's disease, spinal cord injuries tissue engineering application, production of complete organ, kidney, eyes, heart, and brain. \***Stem cell case study.**

\* **denotes Self study**

#### Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

#### Text Books

1. Kursad and Turksen. (2002). Embryonic Stem cells, Humana Press.

#### Reference Books

1. Stem cell and future of regenerative medicine. By committee on the Biological and Biomedical applications of Stem cell Research. (2002). National Academic press.

## MAPPING

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	M	S	H	S
<b>CO2</b>	S	S	M	H	S
<b>CO3</b>	M	H	S	M	H
<b>CO4</b>	H	S	S	M	M

**S** – Strong**H** – High**M** – Medium**L** – Low

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBCOJ1		<b>Title:</b> JOC – Bio-Entrepreneurship		
Batch 2019-2020	Semester NA	Hours / Week 2	Total Hours 30	Credits 4

### Course Objectives

1. To learn about the concepts of entrepreneurship
2. To study the various opportunities in launching and running a business
3. To know the various strategies of effective entrepreneurship

### Course Outcomes (CO)

K1- K4 CO1-CO4	The students will come to know about the concepts of entrepreneurship, learn the different strategies adopted for a better entrepreneurship the various biological entrepreneurship programmes and will be will be equipped enough to become an entrepreneur
-------------------	--

20PBCOJ1

### Syllabus

#### Unit I (6 Hours)

Basics of Bioentrepreneurship Introduction to bioentrepreneurship – Biotechnology in a global scale, Scope in Bioentrepreneurship, Importance of entrepreneurship. Meaning of entrepreneur, function of an entrepreneur, types of entrepreneur, advantages of being entrepreneur. Innovation – types, out of box thinking, opportunities for Bioentrepreneurship. Entrepreneurship development programs of public and private agencies (MSME, DBT, BIRAC, Startup and Make in India). Patent landscape, IP protection and commercialization strategies.

#### Unit II (6 Hours)

Management, Accounting and Finance Management principles of Henry Fayol. Business plan preparation: business feasibility analysis by SWOT, socio-economic costs benefit analysis, Sources of financial assistance – making a business proposal, approaching loan from bank and other financial institutions, budget planning and cash flow management, basics in accounting practices - balance sheet, P&L account, double entry



book keeping, estimation of income, expenditure and Income tax. Collaborations and partnerships, information technology for business administration and expansion.

**Unit III (6 Hours)**

Knowledge Centre and R&D Knowledge centers - Universities, innovation centre, research institutions and business incubators. R&D - technology development and upgradation, assessment of technology development, managing technology transfer, industry visits to successful bio-enterprises, regulations for transfer of foreign technologies, quality control, technology transfer agencies, Understanding of regulatory compliances and procedures (CDSCO, NBA, GLP, GCP & GMP)

**Unit IV (6 Hours)**

Medium & Small Scale Industry Definition, characteristics, need and rationale, objectives, scope and advantages of small scale industries. Types of bioindustries – Pharma, Agri and Industry. Biofertilizers production - \***Azospirillum**, Azolla, Cyanobacteria and its applications. Biopesticides production - Bacterial, fungal, viral and plant insecticides. Sericulture. Apiculture. Dairy farming. Single Cell Protein Production and applications. Vermicomposting and its applications. Mushroom cultivation and its application. Ancillary and tiny industries

**Unit V (6 Hours)**

Marketing and Human Resource Development Assessment of market demand for potential product(s) of interest, Market conditions, segments, prediction of market changes, identifying needs of customers including gaps in the market. Branding issues, developing distribution channels – franchising policies, promotion, advertising, branding and market linkages. Marketing of agro products. Recruitment and selection process, leadership skills, managerial skills, organization structure, training, team building and teamwork.

\* denotes Self study

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

**Text Books**

1. “Entrepreneurship and Business of Biotechnology”, S. N. Jogdand, Himalaya Publishing Home, 2007.

**Reference Books**

1. Stephon, Robbins. (2003). Management. 17<sup>th</sup> edition, Pearson Education.

## MAPPING

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	M	S	M	M
<b>CO2</b>	H	S	M	S	H
<b>CO3</b>	S	M	S	H	S
<b>CO4</b>	H	M	M	M	S

**S** – Strong**H** – High**M** – Medium**L** – Low

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBC0J2		<b>Title:</b> JOC - Food Safety and Quality Control		
Batch 2019-2020	Semester NA	Hours / Week 2	Total Hours 30	Credits 4

### Course Objectives

1. To learn the principles of food quality control
2. To learn the methodologies to standardize and ensuring food safety
3. To gain knowledge on the framed food safety regulations

### Course Outcomes (CO)

K1- K4  CO1-CO4	The students will learn about the various steps in the quality control of food items, learn the various food standards, learn the various methods to determine the quality of foods and be aware the various regulations concerned with the food quality issues
-----------------------	---

20PBC0J2

### Syllabus

#### Unit I (6 Hours)

**Principles of Quality control of food:** Raw material control, processed control and finished product inspection. Leavening agents, classification, uses and optimum levels. Food additives - Preservatives, colouring, flavouring, sequestering agents, emulsifiers, antioxidants.

#### Unit II (6 Hours)

**Standardisation systems for quality control of foods:** National and International standardization system, Food grades, Food laws-compulsory and voluntary standards. Food adulteration - Common adulterants in foods and tests to detect common adulterants.

#### Unit III (6 Hours)

**Standards for foods:** Cereals and pulses, sago and starch, milk and milk products, Coffee, tea, sugar and sugar products.

**Unit IV (6 Hours)**

**Methods for determining quality:** Subjective and objective methods. Sensory assessment of food quality-appearance, color, flavour, texture and taste, different methods of sensory analysis, preparation of score card, panel criteria, sensory evaluation room.

**Unit V (6 Hours)**

**Food safety, Risks and hazards:** Food related hazards, Microbial consideration in food safety, HACCP-principles and structured approach. Chemical hazards associated with foods. \*FSSAI.

\* denotes Self study

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

**Text Books**

1. Food Science-Srilakshmi (2001). 2nd edition, New age international publishers-(2001)

**Reference Books**

1. Swaminathan M. (2014). Essentials of Food and Nutrition. 2<sup>nd</sup> edition. Bappco.

## MAPPING

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	M	S	S	M	M
<b>CO2</b>	H	S	S	M	S
<b>CO3</b>	M	M	M	S	H
<b>CO4</b>	S	S	M	M	M

**S** – Strong**H** – High**M** – Medium**L** – Low

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBCOJ3		<b>Title:</b> JOC –Clinical and Therapeutic Nutrition		
Batch 2019-2020	Semester NA	Hours / Week 2	Total Hours 30	Credits 4

### Course Objectives

1. To enable the basic principles of clinical nutrition
2. To understand the clinical significance of biochemical findings
3. To develop skills in planning and preparation of therapeutic diets for various diseases

### Course Outcomes (CO)

K1- K4 CO1-CO4	The students commemorate the basics of nutritional care ,discern the relation between nutrition and health, apply lifestyle and nutritional assessment techniques, analyse the main nutrients and its functions in the body
-------------------	---

20PBCOJ3

### Syllabus

#### Unit I (6 Hours)

Guidelines for dietary planning: **\*Weights and Measures.** Nutritional Assessment. Nutritional care process. Nutritional intervention: Objectives of diet therapy, Therapeutic modification of the normal diet: diet prescription. Routine Hospital diet - regular diets, clear fluid diet, full fluid diet, soft diet, modifications of food and nutrient intake, Enteral nutrition, parenteral nutrition, Refeeding syndrome, Transitional feeding. Medical and nutritional care record types and uses, Format for medical and nutrition charting and documentation record.

#### Unit II (6 Hours)

Dietician and Nutrition counselling: Role of dietician on hospitalized and outdoor patients and development of nutritional care plan. Specific functions of a therapeutic, administrative and consultant dietician. Team approach in patient care. Psychological considerations in feeding the patients. Inter personal relationship with patients. Nutrition counseling- concept, components, activities for behaviour changes, intervention counseling models, types of counselling session in patients.

**Unit III (6 Hours)**

Weight imbalances, anorexia nervosa and Bulimia nervosa, cardio vascular disorders, Diabetes mellitus-Type I, II, GI Tract Disorders, Liver and gall bladder, Pancreatic disorders, renal disorder, gout, cancer, Musculo -skeletal disorders (Rheumatoid Arthritis, Osteoarthritis, Osteoporosis), Respiratory problems, hyper metabolic conditions- Burns, Sepsis, Surgery.

**Unit IV (6 Hours)**

**Pro and prebiotics:** Probiotics: Taxonomy and important features of probiotic microorganisms. Health effects of probiotics with mechanism of action. Probiotics in various foods: fermented milk products, non-milk products etc. **Prebiotics:** Definition, chemistry, sources, metabolism and bioavailability, effect of processing, physiological effects, effects on human health and potential applications in risk reduction of diseases. perspective for food applications for the-Non-digestible carbohydrates/oligosaccharides, Dietary fibre, Resistant starch, Gums. Palliative diet and nutritional care.

**Unit V (6 Hours)**

Food- Drug Interaction: Effect of Food on Drug Therapy. Effect of Drug on Food and Nutrition. Modification of Drug Action by Food and Nutrition. Effect of Drug on Nutritional Status. Excipients and Food-Drug Interaction. **\*Medical nutritional therapy.**

**\* denotes Self study**

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom

**Text Books**

1. Mahan, L.K. and Escott-Stump, S. (2008). Krause's Food Nutrition and Diet-Therapy. 12<sup>th</sup> edition, W-13 Saunders Ltd., Canada.
2. Garrow J.S, James W. P.T, Ralph A. (2000). Human Nutrition and Dietetics. 10<sup>th</sup> edition, Churchill Livingstone, London.

**Reference Books**

1. Antia F.P. And Philip Abraham. (2001). Clinical Nutrition and Dietetics. Oxford Publishing Company, New Delhi.
2. Williams, S.R. (2003). Nutrition and Diet Therapy. 7<sup>th</sup> edition, Times Mirror/Mosby College Publishing
3. Esther A. Winter feldt, Margret L. Bogle, Lea L. Ebro. (2011). Dietetics: Practice & Future Trends. 3<sup>rd</sup> edition, Jones and Barlet Publishers.U

## MAPPING

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	M	H	S	S
<b>CO2</b>	M	S	S	M	M
<b>CO3</b>	S	H	M	S	H
<b>CO4</b>	M	S	H	H	S

**S** – Strong**H** – High**M** – Medium**L** – Low



**CERTIFICATE COURSE IN  
MEDICAL LABORATORY TECHNOLOGY**

**PBC 100****KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)**Re-accredited by NAAC with 'A' Grade Status – 3.64 CGPA out of 4 (3<sup>rd</sup> Cycle)

College of Excellence (UGC)

**COIMBATORE – 641029, TAMIL NADU, INDIA.****Course Name: M.Sc. Biochemistry****Curriculum and Scheme of Examination under CBCS****(Applicable for the Students Admitted during the Academic Year  
2019-2020 onwards)**

Subject code/ Question paper code	Title of the paper	Instructions hours/cycle	Exam Marks			Duration of Exam (Hrs)	Credits
			CIA	ESE	Total		
20PBC0F1	Paper I: Biochemistry	2	-	100	100	3	4
20PBC0F2	Paper II: Clinical Pathology and Microbiology-I	2	-	100	100	3	4
20PBC0F3	Practical I	2	-	100	100	3	4
20PBC0F4	On the Job training and Viva voce	2	-	100	100	3	8

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBC0F1		<b>Title:</b> Paper I-Biochemistry		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	-	2	60	4

### Course Objectives

1. To acquire the knowledge on laboratory safety and measures
2. To know the techniques of biochemistry and clinical chemistry
3. To obtain information about various enzymes analysis and analytical techniques

### Syllabus

#### Unit I

(12 Hours)

**Laboratory safety and Specimen processing:** General approach to medical laboratory sciences. Safety in laboratory. General laboratory instruments and equipments. Basic chemistry and laboratory chemicals. Specimen processing for biochemical analysis: blood, urine, CSF.

#### Unit II

(12 Hours)

**Biochemical techniques:** Principles of analytical techniques. Basic concepts in analytical chemistry, colorimetry, spectrophotometry, titrimetry, flame photometry, chromatography, electrophoresis, PCR, Real time PRR. Immunochemistry: ELISA, RIA, CLIA, flow cytometry and biochips.

#### Unit III

(12 Hours)

**Clinical chemistry:** Biochemical tests: glucose, protein, albumin, urea, creatinine, uric acid, bilirubin and cholesterol. Enzymes: \*SGOT, SGPT, ALP, ACP, LDH, creatinine kinase, lipase, amylase, choline esterase. Hormones: Insulin, T3, T4, TSH, cortisol, FSH, progesterone and estrogen. Electrolytes and blood gases. Biochemical profile test: liver function test, renal function test, gastric function test, pancreatic function test and endocrine function test.

#### Unit IV

(12 Hours)

**Automation in clinical laboratory:** Basic concepts, automation of the analytical processes, steps of automation in biochemical analysis, computers in the clinical laboratory, types of automated analysers, commonly used analysers of biochemical laboratories. Statistical procedures: Arithmetic mean, median, standard deviation, coefficient of correlation, t test and ANOVA

**Unit V****(12 Hours)**

**Laboratory management:** Clinical laboratory informatics, computer systems, laboratory information systems. Laboratory management: Basic concepts, financial management, quality management-fundamentals, total quality management of clinical laboratory.

**Reference Books**

1. Ochei J and Klothkar A. (2000). Medical Laboratory Science-Theory and Practice. Tata McGraw Hill Publishing Company Limited.
2. Chatterjee MN and Shinde R. (2002). Text book of Medical Biochemistry. 5<sup>th</sup> edition. Jaypee Brothers Medical Publishers.

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBC0F2		<b>Title:</b> Paper II-Clinical Pathology and Microbiology		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	-	2	60	4

### Course Objectives

1. To acquire the knowledge on microbial techniques
2. To know the techniques of serological procedures
3. To obtain information on hematological processing

### Syllabus

#### Unit I

(12 Hours)

**Microbiology:** Introduction to diagnostic microbiology and microbiological techniques. Role of microbiology in laboratory, specimen handling, laboratory records maintenance, safety regulations, basic procedures of diagnostic microbiology, culture environment of microbes and quality control in microbiology.

#### Unit II

(12 Hours)

**Diagnostic Bacteriology:** Systemic grouping of pathogenic bacteria, laboratory identification of infectious agents, diagnosis of anaerobic infection, identifying characteristics of common pathogenic bacteria. Anti microbial susceptibility test. Diagnostic of mycotic infection: Introduction to fungi, parasitic fungi, specimen collection, laboratory diagnosis of mycotic infection, diagnostic mycology.

#### Unit III

(12 Hours)

**Serology:** Serology and serodiagnostic procedures: Principles of immunological reactions, serodiagnosis. Laboratory procedures in serology: Collection and preparation of specimen. CRP test, RA test, ASO test, HIV, immunologic test for pregnancy.

#### Unit IV

(12 Hours)

**Clinical Pathology:** Clinical pathology and urine analysis: Urine analysis, routine examination of urine, rapid chemical test of urine. Laboratory examination of miscellaneous body fluids: CSF, serous fluids, synovial fluids and gastric juices. Semen analysis: Clinical examination, specimen collection, laboratory investigation. Stool examination: Clinical significance, collection of faecal specimen and laboratory investigations.

**Unit V****(12 Hours)**

**Hematology:** Components of blood and their function, specimen collection. Routine haematological test: RBC, WBC, DC, TC, platelet, \*Hb, EST, PCV. Bleeding disorders: Bleeding time, clotting time, routine coagulation test. Blood banking: Human blood grouping system, transfusion reactions, collection and processing of blood for transfusion.

**Reference Books**

1. Ochei Jand Klohatkar A. (2000). Medical Laboratory Science-Theory and Practice. Tata McGraw Hill Publishing Company Limited.
2. Chatterjee MNand Shinde R. (2002). Text book of Medical Biochemistry. 5<sup>th</sup> edition. Jaypee Brothers Medical Publishers.
3. Varley S. (1988). Practical Clinical Biochemistry. 6<sup>th</sup> edition, CBS Publishers and Distributors.

<b>Programme Code: 07</b>		<b>Programme Title: M.Sc Biochemistry</b>		
<b>Course Code: 20PBC0F3</b>		<b>Title: Practical I</b>		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	-	2	60	4

### Course Objectives

1. To attain the knowledge on serum and urine analysis
2. To know the principles and techniques of microbiology
3. To acquire knowledge on pathological techniques

### Biochemistry:

1. Analysis in serum:  
Glucose, creatinine, uric acid, cholesterol, urea, bilirubin, total protein, albumin, total lipids, triglycerides, HDL
2. Analysis in urine:  
Glucose, creatinine, uric acid, urea
3. Analysis in CSF: Sugar and protein
4. Enzymes: SGOT, ALP, LDH, CK, lipase, amylase and choline esterase
5. Hormones: Insulin, TSH, estrogen
6. Electrolytes in serum and urine: Sodium, potassium, chlorides, calcium
7. Routine complete urine analysis

### Microbiology:

8. Sterilization and media preparation
9. Staining procedures: Simple, differential, negative and acid fast staining
10. Identification of pathological organism
11. Biochemical analysis of microbial strains
12. Processing of clinical specimens: Urine, pus, blood and other body fluids

### Clinical Pathology:

13. CRP
14. ASO
15. RA
16. HIV
17. VDRL
18. WIDAL
19. Blood banking: Sample collection and storage

**Reference Books**

1. Mukherjee KL. (1988). Medical Laboratory Technology-A procedure manual for routine diagnostic tests, Vol I, II, III. Tata McGraw Hill Publishing Company Limited.
2. Burtis CA, Ashwood ER. (1999). Teitz Textbook of Clinical Chemistry. 3<sup>rd</sup> edition, WB Saunders Company.
3. Varley S. (1988). Practical Clinical Biochemistry. 6<sup>th</sup> edition, CBS Publishers and Distributors.



**PBC 107**  
**Question paper pattern**

(External only)

**1. THEORY**

Max Marks = 100

Time = 3.00 hrs

**SECTION - A**

(5 x 5=25 marks)

Short answer questions

*Q.No. 1-5: Either (a) or (b) short note type (One question 'a' or 'b' from each unit)*

**SECTION - C**

(5 x 15=75 marks)

Essay type of questions:

*Q.No. 6-10: Either (a) or (b) essay type (One question 'a' or 'b' from each unit)*

**2. PRACTICALS – Question Pattern & Break-up of marks**

**END OF SEMESTER PRACTICAL EXAMINATION**

*Max. Marks: 100*

*Duration: 3hrs*

**I. Major** (One question) (1 x 20 = 20)

**II. Minor** (One question) (1 x 10 = 10)

**III. Spotters** (3 x 5 = 15)

Examine, identify and critically comment on the spotters A, B, C, D and E.

**IV. Viva** (05)

**V. Record / Observation\*** (10)

*\*Record for ESE; Observation for CIA exam.*

**PBC 108**

**DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY**

## PBC 109

**KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)**  
Re-accredited by NAAC with 'A' Grade Status – 3.64 CGPA out of 4 (3<sup>rd</sup> Cycle)  
College of Excellence (UGC)  
**COIMBATORE – 641029, TAMIL NADU, INDIA.**

**Course Name: M.Sc. Biochemistry**

**Curriculum and Scheme of Examination under CBCS**  
**(Applicable for the Students Admitted during the Academic Year 2019-2020)**

Subject code/ Question paper code	Title of the paper	Instructions hours/cycle	Exam Marks			Duration of Exam (Hrs)	Credits
			CIA	ESE	Total		
20PBC0F5	Paper I: Anatomy, Physiology and Laboratory safety	2	-	100	100	3	4
20PBC0F6	Paper II: Clinical Pathology and Medical Microbiology II	2	-	100	100	3	4
20PBC0F7	Practical II	2	-	100	100	3	4
20PBC0F8	On the job training and Viva voce	2	-	100	100	3	8

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBC0F5		<b>Title:</b> Paper I-Anatomy, Physiology and Laboratory safety		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	-	2	60	4

### Course Objectives

1. To learn the anatomy of different organs in human body
2. To know the structure and functions of organs
3. To acquire the knowledge on laboratory safety and measures

### Syllabus

#### Unit I

(12 Hours)

**Gross Anatomy:** Introduction to Anatomy and its Nomenclature-Different systems of Human body, Cell- Structure and function; Body Tissue – their functions, Common anatomical terms (Anterior/Ventral, lateral, medial, median, posterior/dorsal etc.), Anatomical Position & Planes (Supine, prone, recumbent, lithotomy) planes- coronal, sagittal.

#### Unit II

(12 Hours)

**Cardiovascular and Respiratory system:** Structure of Heart & its coverings, Major Blood vessels- arteries and veins, Pulmonary circulation-portal and systemic circulation. Cardiovascular diseases-hypertension, Cardiac Failure, Ischemic heart disease. Respiratory system: Respiratory tract structure, Lungs structure, Mechanism of respiration. Introduction to Respiratory Diseases like Tuberculosis, Pneumonia, Asthma, ARDS, Respiratory failure, \***carcinoma**.

#### Unit III

(12 Hours)

**Digestive and Central Nervous system:** Structure of Digestive system- physiology of digestion. Introduction to bowl diseases like - Gastric ulcer, Carcinoma, Inflammatory Bowel disease, Liver – Cirrhosis, Cholelithiasis and Pancreatitis. Brain – Central and peripheral nervous system. Introduction to central nervous system diseases - Stroke, Alzheimer's disease, Epilepsy, Myasthenia Gravis, Parkinson's disease.

#### Unit IV:

(12 Hours)

**Urinary, Reproductive and Endocrine system:** Structure and functions of kidney- Mechanism of urine formation, Introduction to common kidney diseases like Urolithiasis and Renal failure. Reproductive system: Structure of male and female reproductive system. Testis- Vas deferens, prostate, Seminal vesicles; Ovaries, uterus,

vagina Diseases- Menopause, carcinoma. Hormones: Classification – Mechanism of action – Hypothalamic hormones – Pituitary – Anterior, posterior – Thyroid, Adrenal cortex, Adrenal medulla – Gonadal hormones-GI hormones.

**Unit V:****(12 Hours)**

**Laboratory safety:** General principles of safety programmes: First aid and safety measures for Mechanical, Electrical, Chemical, Radioactive and Biological hazards; Universal safety precautions. General Principles: Care and Cleaning of Glassware, Care of equipment and apparatus, Laboratory chemicals-Proper use, care, storage and labeling, Specimen handling, Appropriate container, Method of collection, Method of transportation, Method of preservation and disposal of laboratory waste. **\*Designing of laboratory sections.**

**\* denotes Self study**

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

**Text Books**

1. Standring S. (2016). Gray's Anatomy: The Anatomical Basis of Clinical Practice. Elsevier, pp. 1584.
2. Ranganathan TS. (2000). A Textbook of Human Anatomy. 5<sup>th</sup> edition, S Chand & amp; Co Ltd.

**Reference Books**

1. Guyton AC and Hall JE. (2000). Text Book of Medical Physiology, 10<sup>th</sup> edition, Saunders Publishers.
2. Greishcimer EM. Physiology and Anatomy with practical considerations. JP Lippincott, Philadelphia.
3. Chaurasia BD and Garg K. (2012) Human Anatomy Regional and Applied. CBS Publications: New Delhi.
4. Fattana. (1991). Human anatomy (Description and applied). Saunders & C P Prism Publishers, Bangalore.
5. Solomon EA. (2008). Introduction to Human Anatomy and Physiology. 3<sup>rd</sup> edition, Saunders: St Louis.

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBC0F6		<b>Title:</b> Paper II-Clinical Pathology and Medical Microbiology		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	-	2	30	4

### Course Objectives

1. To learn the principles and applications of hemotological techniques
2. To acquire a knowledge on antigen-antibody reactions
3. To know the microbial techniques and how to establish the laboratory

### Syllabus

#### Unit I

**Clinical Pathology:** Routine analysis and examination of urine, body fluids, semen and stool. Mantoux test: Blood coagulation test-BT, CT, PT, PTT. Histopathology: Reception of specimen-cytology, fluid cytology, FNAC, PAP smear and histopathological examination preparation and processing, fixing, dehydration, impregnation with paraffin wax, embedding, block making, section cutting, mounting and staining, documentation, slide filling, wax block preservation.

#### Unit II

**Haematology:** Introduction, haemotopoietic system of body, specimen collection, routine haematological test: special tests, estimation of foetal Hb, screening for sickle cell anemia, Heinz body preparation, lupus erythematosus preparation, preparation of bone marrow smear, cytochemical test. Blood banking: Preparation for blood collection, laboratory preparation in blood bank, ABO blood grouping, Rh typing, anti-human globulin (AHG) or coomb's test, compatibility test/cross matching, blood transfusion process and transfusion reactions.

#### Unit III

**Immunology:** Immunity-Definition, classification, mechanism of innate and acquired immunity vaccines. Antigen: Definition, properties and types. Antibodies: Definition, structure, classification and functions. Complement system. Antigen-antibody reaction, different types of reaction, principle and application of antigen-antibody reactions.

**Unit IV:**

**Medical Microbiology:** Introduction to Medical Microbiology-Common methods of sterilization and disinfection-Common media and culturing methods used for bacterial growth. Antimicrobial susceptibility test. Virology: Morphology, pathogenicity and laboratory diagnosis of Hepatitis, AIDS and oncogenic viruses. Mycology: Morphology and laboratory diagnosis of superficial mycosis and deep Mycosis. Parasitology: Morphology, Life-cycle, Pathogenicity and Laboratory diagnosis of E. histolytica, Giardia, Trichomonas, Toxoplasma, Plasmodia and Leishmania.

**Unit V:**

**Laboratory establishment and management:** Space, ventilation, light, water, working benches, arrangement of rooms, laboratory safety, maintenance of records, students code, personal care. Computer laboratory information systems. Laboratory management: Balance sheet, profit loss statement, equity and cash flow, cost accounting. Total quality management of clinical laboratory. Laboratory statistics.

\* denotes Self study

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom
---

**Text Books**

1. Sood Ramnik. (2009). Textbook of Medical Laboratory Technology, 6<sup>th</sup> Ed, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.
2. Orchard G and Nation B. (2018). Histopathology. 2<sup>nd</sup> edition. Oxford University Press, Oxford, United Kingdom.

**Reference Books**

1. Shirley Mitchell Lewis, Barbara J. Bain, Imelda Bates (2006) Dacie And Lewis Practical Haematology, 10th Ed, Churchill Livingstone/Elsevier.
2. Carson FL and Cappellano CH. (2015). Histotechnology: A Self Instructional Text. 4<sup>th</sup> edition. American Society of Clinical Pathologists Press, Chicago, United States
3. Saunders WB. (2014). Cytology : Diagnostic Principles and Clinical Correlates. 4<sup>th</sup> edition. Elsevier Health Sciences, W B Saunders Co Ltd, London, United Kingdom
4. Teitz, Clinical Chemistry. W.B. Saunders Company Harcourt (India) Private Limited New Delhi.
5. Ananthanarayanan and Jayaram Paniker. (2005). Text Book of Microbiology. 6<sup>th</sup> edition Orient Longman, Hyderabad.

<b>Programme Code:</b> 07		<b>Programme Title:</b> M.Sc Biochemistry		
<b>Course Code:</b> 20PBC0F3		<b>Title:</b> Practical II		
Batch 2019-2020	Semester -	Hours / Week 2	Total Hours 60	Credits 4

### Course Objectives

1. To accomplish the information on routine analysis of blood and urine
2. To know the techniques of microbiology and immunology
3. To acquire knowledge on pathological techniques

### **Clinical pathology, Immunology and Microbiology:**

1. Haemoglobin Estimation – Sahli's and Drabkin's method
2. Total RBC and WBC Count
3. Differential Count
4. E.S.R. determination by Westergrener's method
5. Platelet Count
6. Prothrombin time / Partial Thromboplastin time
7. Lupus Erythematosus (L.E) Cell Preparation
8. ABO Grouping: Slide technique
9. Cross matching
10. Rh typing – Slide/tube test
11. Coombs test: Direct and Indirect coombs test
12. Routine examination of urine
13. Routine examination of stool
14. Routine examination of sputum
15. Fixation, Processing, Embedding, Section cutting and preparation of slides
16. Sharpening of Knives
17. Preparation of fixative and decalcifying fluid
18. Principles and working of laboratory instruments (Demonstration)
19. Preparation of buffer solutions and measurement of their pH
20. Estimation of Blood glucose – GOD-POD method
21. Estimation of Urea- DAM method
22. Estimation of Plasma protein – Biuret method
23. Estimation of serum Bilirubin- Diazo method, Uric acid, Creatinine, Cholesterol, HDL Cholesterol
24. Estimation of serum Chloride
25. Estimation of serum Sodium and Potassium (by flame photometer)



26. Estimation of SGOT
27. Estimation of serum Amylase
28. Estimation of serum ALP
29. Hanging drop technique for motility
30. Biochemical tests for identification of pathogens
31. Demonstration of malarial parasites

## PBC 116

### Question paper pattern

(External only)

#### 1. THEORY

Max Marks = 100

Time = 3.00 hrs

#### **SECTION - A**

(5 x 5=25 marks)

Short answer questions

*Q.No. 1-5: Either (a) or (b) short note type (One question 'a' or 'b' from each unit)*

#### **SECTION - C**

(5 x 15=75 marks)

Essay type of questions:

*Q.No. 6-10: Either (a) or (b) essay type (One question 'a' or 'b' from each unit)*

#### **2. PRACTICALS – Question Pattern & Break-up of marks**

### END OF SEMESTER PRACTICAL EXAMINATION

*Max. Marks: 100*

*Duration: 3hrs*

**I. Major** (One question) (1 x 20 = 20)

**II. Minor** (One question) (1 x 10 = 10)

**III. Spotters** (3 x 5 = 15)

Examine, identify and critically comment on the spotters A, B, C, D and E.

**IV. Viva** (05)

**V. Record / Observation\*** (10)

*\*Record for ESE; Observation for CIA exam.*