KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

COIMBATORE – 641 029

DEPARTMENT OF BIOCHEMISTRY (UG)

CURRICULUM AND SCHEME OF EXAMINATIONS (CBCS)
(2021 – 2022 ONWARDS)

KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

COIMBATORE- 641029

Vision:

- Developing the total personality of each and 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 values - moral and ethical.
- Designing the curriculum and offering courses that transform its 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.

DEPARTMENT OF BIOCHEMISTRY (UG)

Vision:

- To promote goal-oriented innovative teaching, interdisciplinary research by interfacing biochemistry with modern and applied biology to address problems affecting human health and welfare.
- Training scholars to be the next generation scientists

Mission:

- To generate new knowledge by teaching and engaging in cutting edge research and to promote academic growth by offering state of the art under graduate, post graduate and doctoral programmes.
- To identify, based on an informed perception of regional and global needs, area of specialization upon which the department can concentrate.
- To undertake collaborative projects which offer opportunities for long term interaction with academia and industries

PROGRAMME OUTCOME (PO)

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.

PO6: To acquire a broad foundation in chemical processes that stresses scientific reasoning and analytical problem solving with a molecular and biological perspective.

PO7: To develop the ability to think logically and clearly by articulation of thoughts, critical evaluation of experimental data and scientific literature.

PO8: To inculcate research culture in consonance with current trends in the field of biochemistry so as to develop broad scientific knowledge in the students.

PROGRAMME SPECIFIC OUTCOME (PSO)

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.

KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)
COIMBATORE –641029
Course Name: B.Sc Biochemistry
Curriculum and Scheme of Examination under CBCS

(Applicable to the students admitted during the Academic Year 2021-2022)

Semester	Part	Subject Code	Title of the Paper	Instruction hours/cycle	Exam. Marks			Duration of Exam(hours)	Credits
					CIA	ESE	TOTAL		
I	I	21TML101	Language I@	6	50	50	100	3	3
	II	21ENG101	English–I	6	50	50	100	3	3
	III	21UBC101	CorePaper1-Chemistry of Biomolecules	7	50	50	100	3	6
	III	-	Core Practical I-Biochemistry	2	-	-	-	-	-
	III	21UZO1A1	Allied Paper1–ZoologyI	5	30	45	75	3	4
	III	-	Allied Practical I–Zoology	2	-	-	-	-	-
	IV	21EVS101	Environmental Studies**	2	-	50	50	3	2
	Total			**30**	-	-		-	
II	I	21TML202	Language II@	6	50	50	100	3	3
	II	21ENG202	English–II	6	50	50	100	3	3
	III	21UBC202	Core Paper2–BioanalyticalTechniques	7	50	50	100	3	6
	III	21UBC2CL	CorePractical1–Biochemistry	2	50	50	100	3	2
	III	21UZO2A2	Allied A2–ZoologyII	5	30	45	75	3	4
	III	21UZO2AL	Allied Practical I–Zoology	2	25	25	50	3	2
	IV	21VED201	Value Education-Moral and Ethics**	2	-	50	50	3	2
			Total	**30**	-	-		-	
III	I	21TML303	Language III@	6	50	50	100	3	3
	II	21ENG303	English–III	6	50	50	100	3	3
	III	21UBC303	CorePaper3–Enzymes and Enzyme Technology	4	50	50	100	3	5
	III	-	Core Practical 2 Biochemistry	3	-	-	-	-	-
	III	21UCH3A3	Allied Paper B1–ChemistryI	5	30	45	75	3	4
		-	Allied Practical 2–Chemistry	2	-	-	-	-	-
	IV	21UGA3S1	Skill Based subject 1- General Awareness	2	50	50	100	2	3
	IV	21TBT301/21TAT 301/21UHR3N1	Basic Tamil*/Advanced Tamil**/ Non-major elective-I**	2	-	75	75	3	2
			Total	**30**	-	-		-	
IV	I	21TML404	Language IV@	6	50	50	100	3	3
	II	21ENG404	English–IV	6	50	50	100	3	3
	III	21UBC404	Core Paper4–Cell Biology	4	50	50	100	3	4
	III	21UBC4CM	Core Practical2–Biochemistry	3	50	50	100	3	2
	III	21UCH4A4	Allied B2–ChemistryII	5	30	45	75	3	4
	III	21UCH4AL	Allied Practical 2–Chemistry	2	25	25	50	3	2
	IV	21UBC4S2	Skill based subject 2-Techniques in Biotechnology	2	50	50	100	3	3
	IV	21TBT402/21TAT 402/21UWR4N2	Basic Tamil*/Advanced Tamil**/Non-major elective- II**	2	-	75	75	3	2
			Total	**30**				-	

V	III	21UBC505	Core Paper 5-Human Physiology	4	50	50	100	3	4
	III	21UBC506	Core Paper 6–Intermediary Metabolism	4	50	50	100	3	4
	III	21UBC507	Core Paper7–Clinical Biochemistry	4	50	50	100	3	4
	III	21UBC508	Core Paper8–Molecular Biology	4	50	50	100	3	4
	III	21UBC5E1	Major Elective1	4	50	50	100	3	5
		-	Core Practical3–Biochemistry	4	-	-	-	-	-
		-	Core Practical4–Biochemistry	2	-	-	-	-	-
		-	Core Practical5–Biochemistry	2	-	-	-	-	-
	IV	**21UBO/UZO/ UBT/UCH5X1**	**Extra Departmental Course (EDC)**	2	50	50	100	3	3
	-	**21UBC5IT**	**Internship Training******	Grade					
			Total	**30**	-	-		-	
VI	III	21UBC609	Core Paper 9–Plant Biochemistry	4	50	50	100	3	4
	III	21UBC610	Core Paper 10– Immunology and Immuno Techniques	4	50	50	100	3	4
	III	21UBC611	Core Paper11–Genetic Engineering	4	50	50	100	3	4
	III	21UBC6E2	Major Elective 2	4	50	50	100	3	5
	III	21UBC6Z1	Project***	4	50	50	100	-	5
	III	19UBC6CN	C.Pr.3 Biochemistry	4	50	50	100	6	3
	III	19UBC6CO	C.Pr.4 Biochemistry	2	50	50	100	4	2
	III	19UBC6CP	C.Pr.5 Biochemistry	2	50	50	100	4	2
	IV	21UBC6S3	Skill Based Subject3-Techniques in Genomics and Proteomics	2	50	50	100	3	3
			Total	**30**	-	-		-	
	V	21NCC/NSS/YRC/PYE/ECC/RRC/ WEC101#	Extension Activities*	-	50	-	50	-	1
Grand Total				**-**	**1770**	**2030**	**3800**	**-**	**140**

Note:

CBCS – Choice Based Credit system
CIA –Continuous Internal Assessment
ESE –End of Semester Examinations

@Hindi/Malayalam/French/Sanskrit–21HIN/MLM/FRN/SAN101-404

*****-No End-of-Semester Examinations. Only Continuous Internal Assessment (CIA)

******-No Continuous Internal Assessment (CIA).Only End-of-Semester Examinations(ESE)

***Project Report–30 marks; *Vivavoce*–20 marks; Internal-50marks.

**** The students shall undergo an Internship training / field work for a minimum period of 2 weeks at the end of the fourth semester during summer vacation and submit the report in the fifth semester. The report will be evaluated for 100 marks along with the internal viva voce by the respective Faculty. 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)

Major Elective Papers
(2papersareto bechosenfromthefollowing6 papers)

1. Microbiology
2. Basics of Bioinformatics
3. Biopharmaceuticals
4. Dairy Biochemistry
5. Biostatistics
6. Nutritional Biochemistry

Non-Major Elective Papers

1. Human Rights
2. Women's Rights
3. Consumer Affairs

Sub. Code &Title of the Extra Departmental Course(EDC):

21UBC5X1–DiagnosticBiochemistry

#List of Extension Activities:

1. National Cadet Corps(NCC)
2. National Service Scheme(NSS)
3. Youth Red Cross(YRC)
4. Physical Education(PYE)
5. Eco Club(ECC)
6. Red Ribbon Club(RRC)
7. Women Empowerment Cell(WEC)

Note:
In core / allied subjects, number of papers both theory and practicals are included wherever applicable. However, the total credits and marks for core/ allied subjects remain the same as stated below.

Tally Table:

S.No.	Part	Subject	Marks	Credits
1.	I	Language – Tamil/Hindi/Malayalam/French/Sanskrit	400	12
2.	II	English	400	12
3.	III	Core -Theory/Practical	1600	60
		Allied -Theory/Practical	400	20
		Electives/Project	300	15
4.	IV	Basic Tamil/Advanced Tamil (OR) Non-major electives	150	4
		Skill Based subject	300	9
		EDC	100	3
		Environmental Studies	50	2
		Value Education	50	2
5.	V	Extension Activities	50	1
		Total	**3800**	**140**

- 50 % CIA is applicable to all subjects except JOC, COP and SWAYAM courses which are considered as extra credit courses.
- The students should complete a **SWAYAM-MOOC** before the completion of the 5th semester and the course completed certificate should be submitted through the HOD to the Controller of Examinations. Two extra credits will be given to the candidates who have successfully completed.
- A**field Trip** preferably relevant to the course should be undertaken every year.

Components of Continuous Internal Assessment (50 Marks)

Components		Marks	Total
Theory			
CIA I	75	(75+75) converted to 30	50
CIA II	75		
Problem based Assignment**		10	
Attendance		5	
Others*		5	
Practical			
CIA Practical		(50) converted to 30	50
Observation Notebook		15	
Attendance		5	
Project			
Review		45	50
Regularity		5	

Components of Continuous Internal Assessment (30 Marks & 25 Marks)

Components		Marks	Total
Theory			
CIA I	45	(45+45) converted to 15	30
CIA II	45		
Problem based Assignment**		5	
Attendance		5	
Others*		5	
Practical			
CIA Practical		(25) converted to 10	25
Observation Notebook		10	
Attendance		5	

* Class Participation, Case Studies Presentation, Field Work, Field Survey, Group Discussion, Term Paper, Workshop/Conference Participation. Presentation of Papers in Conferences, Quiz, Report/Content writing. Etc.

** Two Assignments to be given. (Each 5 marks).

UBC5
BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

(K1-Remembering;**K2**-Understanding;**K3**-Applying;**K4**-Analyzing;**K5**-Evaluating)

Theory Examination – Part I, II, III & Certificate Courses

i) CIA I & II and ESE: 75 Marks

Knowledge Level	Section	Marks	Description	Total
K1 – K2 Q1 to 20	A (Answer all)	20 x 1 = 20	MCQ-10/ Fill ups-5/ One word-5	75**
K2 – K5 Q21 to 28	B (5 out of 8)	5 x 5= 25	Short Answers	
K2 – K5 Q29 to 33	C (3 out of 5)	3 x 10 = 30	Descriptive / Detailed	

****For ESE 75 marks converted to 50 marks.**

ii) CIA I & II and ESE: 45 Marks

Knowledge Level	Section	Marks	Description	Total
K1 – K2 Q1 to 10	A (Answer all)	10 x 0.5 = 5	MCQ	45
K2 – K5 Q11 to 15	B (either or type)	5 x 3 = 15	Short Answers	
K2 – K5 Q16 to 20	C (either or type)	5 x 5 = 25	Descriptive / Detailed	

ESE Practical Examination: Part III & Certificate Courses

Knowledge Level	Section	Marks	Total
K3	Experiments	40	50
K4	Record Work	10	
K5			

Knowledge Level	Section	Marks	Total
K3	Experiments	20	25
K4	Record Work	05	
K5			

ESE Project Viva Voce: Part III & Certificate Courses

Knowledge Level	Section	Marks	Total
K3	Project Report	30	50
K4	Viva voce	20	
K5			

21UBC101

Programme Code: 07		**B.Sc. Biochemistry**		
Course Code: 21UBC101		**Core Paper 1 – CHEMISTRY OF BIOMOLECULES**		
Batch 2021-2022	Semester I	Hours / Week 7	Total Hours 105	Credits 6

Course Objectives

i) To learn the chemistry and structure of different biomolecules
ii) To understand the biological significance of different biomolecules
iii) To learn the Elementary treatment on structure of proteins.

Course Outcomes (CO)

K1 to K5	CO1	Define the functions and properties of carbohydrates, lipids, amino acids, proteins and nucleic acids
	CO2	Classify the biomolecules according to their structures
	CO3	Sketch the basic structure of biomolecules and reactions involving them
	CO4	Distinguish different types of sugars, fats, amino acids and proteins based on the physical, chemical and biological aspects
	CO5	Describe the various types of nucleic acids and their structures

Total hours: 105

UNIT I (12 hrs)

Carbohydrates

Carbohydrates: Definition and Classification. Monosaccharides – Structural aspects-asymmetric carbon atom, D and L isomers, anomers, optical activity and mutarotation. Epimers: pyranose and furanose forms, aldo and keto forms, classification, definition, structure and biological importance.

Hexoses: glucose, fructose, galactose and mannose. Pentoses: Ribose and deoxyribose. Disaccharides: Maltose, sucrose and lactose.

Polysaccharides: Homopolysaccharides:-Starch, glycogen, cellulose, inulin and chitin, Heteropolysaccharides:- Heparin, hyaluronic acid, chondroitin sulphates. Reactions of monosaccharides- Oxidation of glucose (aldonic acid, aldaric acid and uronic acid).

Action of alkalies with sugars, reducing action of sugars in alkaline solution and reaction with phenyl hydrazine.

21UBC101

UNIT II (12 hrs)

Lipids:

Classification and properties of lipids. Types of fatty acids: saturated and unsaturated Essential fatty acids. Classification and significance of phospholipids: Phosphatidyl choline, phosphatidyl ethanolamine, phosphatidyl serine, phosphatidyl inositol and sphingomyelin.

Classification and significance of glycolipids: Cerebrosides and gangliosides. Classification and functions of lipoproteins*. Structure and biological functions of cholesterol.

UNIT III (12 hrs)

Amino acids:

Introduction; definition; classification of amino acids based on structure, side chain metabolism and nutritional requirements. Properties of amino acids – ampholyte and isoelectric point, optical activity. General reactions of amino acids: due to carboxylic group – decarboxylation and amide formation; due to amino group – transamination and oxidative deamination; due to side chain– transmethylation and ester formation.

UNIT IV (12 hrs)

Proteins:

Introduction, general properties, classification and functions. Bonds relating to protein structure – strong bonds (peptide and disulphide bonds) - weak bonds (hydrogen and hydrophobic bonds).

Elementary treatment on structure of proteins – primary, secondary, tertiary and quaternary structure. Denaturation and Renaturation. The amino acid substitution disorder eg. Sickle cell anemia.

UNIT V (12 hrs)

Nucleic acids:

Introduction; Types of nucleic acids; Structure of purine (A and G) and pyrimidine (C,U,T, dihydrouridine and pseudo uridine) bases.

Structure of nucleotides – AMP, dAMP, GMP, dGMP, CMP, dCMP , TMP , UMP. Structure of DNA – Watson and Crick model.

Structure of RNA – mRNA, tRNA and rRNA. Denaturation and Renaturation.

Teaching Methods

Chalk and board/Power point presentation/Seminar/Quiz/Discussion/Assignment

21UBC101

Text Books

1. U. Satyanarayana and U. Chakrapani (2013). Biochemistry. Elsevier and Books & Allied (P)Ltd. Kolkata.
2. Ambika Shanmugam (2008), Fundamentals of Biochemistry for Medical Students, 7th ed., Published by the Author, Chennai – 600035.
3. Deb, A.C. (2011), Fundamentals of Biochemistry, 10th ed., New Central Book Agency Pvt. Ltd., Kolkata 700009.

Reference Books

1. Voet, D., Voet, J.G. and Pratt, C.W. (2013), Fundamentals of Biochemistry, Life at the Molecular Level, 4th ed., John Wiley & Sons, New Delhi,110002.
2. Harper, David a Bender (2015) ,Text book of Harper illustrated Biochemistry, Mc graw hill education, Newyork.
3. APA. Nelson, D. L., & Cox, M. M. (2017). Lehninger principles of biochemistry (7th ed.). W.H. Freeman, Chicago.
4. Vasudevan, DM., Sreekumari, S. and Kannan Vaidyanathan (2011), Text Book of Biochemistry for Medical Students, 6th ed., JAYPEE Brothers Medical Publishers Pvt. Ltd., New Delhi,110002.
5. Robert K. Murray, Daryl K. Grannerand Victor W.Rodwell (2008), 29th ed.,Harper"sIllustrated Biochemistry. McGraw Hill Companies, Inc. New Delhi.
6. J.L.Jain, Sanjay Jain and Nitin Jain, 1997, "Fundamentals of. Biochemistry" (6th. Edition) New Delhi.

** Questions may also be taken from the self-study portion*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	S
CO2	S	H	S	M	S
CO3	S	H	H	S	H
CO4	H	S	S	H	M
CO5	S	H	S	H	M

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

21UBC2CL

Programme Code: 07		**B.Sc Biochemistry**		
Course Code: 21UBC2CL		**C.Pr.1. BIOCHEMISTRY (Lab)**		
Batch 2021-2022	Semester I & II	Hours / Week 2	Total Hours 60	Credits 2

Course Objectives

- To acquire skill of analyzing carbohydrates and amino acids.
- To provide practical knowledge about the characterization of lipids.
- To learn the methodology of separation of amino acids by paper chromatography.

Course Outcomes (CO)

K3 to K5	CO1	Learn the reagent preparation methods for qualitative analysis of biomolecules
	CO2	Practice the qualitative analysis of different carbohydrates and amino acids through individual experiments
	CO3	Practice the qualitative analysis of different amino acids through individual experiments
	CO4	Calculate iodine number of lipids, thereby characterizing them
	CO5	Assess the separation technique of amino acids through paper chromatography

Total Hours: 30

Analysis of Biomolecules

I. Qualitative Analysis of Carbohydrates

a. Monosaccharides -Hexoses: Glucose and fructose. Pentose: Arabinose

b. Disaccharides -Sucrose and Lactose

c. Polysaccharides -Starch

21UBC2CL

II. Qualitative Analysis of Amino acids

a. Arginine

b. Histidine

c. Tyrosine

d. Tryptophan

e. Cysteine

III. Characterization of Lipids (Group Experiment)

Determination of Iodine number

IV. Separation Technique (Demonstration)

Separation of amino acids by paper chromatography

Reference Books:

1. Jayaraman. J. (2011), Laboratory Manual in Biochemistry, 2nd edition, New age International Pvt, Delhi
2. Gupta. R.C and Bharghava. S (2013), Practical Biochemistry, 5th edition, CBS Publishers and Distributors, New Delhi.
3. David. T. Plummer, (2004), An Introduction to Practical Biochemistry, 3rd edition, Tata McGraw Hill Publishing Company Ltd, NewDelhi.
4. Sadhasivam. S. and Manickam. A. (2008). Biochemical Methods, 3rd ed., New Age International Publishers Ltd, NewDelhi.
5. E.J.Wood (1989) Practical Biochemistry colleges, Elsevier, Pergamon.
6. J.L.Jain, Sanjay Jain and Nitin Jain, 1997, "Fundamentals of. Biochemistry" (6th. Edition) New Delhi.

UBC12

21UBC2CL

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	S	S	M
CO2	S	S	S	S	H
CO3	S	S	H	S	H
CO4	H	S	S	H	S
CO5	S	S	H	S	S

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

UBC13

SEMESTER I

21EVS101

Title: For B.A., BBA, B.Com, BCA and B.Sc., Degree Students				
PART IV – ENVIRONMENTAL STUDIES				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**I**	**2**	**30**	**2**

Course Objectives

- The course will provide students with an understanding and appreciation of the complex interactions of man, health and the environment. It will expose students to the multi-disciplinary nature of environmental health sciences
- To inculcate knowledge and create awareness about ecological and environmental concepts, issues and solutions to environmental problems.
- To shape students into good "Ecocitizens" thereby catering to global environmental needs.
- This course is designed to study about the types of pollutants including gases, chemicals petroleum, noise, light, global warming and radiation as well as pollutant flow and recycling and principles of environmental pollution such as air, water and soil
- The course will address environmental stress and pollution, their sources in natural and workplace environments, their modes of transport and transformation, their ecological and public health effects, and existing methods for environmental disease prevention and remediation.

Course Outcomes

On successful completion of the course, the students will be able to

K1 To K5	CO 1	Understand how interactions between organisms and their environments drive the dynamics of individuals, populations, communities and ecosystems
	CO2	Develop an in depth knowledge on the interdisciplinary relationship of cultural, ethical and social aspects of global environmental issues
	CO3	Acquiring values and attitudes towards complex environmental socio-economic challenges and providing participatory role in solving current environmental problems and preventing the future ones
	CO4	To gain inherent knowledge on basic concepts of biodiversity in an ecological context and about the current threats of biodiversity
	CO5	To appraise the major concepts and terminology in the field of environmental pollutants, its interconnections and direct damage to the wildlife, in addition to human communities and ecosystems

UBC14

21EVS101

UNIT I: MULTIDISCIPLINARY NATURE OF ENVIRONMENT (6 hrs)

Definition : scope and importance – Need for public awareness - Natural resources – Types of resources – Forest Resources – Water Resources – Mineral Resources – Food Resources – Energy Resources – Land Resources.

UNIT II: ECOSYSTEMS (6 hrs)

Concept of an ecosystem – Structure and functions of an ecosystem – Procedures, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food web and ecological pyramids – Structure and function of the following ecosystem – Forest Ecosystem – Grassland Ecosystem – Desert Ecosystem – Aquatic Ecosystem.

UNIT III: BIODIVERSITY AND ITS CONSERVATION (6hrs)

Introduction – Definition – Genetic – Species and ecosystem diversity- Bio geographical classification of India – Value of biodiversity – Biodiversity at global, national and local levels – India as a mega - diversity Nation - Hot spot of biodiversity – Threats to biodiversity - Endangered and endemic species of India – Conservation of Biodiversity – *In situ* Conservation of Biodiversity – *Ex situ* Conservation of Biodiversity

UNIT IV: ENVIRONMENTAL POLLUTION (6 hrs)

Definition - Causes, effects and control measures of : Air Pollution – Water Pollution – Soil Pollution – Marine Pollution – Noise Pollution – Thermal Pollution – Nuclear Pollution – Solid Waste Management: Causes, effects, control measures of urban and industrial wastes – Role of individual in prevention of pollution – Pollution case studies – domestic waste water, effluent from paper mill and dyeing, cement pollution – Disaster Management – Food, Drought, Earthquake, Tsunami, Cyclone and Landslide.

UNIT V: SOCIAL ISSUES AND THE ENVIRONMENT (6 hrs)

Sustainable Development – Smart City, Urban planning, Town Planning , Urban problems related to energy – Water Conservation: Rain Water Harvesting and Watershed Management – Resettlement and rehabilitation of people, its problems and concerns, case studies Narmatha Valley Project – Environmental ethics, issues and possible solutions – Climate change, global warming, ozone layer depletion, acid rain, nuclear accidents and holocaust, case studies – Hiroshima and Nagasaki, Chernobyl – Consumerism and waste products – Environmental Protection Act – Air Pollution Act (Prevention and Control) – Water Pollution Act (Prevention and control) – Wild Life Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness – Human Population and the environment – Population Growth and Distribution – Population Explosion – Family Welfare Programme – Environment and Human Health – Human Rights – Value Education – HIV/ AIDS – Women and Child Welfare – Role of Information Technology in Environment and Human Health.

21EVS101

Text Book

1.P.Arul, A Text Book of Environmental Studies, Environmental Agency, No 27, Nattar street, Velacherry main road, Velacheery, Chennai – 42, First Edition, Nov.2004.

References

1. Purohit Shammi Agarwal, A text Book of Environmental Sciences, Publisher Mrs.Saraswati Prohit, Student Education , Behind Naswan Cinema Chopansi Road, Jodhpur.
2. Dr.Suresh and K.Dhameja, Environmental Sciences and Engineering , Publisher S.K.Kataria & Sons, 424/6, Guru Nanak Street, Vaisarak, Delhi -110 006.
3. J.Glynn Henry and Gary W Heinke, Environmental Science and Engineering, Prentice Hall of India Private Ltd., New Delhi – 110 001

UBC16

21UBC202

Programme Code: 07		**B.Sc. Biochemistry**		
Course Code: 21UBC202		**Core Paper 2- BIOANALYTICAL TECHNIQUES**		
Batch	Semester	Hours / Week	Total Hours	Credits
2021-2022	II	7	105	6

Course Objectives

1. To know the various types of buffer systems in blood and plasma and its significance in the maintenance of blood pH
2. To understand the principle, materials, methods and applications of chromatography, electrophoresis and colorimetry.
3. To detect and measure the radioactivity and explore its role in biological and clinical fields.

Course Outcomes (CO)

K1 to K5	CO1	Recall the definition of acids, bases and buffers.
	CO2	Describe the various buffer systems present in blood and plasma, and their role in maintaining the blood pH and various bioanalytical techniques.
	CO3	Demonstrate the types and techniques of chromatography, electrophoresis and colorimetry.
	CO4	Analyze the separated/purified components from the samples by chromatography, electrophoresis and colorimetry.
	CO5	Describe the radioactivity types and their applications.

Total Hours: 105

UNIT I (12 hrs)

Acids, bases, pH scale, ionization-pKa, derivation of Henderson - Hassel Balch equation for acids and bases, buffer solutions, buffer systems of blood and RBC, hemoglobin buffer system. pH indicators.

pH meter. Various ways of expressing the concentrations of solutions – normality, molarity and percentage solution*

UNIT II (12 hrs)

Chromatography: Principle, technique and applications of paper, thin layer, column, ion exchange, molecular sieve and affinity chromatography. HPLC and Gas Chromatography- Mass Spectrometry (GCMS) - technique and applications.

UNIT III (12 hrs)

Electrophoresis: Principle, factors affecting, instrumentation and applications of agarose gel, SDS-PAGE, isoelectric focusing and immune electrophoresis.

Centrifugation – Svedberg unit, Types-density gradient, differential and ultra-centrifuge.

UNIT IV (12 hrs)

Colorimetry –Derivation of Lambert's and Beer law, principle, components, instrumentation and working of a single cell photo electric colorimeter, UV and IR spectrophotometer. Comparison and applications of colorimeter and spectrophotometer.

UNIT V (12 hrs)

Radioactivity: Types of Radioactive decay, Units of radioactivity (Curie, Rutherford and Becquerrel), detection and measurement of radioactivity by scintillation counter – solid and liquid scintillators, counting efficiency and factors affecting counting efficiency. Advantages and disadvantages of scintillation counting. Autoradiography and applications. Applications of radioisotopes in medical diagnosis, archeology, industries and agriculture.

Teaching Method

Chalk and Board/Power point presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Asokan, P (2006), Basics of Analytical Biochemical Techniques, Chinna Publications. Melvisharam, Tamil Nadu.
2. Ambika Shanmugam (2008), Fundamentals of Biochemistry for Medical Students, 7thed., Published by the Author, Chennai – 600035.
3. Jayaraman. J. (2011), Laboratory Manual in Biochemistry, 2nd edition, New age International Pvt, Delhi

Reference Books:

1. Sadhasivam. S. and Manickam. A. (2008). Biochemical Methods, 3rd ed., New Age International Publishers Ltd, NewDelhi
2. Skoog. D.A., West. D.M, James H. F., Crouch. S.R., (2008), Fundamentals of Analytical Chemistry, 4th edition, Barkha Nath Printers, India.
3. Wilson. K. and Walker. J. (2011), Principles and Techniques of Biochemistry and Molecular Biology, 7thed, Cambridge University Press, New York.
4. David. T. Plummer, (2004), An Introduction to Practical Biochemistry, 3rd edition, Tata McGraw Hill Publishing Company Ltd, New Delhi.
5. APA. Nelson, D. L., & Cox, M. M. (2017). Lehninger principles of biochemistry (7th ed.). W.H. Freeman, Chicago.
6. E.J.Wood (1989) Practical Biochemistry colleges, Elsevier, Pergamon.

**Question may also be taken from self-study portion*

UBC18

21UBC202

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	S	H
CO2	H	S	M	S	S
CO3	S	H	H	S	H
CO4	H	H	S	S	H
CO5	H	H	S	S	H

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

UBC19

SEMESTER-II

Programme Code: 01	All UG First years		
MORAL AND ETHICS			
Batch 2021-2022	**Hours / Week** 2	**Total Hours** 30	**Credits** 2

Course Objectives

- To impart Value Education in every walk of life.
- To help the students to reach excellence and reap success.
- To impart the right attitude by practicing self-introspection.
- To portray the life and messages of Great Leaders.
- To insist the need for universal brotherhood, patience and tolerance.
- To help the students to keep them fit.
- To educate the importance of Yoga and Meditation.

Course Outcomes (CO)

After completing the course the students:

K1 to K5	CO1	will be able to recognize Moral values, Ethics, contribution of leaders, Yoga and its practice
	CO2	will be able to differentiate and relate the day to day applications of Yoga and Ethics in real life situations
	CO3	can emulate the principled life of great warriors and take it forward as a message to self and the society
	CO4	will be able to Analyse the Practical outcome of practicing Moral values in real life situation
	CO5	could Evaluate and Rank the outcome of the pragmatic approach to further develop the skills

UBC20

Syllabus

UNIT I: (4 hrs)

Moral and Ethics: Introduction – Meaning of Moral and Ethics – Social Ethics – Ethics and Culture – Aim of Education.

UNIT II: (6 hrs)

Life and Teachings of Swami Vivekananda: Birth and Childhood days of Swami Vivekananda – At the Parliament of Religions – Teachings of Swami Vivekananda

UNIT III: (4 hrs)

Warriors of our Nation: Subhas Chandra Bose – Sardhar Vallabhbhai Patel – Udham Singh – V. O. Chidambaram Pillai – Bhagat Singh – Tiruppur Kumaran – Dheeran Chinnamalai – Thillaiaadi Valliammai – Velu Nachiyar – Vanchinathan

UNIT IV: (8 hrs)

Physical Fitness and Mental Harmony: Simplified Physical Exercise – Hand Exercises – Leg Exercises – Neuro Muscular Breathing Exercises – Eye Exercises – Kabalabathi – Maharasana A & B – Massage - Acupressure – Relaxation – Kayakalpa Yogam - LifeForce – Aim & Objectives – Principle – Methods. Introspection – Analysis of Thoughts – Moralization of Desires – Neutralization of Anger – Eradication of Worries

UNIT V: (8 hrs)

Yoga and Meditation – The Asset of India: Yogasanam – Rules & Regulations – Surya Namaskar – Asanas –Sitting – Stanging – Prone - Supine - Pranayama – Naadi Sudhi – Ujjayi – Seethali – Sithkari - Benefits. Meditation – Thanduvasudhi - Agna – Shanthi – Thuriyam – Benefits.

Text Books:

Value Based Education – Moral and Ethics – Published by Kongunadu Arts and Science College (Autonomous), First Edition (2020).

Reference Books:

1. Swami Vivekananda – A Biography, Swami Nikhilananda, Advaita Ashrama, India, 24th Reprint Edition (2010).
2. Gandhi, Nehru, Tagore and other eminent personalities of Modern India, Kalpana Rajaram, Spectrum Books Pvt. Ltd., revised and enlarged edition(2004).
3. Freedom Fighters of India, Lion M.G. Agrawal, Isha Books Publisher, First Edition (2008).
4. Easy steps to Yoga by Swami Vivekananda, A Divine Life Society Publication(2000).
5. Yoga Practices - 1 – The World Community Service Centre – Vethathiri Publications, Sixth Edition (2017),Erode.
6. Yoga Practices - 2 – The World Community Service Centre – Vethathiri Publications – Eighth Edition (2017),Erode.

UBC21

21UBC303

Programme Code:07		**B.Sc. Biochemistry**		
Course Code: 21UBC303		**Core Paper III – ENZYMES AND ENZYME TECHNOLOGY**		
Batch	Semester	Hours / Week	Total Hours	Credits
2021-2022	III	4	60	5

Course Objectives

1. To perceive knowledge about enzymes and their kinetics.
2. To study about the coenzymes and their roles in the biological system.
3. To know about the recent enzyme technologies and their applications for diagnostic purpose.

Course Outcomes (CO)

K1 To K5	CO1	Remember the role of enzymes in biological system
	CO2	Acquire thorough knowledge on the enzyme kinetics and inhibition.
	CO3	Deploy the properties and functions of coenzymes and cofactors.
	CO4	Analyze the biological importance of immobilized enzymes and applications
	CO5	Understand the types of biosensors, and Artificial enzymes

Total Hours: 60

UNIT I (12 Hrs)

Enzymes: Introduction, Definition, International Classification of enzymes, Numbering and nomenclature. Enzyme unit (IU). Principles of enzyme catalysis. Definition of active sites. Theories proposed – Lock and Key or template model and induced fit model, ordered and random binding of substrate. Enzyme specificity – Group specificity and optical specificity. Turnover number. Enzyme activity and factors affecting the rate of enzyme activity – effect of temperature, pH, enzyme concentration and substrate concentration.

UNIT II (12Hrs)

Enzyme Kinetics: Derivation of Michalies -Mentons equation, transformation of MM equation, Line-Weaver Burk plot. Regulatory enzymes, allosteric enzymes. Enzyme inhibition: competitive, non-competitive and uncompetitive enzyme inhibition. Feedback inhibition.

21UBC303

UNIT III (12 Hrs)

Coenzymes: Definition; structure and functions of thiamine pyrophosphate, nicotinamide adenine dinucleotide, nicotinamide adenine dinucleotide phosphate, Flavin mono nucleotide, Flavin adenine dinucleotide, coenzyme A, lipoic acid, biotin and folate coenzymes. Cofactors**:** Definition and Examples*

UNITIV (12 Hrs)

Enzyme technology: Immobilized enzymes: sources and techniques of immobilization – adsorption, entrapment, microencapsulation, covalent binding and cross linking. Choice of immobilization techniques. Industrial, analytical and medicinal applications of immobilized enzymes.

UNIT V (12Hrs)

Uses of enzymes in analysis: Enzymes of diagnostic importance, Isoenzymes: Definition with example – Lactate dehydrogenase. ELISA.

Biosensors: Principle, types and components of Colorimetric, potentiometric and optical immune sensors, Artificial enzymes: abzymes, synzymes and ribozymes.

Teaching Methods

Chalk and board/Power point presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Anil Kumar & Sarika Garg, (2015), Enzymes and Enzyme Technology, Viva books, New delhi**.**
2. U. Sathyanarayana (2013). Biochemistry 4th edition. Elsevier health sciences. Elsevier India.
3. Martinek, R.: Practical Clinical Enzymology: *J. Am. Med. Tech.*, *31,* 162 (1969).

Reference Books:

1. D. Balasubramanyam, CFA. Bryce, K. Dharmalingham, J. Green, Kunthala Jayaraman, (2007), Concepts in Biotechnology, Universities Press (India) Pvt Ltd, Hyderabad.
2. Talwar. G.P (2012), Text book of biochemistry and Human Biology, 3rd edition, Prentice Hall of India Private Ltd, New Delhi.
3. EE. Conn and PK. Stumpf, G. Bruening and RY. Doi (2010), Outlines of biochemistry, 5th ed, John Wiley and Sons, New York, USA.
4. David L Nelson, Micheal M Cox(2008), Lehninger‟s Principles of Biochemistry, Replikapress (P) Ltd, India.
5. Palmer & Bonner (2007).Enzymes, Biochemistry, Biotechnology, Clinical Chemistry, 2nd Ed, Elsevier publications, India.
6. Nicholas C. Price and Lewis Stevens (2003). Fundamentals of enzymology. Oxford university press. New York. USA.

** Questions may also be taken from the self-study portion*

UBC23

21UBC303

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	S	S
CO2	S	S	S	S	S
CO3	S	H	H	S	H
CO4	H	H	S	S	S
CO5	H	S	S	H	S

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

UBC24

21UBC4CM

Programme Code: 07		**B.Sc. Biochemistry**		
Course Code: 21UBC4CM		**Title: C.Pr.2 BIOCHEMISTRY**		
Batch 2021-2022	Semester III & IV	Hours / Week 3	Total Hours 90	Credits 2

Course Objectives

1. To perceive knowledge about λ max of the substances.
2. To learn about the methods to quantify the components colorimetrically.
3. To learn about the factors influencing the enzyme activity.

Course Outcomes (CO)

K3 to K5	CO1	Recalling the preparation of reagents.
	CO2	Understanding the principles of techniques.
	CO3	Carrying out the experiments using various techniques.
	CO4	Techniques are used to analyze the components both qualitatively and quantitatively.
	CO5	Carrying out the experiments using various enzymes factors

Total Hours : 30

List of Programs

I. COLORIMETRY

1. Estimation of glucose - Ortho-Toluidine method.
2. Estimation of Phosphorus - Fiske & Subbarrow method.
3. Estimation of urea – DAM – TSC method.
4. Estimation of protein - Lowry's method.
5. Estimation of creatinine – Alkaline- Picrate method.
6. Estimation of uric acid - Caraway method.

21UBC4CM

II. PREPARATION OF BUFFER SOLUTIONS [Group experiment]

1. Determination of pH using pH meter.

2.Preparation of buffer solutions.

a. Acetate buffer - pH range- 3.6 -5.6.
b. Phosphate buffer - pH range- 5.8 -8.0.

III. ENZYMOLOGY

a. Effect of pH on the activity of **acid phosphatase**

b. Effect of temperature on the activity of **acid phosphatase**

c. Effect of enzyme concentration on the activity of **acid phosphatase**.

d. Effect of substrate concentration on the activity of **acid phosphatase**

e. Determination of **acid phosphatase** activity

IV. TECHNIQUE (Demonstration Experiments)

1. Determination of absorption maximum (λ max) of any two biochemical substances using UV-VISIBLE Spectrophotometer.

2. Identification of DNA using UV –VISIBLE Spectrophotometer.

Reference Books

1. Jayaraman. J. (2011), Laboratory Manual in Biochemistry, 2nd edition, New age International Pvt, Delhi
2. Sadhasivam. S. and Manickam. A. (2008). Biochemical Methods, 3rd ed., New Age International Publishers Ltd, NewDelhi.
3. Martinek, R.: Practical Clinical Enzymology: *J. Am. Med. Tech.*, *31*, 162 (1969).
4. Gupta. R.C and Bharghava. S (2013), Practical Biochemistry, 5th edition, CBS Publishers and Distributors, New Delhi.
5. David. T. Plummer, (2004), An Introduction to Practical Biochemistry, 3rd edition, Tata McGraw Hill Publishing Company Ltd, New Delhi.
6. E.J.Wood (1989) Practical Biochemistry colleges, Elsevier, Pergamon.

UBC26

21UBC4CM

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	S
CO2	S	S	H	S	H
CO3	S	S	S	S	H
CO4	H	S	S	H	S
CO5	H	S	S	H	S

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

UBC27

21UGA3S1

Programme Code: 01			
SBS I – GENERAL AWARENESS			
Batch 2021-2022	**Hours / Week** 2	**Total Hours** 30	**Credits** 3

Course Objectives

1. To acquire knowledge in relation to various competitive examinations.
2. To encourage the students to newspaper reading and journals.
3. To familiarise the students with online examinations which are being adopted in competitive examinations.

Course Outcomes (CO)

K1 to K5	CO1	Knowledge about literature, Reasoning, Science and Technology and Youth Red Cross.
	CO2	Remembering important data on general knowledge
	CO3	Make use of the data for competitive examinations
	CO4	Analyse social phenomena
	CO5	Comprehend a glimpse and overview of civil service exams.

Syllabus

UNIT I (6 Hours)

1. Tamil and other Literatures

Tamil, English, Christian and Muslim Literatures – Ancient Literature – Bakthi Literature – Epics – Medieval Literature – Modern Literature (Novel, Dramas, Short Stories, Modern Poetry).

2. Economics and Commerce

Basic Economics – Auditing – Management – Capital Market – Foreign Trade – Companies – Banking.

3. Social studies

Indian History – Inventions – Indian Poetry – Constitution - Judiciary – Languages – Literacy – Indian Geography – Lithosphere – Climate – Soil – Agriculture – Population.

UNIT II (6 hours)

4. Numerical Aptitude

Objective Arithmetic : Number systems – probability – HCF and LCM of numbers - decimal fractions – simplification – squareroots and cuberoots – average – percentage – profit and loss – ratio and proportion – time and work – simple interest – area, volume and surface area**.**

5. Verbal Aptitude

Spot the odd one out – correct form of verb – preposition – find out the rightly spelt word – choose the correct meaning of idioms – synonyms and antonyms.

6. Abstract Reasoning

Logic Reasoning : Logic – statement – arguments – statement assumptions – Statement course of action – theme detection – deriving conclusion from passages.

Non – verbal Reasoning : Series – analogy – classification – analytical reasoning – mirror images – water images – paper folding – paper cutting – rule detection – grouping of identical figures.

UNIT III (6 hours)

7. General Science and Technology

SCIENCE - Basic principles and concepts in Physics, Chemistry, Botany and Zoology.

TECHNOLOGY - Metallurgy, instrumentation, discoveries and inventions of techniques.

8. Computer Science

Historical evolution of computers – Computer applications – Data processing concepts – Computer codes and arithmetic – Hardware components – Data Structures.

9. Education

Development process of the learner – Principles of development (physical, social, emotional and intellectual) – Learning process – Teaching and teacher behaviour – Interaction analysis

– Microteaching – Teacher as a leader – Motivation – Personality dimension – concept of mental health – Counselling.

UNIT IV (6 hours)

10. Library and Information Science

Library and Information Science – Basics, Computer, Library Network and others like Research, Reprography etc.

11. Sports and Games

Athletics – Track Events – Field Events – Games – Indoor Games – Outdoor Games – General knowledge – Sport and Olympics – First Aid.

12. Current Affairs

State, Central and International affairs: Budgets – Politics – Sports – Education – Commerce and Industry – Inventions – Science and Technology – Currency – Agriculture – Movies – Guinness records – Awards – IT Industry – Space Research – Defence etc.

UNIT V (6 hours)

13. National Cadet Corps (NCC)

Introduction to the Armed Forces (Army, Navy, Air Force) – Dril – Weapon Training – Map Reading – Civil Defence.

14. National Service Scheme (NSS)

History of NSS – History of Motto, Symbol, Badge – Aims and Objectives – Duties and Total Hours – Organisational and Administrational setup – History of voluntary organization – Regular activities – Special camp activities – Special programmes – awards – Important days.

15. Youth Red Cross (YRC)

History of International Red Cross – History of Indian Red Cross – History of Youth Red Cross – Main objectives of YRC – Emblem – Fundamental principles of Red Cross – Organizational Setup – Activities of Youth Red Cross – Role of different functionaries – Training programmes for YRC Program Officers – Training programme for YRC Volunteers – YRC Song – Working Hours – General orientation – Special orientation – Program skill learning.

Text Book

1. **General Awareness Question Bank**. Kongunadu Arts and Science College, Coimbatore, First Edition 2014.

Reference Books

1. **General Knowledge Manual 2007**, Tata McGraw Hill Publication Company Limited, New Delhi, 2007.
2. Edgar Thorpe and Showick Thorpe, **The Pearson General Knowledge Manual 2013**, Dorling Kindersley India Pvt. Ltd, 2013.
3. Dr. Sanjay R Agashe, Introduction to **Physical Education Fitness and Sports**, Koncept Book, Uttarkhand, 2007.

Teaching Methods

Quiz/Discussion

21UBC404

Programme Code: 07		**B.Sc Biochemistry**		
Course Code: 21UBC404		**Core Paper 4 – CELL BIOLOGY**		
Batch	Semester	Hours / Week	Total Hours	Credits
2021-2022	IV	4	60	4

Course Objectives

1. To perceive knowledge about structure of animal cell membrane and its function.
2. To study about the mechanism of protein sorting and transport in the biological system.
3. To know about the cell cycle and about cancer development.

Course Outcomes (CO)

K1 to K5	CO1	Appreciates and understands the dynamic nature of the cell, including how it occurs and response to the information from its environment.
	CO2	Remembers the different mechanism of receptor activation and regulation.
	CO3	Explores the role of growth hormones in the biological system
	CO4	Predict how alterations or given drugs or chemical treatment would impact cell behavior
	CO5	Describe the Cancer and their types, Tumor suppressor genes function and their products

Total Hours :60

UNIT I (12Hrs)

Cell membrane–Introduction to cell and its organelles, cell theory, comparison between plant and animal cell. Fluid Mosaic Model: Biochemical composition (membrane carbohydrates, membrane proteins and membrane lipids) and functions. Membrane transport: Passive transport–simple diffusion and facilitated diffusion, Active transport–simple active transport and specific transporters antiport and symport, bulk transport-phagocytosis and endocytosis.

UNIT II (12Hrs)

Protein Sorting and Transport: The endoplasmic reticulum: Protein secretion, Targeting proteins to ER, Protein folding and processing. Smooth ER and post translational modification. Ribosomes: Organization, types and function. Golgi apparatus: Organization, protein glycosylation and transportation of proteins. Lysosomes: Acid hydrolases, endocytosis and lysosome formation. Autophagy and phagocytosis

21UBC404

UNIT III (12Hrs)

Cytoskeleton: Chemistry, Organization and function of Microtubules, Microfilaments and Intermediate filaments.

The nucleus: Structure of nuclear envelope; nuclear pore complex; Nucleolus RNA genes–transcription and processing of RNA. Cell division: mitosis and meiosis*.

UNIT IV (12Hrs)

Cell signaling: Modes of cell – cell signaling, steroid hormones and nuclear receptor super family, nitric oxide, neurotransmitters, peptide hormones and growth factors. Functions of surface receptors: G- protein - coupled receptors. Pathways of intracellular signal transduction: The cAMP, cGMP, phospholipids and calcium ion pathways.

UNIT V (12Hrs)

Cell cycle: Overview of cell cycle and its control. Cell cycle control in mammalian cells, check points in cell cycle regulation. Apoptosis-pathways, regulators and effectors in apoptosis.

Cancer: Types, properties, causes and development. Tum or viruses- DNA and RNA viruses. Tumor suppress or genes and functions of their products. Carcinogenic effect of chemicals and radiation.

Teaching Methods

Chalk and board/Power point presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Cooper. G.M.(2009), The Cell: A Molecular Approach, 5th ed., Boston university, ARM press, Washington D.C., USA
2. Verma.P.S. and Agarwal.V.K. (2014),Cell Biology, Genetics, Molecular biology, Evolution and Ecology, S. Chand and Company, New Delhi.
3. U. Satyanarayana and U. Chakrapani (2013). Biochemistry. Elsevier and Books & Allied (P)Ltd. Kolkata.

Reference Books:

1. Harvey Lodish, Baltimore David, Arnold Berk *et al*, (2007), Molecular Cell Biology, 6thed., Scientific American Books, USA.
2. Garrette R.H and Grisham, C. M (2012), Principles of Biochemistry, 5th ed, Saunders college publishers, US.
3. Alberts, Bruce, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter. Essential of Cell Biology. New York: Garland Science, 2019.
4. Pollard, Thomas D., William C. Earnshaw, Jennifer Lippincott-Schwartz, and Graham T. Johnson. Cell biology. 3rd Eds.2017.
5. Alberts, Bruce, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter. Molecular Biology of the Cell. New York: Garland Science, 2002.
6. Stephen R. Bolsover, Elizabeth A. Shephard, Hugh A. White, Jeremy S. Hyams. Cell Biology: A Short Course, 3rd Edition. Wiley and Blackwell. 2011.

** Questions may also be taken from the self-study portion*

UBC32

21UBC404

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	S	H
CO2	S	S	H	S	S
CO3	S	H	H	H	S
CO4	H	H	S	S	H
CO5	S	H	S	H	S

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

UBC33

21UBC4S2

Programme Code: 07		**B. Sc Biochemistry**		
Course Code: 21UBC4S2		**Skill Based Subject II - TECHNIQUES IN BIOTECHNOLOGY**		
Batch	Semester	Hours / Week	Total Hours	Credits
2021-2022	IV	2	30	3

Course Objectives

1. To provide a broad overview of the common and important techniques in Biotechnology
2. To provide sufficient knowledge about the overall biotechnology skills
3. To address the aspects of developmental biology, plant and animal tissue culture, fermentation, bioprocessing and bio nanotechnology

Course Outcomes (CO)

K1 to K5	CO1	Recollect the basics of developmental biology
	CO2	Understand the techniques of plant tissue culture
	CO3	Describe the process and introduce about bioprocess techniques
	CO4	Acquire knowledge fermentation and its role in biotechnology
	CO5	Remember Bio Nanotechnology and their materials applications

Total Hours : 30

UNIT I (6 hrs)

History & basic concepts of development : Overview of how the modern era of developmental biology emerged through multidisciplinary approaches, stages of development- zygote, blastula, gastrula, neurula, cell fate & commitment – potency- concept of embryonic stem cells, differential gene expression, terminal differentiation

UNIT II (6 hrs)

Plant tissue culture - History, Laboratory organization, Sterilization methods, Media preparation, Plant Growth Regulators, Micro propagation, Callus culture, Cell Culture, Organogenesis and Somatic embryogenesis. Haploid production: - Anther, Pollen, Embryo and ovule culture.

UNIT III (6 hrs)

Animal Biotechnology - History of animal cell culture*, Different types of cell culture media, growth supplements, serum free media, balanced salt solution, Different types of cell culture media, growth supplements, serum free media, balanced salt solution, Culture of different tissues and its application.

21UBC4S2

UNIT IV (6 hrs)

Fermentation & bioprocessing - Introduction to fermentation technology, fermentation processes; Microbial culture; Fermentation media; Natural media; synthetic media, Types of Fermentation: Solid Substrate fermentation and submerged fermentation. Introduction to biomass, downstream processing and upstream processing.

UNIT V (6 hrs)

Bio nanotechnology - Nanomaterial in biotechnology - nanoparticles, quantum dots, nanotubes and nanowires. Development of Nano biotechnology. Biological nanoparticles production - plants and microbial. Nano biotechnological applications in health and disease - infectious and chronic.

Teaching Methods

Chalk and board/Power point presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Michael J.F. Barresi and Scott F. Gilbert. (2019), Developmental Biology. 12th ed. Oxford University Press
2. An introduction to Plant Tissue culture by MK Razdan. M.K. 2003. Oxford & IBH Publishing Co, New Delhi, 2003.
3. Plant tissue culture by Bhojwani. S.S and Razdan. M.K 2004.
4. Portner R. 2007. Animal Cell Biotechnology. Humana Press.
5. Peter F Stanbury, Allan Whitaker, Stephen J Hall. Principles of Fermentation Technology. (2016)

Reference Books:

1. Butterworth-Heinemann Press. UK. ¬ H. J. Peppler, D. Perlman. Microbial Technology: Fermentation Technology. (2014). Academic Press.
2. Nalwa HS. 2005. Handbook of Nanostructured Biomaterials and Their Applications in Nano biotechnology. American Scientific Publ.
3. Nano biotechnology - II more concepts and applications. (2007) - Chad A Mirkin and Christof M. Niemeyer (Eds), Wiley VCH.

*Questions may also be taken from the self-study portion

UBC35

21UBC4S2

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	S	H
CO2	S	S	S	S	S
CO3	S	S	H	S	H
CO4	H	H	S	S	H
CO5	H	S	S	H	S

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

UBC36

21UBC505

Programme Code: 07		**B. Sc Biochemistry**		
Course Code: 21UBC505		**Core Paper 5 – HUMAN PHYSIOLOGY**		
Batch 2021-2022	Semester V	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To understand the basic principles and mechanisms involved during the functioning of various organs of the physiological system.

2. To learn the mechanism of action of hormones, and their role under normal and abnormal conditions of the physiological system.

3. To learn the functions of organs and systems to the maintenance of Homeostasis.

Course Outcomes (CO)

K1 to K5	**CO1**	Recall of the structure of skeletal muscle, GI tract, lungs, nephrons, neurons and reproductive system
	CO2	Understanding the mechanism of muscle contraction, mechanism of buffer action , transport of gases between tissues and blood, formation of urine, propagation of nerve application ,mechanism of action of hormones.
	CO3	Explanation of sources of energy for muscle contraction, functions of hormones, spermatogenesis, ovarian cycle, chemical changes during muscle contraction.
	CO4	Synaptic transmission of neuro-muscular transmission, pathophysiology of hormones of pituitary, thyroid, parathyroid and adrenal glands.
	CO5	Understand the structure and function of male and female reproductive system

UBC37

21UBC505

UNIT I (12Hrs)

Skeletal Muscle

Skeletal muscle- General structure and sarcomere unit. Structure of myosin, actin and regulatory proteins (tropomyosin and troponin). Mechanism of muscle fiber contraction. Chemical changes during muscle contraction. Sources of energy for muscle contraction.

Blood and body fluids

Blood - Composition and functions of blood*, blood grouping and blood transfusion, blood coagulation. Role of the anticoagulant- heparin. Ionic composition of ECF and ICF. Buffers of body fluids.
Mechanism of action of bicarbonate and phosphate buffer systems. Formation and functions of lymph - Lymphatic System‟

UNIT II (12Hrs)

Digestive System

Structure of GI tract. Secretion of digestive juices- composition and functions of saliva, gastric juice, pancreatic juice, bile and secretion of small intestine (succus entericus). Digestion and absorption of carbohydrates, Digestion and absorption of proteins. Digestion and absorption of fats. Respiratory System Structure of lungs. Diffusion of gases in lungs. Transport of oxygen from lungs to tissues through blood and factors influencing the transport of oxygen. Transport of CO_2 from tissues to lungs through blood and factors influencing the transport of CO_2.

UNIT III (12 Hrs)

Excretory System

Structure of kidneys. Structure of nephron. Mechanism of formation of urine, micturition and renal regulation of acid- base balance. Physical properties and composition of urine. Role of renin in renin-angiotensin-aldosterone system (RAAS).

Nervous system

Structure of neuron. Resting potential and Action potential. Propagation of nerve impulse. Structure of synapses. Synaptic transmission (electrical and chemical theory). Structure of neuromuscular junction. Mechanism of neuro muscular transmission.
Neurotransmitters – definition and functions of acetyl choline, nor-epinephrine, GABA, serotonin, and dopamine.

UNIT IV (12 Hrs)

Endocrine System

Classification of hormones. Mechanism of action of hormones – intracellular receptor mechanism and second messenger mechanism (cAMP only).Structure and functions of hormones of anterior pituitary gland – growth hormone, prolactin, ACTH, TSH, FSH, LH in female and ICSH in male; posterior pituitary gland – oxytocin and vasopressin (ADH), thyroid gland – T3 and T4 hormones, and calcitonin , adrenal cortex – corticosteroids and aldosterone, adrenal medulla – epinephrine and nor – epinephrine and pancreas - insulin and glucagon. Pathophysiology –Hypo- and Hyper-secretions of growth hormone and thyroid hormones.

UNIT V (12Hrs)

Male Reproductive System

Structure of male reproductive system and spermatogenesis. Structure and functions of testosterone. Female Reproductive System

Structure of female reproductive system. Ovarian cycle. Menstrual cycle. Menopause. Pregnancy and lactation. Structure and functions of estrogens and progesterone.

Teaching Methods

Chalk and board/Power point presentation/Seminar/Quiz/Discussion/Assignment

Text Book

1. Saradha Subramaniam, Madavan kutty K. and Singh H. D. (2012). Textbook of Human Physiology. 6th edition., S. Chand and company LTD. New Delhi.
2. H.S.Ravikumar Patil, H.K.Makari, H.Gurumurthy, S.V.Soumya, (2013). A text book of Human physiology. I.K. International Publishing house Pvt. limited.

Reference Books

1. John E.Hall. Guyton & Hall., (2014). Textbook of Medical Physiology. A South Asian Edition.
2. Chatterjee. M.N. and Rana Shinde (2005). A Text book of Medical Biochemistry. Jaypee Brothers Medical Publishers Pvt. Ltd, Delhi.
3. C.C.Chatterjee., C.C.Chatterjee (2016). Human Physiology VI: 11th edition, Vol (1). CBS publishers & distributers.
4. Robert K. Murray., Granner D.K., Mayes P.A. and Rodwell V.W.,(2008).Harpers Illustrated Biochemistry, 27thed., Appleton and Lange Stanford, Connecticut, USA.
5. Talwar G.P. (2004), A Text book of Biochemistry and Human Biology, 3rd edition. Printice Hall of India Pvt Ltd, New Delhi.

* *Questions may also be taken from the self-study portion*

UBC39

21UBC505

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

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

UBC40

21UBC506

Programme Code: 07		**B. Sc Biochemistry**		
Course Code: 21UBC506		**Core Paper 6–INTERMEDIARY METABOLISM**		
Batch 2021-2022	Semester V	Hours/Week 4	Total Hours 60	Credits 4

Course Objectives

1. To learn the fate of dietary carbohydrates, proteins and lipids.
2. To study the various catabolic and bio synthetic pathways of bio molecules and their significance.
3. To understand the inter relationship between carbohydrate, protein and fat metabolism.

Course Outcomes (CO)

K1 to K5	CO1	Understand the various metabolic pathways of carbohydrates, proteins, fat and nucleic acid metabolism
	CO2	Remember the glycolysis, TCA cycle, Glycogenesis, glycogenolysis, β-oxidation, phospholipid biosynthesis, Urea cycle, Nucleic acid biosynthetic pathway and degradation of purine and pyrimidine
	CO3	Assessment of Bio energetics of various metabolism pathways, role of inhibitors and uncouple electron transport chain
	CO4	Analysis of regulation of various metabolic pathways and their significance
	CO5	Acquire the knowledge of purine and pyrimidine metabolism and biological significance of uric acid and β-amino isobutyrate.

Total Hours : 60

UNIT I **(12Hrs)**

Overview of metabolism: Definition; types of metabolic pathways. Fate of absorbed carbohydrates. Glycolysis: definition; significance; pathway; energy yield from glycolysis; regulation of glycolysis. Cori's cycle. Metabolic fate of pyruvate.

TCA Cycle:-reactions of the cycle; bioenergetics; amphibolic pathway; anaplerotic role of TCA cycle.

Pathway of glycogenesis and glycogenolysis; gluconeogenesis: definition; significance; pathway; substrates for gluconeogenesis; regulation of gluconeogenesis.

21UBC506

UNIT II **(12hrs)**

Biological oxidation: Introduction, high energy compounds, redox potentials; electron transport chain: overview; mitochondrial organization; structural organization of respiratory chain; oxidative phosphorylation; mechanism of oxidative phosphorylation–chemi osmotic hypothesis. Uncouples of oxidative phosphorylation. Transport of reducing equivalents – glycerol-phosphate shuttle and malate–aspartate shuttle.

UNIT III **(12hrs)**

Blood lipids and fate of dietary lipids. Oxidation of fatty acids: Carnitine cycle; Beta–oxidation, alpha oxidation and omega oxidation.

Biosynthesis of saturated fatty acids: Extra mitochondrial and microsomal system for synthesis of fatty acids. Inter conversion of fatty acids. Bio synthesis and degradation: Lecithin, cephalin, phosphatidylinositol and phosphatidylserine. Plasma lipoproteins (Composition).Bio synthesis of glycolipids.*

UNIT IV **(12hrs)**

Amino acid pool, overview of amino acid metabolism–deamination (oxidative and non- oxidative), transamination, de carboxylation. Urea cycle. Metabolism of individual amino acids – glycine, phenylalanine and tyrosine.

UNIT V **(12hrs)**

Interrelationship between carbohydrate fat and protein metabolism. Metabolism of purines: *de novo* synthesis, salvage pathway, catabolism and regulation. Metabolism of pyrimidines: *de novo* synthesis, salvage pathway, catabolism and regulation. Conversion of ribonucleic acid to deoxyribonucleic acid, allopurinol. Biological significance of uric acid and β-amino isobutyrate.

Teaching Methods

Chalk and board/Power point presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Deb, A.C. (2011), Fundamentals of Biochemistry, 10th ed., New Central Book Agency Pvt.Ltd., Kolkata700 009.
2. Satyanarayana, U.and Chakrapani, U. (2013) Biochemistry, 4th ed., Books and Allied Pvt. Ltd,Kolkata,700010.

Reference Books:

1. Robert K. Murray, Daryl K. Granner and Victor W. Rodwell (2008), Harper's Illustrated Biochemistry,29thed,McGraw Hill Companies, Inc. New Delhi.
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. Moran, Horton, Scrimgeour, Perry & Rawn (2013), Principles of Biochemistry, 5th edition. Pearson New International Edition, UK.

**Questions may also be taken from the self-study portion*

UBC42

21UBC506

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	S	H
CO2	H	S	S	H	S
CO3	S	S	S	H	S
CO4	S	S	S	S	S
CO5	S	H	S	H	S

S–Strong H–High M–Medium L–Low

UBC43

21UBC507

Programme Code: 07		**B.Sc. Biochemistry**		
Course Code: 21UBC507		**Core Paper 7- CLINICAL BIOCHEMISTRY**		
Batch 2021-2022	Semester V	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To provide students with a conceptual background in Clinical Biochemistry
2. To provide students with an understanding of various types of diseases and their causes, symptoms, prevention, management and treatment

Course Outcomes (CO)

K1 to K5	CO1	Recall the metabolism of carbohydrates, lipids and proteins
	CO2	Describe the disorders of carbohydrate, lipids, protein and amino acids metabolism & assess the gastric, intestinal, liver and kidney functions
	CO3	Demonstrate the types, clinical pathology and diagnosis of disorders of carbohydrate, lipids, protein and amino acids
	CO4	Analyze the blood and serum samples for the diagnosis and prognosis of Diseases
	CO5	Analyze the Liver and Kidney function tests

Total Hours : 60

UNIT I (12 hrs)

Disorders of carbohydrate metabolism: Normal glucose level in blood*, renal threshold value. Hypoglycemia: Definition and causes of hypoglycemia. Hyperglycemia: Definition and causes of hyperglycemia.

Diabetes mellitus: Introduction, types of diabetes mellitus; clinical pathology and diagnosis. Glycosylated hemoglobin and its significance.

UNIT II (12 hrs)

Disorders of lipid metabolism: Plasma lipids and lipo proteins – Introduction; hyper lipo proteinemia. Type I, II, III, IV and V and A beta lipoproteinemia. Hypolipo proteinemia: α-β–lipo proteinemia, hypo beta lipoproteinemia, Tangier‟ disease and lecithin – cholesterol acyl-transferase deficiency.

21UBC507

UNIT III (12 hrs)

Plasma protein abnormalities. Hypoplasma proteinuria and hyper plasma proteinuria

Disorders of amino acid metabolism: Cystinuria, phenylketonuria and maple syrup diseases. Definition and causes of hypo and hyper uremia. Definition and causes of hypo and hyper uricemia.

UNIT IV (12 hrs)

Gastric and Intestinal functional tests:

Gastric functional tests – Introduction, tests of gastric function – The insulin stimulation test and tubeless gastric analysis. Intestinal functional tests – Introduction, tests used in the diagnosis of malabsorption – determination of total faecal fat (fat balance test), test of monosaccharide absorption (xylose excretion test) and determination of total protein (Lowry's method).Pancreatic function test.

UNIT V (12hrs)

Liver and Kidney function tests. Liver function tests, estimation of conjugated and total bilirubin in serum (diazomethod), detection of bilirubin and bile salts in urine (Fouchet‟s test and Hay‟s sulphur test) and marker enzymes: SGOT, SGPT, γ-glutamyl transferase.

Kidney function test: Urea clearance test, creatine clearance test and GFR.

Teaching Methods

Chalk and board/Power point presentation/Seminar/Quiz/Discussion/Assignment

Text Books

1. Ambika Shanmugam (2008), Fundamentals of Biochemistry for Medical Students, 7th ed.,Published by the Author, Chennai – 600035.
2. Deb, A.C. (2011), Fundamentals of Biochemistry, 10th ed., New Central Book Agency Pvt. Ltd., Kolkata 700009.

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, HarcourtBrace 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.

* *Questions may also be taken from the self-study portion*

21UBC507

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	S	H
CO2	H	S	M	S	S
CO3	S	H	H	S	H
CO4	H	H	S	S	H
CO5	H	S	H	S	H

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

UBC46

21UBC508

Programme Code: 07		**B.Sc Biochemistry**		
Course Code: 21UBC508		**Core Paper 8 – MOLECULAR BIOLOGY**		
Batch	Semester	Hours / Week	Total Hours	Credits
2021-2022	V	4	60	4

Course Objectives

1. To understand the scientific process in the content of learning the fundamental biological and chemical factors of molecular biology.
2. To gain knowledge about DNA replication, DNA repair mechanism and mutation.
3. To understand the mechanism of transcription and reverse transcription.
4. To acquire the knowledge about gene regulation.

Course Outcomes (CO)

K1 to K5	CO1	Understand the dynamics of protein synthesis with respect to ribosome structure, function and accuracy of translation
	CO2	Remember the Genetic Code and the amino acid which it codes. the role of various enzymes and proteins in DNA replications, transcription and translation
	CO3	Advanced and integrated knowledge of the process on transcription and DNA recombination and repair process
	CO4	Explore the process of translation, genetic code and post translational modifications
	CO5	Describe the regulation of gene expression and types of operon and their regulation

Total Hours: 60

UNIT I (12Hrs)

Organization of eukaryotic chromosome, Nucleosomes are the fundamental unit of chromatin, types and properties of histones. Chromatin assembly. DNA carries genetic information, Transformation, Transduction, Conjugation, Griffith's Experiment, Avery's Experiment and Hershey – Chase experiment.

UNIT II (12Hrs)

DNA Replication: DNA Replication, semi conservative mechanism, The Meselson – Stahl experiment, enzymology of DNA replication, initiation, elongation and termination. DNA repair mechanism: excision repair, mismatch repair and SOS response. Inhibitors of DNA replication. Mutation: spontaneous and induced mutation.

21UBC508

UNIT III (12 Hrs)

Transcription: Central Dogma, Synthesis of RNA, DNA dependent RNA Polymerase, sigma factor, association of RNA polymerase with DNA, initiation, elongation, termination of transcription, post transcriptional modification of RNA, reverse transcription*, RNA directed RNA polymerase.

UNIT IV (12 Hrs)

Translation: Genetic Code: Features of genetic code, chemical composition of eukaryotic and prokaryotic ribosomes, and activation of amino acids, initiation, elongation and termination of protein synthesis in prokaryotes, post translational modification of proteins and inhibitors of protein synthesis.

UNIT V (12Hrs)

Gene Regulation:

Regulation of gene expression in E.coli. Terminology in regulation of gene expression. Types of control of operons ,lactose operon in E.coli, negative regulation and positive regulation, lac operon, arabinose operon and tryptophan operon and its regulation.

Teaching Methods

Chalk and board/Power point presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Ajoy Paul (2007),Text Book of Cell and Molecular Biology, Books and allied Pvt.Ltd. Kolkata.
2. G.P. Jayanthi (2009), Molecular Biology, MJP publishers, Chennai.

Reference Books:

1. Robert .H. Tamarin (2008), Principles of Genetics, 7th ed., Tata McGraw Hill Publishing Company Ltd, Kolkata.
2. Gardner and Simmon Snustad(2008),Principlesofgenetics,7th ed.,JohnWiley&SonsInc. USA.
3. DavidL.Nelson,MichealM.Cox(2008),Lehninger"sPrinciplesofBiochemistry,Replik a press (P) Ltd,India.
4. David Freifelder (2004). Molecular Biology . 5th edition. Jones & Bartlett Publishers.

**Questions may also be taken from the self-study portion also*

21UBC508

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	S	S
CO2	S	S	S	S	S
CO3	S	S	S	H	S
CO4	H	S	S	S	S
CO5	H	S	H	S	S

S– Strong H– High M – Medium L –Low

UBC49

21UBC6CN

Programme Code: 07		**B.Sc Biochemistry**		
Course Code: 21UBC6CN		**C.Pr.3. BIOCHEMISTRY (Lab)**		
Batch	Semester	Hours / Week	Total Hours	Credits
2021-2022	V & VI	4	120	3

Course Objectives

1. To make students learn the methods of collection of blood and urine samples and separation of serum

2. To analyze the biochemical parameters in urine and blood samples and indicate their clinical significance

3. To demonstrate the kit methods for the assay of bio chemical parameters

Course Outcomes (CO)

K3 to K5	CO1	Apply various techniques for the assay of important biochemical parameters and interpret their values
	CO2	Calculate the values from the graph obtained in the experiment
	CO3	Estimate the level of bilirubin, SGOT, SGPT, LDH, CKMB in the given sample using kit method
	CO4	Understanding the quantitative estimation of Glucose and Calcium in urine
	CO5	Analyze the quantitative estimation of biochemical parameters in blood

Total Hours :120

List of programs

I. Quantitative estimation of the following in urine

1. Glucose - Benedicts method
2. Calcium - Permanganate method

II. Quantitative estimation of the following in the blood

1. Glucose - Ortho-Toluidine method.

2. Urea - DAM – TSC method.
3. Cholesterol - Zak's method
4. Phosphorus - Fiske and Subbarrow method
5. Uric acid - Caraway Method
6. Iron and Hemoglobin – Wong's method
7. Total protein, Globulin and A:G ratio

21UBC6CN

III. Group Experiments (kit method)

1. Bilirubin – Direct and Indirect.
2. SGOT.
3. SGPT.
4. LDH
5. CKMB

Reference Books

1. S.P. Singh (2013), Practical Manual of Biochemistry, 7th ed., CBS Publishers and Distributors, New Delhi.
2. Sadhasivam. S. and Manickam. A. (2008). Biochemical Methods, 3rd ed., New Age International Publishers Ltd, New Delhi.
3. Shivaraja shankara, Y.M.(2018).Laboratory manual for practical Biochemistry, Jaypee Brothers Medical Publishers(P) Ltd, New Delhi.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	S	S	S
CO2	S	H	S	S	H
CO3	S	S	H	S	H
CO4	H	S	S	H	M
CO5	H	S	H	H	S

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

21UBC6CO

Programme Code: 07		**B.Sc Biochemistry**		
Course Code: 21UBC6CO		**C.Pr.4. BIOCHEMISTRY (Lab)**		
Batch 2021-2022	Semester V & VI	Hours / Week 2	Total Hours 60	Credits 2

Course Objectives

1. To isolate plasmid DNA and genomic DNA, isolation and restriction digestion of DNA through demonstration experiments
2. To perform simple staining, gram staining and negative staining, isolation of microbes and biochemical tests for identifying bacteria
3. To demonstrate media preparation, callus initiation in plant tissue and mitosis in onion root tips

Course Outcomes (CO)

K3 to K5	CO1	Recall the methods of genetic technology and Employ molecular methods in isolation, restriction digestion and separation of DNA
	CO2	Recall the microbiological methods and performing of staining, plating techniques
	CO3	Analyze biochemical tests for identifying microorganisms
	CO4	Familiarize the techniques of plant tissue culture and cell biology through demonstrations
	CO5	Introducing bioinformatics tools and learning basic tools on proteomics and genomics

Total Hours :30

List of programs

GENETIC TECHNOLOGY

a. Estimation of DNA by diphenylamine method
b. Estimation of RNA by orcinol method
c. Preparation of buccal smear
d. Separation of DNA by agarose gel electrophoresis(Demo)
e. Isolation of Plasmid DNA from bacteria(Demo)
f. Isolation of Genomic DNA from liver/plant/bacterial source(Demo)

21UBC6CO

MICROBIOLOGY

a. Isolation of pure culture - serial dilution, pour plate, spread plate and streak plate.
b. Simple staining, Gram staining and Negative staining.
c. Biochemical tests for identification of Bacteria.
d. Isolation of microbes from samples – sewage/ water/ soil.
e. Antibiotic Sensitivity Test – Kirby Bauer Method

PLANT BIOTECHNOLOGY (Demonstration)

a. Preparation of media and sterilization.
b. Initiation of callus culture.

BIOINFORMATICS

a. Analytical tools for sequences databanks: BLAST, FASTA, Pair wise alignment- Multiple alignment- Clustal W.
b. Structural databanks: Protein databank(PDB)
c. *In silico* analysis of Proteins

Reference Books

1. Sadhasivam. S. and Manickam. A. (2008). Biochemical Methods, 3rd ed., New Age International Publishers Ltd, New Delhi.
2. Ramnik Sood(2003), Medical Laboratory Technology, 5th ed., (reprint), Jaypee brothers, Medical Publishers Private Ltd, New Delhi.
3. Kannan. N. (2002), Laboratory Manual in General Microbiology, Panima publishing corporation, Delhi.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	S	M
CO2	S	S	S	H	H
CO3	H	S	H	S	H
CO4	H	S	S	H	M
CO5	H	S	H	S	S

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

UBC53

21UBC6CP

Programme Code: 07		**B. Sc Biochemistry**		
Course Code: 21UBC6CP		**C.Pr.5. BIOCHEMISTRY (Lab)**		
Batch	Semester	Hours / Week	Total Hours	Credits
2021-2022	V & VI	2	60	2

Course Objectives

1. To estimate chlorophyll, starch, total phenols and qualitatively analyze various secondary metabolites in plant sample
2. To determine RA and pregnancy tests using kit method
3. To demonstrate RBC count, total and differential count of WBCs and identifying blood groups

Course Outcomes (CO)

K3 to K5	CO1	Practice techniques of different plant component isolation and qualitative analysis of secondary metabolites
	CO2	Performing quantification methods of chlorophyll, starch and total phenols present in plant sample
	CO3	Recollecting the techniques antigen- antibody interactions in immunological kit methods
	CO4	Learning identification of blood groups
	CO5	Calculate the number of RBC and WBCs

Total Hours :30

List of programs

PLANT BIOCHEMISTRY

a. Qualitative Analysis of Secondary Metabolites - Alkaloids, Flavonoids, Saponins and Glycosides
b. Estimation of chlorophyll.
c. Estimation of starch.
d. Estimation of total phenols.

21UBC6CP

IMMUNOLOGY

a. Widal test (kit method)

b. Simple and double immunodiffusion test (kit method)

PHYSIOLOGY (Demonstration)

a. Identification of blood groups.

b. Enumeration of RBCs.

c. Enumeration of total WBCs.

d. Differential count of WBCs.

Reference Books

1. Sadhasivam. S. and Manickam. A. (2008). Biochemical Methods, 3rd ed., New age International Publishers Ltd, NewDelhi.
2. Kannan. N. (2002), Laboratory Manual in General Microbiology, Panima publishing corporation,Delhi.
3. Ramnik Sood (2003), Medical Laboratory Technology, 5th ed., (reprint), Jaypee brothers, Medical Publishers Private Ltd, NewDelhi.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	S	H
CO2	S	S	S	H	H
CO3	S	M	H	S	H
CO4	H	S	S	H	S
CO5	S	H	S	S	H

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

UBC55

21UBC5X1

Programme Code: 07		**For B.Sc Botany, Zoology, Chemistry & Biotechnology**		
Course Code: 21UBC5X1		**Extra Departmental Course DIAGNOSTIC BIOCHEMISTRY**		
Batch	Semester	Hours / Week	Total Hours	Credits
2021-2022	V	2	30	3

Course Objectives

1. To make the students to know the principles for routinely conducted tests in diagnostic laboratories.
2. To select the appropriate biochemical tests to the diagnosis of the diseases.
3. To enable the students to interpret the laboratory data properly.

Course Outcomes (CO)

K1 to K5	CO1	Remember the basic concepts of collection of samples
	CO2	Understand the idea about the tests performed using blood, serum and enzymes
	CO3	Familiarize with the clinical importance of hormones
	CO4	Analyze and execute the clinical laboratory techniques
	CO5	Recollect Biosafety measures and laboratory wastes

Total Hours :30

UNIT I (6 hrs)

Introduction to Diagnostic Biochemistry. Components of blood - cellular and fluid components and their functions. Collection of blood specimens and separation of plasma and serum using anticoagulants (heparin, EDTA and sodium citrate).

UNIT II (6 hrs)

Hematology – Introduction, hemoglobin- normal value and functions of hemoglobin. ESR, Significance of glycosylated hemoglobin. Blood grouping*.

UNIT III (6 hrs)

Serology**:** Introduction, importance and clinical significance of ELISA, Fluorescent antibodies, VDRL test, Widal test, RA test, Pregnancy test and CRP test.

UNIT IV (6 hrs)

Enzymology**:** overview and diagnostic value of enzyme assays. Assay and clinical importance of Serum glutamate oxalo acetate transaminase, serum glutamate pyruvate transaminase, lactate dehydrogenase, creatine kinase, Acid phosphatase and alkaline phosphatase.

UNIT V (6 hrs)

Endocrinology**:** Introduction and clinical importance of hormone assay Thyroid hormones: T3, T4 and TSH Sex hormones**:** FSH, testosterone, progesterone and estrogen. Biosafety measures and disposal of laboratory waste.

Teaching Methods

Chalk and board/Power point presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Pal G.K. and Pravati Pal (2010), Text Book of Practical Physiology, 3rd ed., Universities Press, Hyderabad, 500029.
2. Gowenlock.A.H.; Janet R Mc Murray, Donaly M Mc Lauchlan; (2002) Varley‟s Practical Clinical Biochemistry; 6th ed.,Sathish Kumar Jain for CBS Publishers and Distributors, New Delhi.

Reference Books:

1. Thomas M Devlin, (2002), Text book of Biochemistry with Clinical Correlations, 5th ed., John Wiley and Sons, Inc. Publications .USA.

2. Harish Mohan (2010), Text Book of Pathology, 6th ed., JAYPEE Brothers Medical PublishersPvt Ltd, New Delhi, 11000

**Questions may also be taken from the self study portion also*

UBC57

21UBC5X1

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	S
CO2	S	S	S	H	H
CO3	H	S	H	S	S
CO4	S	S	S	H	H
CO5	S	H	S	H	S

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

UBC58

21UBC609

Programme Code: 07		**B.Sc Biochemistry**		
Course Code: 21UBC609		**Core Paper 9 – PLANT BIOCHEMISTRY**		
Batch	Semester	Hours / Week	Total Hours	Credits
2021-2022	VI	4	60	4

Course Objectives

1. To understand the metabolic processes in plants and role of various biosynthetic pathways.
2. To acquire knowledge about photosynthetic apparatus, role of nitrogen in plants and plant growth regulators
3. To explore about the photo morphogenesis and secondary metabolites in plants.

Course Outcomes (CO)

K1 to K5	CO1	Recollect the structure and function of plant cell.
	CO2	Understand the mechanism of photosynthesis in plants.
	CO3	Execute the concept of role of minerals and growth hormones in plants.
	CO4	Acquire the Photo morphogenesis function and development of plant
	CO5	Analyze the nature and functions of secondary metabolites

Total Hours :60

UNIT I (12 Hrs)

Introduction to plant cell structure*. Photosynthesis**:** Overview, Pigments – chlorophylls, carotenoids and phycobillins. Photosynthetic apparatus. Photo system I and II – Mechanism of Photosynthesis-cyclic and non-cyclic photo phosphorylation. Light reactions–Red drop and Emerson‟s enhancement effect, Hill‟s reaction, Arnons work. Dark reactions: C3, C4 and CAM pathway.

UNITII (12Hrs)

Role of nitrogen in plants. Nitrate reduction. Nitrogen cycle, Nitrogen fixation: non-biological, biological- symbiotic, non-symbiotic and associative. Biochemistry of nitrogen fixation and factors Mineral nutrition in plants: Major elements: Nitrogen, Phosphorus, Sulphur, Calcium, Magnesium and Potassium-specific roles and deficiency symptoms in plants.

Minor elements: Iron, manganese, copper, zinc, boron, molybdenum, chlorine and nickel-specific roles and deficiency symptoms in plants controlling biological nitrogen fixation.

21UBC609

UNIT III (12 Hrs)

Plant growth regulators: Chemistry, biosynthesis, physiological effects, applications of auxins, gibberellins, cytokinins, abscisic acid and ethylene.
Vitamins in plants**:** occurrence and biological functions.

UNIT IV (12 Hrs)

Photo morphogenesis: Photo periodism. Phytochrome - Function in growth and development of Plant. Biochemistry of seed germination. Biochemistry of fruit ripening. Seed storage proteins in legumes and cereals.

UNIT V (12Hrs)

Secondary metabolites: Classification, Biosynthetic pathways (structures not needed) and biological functions of terpenes, alkaloids, cyanogenic glycosides, phenolics, flavonoids (anthocyanins) and tannins.

Teaching Methods

Chalk and board/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Jain. V. K. (2013)., Fundamentals of Plant physiology, 17th ed., S. Chand and Company Ltd, New Delhi,India.
2. Verma. P. K. (2005)., Text Book of Plant Physiology, 8th ed., EMKAY Publications, Bhopal.

Reference Books:

1. Buchanan. B. B, Gruissem. W., Jones. R. (2015), Biochemistry and molecular biology of plants, 2ndedition, Wiley Blackwell publishers,USA.

2. Hopkins .W. G.(2008), Introduction to Plant Physiology, 2nd ed., John Wiley and sons Publishers,UK.

3. Heldt. H. W. (2005). Plant Biochemistry, 3rd edition. Academic Press, USA.

**Questions may also be taken from the self-study portion*

UBC60

21UBC609

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	S
CO2	S	S	S	H	H
CO3	S	S	H	S	S
CO4	H	S	S	H	M
CO5	H	S	H	S	H

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

UBC61

21UBC610

Programme Code: 07		**B.Sc Biochemistry**		
Course Code: 21UBC610		**Core Paper 10 – IMMUNOLOGY AND IMMUNOTECHNIQUES**		
Batch	Semester	Hours / Week	Total Hours	Credits
2021-2022	VI	4	60	4

Course Objectives

1. To learn about the basic principles of immunology, functioning of immune system, and immunological techniques in clinical and research laboratories.
2. To comprehend about the different types of immune mechanisms involving in various abnormal conditions and diseases.

Course Outcomes (CO)

K1 to K5	CO1	Learning the basics of immunity and immune system, formation role of cytokines, different features of antigens and antibodies.
	CO2	Understanding of the mechanism of antibody and cell mediated immunity, action of complement system.
	CO3	Learning the development of various clinical conditions during the different abnormal conditions.
	CO4	Define the Autoimmune diseases and AIDS development of clinical symptoms
	CO5	Applications of antigen – antibody reactions in the diagnosis of various infectious diseases using different techniques.

Total Hours:60

UNIT I (12Hrs)

Immunity- Definition and types. Innate immunity- Definition; Physical, biochemical, cellular and genetic factors. Acquired immunity - active and passive .Child Immunization chart*. Cells of the immune system- B and T lymphocytes , Natural Killer cells , Macrophages, Antigen presenting cells, Eosinophils, Neutrophils and Mast cells. Lymphoid organs – Primary (Thymus, Bursa of Fabricius and Bone marrow) and Secondary lymphoid organs(Spleen , Lymph node and MALT).

UNIT II (12Hrs)

Antibody mediated immunity – Definition; Maturation of B – lymphocytes; Activation of B – lymphocytes by antigens and production of antibodies. Primary and secondary immune responses. Cell mediated immunity – Definition; Maturation and types of T-lymphocytes; Activation of TH cells; Cytokines–definition and types. Functions (any four) of Inter leukins (IL- 1, IL-2,IL-4,IL-12), Interferons(IFNs), Tumor necrosis factor(TNFs),Colony stimulating factors (CSFs). Cytotoxic activity of Tc, NK and K cells.

UNIT III (12 Hrs)

Antigens– Definition, Characteristic features of antigens, Cross reactivity, Haptens and adjuvants. MHC (Major Histocompatability Complex) - Definition with examples (HLA and H-2).

MHC antigens – Definition and Classification (structures not required).MHC Restriction. Antibodies – Definition. Structure of Immunoglobulin **(**with reference to IgG**);** Classification of immunoglobulins; Properties and biological functions of immunoglobulins (IgG, IgM, IgA, IgD and IgE); Complement system – Definition and components of complement system; Classical complement pathway, alternate pathway. Phagocytosis and Inflammation.

UNIT IV (12 Hrs)

Hypersensitivity – Definition, types, and clinical manifestation: Type I, II, III and IV and their clinical manifestations. Autoimmune diseases – Definition; Myasthenia gravis, Rheumatoid arthritis and Grave‟s disease. Transplantation – Definition and classification. Mechanism and complications of allograft rejection. AIDS **–**Definition**.** AIDS virus – structure. Mechanism of action of AIDS virus on T-cells, Development of disease and Clinical symptoms.

UNIT V(12Hrs)

Antigen antibody interactions –formation of precipitation, and agglutination- precipitin curve test. Agglutination- blood grouping and Widal test. Precipitation- Double immunodiffusion (Ouchterlony procedure), Radial immunodiffusion, Immunoelectrophoresis, Rocket immune diffusion, Counter current immune diffusion, Fluorescent antibody technique, Radio Immuno Assay (RIA), Enzyme Linked Immunosorbent Assay (ELISA), Western blotting technique, Immunohistochemistry.

Teaching Methods

Chalk and Board/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Ananthnarayanan. R and Jayaraman Panikar C.K. (2009). Text book of Microbiology, 8th edition, Orient Longman Ltd, Madras.
2. Arvind Kumar. (2013)Textbook of immunology. TERI Publications.

Reference Books

1. David Male, Jonathan Brastoff, Roitt Ivan and David Roth (2012). Immunology, 8th ed., Times mirror, International Gower Medical Publishing Ltd, printed by Grajos SA, Arts Sobrepapel, Barcelona, Spain.
2. Peter Delvis, Seamus Martin, Dennis Burton and Evan Roitt (2012). Roitt‟s Essential Immunology, Wiley Blackwell Publishers.
3. Judy owen, Jenni punt, Sharon Stanford, Patricia Jones (2018). Kuby Immunology. Macmillan learning.

**Questions may also be taken from the self-study portion*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	M	M	M	H	H
CO2	S	S	S	S	S
CO3	H	M	H	H	H
CO4	S	S	S	S	S
CO5	S	H	S	S	H

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

UBC64

21UBC611

Programme Code: 07		**B.Sc Biochemistry**		
Course Code: 21UBC611		**Core Paper 11 – GENETIC ENGINEERING**		
Batch 2021-2022	Semester VI	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To provide students with a broad conceptual background in the field of genetic engineering
2. To describe the methods used to create recombinant DNA molecules and introduce them into prokaryotic cells
3. To expose the students to the application of genetic engineering in medicine and agriculture

Course Outcomes (CO)

K1 to K5	CO1	Recognize the concept of recombinant DNA technology or genetic engineering
	CO2	Describe a range of techniques in gene manipulation, the cloning vectors available and the containment procedures
	CO3	Understanding the techniques of DNA sequencing, Genetic finger printing, and PCR applications
	CO4	Examine the difficulties during the expression of eukaryotic DNA in prokaryotes and how to overcome these difficulties
	CO5	Demonstrate the application of transgenic plants with herbicide resistance, virus resistance, pest resistance and male infertility and the production of recombinant insulin

Total Hours :60

UNIT I (12 hrs)

Gene cloning- introduction, basic steps in gene cloning; methods to generate desired foreign genes- isolation of prokaryotic gene by restriction enzyme, isolation of eukaryotic gene by DNA synthesis. Joining DNA molecules: ligases, linkers and homopolymers. Cloning vectors- characteristics of an ideal vector molecule: natural vectors- *E.coli* plasmids; *in-vitro* vectors – pBR322; λ-phage; single stranded vector- M13.

UNIT II (12hrs)

Introduction of rDNA into bacterial cells: Transformation of *E.coli*-preparation of competent cells and uptake of DNA by cells ; selection for transformed cells. Identification of recombinants – insertional inactivation, blue - white selection. Genomic library and cDNA library. Identification of a clone from gene library - Southern, Northern and Western blotting techniques.

UNIT III (12 hrs)

DNA sequencing: Outline of Sanger's method. Genetic finger printing–technique and applications. *In vitro* mutagenesis: site directed mutagenesis, protein engineering. Basic PCR – Technique and applications;

UNITIV (12 hrs)

Expression vectors of *E. coli*: Constituents; examples of promoters – expression cassettes – problems caused in expression of eukaryotic genes; fusion proteins. Production of recombinant insulin. Safety aspects, ethics and hazards of genetic engineering*, HGP: objectives and applications.

UNIT V (12hrs)

Gene transfer in plants: Ti plasmid vectors; mechanism of T-DNA transfer, virulence genes, electrofusion, biolistics process. Applications of transgenic plants – herbicide resistance, male infertility, virus resistance, pest resistance, antisense RNA.

Teaching Methods

Chalk and board/Power point presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. S. B. Primrose and R.M. Twyman (2001). Principles of Gene Manipulation and Genomics.7th ed. Blackwell Publishing, UK.
2. Satyanarayana, U. (2007), Biotechnology, Books and Allied (P) Ltd, Kolkata, 700010.
3. Kumaresan , K (2010). Biotechnology, revised edition, SARAS publication, Kanniya kumari, India.

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.

**Questions may also be taken from the self study portion*

UBC66

21UBC611

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	S	S	S
CO2	S	H	S	S	H
CO3	S	S	H	S	H
CO4	H	S	S	H	M
CO5	H	S	S	H	S

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

UBC67

21UBC6S3

Programme Code: 07		**B.Sc Biochemistry**		
Course Code: 21UBC6S3		**Skill Based Subject 3– TECHNIQUES IN GENOMICS AND PROTEOMICS**		
Batch	Semester	Hours / Week	Total Hours	Credits
2021-2022	VI	2	30	3

Course Objectives

1. To perceive knowledge about structure of animal cell membrane and its function.
2. To study about the mechanism of protein sorting and transport in the biological system.
3. To know about the cell cycle and about cancer development.

Course Outcomes (CO)

K1 to K5	CO1	Recollect the organization of the nuclear DNA and mapping
	CO2	Get thorough knowledge about human genome project and sequencing
	CO3	Update the knowledge about comparative genomics
	CO4	Understanding the transcriptomics and Pharmacogenomics applications
	CO5	Analyze the applications of proteomics in various diseases

Total Hours:30

UNIT I (12 Hrs)

Genomics : Definition, omics and its importance. Organization of nuclear DNA and mitochondrial DNA in eukaryotes. Telomeres, Centromeres* and Transposons. RFLP and RAPD. BAC libraries and cDNA libraries**.** Mapping of genome- molecular markers, cytogenetic maps, physical mapping- Restriction mapping, Fluorescent *in situ* hybridization technique, Radiation hybrid mapping, sequence tagged site mapping. Gene editing- Crispr/Cas 9.

UNITII (12 Hrs)

Sequencing techniques: High throughput sequencing and shotgun sequencing. PCR and RT-PCR. Complementary DNA (cDNA). Human Genome Project (HGP) - features. Positional cloning. Identifying disease genes and Gene therapy

UNIT III (12 Hrs)

Comparative genomics – Definition and its importance. Ortholog and Paralog. Comparative genomics of model organisms- bacteria, *C.elegans* and Drosophila. Synthetic genomes and their applications.

UNITIV (12 Hrs)

Transcriptomics-Definition and applications; DNA microarray and RNA – Seq analysis .Messenger RNA (mRNA) in the cell. Northern blot. Expression profiling and microarray data analysis. Pharmacogenomics.-Introduction and applications. Drug designing and Genetic tests.

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21UBC6S3

UNIT V (12Hrs)

Proteomics- Definition, structural genomics-MALDI-ToF Mass spectrometry (MS), PFGE. Functional genomics: 2D gel electrophoresis. Protein microarray. Peptide finger printing.

Teaching Methods

Chalk and board/Power point presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Brown T.A. (2015). Gene Cloning and DNA analysis, 7th ed., Blackwell publishing Ltd, UK.

2. Primrose S.B and Twyman (2006).Principles of Gene Manipulation and Genomics. 7th ed., Blackwell Publishing, USA.

Reference Books:

1. Stracham.T and Read.A.P.(2004), Principles of Human Molecular Genetics, 3rd edition. Garland Science Publication, NewYork.

2. Clark. D. P. and Pazdernik.N. J (2009). Biotechnology applying the Genetic revolution, Elseiver Academic Press, USA.

** Questions may also be taken from the self study portion*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	S	H
CO2	S	H	S	H	S
CO3	S	S	S	S	H
CO4	H	S	S	S	M
CO5	H	S	H	S	H

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

UBC69

MAJOR ELECTIVE PAPERS

Programme Code: 07	**B.Sc Biochemistry**		
Major Elective – MICROBIOLOGY			
Batch 2021-2022	Hours/Week 4	Total Hours 60	Credits 5

Course Objectives

1. To provide students with a conceptual background in microbiology
2. To provide students with an understanding of various microbiological techniques
3. To make the students to be familiar with the relationship between microbes and human beings

Course Outcomes (CO)

K1 to K5	CO1	Recall the characteristics of bacteria, algae, fungi and viruses
	CO2	Describe the role of microbes as normal flora and as disease causing agents
	CO3	Demonstrate the microscopic techniques, staining and culturing methods
	CO4	Recollect the microbial diseases and their symptoms and prevention
	CO5	Analyze the bacteriological examination and purification of drinking water

Total Hours:60

UNITI **(12 hrs)**

Introduction to microbiology, Microscopy Bright field microscopy, fluorescent microscopy, electron microscopy-transmission electron microscopy, scanning electron microscopy. Culture techniques for isolation of bacteria-streak plate technique, pour plate technique. Staining- Simple staining, flagella staining, gram staining, acid-fast staining.

UNITII **(12 hrs)**

Prokaryotes: Morphology of bacteria, component parts, cell wall structure, growth curve, media composition**.** Eukaryotes: Morphology, characteristics and importance of algae and fungi.

UNITIII **(12hrs)**

Viruses: Cultivation of viruses using fertilized eggs and animal cell culture, structure of viruses, plaque assay.Bacteriophages–T_4 phage, stages in lifecycle; Lambda phage-lifecycle; switch between lysogeny and lyticcycle. Oncogenic viruses– oncogenicDNAviruses-SV40;oncogenic RNA viruses-

HIV.

UNITIV **(12hrs)**

Microbial diseases: Normal human micro flora, host parasitic interaction, exo and endotoxins. Water borne diseases– Aetiology, pathogenesis and symptoms of cholera and dysentery. Air-borne diseases–Aetiology, causes, symptoms and prevention of TB and diphtheria. Direct contact disease–Aetiology and symptoms of rabies*.

UNITV **(12 hrs)**

Water microbiology: Microbes in water; bacteriological examination of water; purification of drinking water. Soil microbiology**:** Rhizosphere and mycorrhiza. Microbiology of food borne diseases: Botulism, staphylococcal poisoning, salmonellosis and perfringens poisoning.

Teaching Methods

Chalk and board/Power point presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. Micheal J. Pelczar, E.C.S. Chanand Noel R.Krieg (2008), Microbiology5thed.,Tata McGraw -Hill Publishing Company Ltd, New Delhi.
2. R.C.Dubey and D.K.Maheshwari (2005),Text Book of Microbiology, S Chand and Company Ltd. New Delhi.

Reference Books:

1. Geetha Sumbali and R.S. Mehrotta (2009), Principles of Microbiology, Tata McGraw – Hill Education private limited, New Delhi.
2. Joanne Willey ,LindaSherwood, ChristopherJ. Woolverton(2016), Prescott's Microbiology 10thed., McGraw-HillEducation,Chennai,Tamilnadu.

**Questions may also be taken from the self-study portion*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	S	H
CO2	H	S	M	S	S
CO3	S	H	H	S	H
CO4	H	H	S	S	H
CO5	H	S	H	S	H

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

UBC71

Programme Code: 07	**B.Sc Biochemistry**		
Major elective- BASICS OF BIOINFORMATICS			
Batch	Hours / Week	Total Hours	Credits
2021-2022	4	60	5

Course Objectives

1. To know about various tools for data base search.
2. To acquire knowledge about different biological databases.
3. To provide knowledge about Gene prediction and drug designing.

Course Outcomes (CO)

K1 to K5	CO1	Recognize the available bioinformatics resources on web like DNA and protein databases
	CO2	Understand concepts of similarity searching databases and algorithms
	CO3	Construct genome annotations and algorithms
	CO4	Outline the concepts of structure based drug design, protein structure levels and databases
	CO5	Analyze the biological sequence databases and their tools

Total Hours: 60

UNITI (12Hrs)

Bioinformatics -Overview and application. Bioinformatics resources on web*. PubMed .Nucleic acid databases GENBANK, DDBJ and EMBL. Sequence submission and file formats. Protein sequence data bank SWISSPROT, UNIPROT. Data mining of biological database with ENTREZ.

UNIT II (12Hrs)

Data base similarity searching –Local and Global alignment. BLAST and FASTA. Similarity searching algorithms and program, dot plot.

UNIT III (12 Hrs)

Genome annotation- analysis of regulatory regions in genome- promoters, splice site, termination signals. ORF prediction. Algorithms for gene prediction.

UNIT IV (12 Hrs)

Protein structure-levels, basic physio chemical properties, Mol weight, amino acids, transmembrane region and tools in ExPASY. Secondary structure prediction: Chou–Fasman and GOR methods. Tertiary structure prediction.3D structure prediction-homology modeling.

UBC72

UNIT V (12Hrs)

Biological databases Nucleic acid sequence databases. Molecular visualization tools RasMol and Chime.

Teaching Methods

Chalk and board/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text books:

1. Rastogi. S. C, Namita – Mendiratta and Parag Rastogi, (2004) BioInformatics – Concepts, Skills and applications, Rastogi Publications, Meerut, India.
2. Ignatchimuthu, S, (2009), Basic Bioinformatics, Narosa Publishing House Pvt Ltd, New Delhi.
3. Ruchi Singh (2014). Bioinformatics: Genomics and Proteomics. S. Chand & Company Pvt. Ltd. NewDelhi.

Reference books:

1. Attwood. T. K. Parry D.J. and Smith (2001). Introduction to BioInformatics, Prentice Hall Publishers, Pearson Education, India.
2. Mani.K and Vijayaraja (2005), BioInformatics – A practical Approach, Aparna Publications, Coimbatore.
3. Dr. P. Shanmughavel, (2006), Trends in Bioinformatics, Pointer Publishers, Jaipur, India.

** Questions may also be taken from the self study portion*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	S
CO2	S	H	S	H	S
CO3	S	H	H	S	H
CO4	H	S	S	H	S
CO5	H	S	H	S	H

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

UBC73

Programme Code: 07	**B.Sc Biochemistry**		
Major Elective – BIOPHARMACEUTICALS			
Batch 2021-2022	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To demonstrate the basics of biopharmaceutical to the under graduate students.
2. To motivate the undergraduate students in analyzing the drug metabolism and mode of action.
3. To elaborate basic of formulations of drugs and to apply them in clinical trials.

Course Outcomes (CO)

K1 to K5	CO1	Acquire knowledge on drug development, principles, mechanism of actions of drugs
	CO2	Outline on preparation of biotechnology oriented pharmaceutical products.
	CO3	Quality control tests and manufacturing, packaging of drugs
	CO4	Help them to analyze the pharmaceutical products available in the market and Evaluate the recent advances in drug manufacturing
	CO5	Relate the regulations in clinical trial and management.

Total Hours: 60

Unit I (12 Hrs)

Drugs: Introduction - Development of Drugs and Pharmaceutical Industry. Drug Metabolism and Pharmacokinetics - ADME – Physico-Chemical Principles –Pharmacodynamics – Routes of drug administration – enteral, parenteral and topical. Action of drugs in humans.

Unit II (12Hrs)

Manufacturing Principles: Compressed tablets – wet granulation, – Dry granulation – Direct compression – Tablet presses formulation – Coating – Pills – Capsules sustained, action dosage forms. Quality control tests for tablets and capsules. Packaging of solid dosage forms.

Unit III (12 Hrs)

Formulations: Manufacturing Principles – Parental, solutions – Oral liquids – injections – Ointments. Quality control tests for semisolid and liquid dosage forms. Packaging of semisolid and liquid dosage forms.

Unit IV (12 Hrs)

Pharmaceutical Products – Vitamins and Antiseptics - Pharmaceutical Vitamins, Cold remedies, Laxatives, Analgesics, External Antiseptics, Antacids and Antibiotics, Biological hormones, recent advances in the manufacture of drugs using r-DNA Technology and monoclonal antibodies

Unit V (12 Hrs)

Trials & Regulations: Clinical Trials & Regulations - Clinical Trials – Design, double blind studies, placebo effects. FDA regulations (General) and Indian Drug regulations- highlight. Good Laboratory Practice, Good manufacturing practice.

Teaching Methods

Chalk and board/Power point presentation/Seminar/Quiz/Discussion/Assignment

Text Books

1. DM Brahmankar, Sunil B Jaiswal, "Biopharmaceutics and Pharmacokinetics-A Treatise", Vallabhprakashan,2005.
2. Ansel, H., Allen, L., Popovich, N, "Pharmaceutical Dosage Forms and Drug Delivery Systems", Williams & Wilkins,1999.

Reference Books

1. Lippincott, "Remington's Science and Practice of Pharmacy", Williams & Wilkins publishers,2005.
2. Goodman & Gilman's, "The pharmacological basis of therapeutics" by Joel Griffith Hardman, Lee E. Limbird, Alfred G.Gilman.2005
3. Tripathi KD, "Essential of Medical pharmacology", Jaypee Brothers Medical Publishers2003.

** Questions may also be taken from the self study portion*

UBC75

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	S	H
CO2	H	S	M	S	S
CO3	S	H	H	S	H
CO4	H	H	S	S	H
CO5	H	S	H	H	S

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

UBC76

Programme Code: 07	**B.Sc Biochemistry**		
Major elective- DAIRY BIOCHEMISTRY			
Batch 2021-2022	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To understand the basic concepts of dairy technology.
2. To provide knowledge about the milk processing techniques.
3. To learn the properties of Milk.

Course Outcomes (CO)

K1 to K5	CO1	Recognize the properties of milk.
	CO2	Recall the methods of testing density, fat content and acidity of milk.
	CO3	Analyze the carbohydrates, lipids, proteins and enzymes present in milk.
	CO4	Understand the non-fermented milk products
	CO5	Acquire knowledge about the various milk products available and milk processing techniques practiced.

Total Hours: 60

UNITI (12Hrs)

Milk- Definition of milk*, physical properties-acidity, viscosity, freezing point and boiling point. Composition of milk, Nutritive value of milk. Vitamins and minerals in milk. Assessment of quality of milk- Density of milk (Lactometer), Determination of fat content (Butyrometer), Acidity of milk (Alcohol test).

UNITII (12Hrs)

Carbohydrates- Types of sugars in milk and their importance. Lipids-Different types of lipids in milk, structure and size of fat globules, physical properties of milk fat.

UNIT III (12 Hrs)

Proteins- Milk protein chemistry. Different types of proteins-Caseins, Caesinate complex, Whey proteins. Production and forms of whey proteins-α-lactalbumin, β-lactoglobulin and other proteins. Determination of protein fraction in milk- Polyacrylamide gel electrophoresis.

UNIT IV (12 Hrs)

Enzymes of milk. Effect of heat on protein, fat and sugar - protein mixture of milk. Milk products : Non fermentable products-Whey protein concentrate, Skim milk, Evaporated milk, Sweetened condensed milk, Dry milk, Khoa, Rabri, Ice cream, Standardized milk, Toned milk, Double toned milk, Sterilized milk, Flavored milk, Cream and Colostrum. Fermentable milk products-Butter, Cheese and Curd.

UNIT V (12Hrs)

Processing of milk - clarification, pasteurization- HTST & UHTS, role of alkaline phosphatase in pasteurization, effects of pasteurization .Homogenization of milk. Microbial spoilage of milk - steps involved in spoilage of milk. General types of microorganisms of milk and their biological importance. Pathogenic microorganisms in milk (any five). Fermentation of milk.

Text Books

1. B. Srilakshmi (2007), Food Science, 4th ed., New age international (P) Limited Publishers, New Delhi, India.

Reference books

1. Dr. M. Swaminathan (2006), Handbook of Food and Nutrition, 5th ed., Bangalore Printing and Publishing Co. Limited, Bangalore.
2. R.C. Dubey and D.K. Maheshwari (2005), A Text book of Microbiology, S Chandand Company Ltd, NewDelhi.

** Questions may also be taken from the self-study portion*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	S	S	H
CO2	S	S	S	S	S
CO3	S	H	H	S	H
CO4	H	S	S	H	S
CO5	H	S	H	S	H

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

UBC78

Programme Code: 08	**B.Sc Biochemistry**		
Major elective- BIOSTATISITICS			
Batch 2021-2022	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To learn the different methods of collecting data and processing
2. Toknowaboutthedifferentstatisticalmethodstointerpretthecollectedstatisticaldata
3. To know the concept of article writing, report writing and thesis making soon

Course Outcomes (CO)

K1 to K5	CO1	The students get an idea on choosing the appropriate method of collecting data
	CO2	The students learn how to select the statistical method and process the collected data
	CO3	The students can device and standardize the statistical methods
	CO4	The students can understand the classification and tabulation data problems
	CO5	The students will be well versed in preparing a report, publishing an article and writing a project dissertation.

Total Hours: 60

Unit I (12 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.

Unit II (12 Hours)

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 (12Hours)

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. Collection of Secondary Data: characteristics, Selection of appropriate method, Case Study method.

Unit IV (12 Hours)

Classification and tabulation of data*. Diagrammatic & graphic presentation of data. Problems involving arithmetic mean, median, mode, quartiles, deciles and percentiles.

Unit V (12Hours)

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.

* denotes Self study

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, 28th edition, Sultan Chand & Sons

Reference Books

1. Sundar Rao, Jesudian Richard. (2009). An Introduction to Bio-Statistics. 4th edition, Prentice-Hall of IndiaPvt.Ltd.
2. Naren Kr. Dutta (2002). Fundamentals of Biostatistics: Practical Approach. Kanishka Publisher.
3. S.P.Gupta.(2016).FundamentalsofStatistics.6thedition,SultanChand.

** Questions may also be taken from the self-study portion*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	S	M	H
CO2	M	H	H	S	M
CO3	S	M	S	H	H
CO4	S	H	S	M	H
CO5	S	H	S	H	S

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

UBC80

Programme Code: 09	**B.Sc Biochemistry**		
Major elective- NUTRITIONAL BIOCHEMISTRY			
Batch 2021-2022	Hours / Week 4	Total Hours 60	Credits 5

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 micro nutrients 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 to K5	CO1	Lean about the significance and role of nutrition in maintaining the health
	CO2	Describe the biochemical and physiological functions of the nutrients and their integrated role.
	CO3	Explore the nutritive value of carbohydrates, proteins and amino acids and their importance
	CO4	Learning about malnutrition and balanced diets
	CO5	Evaluate the therapeutic role of key nutrients in maintaining health.

Total Hours: 60

Unit I (12 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 BMR.

Unit II (12 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 (12Hours)

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

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 **(12Hours)**

Nutrition and body defenses: Effect of drugs on food and nutrients, drug - nutrient interaction - nutritional therapy food preparation and management. Role of diet and nutrition in the prevention and treatment of diseases.

* denotes Self study

Text Books

1. , 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. Srilakshmi 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

** Questions may also be taken from the self-study portion*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	S	M	H
CO2	M	H	H	S	M
CO3	S	M	S	H	H
CO4	S	H	S	M	H
CO5	S	H	S	S	S

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

UBC82

SEMESTER III
NON MAJOR ELECTIVE PAPERS

21UHR3N1

PART IV -NON MAJOR ELECTIVE – I HUMAN RIGHTS

Total Hours of Teaching: 2/week **Total Credits: 2**

Course Objectives

1. To prepare for responsible citizenship with awareness of the relationship between Human Rights, democracy and development.
2. To impart education on national and international regime on Human Rights.
3. To sensitive students to human suffering and promotion of human life with dignity.
4. To develop skills on human rights advocacy
5. To appreciate the relationship between rights and duties
6. To foster respect for tolerance and compassion for all living creature.

Course Outcomes (CO)

K1 to K5	CO1	Understand the hidden truth of Human Rights by studying various theories.
	CO2	acquire overall knowledge regarding Human Rights given by United Nation Commission. (UNO)
	CO3	gain knowledge about various organs responsible for Human Rights such as National Human Rights Commission and state Human Right commission (UNHCR)
	CO4	get habits of how to treat aged person, others and positive social responsibilities
	CO5	treat and confirm, child, refugees and minorities with positive social justice.

UNIT – I

Definition, Meaning, Concept ,Theories and Kinds of Human Rights- Evaluation and Protection of Human Rights in India- Development of Human Rights under the United Nations.

UNIT – II

United Nations Charter and Human Rights - U.N. Commission on Human Rights- Universal Declaration of Human Rights - International Covenant on

- Civil & Political Rights
- Economic, Social and Cultural Rights

UNIT – III

Human Rights and Fundamental Rights (Constitution) - Enactments regarding Human Rights Laws in India - National Human Rights Commission and State Human Rights Commission.

UNIT – IV

Aged persons and their Human Rights - Human Rights of Persons with Disabilities - Tribal Human Rights in India - Three Generation Human Rights -Social Awareness and Responsibilities of Individuals.

UNIT – V

Rights of Women, Child, Refugees and Minorities –Social media and Human Rights - NGO's in protection of Human Rights - Right to Election

Books for Study:

1. Human Rights (2019) Published by Kongunadu Arts and Science College, Coimbatore –29.

Book for Reference:

1. Human Rights, (2018)Jaganathan,MA.,MBA.,MMM.,ML.,ML., Humanitarian Law and Refugee Lawlaw series. J.P.Arjun Proprietor,Usha Jaganathan 1st floor, Narmatha Nanthi street, Magathma Gandhi Nagar, Madurai – 625014.

Question Paper Pattern
(External only)

Duration: 3 hrs Max: 75 marks

Section A(5x5=25)

Short notes
Either - Or/ Type - Question from each unit

Section B(5X10=50)

Essay type
Either - Or/ Type - Question from each unit

UBC84

SEMESTER – IV

NON- MAJOR ELECTIVE – II WOMEN'S RIGHTS

21UWR4N2

Total Hours of Teaching: 30 **Total Credits: 2**

Course Objectives

1. To know about the laws enacted to protect Women against violence.
2. To impart awareness about the hurdles faced by Women.
3. To develop a knowledge about the status of all forms of Women to access to justice.
4. To create awareness about Women's rights.
5. To know about laws and norms pertaining to protection of Women.
6. To understand the articles which enables the Women's rights.
7. To understand the Special Women Welfare laws.
8. To realize how the violence against Women puts an undue burden on healthcare services.

Course Outcomes (CO)

After Completion of the Course the student will be able to

K1 to K5	CO1	Appraise the importance of Women's Studies and incorporate Women's Studies with other fields.
	CO2	Analyze the realities of Women Empowerment, Portrayal of Women in Media, Development and Communication.
	CO3	Interpret the laws pertaining to violence against Women and legal consequences.
	CO4	Contribute to the study of the important elements in the Indian Constitution, Indian Laws for Protection of Women.
	CO5	Spell out and implement Government Developmental schemes for women and create awareness on modernization and impact of technology on Women.

Syllabus

Unit I **(6 hrs)**

Women's Studies:

Basic concepts of Women's studies in Higher education, Women's studies perspectives- Socialization- Patriarchy- Women's studies as an academic discipline- Growth and development of Women's studies as a discipline internationally and in India.

Unit II **(6 hrs)**

Socio-Economic Development of Women:
Family welfare measures, role of Women in economic development, representation of Women in media, status of Women land rights, Women Entrepreneurs, National policy for the empowerment of women.

Unit III **(6 hrs)**

Women's Rights – Access to Justice:
Crime against Women, domestic violence – physical abuse- verbal abuse – emotional abuse - economic abuse – minorities, dowry- harassment and death, code of conduct for work place, abetment of suicide.

Unit IV **(6 hrs)**

Women Protective acts:
Protective legislation for Women in the Indian constitution- Anti dowry, SITA, PNDT, and Prevention Sexual Harassment at Workplace (Visaka case), Domestic violence (Prevention) Act.

Unit V **(6 hrs)**

Women and Child welfare:
Safety provisions - various forms of mass media, radio, visual, internet, cyber space, texting, SMS and smart phone usage. Healing measures for the affected Women and child society by private and public sector, NGO and society.

Teaching Methods:

Smart Class Room / Powerpoint Presentation / Seminar / Quiz / Discussion / Flipped Class

Text Book:

1. **Women's Rights** (2021), Published by Kongunadu Arts & Science College, Coimbatore – 641 029.

Reference Books:

1. **"Rights of Indian Women"** by Vipul Srivatsava. Publisher: Corporate Law Advisor, 2014.
2. **"Women's security and Indian law"** by Harsharam Singh. Publisher: Aabha Publishers and Distributors, 2015.
3. **"Women's Property Rights in India"** by Kalpaz publications, 2016.

Question Paper Pattern

Duration :3 hrs Max: 75 marks

Section A (5 X 5=25 Marks)

Short notes
Either – Or/ Type - Question from each unit.

Section B (5 X 10=50 Marks)

Essay type Either – Or/ Type - Question from each unit.

UBC86

NON- MAJOR ELECTIVE – CONSUMER AFFAIRS

Total Hours of Teaching: 30 **Total Credits: 2**

Course Objectives

1. To familiarize the students with their rights and responsibilities as a consumer.
2. To understand the procedure of redress of consumer complaints.
3. To know more about decisions on Leading Cases by Consumer Protection Act.
4. To get more knowledge about Organizational set-up under the Consumer Protection Act
5. To impart awareness about the Role of Industry Regulators in Consumer Protection
6. To understand Contemporary Issues in Consumer Affairs

Course Outcomes (CO)

K1 to K5	CO1	Able to know the rights and responsibility of consumers.
	CO2	Understand the importance and benefits of Consumer Protection Act.
	CO3	Applying the role of different agencies in establishing product and service standards.
	CO4	Analyse to handle the business firms' interface with consumers.
	CO5	Assess Quality and Standardization of consumer affairs

UNIT I **6 hrs**

Conceptual Framework - Consumer and Markets: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labeling and packaging along with relevant laws, Legal Metrology. Experiencing and Voicing Dissatisfaction: Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer

Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000suite

UNIT II **6 hrs**

The Consumer Protection Law in India - Objectives and Basic Concepts: Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice, restrictive trade practice.
Organizational set-up under the Consumer Protection Act: Advisory Bodies: Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions, National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important case law.

UNIT III **6 hrs**

Grievance Redressal Mechanism under the Indian Consumer Protection Law - Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties.
Leading Cases decided under Consumer Protection law by Supreme Court/National Commission: Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices.

UNIT IV **6 hrs**

Role of Industry Regulators in Consumer Protection

i. Banking: RBI and Banking Ombudsman
ii. Insurance: IRDA and Insurance Ombudsman
iii. Telecommunication: TRAI
iv. Food Products: FSSAI
v. Electricity Supply: Electricity Regulatory Commission
vi. Real Estate Regulatory Authority

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UNIT V **6 hrs**

Contemporary Issues in Consumer Affairs - Consumer Movement in India: Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing, Sustainable consumption and energy ratings.

Quality and Standardization: Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance; Role of International Standards: ISO an Overview.

Note: Unit 2 and 3 refers to the Consumer Protection Act, 2086. Any change in law would be added appropriately after the new law is notified.

Teaching Methods:

Smart Class rooms /Power Point Presentations / Seminars/Quiz /Discussion /Flipped Classrooms

SUGGESTED READINGS:

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) Consumer Affairs, UniversitiesPress.
2. Choudhary, Ram Naresh Prasad (2005). Consumer Protection Law Provisions and Procedure, Deep and Deep Publications PvtLtd.
3. G. Ganesan and M. Sumathy. (2012). Globalisation and Consumerism: Issues and Challenges, RegalPublications
4. Suresh Misra and Sapna Chadah (2012). Consumer Protection in India: Issues and Concerns, IIPA, NewDelhi
5. Rajyalaxmi Rao (2012), Consumer is King, Universal Law Publishing Company
6. Girimaji, Pushpa (2002). Consumer Right for Everyone Penguin Books.
7. E-books :-www.consumereducation.in
8. Empowering Consumers e-book,www.consumeraffairs.nic.in
9. ebook,www.bis.org
10. The Consumer Protection Act, 2086 and its later versions.

UBC89

Question paper pattern (External Only)

Duration: 3 hrs Max: 75 Marks

Section A (5 x 5=25)

Short notes

Either – or / type – question from each unit.

Section B (5 x 10=50)

Essay type

Either – or / type – question from each unit.

UBC90

ALLIED BIOCHEMISTRY

21UBC3A3

Programme Code: 07		**For B.Sc Zoology**		
Course Code: 21UBC3A3		**ALLIED BIOCHEMISTRY I**		
Batch	Semester	Hours / Week	Total Hours	Credits
2021-2022	III	5	75	4

Course Objectives

1. To make the students to understand the basic principles of biochemistry.
2. To learn about the mechanism of action of enzymes in the biological system.
3. To learn the Structure and chemistry of different biomolecules

Course Outcomes (CO)

K1 to K5	CO1	Understands the properties, types and functions of carbohydrates, proteins, lipids, enzymes, nucleic acids and their and functions.
	CO2	Remembers the structures of monosaccharides, dis saccharides and polysaccharides and amino acids
	CO3	Applies the concept of enzymatic activity in biological system.
	CO4	Acquire knowledge about the nuclear organization of prokaryotes in eukaryotes.
	CO5	Describe the Nucleic acid structure and their types, Denaturation and Renaturation of DNA

Total Hours :75

UNIT I

(15 Hrs)

Carbohydrates

Carbohydrates**:** Definition and Classification*. Monosaccharides – Structural aspects-asymmetric carbon atom, D and L isomers, anomers, optical activity and mutarotation. Epimers: pyranose and furanose forms, aldo and keto forms, classification, definition, structure and biological importance.

Hexoses: glucose, fructose, galactose and mannose. Pentoses: Ribose and deoxyribose. Disaccharides: Maltose, sucrose and lactose.

Polysaccharides: Homopolysaccharides: Starch, glycogen, cellulose, inulin and chitin, Heteropolysacchrides: Heparin, hyaluronic acid, chondroitin sulphates. Reactions of monosaccharides- Oxidation of glucose (aldonic acid, aldaric acid and uronicacid).

Action of alcohols and alkalies with sugars, reducing action of sugars in alkaline solution and reaction with phenyl hydrazine.

21UBC3A3

UNIT II (15 Hrs)

Lipids: Classification and properties of lipids. Types of fatty acids: saturated and unsaturated: essential fatty acids. Classification and significance of phospholipids: Phosphatidyl choline, phosphatidyl ethanolamine, phosphatidyl serine, phosphatidyl inositol and sphingomyelin.
Classification and significance of glycolipids: Cerebrosides and gangliosides. Classification and functions of lipoproteins. Structure and biological functions of cholesterol.

UNIT III (15 Hrs)

Amino acids: Classification of amino acids (chemical nature). Essential and non-essential amino acids*. Reactions of amino acids: actions of amino group with benzoic acid, ninhydrin, fluorodinitrobenzene (FDNB), and oxidative deamination.
Reactions of carboxyl group – decarboxylation and amide formation.
Proteins: Definition, classification (chemical nature) and functions of proteins. Structure of proteins- Primary, secondary, tertiary (myoglobin) and quaternary (hemoglobin).
Denaturation and renaturation of proteins. Ampholytes and isoelectric pH.

UNIT IV (15 Hrs)

Enzymes: Definition, classification and nomenclature of enzymes by IUB , Enzyme units (IU) with examples. Enzyme kinetics- Derivation of Michealis- Menton Equation (single substrate),properties of enzymes, enzyme specificity, mechanism of enzyme action. Theories proposed for the enzyme action- Lock and Key model, induced fit mechanism. Active site and its characteristic features. Factors affecting enzyme activity – Effect of pH, temperature, substrate concentration and enzyme concentration. Types of inhibition of enzyme action – Competitive, non– competitive,uncompetitive inhibition.Coenzymes-definition with and any five examples. Cofactors- definition with and any five examples.

UNIT V (15Hrs)

Nucleic acids: Components, structure of purine bases: Adenine and guanine. Structure of pyrimidine bases: Cytosine, uracil and thymine. Structure of nucleoside and nucleotide. Double helical structure of DNA. Type of bonds of DNA molecule. Denaturation and renaturation of DNA. Structure and types of RNAs: mRNA, tRNA and rRNA.

Teaching Methods

Chalk and board/ Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

Text Books:

1. A.C. Deb (2011), Fundamentals of Biochemistry, 9th ed., New Central Book Agency Pvt.Ltd.Kolkata.
2. Ambika Shanmugam (2008), Fundamentals of Biochemistry for medical students. 7th ed., Lippincott Wiliams & Wilkins, Authur, III Cross Street, West C.I.T. Nagar, Chennai – 600035.
3. Lehninger.L.A(2008),Principles of Biochemistry ,W.H .Freeman publishers,India.

21UBC3A3

Reference Books:

1. M.N. Chatterjee and Rana Shinda (2005), Text book of Medical Biochemistry, Jaypee brother medical publishers Pvt Ltd. NewDelhi.
2. J.L. Jain, Sanjay Jain and Nitin Jain (2007), Elementary Biochemistry, 3rd ed., S Chand and company Ltd, New Delhi.
3. David L. Nelson, Micheal M.Cox(2008), Lehninger‟s Principles of Biochemistry, Replika press (P) Ltd, India.
4. Robert K. Murray, Daryl K. Garnerand Victor W. Rodwell (2008), Harper‟s Illustrated biochemistry, 29th ed., Appleton and Lange Stanford, Connecticut, USA.

**Question for Examination may also be taken from the self-study portion*

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	S
CO2	H	S	S	M	S
CO3	S	H	H	S	H
CO4	H	S	S	H	M
CO5	S	H	S	H	S

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

UBC93

21UBC4A4

Programme Code: 07		**For B.Sc Zoology**		
Course Code: 21UBC4A4		**Title: ALLIED BIOCHEMISTRY II**		
Batch	Semester	Hours / Week	Total Hours	Credits
2021-2022	IV	5	75	4

Course Objectives

1. To learn about the various biochemical techniques applicable in both research and clinical laboratories.
2. To provide knowledge on metabolic reactions involved in biological reactions.
3. To study the Interrelationship between various biomolecules.

Course Outcomes (CO)

K1 to K5	CO1	Remember the concept of pH and buffer system.
	CO2	Understand the idea about the working principle of various analytical techniques.
	CO3	Deploy the activity of radioisotopes and their applications in biological system.
	CO4	Interpret the metabolic pathways of various molecules.
	CO5	General pathway of lipid and protein metabolism

Total Hours: 75

UNIT I (15Hrs)

Buffers and buffer system:

Buffers: Definition. Concept of ionization, pKa, pH and derivation of Henderson-Hasselbalch equation, Acid- base indicators. Components and working of pH meter. Buffer systems of blood and body fluids; Hemoglobin buffer system. Various ways of expressing the concentration of solutions - Normality, Molarity and percentage solutions.*

UNIT II (15Hrs)

Colorimetry and Centrifugation.

Colorimetry – Beer and Lambert's law. Instrumentation and working of photoelectric colorimeter (single cell) and spectrophotometer. Comparison of colorimeter and spectrophotometer.

Centrifugation- Principle and types. Technique and applications of Ultra centrifuge- Density gradient centrifuge and Differential Centrifugation

21UBC4A4

UNIT III (15 Hrs)

Chromatography and Electrophoresis Chromatography- Definition, Rf factor, Principle and technique of paper chromatography with reference to separation of amino acids, Affinity chromatography with reference to separation of proteins.

Electrophoresis-Definition, factors affecting mobility of ions in electric field, principle and working of PAGE (polyacrylamide gel electrophoresis) with reference to separation of serum proteins and

SDS-PAGE (sodium do decyl sulphate-PAGE) with reference to separation of protein subunits. Role of protein solubilizes – Urea, β- mercaptoethanol, SDS.

UNIT IV (15 Hrs)

Metabolic pathways: Carbohydrate metabolism: Glycolysis, conversion of pyruvate into acetyl Co A. TCA cycle, Glycogenesis and glycogenolysis. Respiratory chain and oxidative phosphorylation.

Respiratory chain (Electron Transport Chain)- Mitochondrial organization of ETC and structural organization of ETC. Oxidative phosphorylation.

UNIT V

Metabolic pathways, lipid and protein metabolism. Lipid metabolism: Beta-oxidation, biosynthesis of saturated fatty acids- Palmitic acid. Protein metabolism: General pathway of amino acid metabolism – deamination, transamination and decarboxylation. Urea cycle. Interrelationship of carbohydrate, fat and protein metabolism (flow chart only)

Teaching Methods

Chalk and board/Power point presentation/Seminar/Quiz/Discussion/Assignment

Text books

1. P. Asokan, (2006), Basics of Analytical Biochemical Techniques, Chinna Publications, TamilNadu.

2. A.C. Deb (2011), Fundamentals of Biochemistry, 9th ed., New Central Book Agency Pvt. Ltd. Kolkata.

3. Satyanarayana.U and Chakrapani,U (2013),Biochemistry,4th ed., Books and allied pvt. Ltd, Kolkata.

Reference Books:

1. Keith Wilson and John walker (2011), Principles and Techniques of Biochemistry and Molecular Biology. 7th ed., Cambridge University Press, New York.

2. Robert K. Murray, Daryl K.Garner and Victor W. Rodwell (2008), Harper‟s Illustrated Biochemistry, 29th ed., Appleton and Lange Stanford, Connecticut, USA.

3. AmbikaShanmugam,(2008),FundamentalsofBiochemistryforMedicalStudents‟.7thed.,Lippincott Wiliams & Wilkins, Authur, III Cross Street, West C.I.T. Nagar, Chennai – 600035.

4.Garrette,R.H and Grisham,L.M.(2012),Principles of biochemistry, 5th ed, Saunders College Publishers, USA.

**Question for Examination may also be taken from the self-study portion*

UBC95

21UBC4A4

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	M
CO2	S	S	S	S	S
CO3	S	S	H	S	H
CO4	H	S	S	H	S
CO5	S	M	S	H	S

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

UBC96

21UBC4AL

Programme Code: 07		**For B.Sc Zoology**		
Course Code: 21UBC4AL		**A.Pr.2. BIOCHEMISTRY**		
Batch 2021-2022	Semester III & IV	Hours / Week 2	Total Hours 60	Credits 2

Course Objectives

1. To acquire the skill of analyzing carbohydrates and amino acids.
2. To provide practical knowledge about the quantitative analysis of carbohydrate and protein.
3. To learn the methodology of separation of amino acid by paper chromatography.

Course Outcomes (CO)

K3 to K5	CO1	Recall the classification of biomolecules and iearn the preparation of reagents
	CO2	Practice the qualitative analysis of different carbohydrates through individual experiments
	CO3	Qualitate various amino acids through individual experiments
	CO4	Calculate acid and iodine number of lipids, thereby characterizing them
	CO5	Assess the separation technique of amino acids through paper chromatography

Total Hours: 30

List of Programs

1. QUALITATIVE ANALYSIS

1. Analysis of carbohydrates:

a. Monosaccharides- Pentose- Arabinose. Hexoses- Glucose and fructose

b. Disaccharides- Sucrose, maltose and lactose

c. Polysaccharide-Starch.

2. Analysis of Amino acids:

a. Histidine b. Tyrosine. c. Tryptophan d. Arginine e. Cysteine

II. QUANTITATIVE ANALYSIS OF BIOMOLECULES [Group experiments]

- Estimation of glucose by anthrone method.
- Estimation of proteins by Lowry's method.

21UBC4AL

III. SEPARATION TECHNIQUE [Demonstration]

Separation of amino acids by paper chromatography

Reference Books:

1. Sadhasivsam. S and Manickam. A. (2008), Biochemical Methods, revised 2nd ed., New age International Publishers, India.
2. Jeyaraman. J. (2007), Laboratory Manual in Biochemistry, New Age International Publishers, New Delhi.
3. David T Plummer. (2017), An Introduction to Practical Biochemistry, 3rd ed, Tata McGraw Hill publishing Co Ltd, NewDelhi.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	S
CO2	S	S	S	H	S
CO3	S	S	H	S	H
CO4	H	S	S	H	M
CO5	H	S	H	H	S

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

CERTIFICATE COURSES

UBC99

CERTIFICATE COURSE IN MUSHROOM TECHNOLOGY

(Curriculum and scheme of examination applicable to students admitted from the academic year 2021- 2022 onwards)

Subject code/ Question paper code	Title of the Paper	Lecture hours/ week	Exam marks			Duration of exam	Credits
			CIA	ESE	Total		
21CBCA101	Mushroom Science	2 Hrs	50	50	100	3	2
21CBCA102	Mushroom Cultivation	2 Hrs	50	50	100	3	2
21CBCA1CL	Practical	2 Hrs	50	50	100	3	2
21CBCA1Z1	Project work	2 Hrs	50	50	100	-	2
Total					**400**		**8**

CIA- Continuous Internal Assessment; ESE- End of Semester Examinations

UBC100

21CBCA101

Programme Code:07	B.Sc Biochemistry		
Course Code: 21CBCA101	**MUSHROOM SCIENCE**		
Batch 2021-2022	Hours / Week 2	Total Hours 30	Credits 2

Course Objectives:

1. To learn the basics of mushroom biology
2. To learn the nutritional and medicinal properties of mushrooms
3. To learn the morphology and life cycle of mushrooms

Course Outcomes (CO)

On successful completion of the course, the students will be able to

K1 to K5	CO1	To learn the mushrooms and its properties
	CO2	Investigate the current status of mushroom biology
	CO3	Implement the acquired knowledge on commercial applications of mushroom
	CO4	To learn the Knowledge of mushroom culture technology
	CO5	To explore the mushroom types and spawn production process

Total Hours:60

UNIT – I (12 Hours)

Mushrooms: Introduction, biodiversity, edible and non-edible species, systematic position, distribution and morphology. Nutritional and physical requirements for growth. The role of mushrooms in nature: saprobes, parasites, mycorrhiza formers. Status of mushroom cultivation, Advantages of mushroom cultivation for India, scope of mushroom cultivation and marketing.

UNIT – II (12 Hours)

Mushroom Formation: Role of environmental factors (Hydrogen Ion Concentration (pH), Temperature, Aeration, Light, and Gravity), Nutritional Factors (Concentration of Nutrients, Nature of Carbohydrate, Nitrogen, Mineral Nutrition, Vitamins) and Chemical Factors.

Submerged Cultivation of Mushrooms (SCM): Introduction, Concept of SCM, Methods and Techniques of SCM, Physical, Chemical and biological factors that Influence the SCM. Cultivation of Medicinal Fungi in Bioreactors: Introduction, Overview of Cultivation Technologies, Production of Biomass in Bioreactors, Submerged Bioprocessing and Solid-State Bioprocessing.

UNIT – III (12 Hours)

Nutritional and medicinal significance of mushrooms: Nutritional composition (protein, essential amino acids, fat, vitamins, carbohydrates and fiber, minerals and nucleic acids) and significance of edible mushrooms; Medicinal properties of edible mushrooms - Anti-tumor, Anti-viral, Hypocholesterolemia, Antibiotic, Anti-inflammatory activities and Tonic.

UNIT – IV (12 Hours)

Mushroom Tissue Culture Technology: Commonly used growth media, preparation of media, methods of isolation of mushroom tissue, inoculation, mycelial growth, storage and preservation of cultures. Revival of cultures, sub culturing methods. Factors affecting the growth of mycelial cultures. Equipment's for mushroom tissue culture process.

UNIT – V (12 Hours)

Mushroom Spawn Production Technology: Definition and history of spawn. Types of substrates used for spawning. Mode of spawning: liquid and solid spawning. Spawn production process: selection of substrate, processing of substrate, preparation of spawn packet, sterilization, inoculation of culture, growth and maturity of spawn. Preparation of mother spawn, F1 and F2 generation spawn. Factors affecting the spawn production process. Infrastructural facilities required for spawn production. Economics of spawn production.

Text Book:

1. Better life with mushrooms (2014), S. Krishnakumari and S. Kathiravan, Kongunadu Arts and Science College, Coimbatore – 641029, Tamil Nadu, India.

References:

1. Mushroom Cultivation, Tripathi, D.P. (2005) Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.
2. PathakYadavGour (2010). Mushroom Production and Processing Technology, Published by Agrobios(India).
3. Nita Bahl, 2002. Hand Book on Mushroom 4th edition. Vijay Primlani for oxford and IBH Publishing Co. Pvt. Ltd., NewDelhi.
4. Training Manual on Culture Techniques & Spawn Production (2017), S. Krishnakumari, S. Kathiravan, M. Karthik, V. Suganthi, and B. Krishna, Kongunadu Arts and Science College, Coimbatore – 641029, Tamil Nadu, India.
5. Shu-Ting Chang and Philip G. Miles (2004) Mushrooms -Cultivation, Nutritional Value, Medicinal Effect, and Environmental Impact.2nd edition. CRC PressLLC.
6. Philip G. Miles and Shu-Ting Chang. Mushroom Biology Concise Basics and Current Developments (1997). World Scientific Publishing Co. Pte.Ltd.
7. Marian Petre (2016). Mushroom Biotechnology. Developments and Applications. 1st edition. Academic Press.USA.

UBC102

21CBCA101

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	S	S
CO2	S	S	S	H	S
CO3	S	S	M	S	H
CO4	H	S	S	H	M
CO5	H	S	H	S	S

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

UBC103

21CBCA102

Programme Code:07	B.Sc Biochemistry		
Course Code: 21CBCA102	MUSHROOM CULTIVATION		
Batch 2021-2022	Hours / Week 2	Total Hours 30	Credits 2

Course Objectives:

1. To learn the various aspects of mushroom tissue culture technology.
2. To know about the processes involved in mushroom spawn production.
3. To learn the technology of oyster and milky mushroom cultivation.
4. To create an awareness on management of post mushroom substrate.
5. To get involved in value added product production from mushrooms.

Course Outcomes: (CO)

On successful completion of the course, the students will be able to

K1 to K5	CO1	Learn the process of oyster mushrooms cultivation
	CO2	Learn the process of milk mushroom cultivation
	CO3	Study the biotic and abiotic factors responsible for disorders
	CO4	To acquire the knowledge of value addition products from mushroom
	CO5	Affairs business and entrepreneurial skill in mushroom trade

UNIT –I (12 Hours)

Technology of Oyster Mushroom Cultivation: Infrastructural facilities required for oyster mushroom cultivation. Substrates used for cultivation. Process of cultivation: Sterilization of cultivation chamber, selection of substrate, processing, sterilization, packing of substrate, spawn inoculation, spawn running, maintenance of temperature and humidity, harvest of mushrooms and packing of mushrooms. Economics of oyster mushroom cultivation.

UNIT – II (12 Hours)

Technology of Milky Mushroom Cultivation: Infrastructural facilities required for milky mushroom cultivation. Substrates used for cultivation. Process of cultivation: Sterilization of

cultivation chamber, selection of substrate, processing, sterilization, packing of substrate, spawn inoculation, spawn running, maintenance of temperature and humidity, casing process, harvest of mushrooms and packing of mushrooms. Economics of milky mushroom cultivation.

UNIT –III (12 Hours)

Mushroom Disease Management: biotic factors responsible for disorders: Nematodes, Parasitic fungi, Antagonistic fungi, Pathogenic bacteria, virus, Viroids, mycoplasmas, and rickettsias. Abiotic factors responsible for disorders.

UNIT-IV (12 Hours)

Management of Post Mushroom Substrate (PMS): Use of Post Mushroom Substrate in soil reclamation, organic fertilizer, source for biogas production, animal feed, casing material for mushroom cultivation, vermi compost production and other uses. Societal and Environmental impact of PMS management.

Value addition to mushrooms: Preparation of soups, soup powder, biscuit, pickles, ketchup, candy, chips, instant food items and bakery products. Equipment‟s required for value addition to mushrooms.

UNIT–V (12Hours)

Strategies for successful and sustainable mushroom trade: Marketing channels, Marketing strategies, Processing, Organization, Accessing market information, Education, business skills and a willingness to take risks, Diversification options, Business and entrepreneurial skills and Sustainable mushroom trade.

Text Book:

1. Better life with mushrooms (2014), S. Krishnakumari and S. Kathiravan, Kongunadu Arts and Science College, Coimbatore – 641029, Tamil Nadu, India.

Reference Books:

1. Mushroom Cultivation, Tripathi, D.P. (2005) Oxford & IBH Publishing Co. Pvt. Ltd, NewDelhi.
2. PathakYadavGour (2010). Mushroom Production and Processing Technology, Published by Agrobios(India).
3. Nita Bahl, 2002. Hand Book on Mushroom 4th edition. Vijay Primlani for oxford and IBH Publishing Co. Pvt. Ltd., NewDelhi.
4. Training Manual on Culture Techniques & Spawn Production (2017), S. Krishnakumari, S. Kathiravan, M. Karthik, V. Suganthi, and B. Krishna, Kongunadu Arts and Science College, Coimbatore – 641029, Tamil Nadu, India.
5. Elaine Marshall and N. G. (Tan) Nair. (2009) make money by growing mushrooms. Rural Infrastructure and Agro-Industries Division, Food and Agriculture Organization of the United Nations. Rome.
6. Shu-Ting Chang and Philip G. Miles (2004) Mushrooms -Cultivation, Nutritional Value, Medicinal Effect, and Environmental Impact.2nd edition. CRC PressLLC.
7. Philip G. Miles and Shu-Ting Chang. Mushroom Biology Concise Basics and Current Developments (1997). World Scientific Publishing Co. Pte.Ltd.
8. Marian Petre (2016). Mushroom Biotechnology. Developments and Applications. 1st edition. Academic Press.USA.

UBC105

21CBCA102

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	S	S
CO2	S	S	S	H	S
CO3	S	S	M	S	H
CO4	H	S	S	H	M
CO5	H	S	H	S	S

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

UBC106

21CBCA1CL

Programme Code:07	B.Sc Biochemistry		
Course Code: 21CBCA1CL	PRACTICAL - LAB IN MUSHROOM CULTIVATION		
Batch 2021-2022	Hours / Week 2	Total Hours 30	Credits 2

Course Objectives:

1. To provide a hands-on training on the technologies of mushroom tissue culture, spawn production and cultivation.
2. To equip the students with the different techniques and instrumentation.

Course Outcomes (CO)

On successful completion of the course, the students will be able to

K3 to K5	CO1	To understand the mushroom tissue culture
	CO2	To study the different techniques and instruments
	CO3	To learn the Spawn production technology
	CO4	Acquire skills in mushroom cultivation technology
	CO5	Analyze the primary and secondary metabolites in mushroom

I. Tissue culture, spawn and mushroom production techniques

1. Sterilization of tissue culture and spawn productionutensils.*
2. Media preparation for mushroom tissue culture.*
3. Inoculation of the tissue/culture into the culture media.
4. Sub culturing of mycelia from slant/petri plate.
5. Mushroom spawn preparation*
6. Preparation of F1 and F2 generation from mother spawn*
7. Substrate processing for mushroom production.*
8. Making of mushroom beds.*

II. Analysis of primary and secondary metabolites

9. Estimation of primary metabolites from powdered mushroom sample.
    a. Carbohydrate
    b. Starch
    c. Total protein

10. Estimation of primary metabolites from powdered mushroom sample.
    a. Phenols
    b. Flavonoids

Text Book:

1. S.Sadasivam and A.Manikam (2005). Biochemical Methods. 2nd edition. New Age International (P) Limited Publishers. New Delhi.

References:

1. Mushroom Cultivation, Tripathi, D.P. (2005) Oxford & IBH Publishing Co. Pvt.Ltd, NewDelhi.
2. PathakYadavGour (2010). Mushroom Production and Processing Technology, Published by Agrobios(India).
3. Training Manual on Culture Techniques & Spawn Production (2017), S. Krishnakumari, S. Kathiravan, M. Karthik, V. Suganthi, and B. Krishna, Kongunadu Arts and Science College, Coimbatore – 641029, Tamil Nadu, India.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	S	S
CO2	S	S	S	H	S
CO3	S	S	M	S	H
CO4	H	S	S	H	M
CO5	H	S	H	S	S

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

UBC108

Project **Marks 100**

1. Allotment of research topic

2. Literature survey of the allotted research topic

3. Preparation and submission of synopsis based on literature survey, objective and preliminary Research work, etc.

4. Presentation of the Submitted Dissertation Submission (on topic assigned) and Evaluation by Viva voce examination.

UBC109

CERTIFICATE COURSE IN INDIGENOUS FOOD AND NUTRACEUTICALS

(Curriculum and scheme of examination applicable to students admitted from the academic year 2021-2022 onwards)

Subject code/ Question paper code	Title of the Paper	Lecture hours/ week	Exam marks			Duration of exam	Credits
			CIA	ESE	Total		
21CBCB101	Nutraceuticals	2 Hrs	50	50	100	3	2
21CBCB102	Indigenous Food	2 Hrs	50	50	100	3	2
21CBCB1CL	Practical	2 Hrs	50	50	100	3	2
21CBCB1Z1	Project work	2 Hrs	50	50	100	-	2
Total					**400**		**8**

CIA- Continuous Internal Assessment; ESE- End of Semester Examinations

UBC110

21CBCB101

Programme Code:07	**B.Sc Biochemistry**		
Course Code: 21CBCB101	**NUTRACEUTICALS**		
Batch 2021-2022	Hours / Week 2	Total Hours 30	Credits 2

Course Objectives

1. To learn the basics of nutraceutical Sciences
2. To learn the Nutrition related diseases and disorders
3. Impart knowledge of specialty nutraceuticals their technology requirements.

Course Outcomes (CO)

On successful completion of the course, the students will be able to

K1 to K5	CO1	Describe the basics of nutraceutical Sciences
	CO2	To study the different types of Nutrition related disorders
	CO3	To learn the nutraceuticals technology and their requirements
	CO4	To learn the nutrition related diseases and disorders
	CO5	Acquire the knowledge about prebiotics and probiotics nutraceuticals

UNIT I (6 hrs)

Nutrients

Basics of energy balance - Basal Metabolic Rate (BMR), Body Mass Index (BMI) and Standard Dynamic Action (SDA) with special reference to nutraceutical industry. Energy Carbohydrates, lipids and proteins Fat soluble vitamins-A, D, E and K Water soluble vitamins – thiamine, riboflavin, niacin, pyridoxine, folate, vitamin B12 and vitamin C Minerals – calcium, iron, iodine, fluorine, copper and zinc.

UNIT II

Nutritional significance of dietary components (6 hrs)

Physiological role and nutritional significance of carbohydrates, lipids, proteins, vitamins (water soluble and fat soluble) minerals and fibre. Dietary sources. Functions. Digestion, absorption and storage, metabolism of carbohydrates – lipids – proteins.

UNIT III **(6 hrs)**

Phytonutraceuticals

Introduction to free radicals, Reactive oxygen species, Free radicals involvement in other disorders. Antioxidants - use of antioxidants as dietary supplements in prevention and treatment of cancer, obesity and stress. Plant secondary metabolites- Alkaloids, phenols, Flavonoids Terpenoids and their role in maintaining good health. Algae as source of omega - 3 fatty acids.

UNIT IV **(6 hrs)**

Nutrition related diseases and disorders

Carbohydrates, Protein, amino acids, Fat, vitamins and minerals - excess and deficiency, symptoms, prevention and management. Role of nutraceuticals with special reference to the prevention and treatment of diabetes mellitus, hypertension, hypercholesterolemia and cancer. Brief idea about some Nutraceutical rich supplements e.g. Bee pollen, Caffeine, Green tea, Lecithin, Mushroom extract, Chlorophyll, Kelp and Spirulina etc.

UNIT V **(6 hrs)**

Microbial nutraceuticals

Concept of prebiotics and probiotics - principle, mechanism, production and technology involved, applications - examples of bacteria used as probiotics, use of prebiotics in maintaining the useful microflora - extraction from plant sources. Bio fortification and nutritional enhancement.

Text Books:

1. Swami Nathan, M.(2004) Advanced Textbook of Food and Nutrition, Volume II, Second Edition, the Bangalore Printing and Publishing Co. Limited, India.

References Books

1. Srilakshmi, B. (2013) Nutrition Science Revised Fourth Edition, New Age International Publishers, New Delhi.

2. Israel Goldberg (Ed.) (1999) Functional foods, designer foods, pharma foods, Nutraceuticals, Aspen publishers Inc., USA

3. L. Rapport and B. Lockwood (2002) Nutraceuticals, 2nd Edition, Pharmaceutical Press, London.

5. M. Maffei (Ed.) (2003) Dietary Supplements of Plant Origin, Taylor & Francis, London.

4. Shahidi and Weerasinghe (Ed.) (2004) Nutraceutical beverages Chemistry, Nutrition and health Effects, American Chemical Society, Washington.5. Richard Neeser & J. Bruce German (2004) Bioprocesses and Biotechnology for Functional Foods and Nutraceuticals, Jean, Marcel Dekker, Inc

6. Frei, B. (1994) Natural antioxidants in human health &disease. Academic Press, USA.

7. San Diego, Tannock, G.W. (1999) Probiotics: A critical review, Horizon Scientic Press, UK.

8. H. Panda, Herbal beauty products with formulation & processes, Asia Pacific Business Press Inc.

UBC112

21CBCB101

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	S	S
CO2	S	S	S	H	S
CO3	S	S	M	S	H
CO4	H	S	S	H	M
CO5	H	S	H	S	S

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

UBC113

21CBCB102

Programme Code:07	**B.Sc Biochemistry**		
Course Code: 21CBCB102	**INDIGENOUS FOOD**		
Batch	Hours / Week	Total Hours	Credits
2021-2022	2	30	2

Course Objectives

1. To learn the food processing and product development
2. Training in the formulation, processing, manufacture and packaging requirements of food products
3. To learn Food laws and Regulations

Course Outcomes (CO)

On successful completion of the course, the students will be able to

K1 to K5	CO1	Describe the basics of Food processing and product development
	CO2	To Understand the formulation and packaging of food products
	CO3	Using statistical analytical techniques and their applications
	CO4	Using the software tools quality control equipment's and applications
	CO5	To study about the Food laws and regulations

UNIT I (6 hrs)

Introduction to food processing industry

Introduction and scope of food processing industry – Indian scenario; Opportunities and domains of food processing sectors; Skills required in the different sectors: Dairy, Vegetable, Fruits, Beverages, Spices processing sectors; Government policies: FICSI.

UNIT II (6 hrs)

Product development

Activity screening, formulations of products from minor millets, energy drinks, bars, sports drinks, fortified products, geriatric products, veterinary products, immune boosters, and bioavailability.

Packaging Principles of packaging; Types of packaging; Special packaging: Vacuum, gas and shrinkage packaging; Function of packaging; Packaging materials: structural qualities, performance, moisture and gas transmission; Interaction between food and packaging material; Shelf life testing.

UNIT III (6 hrs)

Quality Assurance

Quality checks - quality assurance samples, master sample, internal controls, statistical analysis of test data, techniques and concepts of statistical quality control and statistical process control, non-conformities. Operational aspects – calibration, accuracy checks of quality control equipment's and applications of software used in quality analysis.

UNIT IV (6 hrs)

Reporting and documentation

Quality analysis Reporting of different products, Documentation – methods and procedures of writing and maintaining lab, research records, research performance reports, schemes and guidelines, power point presentations, tables, charts, word documents, development of research objectives and proposal writing for funding and contractual purposes, publications and technical writing, Regulatory compliance of the final documents.

UNIT V (6 hrs)

Food Laws and Regulations

FDA, FPO, MPO, AGMARK. HACCP and GMPs on Food Safety. Adulteration of foods. Regulations and Claims – Current Products: Label Claims, Nutrient Content Claims, Health Claims, Dietary Supplements Claims. FSSAI Roles and responsibilities.Marketing and regulatory issues for functional foods and nutraceuticals recent developments and advances in the area of nutraceuticals and functional foods.

Text Books

1. Anjaneyulu, Y. and Marayya, R. (2005). Quality assurance and quality management in pharmaceutical industry. Hyderabad, A.P.: Pharma Book Syndicate.

Reference Books

2. Jameel, F., Hershenson, S., Khan, M. and Martin-Moe, S. (n.d.). Quality by design for biopharmaceutical drug product development.

3. Reklaitis, G., Garci´a-Munoz, S. and Seymour, C. (n.d.). Comprehensive quality by design for pharmaceutical product development and manufacture.

4. Abraham, J. and Lawton Smith, H. (2003). Regulation of the pharmaceutical industry. Hound mills, Basingstoke, Hampshire: Palgrave Macmillan.

5. Haider, S. (2002). Validation standard operating procedures. Boca Raton [Fla.]: St. Lucie Press, London New York.

UBC115

21CBCB102

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	S	S
CO2	S	S	S	H	S
CO3	S	S	M	S	H
CO4	H	S	S	H	M
CO5	H	S	H	S	S

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

UBC116

21CBCB1CL

Programme Code:	**B.Sc. Biochemistry**		
Course Code: 21CBCB1CL	**PRACTICAL-LAB IN INDIGENOUS FOOD AND NUTRACEUTICALS**		
Batch 2021-2022	Hours/Week 2	Total Hours 30	Credits 2

Course Outcomes (CO)

On successful completion of the course, the students will be able to

K3 to K5	CO1	Understand the food processing and product development
	CO2	Impact the knowledge of formulation and packaging of food products
	CO3	Study about the Food laws and regulations
	CO4	Skills in Preparation of labelling food products
	CO5	Study the evaluation probiotic/prebiotic foods

1. Identification of food sources for various nutrients using food composition tables.
2. Principle and practice of various extraction procedures used in herbal industry. Phytochemical profiling of plant sample and extract.
3. Record diet of self using 24 hour dietary recall and its nutritional analysis.
4. Nutritional labelling of food products.
5. Estimation of BMI and other nutritional status parameters.
6. Formulation of a health drink.
7. Industry visit to a food processing and nutraceutical unit.
8. Preparation of certificate of analysis of processed food.
9. Preparation and evaluation of various food samples- cookies/ biscuits/ snack foods
10. Preparation and evaluation of probiotic/prebiotic foods.

UBC117

21CBCB1CL

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	M	H	S
CO2	S	S	S	H	S
CO3	S	S	H	S	H
CO4	H	S	S	S	M
CO5	H	S	H	H	S

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

PROJECT - Viva- voice **100 Marks**

1. Allotment of research topic
2. Literature survey of the allotted research topic
3. Preparation and submission of synopsis based on literature survey, objective and preliminary Research work, etc.
4. Presentation of the Submitted Dissertation Submission (on topic assigned) and Evaluation by Viva voce examination.

UBC118

CERTIFICATE COURSE IN PHARMACOVIGILENCE AND REGULATORY AFFAIRS

(Curriculum and scheme of examination applicable to students admitted from the academic year 2021-2022 onwards)

Subject code/ Question paper code	Title of the Paper	Lecture hours/ week	Exam marks			Duration of exam	Credits
			CIA	ESE	Total		
21CBCC101	Pharmacovigilance	2 Hrs	50	50	100	3	2
21CBCC102	Indigenous Food	2 Hrs	50	50	100	3	2
21CBCC1CL	Practical	2 Hrs	50	50	100	3	2
21CBCC1Z1	Project work	2 Hrs	50	50	100	-	2
Total					**400**		**8**

CIA - Continuous Internal Assessment; ESE- End of Semester Examinations

UBC119

21CBCC101

Programme Code:07	**B.Sc Biochemistry**		
Course Code: 21CBCC101	**PHARMACOVIGILANCE**		
Batch 2021-2022	Hours / Week 2	Total Hours 30	Credits 2

Course Objectives:

Upon completion of this course the student should be able to:

1. Understand the Adverse Drug Reactions
2. Understand the Reporting Database.
3. Eligible to understand the role of clinical pharmacist in Pharmacovigilance.

Course Outcomes (CO)

On successful completion of the course, the students will be able to

K1 to K5	CO1	Describe the basics of Drug reactions
	CO2	To Understand the reporting Database
	CO3	To study about the clinical pharmacist in Pharmacovigilance.
	CO4	Acquire the knowledge about the Pharmacovigilance scope and opportunities
	CO5	To study about the Pharmacovigilance software tools

Total hours:30

UNIT I

Introduction to Pharmacology and Pharmacovigilance (6 hrs)

History of pharmacology, ADME properties and mechanism of drug absorption and its metabolism, Pharmacokinetics, materials and formulations, drug delivery system. History and development of Importance of safety monitoring of Medicine WHO international drug monitoring programme, Pharmacovigilance Program of India (PvPI) and milestones.PV- Pharmacovigilance, - Master key for drug safety monitoring – Types of PV – Role of pharmaceutical profession in PV.

UNIT II (6 hrs)

Methods, ADR reporting and tools used in pharmacovigilance

International classification of diseases, International Non-proprietary names for drugs, Passive and Active surveillance, Comparative observational studies, targeted clinical investigations and Vaccine safety surveillance. Spontaneous reporting system and Reporting to regulatory authorities, Guidelines for ADRs reporting. Argus, Aris G Pharmacovigilance, Vigi Flow, Statistical methods for evaluating medication safety Data.

UNIT III (6 hrs)

Case Processing

Pharmacovigilance Database. ICSR narrative process of uploading ICSRs in software to PVPI. Case Processing- Global Perspective of Pharmacovigilance. Case Narrative Writing. Pharmacovigilance- Auditing and Inspection. Quality System in Pharmacovigilance. SOPs in Pharmacovigilance.

UNIT IV (6 hrs)

The scope of Pharmacovigilance and opportunities

PV a career path for health care professional Pharmacovigilance planning -Need PV in Industry-Example of case studies of Pharma companies & PV audits – Future of PV in India

UNIT V **(6 hours)**

Pharmacovigilance Software Tools

Pharmacovigilance communications and Pharmacoepidemiology. Pharmacoepidemiology; main sources of epidemiological pharmacovigilance information. An overview and applications of Pharmacovigilance Software.

Text Books

1. Textbook of Pharmacovigilance by SK Gupta. Publisher: Jaypee Brothers, Medical Publishers Pvt. Limited.
2. Practical Manual of Experimental and Clinical Pharmacology by Bikash Medhi, Ajay Prakash. Publisher: Jaypee Brothers, Medical Publishers Pvt. Limited.
3. Stephens' Detection of New Adverse Drug Reactions by John Talbot, Patrick Waller. Publisher: John Wiley & Sons.

Reference Books

1. Cobert's Manual of Drug Safety and Pharmacovigilance by Barton Cobert. ISBN-13: 9780763791599. 5. Mann's Pharmacovigilance, 3rd Edition by Elizabeth B. Andrews and Nicholas Moore. ISBN-13: 9780470671047.
2. An Introduction Pharmacovigilance by Patrick Waller. Publisher: Wiley-Blackwell

UBC121

21CBCC101

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	S	S
CO2	S	S	S	H	S
CO3	S	S	M	S	H
CO4	H	S	S	H	M
CO5	H	S	H	S	S

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

UBC122

21CBCC102

Programme Code:07	**B.Sc Biochemistry**		
Course Code: 21CBCC102	**REGULATORY AFFAIRS**		
Batch 2021-2022	Hours / Week 2	Total Hours 30	Credits 2

Course Objectives

Upon completion of this course the student should be able to:

1. Understand the Regulatory affairs
2. Learn Documentation reviews
3. Learn to the Clinical trails

Course Outcomes (CO)

On successful completion of the course, the students will be able to

K1 to K5	CO1	Understanding the Principles and guidelines of ethical committee
	CO2	Study about the Regulatory activities and laws
	CO3	Learn about the drug safety pharmacovigilance
	CO4	Acquire the knowledge about the Clinical trial reports
	CO5	Study about the controlled drug regulation

UNIT- I: (6 hrs)

Regulatory Perspectives of Clinical Trials:

Origin and Principles of International Conference on Harmonization – Good Clinical Practice (ICH-GCP) guidelines Ethical Committee: Institutional Review Board, Ethical Guidelines for Biomedical Research and Human Participant-Schedule Y, ICMR, Informed Consent Process: Structure and content of an Informed Consent Process Ethical principles governing informed consent process.

UNIT II (6 hrs)

Regulatory activities PV laws and Guideline

Regulatory and procedural guidelines involved in Global PV – Good Pharmacovigilance practices (GVP) Expectations of regulatory authority towards industry – Brief introduction on PVGI – PV guidelines of India.

UNIT- III: (6 hrs)

Clinical Trial Documentation:

Guidelines to the preparation of documents, Preparation of protocol, Investigator Brochure, Case Report Forms, Clinical Study Report Clinical Trial Monitoring-Safety Monitoring in CT Adverse Drug Reactions: Definition and types. Detection and reporting methods. Severity and seriousness assessment. Predictability and preventability assessment. Management of adverse drug reactions; Terminologies of ADR. The role of the pharmaceutical professional in drug safety and pharmacovigilance.

UNIT- IV: (6 hrs)

Documents overviews:

Integration of regulatory affairs in pre- & post-marketing company activities; planning and reviewing product strategy. Prescription-Only-Medicines (POM) & Over-The-Counter (OTC) medicines; OTC switching strategies. Generics and biosimilar. Parallel imports, Common Technical Document (CTD & eCTD). Overviews; aggregate clinical trial report reviews, including annual reports and CTD summaries.

UNIT- V: (6 hrs)

Clinical Trials:

Types and Design: Experimental Study- RCT and Non RCT, Observation Study: Cohort, Case Control, Cross sectional Clinical Trial Study Team Roles and responsibilities of Clinical Trial Personnel: Investigator, Study Coordinator, Sponsor, Contract Research Organization and its management. Controlled Drug regulation.

Text Books

1. Textbook of Pharmacovigilance by SK Gupta. Publisher: Jaypee Brothers, Medical Publishers Pvt. Limited.
2. Cobert's Manual of Drug Safety and Pharmacovigilance by Barton Cobert. ISBN-13: 9780763791599. 5. Mann's Pharmacovigilance, 3rd Edition by Elizabeth B. Andrews and Nicholas Moore. ISBN-13: 9780470671047.

Reference Books

1. Pharmacovigilance Medical Writing: A Good Practice Guide by Justina Orleans-Lindsay. Publisher: John Wiley & Sons.
2. ICH of technical requirements for registration of pharmaceuticals for human use. ICH Harmonized Tripartite Guideline. Guideline for GCP.E6
3. Ethical Guidelines for Biomedical Research on Human Subjects 2000. ICMR, New Delhi

UBC124

21CBCC102

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	S	S
CO2	S	S	S	H	S
CO3	S	S	M	S	H
CO4	H	S	S	H	M
CO5	H	S	H	S	S

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

UBC125

21CBCC1CL

Programme Code:07	B.Sc Biochemistry		
Course Code: 21CBCC1CL	**PRACTICAL- LAB IN PHARMACOVIGILENCE AND REGULATORY AFFAIRS**		
Batch	Hours/Week	Total Hours	Credits
2021-2022	2	30	2

Course Outcomes (CO)

On successful completion of the course, the students will be able to

K3 to K5	CO1	Understand the Documentation of drug monitoring
	CO2	Impact the knowledge of Regulatory authority sources
	CO3	Study about the medical coding
	CO4	Learn about the Pharmacovigilance Software
	CO5	Study the Clinical safety data management reports

The practical will include case studies on topics covered in the theory above

Passive surveillance • Spontaneous Reports • Case series • Stimulated Reporting • Active surveillance • Sentinel sites • Drug event monitoring • Registries • Comparative Observational Studies • Cross-Sectional Study (Survey) • Case-Control Study Cohort Study • Targeted Clinical Investigations • Descriptive Studies • Natural History of Disease • Drug Utilization Study.

Medical coding • QC review • Medical review • Different Pharmacovigilance Software Contractual agreements Regulatory authority sources • Call centers • Triage of cases the minimum information required for reporting purpose • Case processing • Data entry into safety database. Clinical Safety Data Management: Data Elements for Transmission of Individual Case Safety Reports.

UBC126

21CBCC1CL

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	M	H	S
CO2	S	S	S	H	S
CO3	S	S	H	S	S
CO4	H	H	S	S	M
CO5	H	S	S	H	H

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

Project **Marks 100**

1. Allotment of research topic

2. Literature survey of the allotted research topic

3. Preparation and submission of synopsis based on literature survey, objective and preliminary Research work, etc.

4. Presentation of the Submitted Dissertation Submission (on topic assigned) and Evaluation by Viva voce examination.

UBC127

CHOICE-BASEDCREDITSYSTEM

QUESTION PAPER PATTERN FOR PART III
B.Sc BIOCHEMISTRY FOR ALL SIX SEMESTERS

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

Section A (10x1=10marks)

Q.No:1-10

Multiplechoicequestionswithfourchoicestobetakenfromallunitsintheprescribed syllabus

Section B (5x5=25marks)

Q.No:11-15

Five paragraph questions (3 out of 8 in about 150wordseach) to be taken from all the units in the prescribed syllabus.

Section C (5x8=40marks)

Q.No:16-20

Five essay type questions (3 out of 5 in about500wordseach) to be taken from all the units in the prescribed syllabus.

UBC114

CHOICE- BASED CREDIT SYSTEM.

QUESTIONPAPERPATTERNFORPARTIII
Allied.B.2BIOCHEMISTRYFORTHIRDANDFOURTHSEMESTER

20UBC3A3 &20UBC4A4

Time:3hours **Max. Marks: 45**

Section A (10x0.5=10marks)

Q.No:1-10

Multiple-choice questions with four choices to be taken from all units in the prescribed Syllabus

Section B (5x3=15marks)

Q.No:11-15

Five paragraph questions (either – or type in about 150 words each) to be taken from all the units in the prescribed syllabus.

Section C (5x5=25marks)

Q.No:16-20

Five essay type questions (either –or type inabout500words each) to be taken from all the units in the prescribed syllabus.

UBC115

Part IV – I Semester
ENVIRONMENTALSTUDIES

21EVS101

<u>Question Paper Pattern</u> (External only)

Duration:3hours TotalMarks:50

Answer all Questions (5x10= 50Marks)

Essay type, either or type questions from each unit.

UBC116

Part IV–II Semester

Value Education–Moral and Ethics

21VED201

Question Paper Pattern(External only)

Duration:3 hours TotalMarks:50

Answer all Questions (5x10= 50Marks)

Essay type, either or type questions from each unit.

UBC117

Part IV–III Semester

21UGA3S1

Skill Based Subject 1 – GENERAL AWARENESS (ONLINE)

Question Paper Pattern Max.Marks100

End of Semester Examination(ESE)-On-Line Examination 75Marks

1. 150questionsaretobegiven. each question carries ½mark.
2. In each unit, 30questionsare to be given, covering all the5 units.

Continuous Internal Assessment (CIA) (through On-Line) 25Marks

a) Two Exams. 15Marks

b) Assignment** 5Marks

c) Attendance 5Marks

**Each student has to submit an assignment in the Current Affairs area.

UBC118

PARTIV – SEMESTER III and IV
NON–MAJOR ELECTIVES I AND II (2020-2021)

21UHR3N1&21UWR4N2

QUESTIONPAPERPATTERN

Duration: 3hours **Max.Marks:75**

Answer ALL Questions

SECTIONA(5X5= 25marks)

Short answers, either or type, one question from each unit.

SECTIONB(5X10= 50marks)

Essay type questions, either or type, one question from each unit.

UBC119

PART III CORE AND ALLIED BIOCHEMISTRY PRACTICALS

APPLICABLE TO STUDENTS ADMITTED FROM THE ACADEMIC YEAR2021-2022

GENERAL GUIDELINES TO EXAMINERS

All matters concerned with practical examinations have to be treat as strictly confidential. Both the examiners are jointly responsible in conducting practical examination.

Preparing, conducting and valuing are to be done in accordance with the general and specific instructions issued.

PREPARATION FOR EXAMINATION:

Question papers and valuation schemes for various batches of practical examinations as per time-table have to be collected from the principal/chief Superintendent of the center.
Preparation of solutions and packing of substances are to be done as per the requirement of the questions and the number of candidates registered in the batch on the previous day/ session I in advance after receiving the concerned question paper cover. Prepared solutions and substances should be kept under safe custody. Values of weights and volumes, names of substances etc., are to be preserved confidentially by the examiners.

CONDUCT OF EXAMINATIONS:

Seats for candidates are to be marked by numbers serially and the required apparatus/instruments to be provided at the places. Candidates have to be admitted into the laboratory in time after verifying their hall tickets and identity cards. Seats have to be allotted to the candidates in batch by lot system. One main book, one additional book if needed, a graph sheet, log table and O.D. chart etc., shall be kept on the table noted against the sample number.
Marks shall be allotted for the write up of principle, brief procedure and calculation steps of the experiment allotted to the candidate, as per the scheme and written within thirty minutes for six hours and 15 minutes for three hours duration practicals in the additional book provided to them, collected immediately and valued by the examiners.

The examiners shall dictate to the candidates an outline of the procedure to be adopted for volumetric and colorimetric experiments.

Examiners should supervise the candidates while carrying out the experiments. Reporting of result alone at the end of the practical examination session should not be taken as an indication for having carried out the experiment properly. For qualitative analysis confirmatory tests should be shown to the examiner by the student.
Volumes and colorimetric readings have to be attested by the examiners as and when reported to them by the candidates before completing the final calculations.

Two systematic analyses have to be carried out in3hrs for qualitative analysis

For three hours practical on experiment has to be carried out. For six hours practical two experiments have to be carried out.

UBC120

VALUATION O FRECORD NOTE BOOKS

Every candidate should submit a certified bonafide record of practical experiments at the timeofhis/herfirstappearanceforthepracticalexamination.Incaseofarrear/improvementcandidates , whose note books were already submitted and valued, a statement to the effect that they have already submitted the records at a previous examination should be obtained from them and the consolidated statement be sent to the controller of examinations at the closure of the practical examinations.

Signature of the Examiners

20% of the total marks of core practical 1, 2, 3, 4 and 5 of each practical examination is allotted for record note book. The criteria for awarding marks include neatness, regularity in submission, accuracy of result, number of exercises done etc. Record notebook should be signed by both the examiners and punched after valuation.

UBC121

QUESTIONPAPERPATTERNFORPARTIIIPRACTICALBIOCHEMISTRY

CorePractical1-Biochemistry

21UBC2CL

Time: 3hrs **Max. Marks: 50**

a. Analysesystematicallythegivenunknownsugarsolutionandwritethesystematicprocedure (20marks).

b. Analysesystematicallythegivenunknownaminoacidsolutionandwritethesystematicproce dure (20marks).

c. Record –10marks

Valuation of answer scripts:

A.Core Biochemistry Practical 1

For qualitative analysis, the following samples shall be given

I –Carbohydrate

Glucose, Fructose, Arabinose, Sucrose, Lactose and Starch

II –Amino acid

Arginine, Histidine, Tyrosine, Tryptophan and Cysteine

ESE

Qualitative Analysis

	Marks
Analysis I	
Procedure	05
Tests and Results	15
Analysis II	
Procedure	05
Tests and results	15
Record	10

Total	**50**

CIA	***Marks***
Attendance	5
Observation note book &Regularity	15
CIA model practical test	30
Total	**50**
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Total	**100**

UBC122

QUESTION PAPER PATTERN PARTIII PRACTICAL BIOCHEMISTRY
Core Practical 2-Biochemistry

Time: 3hours

Max. Marks: 50marks

I. a)Estimatetheamountofphosphoruspresentin100mlofgivenunknownsolution.(Oddnumberedcandidates)

(OR)

b)Determine the Km value of the enzyme acid phosphatase by Michaelis-Menton method(Even numbered candidates) (30)

II. Write the procedures assigned to the above experiments. (10)

III. Record submitted (10)

ESE

Colorimetric experiment

No.	**Details**	**Marks**
1	Tabular column	5
2	Graph	5
3	Calculation	5
4	Accuracy of result	15
5	Procedure	10
6	Record	10
	Total	50

CIA

No.	**Details**	**Marks**
1	Attendance	5
2	Observation note Book& Regularity	15
3	CIA model practical test	30
	Total	50

UBC123

21UBC6Z1

QUESTION PAPER PATTERN FOR PART III **21UBC6CN**

PRACTICAL BIOCHEMISTRY

Core Practical 3 - Biochemistry

Time 6 hours

Max. Marks: 50marks

I. Foroddnumberedcandidates.Estimatetheamountofglucosepresentin100mloftheurinesampleb y Benedict's method. **(or)**
For even numbered candidates Estimate the amount of calcium present in 100ml of the given urine sample by permanganate method. (15)

II. Foroddnumberedcandidates.Estimatetheamountofureapresentin100mlofthegivenserum sample by DAM-TSC method. **(or)**
For even numbered candidates. Estimate the amount of uric acid present in 100mlofthe given serum sample by caraway method. (15)

III. Write the procedures assigned to the above experiments.(10)

IV. Record submitted(10)

ESE

I Urine Analysis

No.	Details	Marks
1	Procedure	5
2	Tabular column	5
3	Calculation	5
4	Accuracy Results	5
	Total	**20**

UBC124

II Blood Analysis

No.	Details	Marks
1	Procedure	5
2	Tabular column	3
3	Calculation	3
4	Graph	3
5	Accuracy Results	6
	Total	**20**
	Record	**10**
	Grand Total	**50**

CIA

No.	Details	Marks
1	Attendance	5
2	Observation note Book & Regularity	15
3	CIA model practical test	30
	Total	**50**

UBC125

QUESTION PAPER PATTERN FOR PAPER T III PRACTICAL

BIOCHEMISTRY

Core Practical 4–Biochemistry

21UBC6CO

Time: 4 hours **Max.marks:50marks**

I. a) Estimate the amount of DNA present in the given sample by Diphenylamine method

(or)

b) Estimate the amount of RNA present in the given sample by Orcinol method **30marks**

II. a) Using simple staining method determine the microorganism in the given sample

(or)

b)Identifythemicroorganismthegivensamplebythemethodofgramstaining **10marks**

III. Record **10marks**

UBC126

CORE PRACTICAL 4–BIOCHEMISTRY

ESE

I. Genetic Technology

No.	Details	Marks
1	Procedure	10
2	Tabular Column	05
3	Graph	05
4	Calculation	05
5	Accuracy of results	05
	Total	**30**

II. Microbiology

No.	Details	Marks
1	Procedure	05
2	Report	05
	Total	**10**
1	Record	**10**
	Total ESE	**50**

CIA

No.	Details	Marks
1	Attendance	5
2	Observation note Book & Regularity	15
3	CIA model practical test	30
	Total	**50**

UBC127

QUESTION PAPER PATTERN FOR PART III PRACTICAL

BIOCHEMISTRY

Core Practical 5–Biochemistry

21UBC6CP

Time: 4hours **Max. Marks: 50marks**

I. a) Estimate the amount of starch present in the given sample (or)

b) Estimate the amount of total phenols present in the given sample **30marks**

II. a) Examine the given urine sample whether it contains HCG Hormone (or)

b) Analyze the serum sample for RA Factor **10marks**

III. Record **10marks**

UBC128

COREPRACTICAL 5–BIOCHEMISTRY

ESE

I. Plant Biochemistry

No.	Details	Marks (Biochemical parameters)
1	Procedure	10
2	Tabular Column	05
3	Graph	05
4	Calculation	05
5	Accuracy of results	05
	Total	**30**

II. Immunology

No.	Details	Marks (Biochemical parameters)
1	Procedure	05
2	Report	05
	Total	**10**
	Record	**10**
	Total ESE	**50**

CIA

No.	Details	Marks
1	Attendance	5
2	Observation note Book & Regularity	15
3	CIA model practical test	30
	Total	**50**

UBC129

COMPONENT FOR PROJECT

Maximum marks: 100

CIA/ESE	Particulars	Project outof100marks
CIA	Project review	45
	Regularity	5
	Total internal marks	**50**
ESE*	Project report present	30
	Viva voce	20
	Total external marks	**50**
Total marks (CIA+ESE)		**100**

*Project report and viva voce will be evaluated jointly by both the project supervisor (Faculty of department) and an External examiner.

UBC130

QUESTION PAPER PATTERN FOR PART III PRACTICAL BIOCHEMISTRY

Allied Practical 2-Biochemistry

21UBC4AL

Time: 3hours

Total: 25marks

I. Qualitatively analyze the given unknown sugar sample and give the systematic procedure (10 marks).
II. Analysesystematicallythegivenunknownaminoacidsolutionandwritetheproced ure (10 marks).
III Record –5marks

Allied Practical 2 Biochemistry

For qualitative analysis, the following samples shall be given.

I. Carbohydrate

Pentose, glucose, fructose, sucrose, lactose and starch.

II. Amino acids

Histidine, Tyrosine, Tryptophan, Arginine and cysteine.

Qualitative Analysis

ESE	**Marks**	
Analysis I		
Procedure	5	
Tests and Results	5	
		10
Analysis II		
Procedure	5	
Tests and results	5	
		10
Record		**05**

Total (ESE)		**25**
CIA		
Attendance	5	
Observation note book &		
Regularity	10	
CIA model practical test	10	
		25

	Total marks	**50**