Scheme of Examination

(Applicable to the students admitted during the academic year 2020-2021 on words)

B.Sc., Biochemistry with Nanotechnology

Semester	Part	Course. Code	Name of the Course	Instruction hours / week	Duration of Examination	Examination Marks			Credits
						CIA	ESE	Total	
I	I	18U1TAM101/ 18U1HIN101 / 18U1MAL101/ 20U1FRN101	Language I	5	3	25	75	100	4
	II	20U2ENG101	English I	5	3	25	75	100	4
	III	20U3BNC101	Core Paper I - Biomolecules	5	3	25	75	100	4
		20U3BNC102	Core Paper II -Cellular Biochemistry	5	3	25	75	100	4
		20U3BNP204	Core Paper IV- Biochemistry Practical- I	3	-	-	-	-	-
		19U3BNA101	Allied Paper I- Biochemical Techniques	4	3	20	55	75	3
	IV	18U4ENV101	Ability Enhanced Compulsory Course - Environmental Studies	2	3	-	50	50	2
	IV	18U4HVY201	Value Education – Human Values and Yoga Practice I	1	-	-	-	-	-
				30				**525**	**21**
II	I	18U1TAM202/ 18U1HIN202/ 18U1MAL202/ 20U1FRN202	Language II	5	3	25	75	100	4
	II	20U2ENG202	English II	5	3	25	75	100	4
	III	20U3BNC203	Core Paper III- Introduction to Nanoscience	5	3	25	75	100	4
		20U3BNP204	Core Paper IV- Biochemistry Practical- I	5	3	40	60	100	4
		20U3BNA202	Allied Paper II- Essentials of Basic Microbiology	4	3	20	55	75	3
		18U3BNR203	Allied Paper III –Microbiology Practical	3	3	20	30	50	2
	IV	18U4HRC202	Human Rights and Constitution of India	2	3	-	50	50	2
		18U4HVY201	Value Education – Human Values and Yoga Practice I	1	2	25	25	50	2
				30				**625**	**25**
III	I	20U1TAM303/ 19U1HIN303/ 20U1MAL303/ 20U1FRN303	Language III	5	3	25	75	100	4
	II	20U2ENG303	English III	5	3	25	75	100	4
	III	20U3BNC305	Core Paper V- Enzymology and its Applications	5	3	25	75	100	4
		20U3BNP407	Core Paper VII-Biochemistry Practical - II	3	-	-	-	-	-
		19U3BNA304	Allied Paper IV- Biostatistics	4	3	20	55	75	3
	IV	18U4BNS301	Skill Based Paper I- Bioinformatics	3	3	20	55	75	3
		19U4NM3BT1/ 19U4NM3AT1/ 19U4NM3CAF/ 19U4NM3GTS/ 19U4NM3WRT	# @ Basic Tamil / ##Advanced Tamil / * NME: Consumer Affairs / Gandhian Thoughts / Women's Rights	2	3	50		50	2
		20U4BN3ED1/ 20U4BN3ED2	Extra Departmental Course	2	3	-	50	50	2

		18U4HVY402	Value Education – Human Values and Yoga Practice II	1	-	-	-	-	-
		19U4BNVALC	** Skill Enhancement Add On Course – Institution Industry Linkage	-	-	-	-	-	Grade
				30				**550**	**22**
IV	I	20U1TAM404/ 19U1HIN404 / 20U1MAL404/ 20U1FRN404	Language IV	5	3	25	75	100	4
	II	20U2ENG404	English IV	5	3	25	75	100	4
	III	19U3BNC406	Core Paper VI- Intermediary Metabolism	4	3	25	75	100	4
		20U3BNP407	Core Paper VII-Biochemistry Practical-II	4	6	40	60	100	4
		18U3BNA405	Allied Paper V - Basics of Computer Science	4	3	20	55	75	3
		18U3BNR406	Allied Paper VI - Basic Computer Science Practicals	2	3	20	30	50	2
	IV	20U4BNS402	Skill Based Paper II – Biophysics	3	3	20	55	75	3
		19U4NM4BT2/ 19U4NM4AT2 19U4NM4GEN	# @ Basic Tamil / ##Advanced Tamil /General Awareness	2	3	-	50	50	2
		18U4HVY402	Value Education – Human Values and Yoga Practice II	1	2	25	25	50	2
		20U4BNVALC	**Skill Enhancement Add On Course – Institution Industry Linkage	-	-	-	-	-	Grade
				30				**700**	**28**
V	III	20U3BNC508	Core Paper VIII- Human Physiology	4	3	25	75	100	4
		20U3BNC509	Core Paper IX -Clinical Biochemistry	4	3	25	75	100	4
		20U3BNC510	Core Paper X- Nano Biotechnology	4	3	25	75	100	4
		20U3BNC511	Core Paper XI- Plant Biochemistry	4	3	25	75	100	4
		18U3BNP614	Core Paper XIV- Biochemistry Practical - III	4	-	-	-	-	-
		19U3BNP615	Core Paper XV- Biochemistry Practical - IV	4	-	-	-	-	-
		20U3BNE501/ 18U3BNE502/ 18U3BNE503	(Discipline Specific) Elective -I	3	3	20	55	75	3
	IV	20U4BNS503	Skill Based Paper III – Genomics and Proteomics	3	3	20	55	75	3
				30				**550**	**22**
VI	III	20U3BNC612	Core Paper XII - Molecular Biology	4	3	25	75	100	4
		20U3BNC613	Core Paper XIII - Biomedical Applications of Nanotechnology	4	3	25	75	100	4
		18U3BNP614	Core Paper XIV- Biochemistry Practical-III	5	6	40	60	100	4
		19U3BNP615	Core Paper XV-Biochemistry Practical -IV	5	6	30	45	75	3
		18U3BNE604/ 18U3BNE605/ 20U3BNE 606	(Discipline Specific) Elective -II	4	3	20	55	75	3
		20U3BNE607/ 18U3BNE608/ 18U3BNE609	(Discipline Specific) Elective -III	4	3	20	55	75	3
	IV	20U4BNZ604	Skill Based Paper IV – Bioinformatics Practical	4	3	30	45	75	3
	V	19U5EXT601	Extension Activities	-	-	50	-	50	2
				30				**650**	**26**
Total								**3600**	**144**
Additional Credit (Optional) Semester II-VI									$8^{\$}$

 # Basic Tamil -Students who have not studied Tamil up to 12th standard.

##**Advance Tamil** – Students who have studied Tamil language up to 12th standard and chosen other languages under part I of the programme but would like to advance their Tamil language skills.

*** NME** – Student shall choose any one course out of three courses.

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

$ - Not included in Total marks & CGPA Calculation

** - Examination and evaluation for value added course shall be conducted by the industry and the marks shall be submitted to the CoE for the award of the grade.

List of Discipline Specific Elective papers (Choose any one of the paper)

Elective-I	Subject Code		Name of the Subject
Elective – I	**20U3BNE 501**	**A**	Immunology
	18U3BNE 502	**B**	Pharmaceutical Biochemistry
	18U3BNE 503	**C**	Nutritional Biochemistry
Elective – II	**18U3BNE 604**	**A**	Plant and Animal Biotechnology
	18U3BNE 605	**B**	Genetic Engineering
	20U3BNE 606	**C**	Plant Based Therapeutics
Elective - III	**20U3BNE 607**	**A**	Diagnostic Biochemistry
	18U3BNE 608	**B**	Sports Biochemistry
	18U3BNE 609	**C**	Public Health & Hygiene

Extra Departmental Course offered by Biochemistry with Nanotechnology

Sl. No.	Subject Code	Name of the Subject
1	**20U4BN3ED1**	Basics of Nutrition
2	**20U4BN3ED2**	Herbal Remedies

Additional Credit Course

Earning Additional credit course is not mandatory for Course

Completion Additional credits: 8

Sl. No.	Subject	Credit/ course	Total credits
1	Completion of Certificate Course	1	1
2	Hindi/ other Foreign languages	1	1
3	Self Study Papers	1	2
4	MOOC Courses/Spoken Tutorial prescribed by the Department	1	3

5	Representation - Sports/Social Activities/ Co curricular/Extracurricular Activities at University/ District/ State/ National/ International levels	1	1
		Total	8

Rules: The Students can earn additional credits only if they complete the above during the course period (II to V Semester) and based on the following criteria. Proof of Completion must be submitted to the Office of Controller of Examinations before the commencement of the VI Semester. (Earning Additional credit course is not mandatory for Course Completion)

1. Students can complete Certification Courses for a minimum of 30hrs (II to V Semester only) from reputed centres and the same certificate shall be produced to earn a credit. They shall be guided by the Department if needed.
2. Students can opt Hindi/ any Foreign Language approved by Certified Institutions to earn one credit. The certificate of Hindi must be obtained from Dakshin Bharat Hindi Prachar Sabha and He/ She has to enroll and complete during their course period (II to V Semester only)
3. Students can earn one credit, if they complete one self-study Paper prescribed by the Department. The Departments shall offer two Self Study Papers.

Self-Study Paper offered by Biochemistry with Nanotechnology Department

Sl. No.	Semester	Course code	Course Title
1	Semester II to V	**18UBNSS01**	Biofuels
2		**18UBNSS02**	Nutrition and Food Adulteration

4. Students can earn one Credit, if they complete any one MOOC courses/ Spoken Tutorial prescribed by the Department. Students shall earn a maximum of 3 Additional Credits by completing 3 online courses.

List of Online Courses prescribed by Biochemistry with Nanotechnology Department

1. Cell Designer
2. Jmol
3. Avogadro
4. Biopython
5. USCF Chimera

Note: Other than the above mentioned courses, any course from recognized websites with the consent of the Head of the Department will also be accepted.

Summer Training /Internship

The student should undergo a Summer Training / Internship in any of the recognized research laboratory or biochemistry lab for a period of 20 days during IV semester vacation and submit a certificate and report to the Department during the beginning of V semester.

5. Award Winners in Sports/Social Activities/ Co curricular/ Extra Curricular Activities at University/ District/ State/ National/ International levels can earn One Extra Credit by producing the Certificate.

Dr.P.T.Pratheesh
CHAIRMAN
Board of Studies in Biochemistry with Nanotechnology
Nehru Arts and Science College
Coimbatore

Course Code	Title		
20U3BNC101	Core Paper I - Biomolecules		
Semester: I	Credits: 4	CIA : 25 Marks	ESE: 75 Marks

Course Objective

The Course has the significance of the complex bio-molecules, polysaccharides, lipids, proteins, nucleic acids, vitamins and minerals.

Course Outcomes (CO)

CO1	Learn and remember the basic functions of macro molecules
CO2	Understand the structures of chemical compounds.
CO3	Understand the biological importance of chemical compounds in human body
CO4	Apply the tests to identify the basic chemical compounds.
CO5	Analyze the significance of chemical compounds in human body.

Offered by: Biochemistry with Nanotechnology

Course Content **Instructional Hours / Week: 5**

Unit	Description	Text Book	Chapter
I	**Carbohydrates** – Carbohydrate –Definition, Occurrence, Haworth projections. Classification, structures, properties, and biological importance of monosaccharides, Disaccharide, Polysaccharides Monosaccharides – Glucose, Fructose, Galactose, Mannose Disaccharides-Sucrose, Lactose, Maltose and Cellobiose. Trisaccharides-Structure of Raffinose. Polysaccharides- Homo-polysaccharides-starch, glycogen and cellulose.Heteropolysaccharides-hyaluronic acid, chondroitin sulfate and heparin.	2	11
	Instructional Hours		**15**
II	**Lipids** – Definition, classification, structure, properties of fatty acids, distribution and biological importance of fats, waxes compound and derived lipids.	1	9
	Physical and chemical properties of fats, cholesterol and bile acids, Lipids as signals, cofactors and pigments.	1	9
	Instructional Hours		**15**
III	**Proteins** – Introduction, classification and properties of amino acids, biologically active peptides, classification based on solubility, shape composition and function.	1	5
	Structure and properties of peptide and proteins. Determination of primary structure of peptides-Glutathione, Oxytocin and Vasopressin, Insulin	1	5
	Instructional Hours		15

IV	**Importance of nucleic acids** in living system, general composition of nucleic acids- purine and pyrimidine bases, structure of nucleosides and nucleotide. Tautomeric forms of bases.Salwage pathway of purines & pyrimidines DNA: Watson and crick model; A, B and Z forms, DNA denaturation and renaturation. RNA –Types: mRNA, tRNA and rRNA: Nucleoproteins; structure of chromatids, nucleosomes and histones.	2	4
	Instructional Hours		15
V	**Vitamins and Minerals:** Vitamins: Definition, Classification –Fat soluble vitamins- sources, structure and functions; Water soluble vitamins-sources, structure and functions. Minerals: Mineral requirement, essential macro minerals and essential micro minerals, sources and functions.	1	15
	Instructional Hours		15
		Total Hours	**75**

Text Book(s):

1. Deb, A.C., **Fundamentals of Biochemistry**, New Central Agency, Calcutta, 20th Edition, 2016.
2. J L Jain, Nitin Jain &Sunjay Jain., **Fundamentals of Biochemistry**, S. Chand Publishing,7th Edition, 2017.

Unit I : Text book 1, Chapter 11.
Unit II : Text book 1, Chapter 09.
Unit III : Text book 1, Chapter 05.
Unit IV :Text book 2, Chapter 04.
Unit V : Text book 1, Chapter 15.

Reference Book(s):

1. Lehninger, A.L., Nelson, D.L., Cox, M.M., **Principles of Biochemistry**, CBS Publishers, 4th Edition, 2015.
2. LubertStryer, **Biochemistry**, Freeman and Company, 7th Edition, 2016.

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
5	5	6	3	3	3	25

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	L	M	M
CO2	H	H	M	M	L
CO3	H	H	M	M	M
CO4	M	M	L	M	H
CO5	H	M	M	M	L

high; M-Medium; L-Low.

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21 Mrs. G. SUJITHA	12/8/21 Dr. P.T. Pratheesh	Convenor CDC	16 AUG 2021

Course Code	Title		
20U3BNC102	Core Paper II - Cellular Biochemistry		
Semester: I	Credits: 4	CIA : 25 Marks	ESE: 75 Marks

Course Objective

To enable the students to understand and apply cytological, biochemical, physiological and genetic aspects of the cell, including cellular processes common to all cells, as well as processes in certain specialized cells.

Course Outcomes (CO)

CO1	Recall the basics of the biological concepts and processes.
CO2	Understand the various macromolecular components of cells and their function
CO3	Apply the fundamentals of function and structure of cells including the metabolic reactions that occur in cells.
CO4	Analyse cellular processes and mechanisms that lead to physiological functions as well as examples of pathological state.
CO5	Evaluate the metabolic reactions that occur in the cells.

Offered by: Biochemistry with Nanotechnology

Course Content **Instructional Hours / Week: 5**

Unit	Description	Text Book	Chapter
I	**An Overview of cells**: Origin and evolution of cells, Cell theory, Classification–Prokaryotic cells and Eukaryotic cells and its difference. Subcellular fractionation. **Molecular composition of cells**: Water, Carbohydrates, lipids, nucleic acids and proteins.	1	2
	Cell Cycle: Introduction, Phases, Meiotic and Mitotic division.	1	2
	Instructional Hours		**15**
II	**Cell Membrane**: Structure and function of plasma membrane, Fluid mosaic model of membrane. Membrane proteins, Membrane lipids and carbohydrates and their role.	2	4
	Transport across membranes : Diffusion – active and passive diffusion,Osmosis,Endocytosis,Exocytosis.	2	4
	Instructional Hours		**15**
III	**Sub Cellular Organelles**. Organization, Sructure and function of Golgi apparatus, Endoplasmic reticulum, Lysosomes, mitochondria, peroxisomes andits marker enzymes.	2	8
	Ribosomes – Types, structure and function	2	8
	Instructional Hours		**15**

IV	**Nucleus**– Structure and function. Transport across Nuclear Envelope, Nuclear pore complex (NPC), Chromosomes, Chromatin: molecular organization, Nucleolus. **Cytoskeleton**: Micro intermediate and Macro filaments Microtubules – Actin filaments– Macrofilaments- Tubulin	1	8
	Instructional Hours		**15**
V	**Oncogenesis** – Development and causes of cancer, Types of cancer, Properties, early detection and Treatment. **Oncogenes**: Retro viral, proto-oncogenes. Tumor suppressor genes and its function.	1	15
	Instructional Hours		**15**
	Total Hours		**75**

Text Book(s):

1. Ajoy Paul, Textbook of Cell and Molecular Biology, Books and Allied Pvt. Ltd., 3rd Edition, 2016.
2. De Robertis, EDP, E.M.F Robertis., Cell and Molecular Biology, Saunders Company.8thEdition, 2011.

Unit I : Text book 1, Chapter 02.
Unit II : Text book 2, Chapter 04.
Unit III : Text book 2, Chapter 08.
Unit IV : Text book 1, Chapter 08.
Unit V : Text book 1, Chapter 15.

Reference Book(s):

1. Harvey Lodish, Baltimore, Arnold Berk, **Molecular biology**, W.H. Freeman & Co Ltd., 8th Edition, 2016.
2. Cooper M. The Cell-A **Molecular Approach**, ASM Press, 7th Edition, 2015.
3. Bruce Alberts and Alexander Johnson, **Molecular Biology of the Cell**.GS Publishers, Sixth Edition, 2014.

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
5	5	6	3	3	3	25

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	M	H	H
CO2	H	M	M	L	M
CO3	H	M	M	L	L
CO4	M	H	M	M	L
CO5	M	H	H	M	M

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21 (Dr. S. Subasiammani)	12/8/21 Dr. P.T. Prathees h.	Convenor CDC	16 AUG 2021

Course Code	Course Title		
20U3BNP204	Core Paper IV Biochemistry Practical - I		
Semester: I / II	Credits: 4	CIA : 40 marks	ESE : 60 marks

Course Objective

Biochemistry Practical's allows the students to gain technical competence, and allow them to experience, and become skilled in planning experiments, and processing and presenting data

Course Outcomes (CO)

CO1	Recall and learn how to follow experimental protocols.
CO2	Understand how to use a particular apparatus, observe and record accurately.
CO3	Apply the fundamentals to process data and use statistical methods.
CO4	Analyze, plan experiments, validate assays, write protocols, be critical of data
CO5	Interpret the results with respect to biological systems.

Offered by: Biochemistry with Nanotechnology.

Course Content **Instructional hours/ week :5**

1. ANALYSIS OF SUGARS

a) **Monosaccharides**-Glucose, Fructose, Galactose, Mannose, Pentose.
b) **Disaccharides**-Sucrose, Maltose and Lactose.
c) **Polysaccharides**-Starch and Dextrin.

2. ANALYSIS OF AMINO ACIDS

a) Histidine b) Tyrosine c) Tryptophan d) Methionine e) Cysteine f) Arginine

3. DEMONSTRATION EXPERIMENTS

a) Preparation of buffer and its pH measurements using pH meter.
b) Separation of amino acids by TLC.
c) Separation of sugars by circular paper chromatography

Instructional hours :75

Text Book(s):

1. J. Jayaraman, **Laboratory Manual in Biochemistry**, New Age International Publishers, 2011.
2. Pattabiraman, **Laboratory Manual & Practical Biochemistry,** All India Publishers and Distributors, 4th Edition 2015.

Reference Book:

1. David T. Plummer, **An Introduction to Practical Biochemistry**., Tata McGraw-Hill Education 3rd Edition (1998).
2. GeethaDamodaran K, **Practical Biochemistry**, Jaypee- The Health Sciences Publisher,2nd Edition, 2016.
3. TiwariAnand, **Practical Biochemistry: A Student Companion**, Lambert Publications, 2015**.**

Tools for Assessment (40 Marks)

Practical's (total of 10)	Model I	Model II	Observation Note book	Attendance	Total
10	10	10	6	4	40

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	M	L
CO2	H	H	M	M	M
CO3	M	M	M	M	M
CO4	M	L	M	M	H
CO5	M	M	M	M	H

High; M-Medium; L-Low.

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21 Mrs. G. SUJITHA	12/8/21 Dr. P.T. Praneesh	Convenor CDC	16 AUG 2021

Course Code	Title		
19U3BNA101	Allied Paper I - Biochemical Techniques		
Semester: I	Credits: 3	CIA : 20 Marks	ESE: 55 Marks

Course Objective

To enable the students to understand some of the experimental techniques used in biochemistry and molecular biology. These include methods for purifying proteins, expressing recombinant proteins in bacterial cells, and analyzing biological molecules.

Course Outcomes (CO)

CO1	Recall the basic lab skills (including dilutions, good pipetting technique, and basic statistical analysis).
CO2	Understand the various experimental techniques used in biochemical laboratories.
CO3	Apply the skills required to design and handle the data from scientific experiments.
CO4	Analyze biological molecules by various techniques carried out experimentally.
CO5	Analyze and interpret the biological molecules using scientific validation.

Offered by: Biochemistry with Nanotechnology

Course Content **Instructional Hours / Week: 4**

Unit	Description	Text Book	Chapter
I	**Electrochemical Techniques**: pH meter- pH scale, Measurement of pH by glass electrode and hydrogen electrode. Henderson- Hassalbach equation, Buffer solutions, Buffer systems of blood-Hb, Protein and Phosphate buffer system.	2	15
	Preparations of solutions-molality, molarity, normality, mole fractionand simple problems to be worked out.	2	15
	Instructional Hours		**12**
II	**Chromatography.** Principle, materials, methods and applications of paperchromatography, TLC, GLC, Adsorption, Ion-exchange, Affinity, Molecular-Sieve Chromatography. Preparative and analytical applications, HPLC, FPLC and GC-MS [principles only].	2	13
	Instructional Hours		**12**
III	**Electrophoresis** – BasicPrinciple, instrumentation and applications Paper electrophoresis, Agarose gel electrophoresis, PAGE, SDS-PAGE, Immuno electrophoresis, Isoelectric focusing; ELISA (Principle only).	1	5
	Centrifugation - Principle of centrifugation, Types of centrifuges – Bench top, high speed, ultra, Analytical centrifuge, different types of rotors. Differential centrifugation, density gradient centrifugation (Rate zonal and Isopycnic).	1	5

	Instructional Hours		**12**
IV	**Spectrophotometry**-Principle, instrumentation and application of Colorimetry, UV-Visible absorption spectrophotometry, Flurimetry and flame photometry.	1	7
	Biomedical Technology-ECG, EEG, CT-Scan, Doppler, MRI scan- Principle and application only.	1	7
	Instructional Hours		**12**
V	**Radiochemical Techniques**- Radiation, types of radioactive decay, half-life, Units of radio activity. Detection and measurement of radioactivity - methods based upon ionization (GM counter), method based upon excitation (Scintillation counter).	2	14
	Autoradiography. Applications of radioisotopes in the biological and medical sciences. Biological hazards of radiation and safety measures in handling radio isotopes.	2	14
	Instructional Hours		**12**
	Total Hours		**60**

Text Book(s):

1. David T. Plummer, An **Introduction to Practical Biochemistry**. Tata McGraw-Hill Education 3rd Edition (1998).
2. Keith Wilson, Kenneth H.Goulding,.**A Biologists Guide to Principles and Techniques of Practical Biochemistry**. Cambridge University Press.3rd Edition, 1992.

Unit I : Text book 2, Chapter 15.
Unit II : Text book 2, Chapter 13.
Unit III : Text book 1, Chapter 05.
Unit IV : Text book 1, Chapter 07.
Unit V : Text book 2, Chapter 14.

Reference Book (s):

1. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, **Biomedical Instrumentation and Measurement**- 2nd Edition.1999.
2. M.H. Fulekar ,BhawanaPandey, **Bioinstrumentation**, International Publishing House, 2013.
3. BruceAlberts and Alexander Johnson, **Molecular Biology of the Cell**. GS Publishers, Sixth Edition, 2014.
4. John F.Robyt and Bernard J White, **Biochemical Techniques Theory and Practice**, 2015.

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
4	4	5	2	2	3	20

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	M	M	L
CO2	H	M	M	L	L
CO3	M	M	M	L	M
CO4	H	H	H	M	M
CO5	H	H	H	H	M

igh; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21 (Dr. N. Vijaya Lakshmi)	12/8/21 Dr. P. T. Pratheeja	Convenor CDC	16 AUG 2021

18U4ENV101	Ability Enhancement Compulsory Course - Environmental Studies	
Semester: I	Credit: 2	ESE: 50 Marks

(Common to all UG Programmes)

Course Objective:

This course enables the students to recognize the interconnectedness of multiple factors in environmental challenges and communicate clearly and competently matters of environmental concern.

Course Outcome:

CO 1	To understand key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
CO 2	To understand concepts and methods from ecological and physical sciences and their application in environmental problem solving.
CO 3	To solve the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
CO 4	To reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
CO5	To apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.

Course Content **Instructional Hours / Week : 2**

Unit	Description	Text Book	Chapter
I	**Natural Resources:** Forest resources, Water resources, Mineral resources Food resources and Energy resources.	1	5
	Instructional Hours		**6**
II	**Ecosystems:** Concept of an ecosystem, Structure and function; Introduction, types characteristic features, structure and function of ecosystem **Activity: Prepare an album on types of Ecosystem.**	1	3
	Instructional Hours		**6**
III	**Environmental Pollution:** Definition Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution and Noise pollution, Solid waste management **Activity: Discuss the solutions for water pollution.**	1	8,9,11, 10,12,15
	Instructional Hours		**6**
IV	**Social Issues and the Environment** Water conservation, rain water harvesting, watershed management, Environmental ethics : Issue summits' and possible solutions and Public awareness **Activity: Identify and analyze a Social Issue and an Environmentissue in your locality.**	1 2	17 9

	Instructional Hours		**4**
V	**Disaster Management:** Floods, Earthquakes, Cyclones, Landslides: From management to mitigation of disasters: The main elements of a mitigation and measures of strategy: Floods, Earthquakes, Cyclones and Landslides	3	16
	Instructional Hours		**6**
Case Studies: Use Social media for e-networking and dissemination of ideas on environmental issues. (Or) Visit to a Nearby biome / Wildlife Sanctuary/ our own campus & study the various bioresources.			**2**
	Total hours		**30**

Text Book(s):

1. Agarwal,K.M.,Sikdar,P.K.,Deb,S.C. (2002). A Textbook of Environment. Macmillan India Ltd. Kolkata, India.
2. Dash.M.C. (2004). "Ecology, Chemistry & Management of Environmental Pollution". Published By Rajiv Beri For Macmillan India Ltd. 2/10 Ansari Road, Daryaganj, New Delhi – 110002.

Ltd 345 p.

Course designed by	Verified by	Checked by	Approved by
12/8/21 Dr. P.T. Prathiesh	12/8/21 Dr. P.T. Prathiesh	Convenor CDC	16 AUG 2021

18U4HVY201	Value Education - Human Values and Yoga Practice I		
Semester: I & II	Credit: 2	CIA: 25 Marks	ESE: 25 Marks

(Common to all UG programmes)

Course Objective:

- To help the students appreciate the essential complementarily between 'values' and 'skills' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings
- To prepare and distribute standardized Yoga teaching and training materials with reference to institute health

Course Outcome (CO):

At the end of the course, students are expected

CO 1	To inculcate in students, a sense of respect towards harnessing values of life and spirit of fulfilling social responsibilities.
CO 2	To inspire individuals to choose their own personal, social, moral and spiritual values and be aware of practical methods for developing and deepening.
CO 3	To inculcate cultural behavioral patterns
CO 4	To understand physical body and Health concepts

Course Content **Instructional Hours / Week: 1**

Unit	Description	
I	**Human Values**-Introduction-Definition of Ethics and Values-Character and Conduct -Nature and Scope of Ethics.	
	Instructional Hours	**6**
II	**Individual and Society**-Theories of Society-Social Relationships and Society-Empathy: Compassion towards other being - Environmental Ethics and Nature.	
	Instructional Hours	**6**
III	Cultural Education - Purity India - Patriotism - Time management. Greatness of Womanhood - Food is medicine- Individual peace - World Peace.	
	Instructional Hours	**6**
IV	Power of Meditation- Development of mind in stages - Mental Frequencies - Methods for Concentration. Meditation Practices - Surya namaskar.	
	Instructional Hours	**6**
V	Simplified Physical Exercise – Kayakalpa Practices - Training for Potentialising the Mind.	
	Instructional Hours	**6**
	Total Hours	**30**

Textbook:

1. **"Value Education",** compiled by Centre for Human Excellence, Nehru Arts and Science College.

Tools for Assessment (25 Marks)

CIAI	CIA II	Model	Assignment	Seminar	Attendance	Total
5	5	6	3	3	3	25

Course designed by	Verified by	Checked by	Approved by
12/8/21 Dr. P.T. Prathesh	12/8/21 Dr. Rebecca	Convenor CDC	16 AUG 2021

Course Code	Course Title		
20U3BNC203	Core Paper III - Introduction to Nanoscience		
Semester: II	Credits: 4	CIA : 25 marks	ESE : 75 marks

Course Objective: The course has knowledge about atomic and crystal structures, bonding pattern in solids, various types of organic materials and its significance

Course Outcomes (CO)

On successful completion of the course the students will have a knowledge about

CO1	Recollect atomic structure and electronic configuration
CO2	Understand types of crystal structure
CO3	Understand the types of different bonds
CO4	Understand the principal and application of semiconductors
CO5	Comprehend the introduction of Nanotechnology

Department offered: Biochemistry with Nanotechnology

Course Content **Instructional Hours/Week:5**

Unit	Description	Text Book	Chapter
I	Atomic structure and Electronic Configuration: Introduction – Atomic Structure – Electron – Properties of Cathode Rays – Nucleus – Atomic Number - Atomic Weight	1	2
	Isotope – Isobar – Avogadro Number – Atomic Model - Vector Model – Quantum Numbers – Pauli Exclusion principle	1	2
	Instructional Hours		**15**
II	Crystal Structure : Introduction – Crystal Structure – Space Lattice – Unit Cell – Crystal Systems	1	3
	Atomic Packing – Coordination Number – Crystal Symmetry – Atomic Radius– Atomic Packing factor.	1	3
	Instructional Hours		**15**
III	Bonds in Solids : Introduction – Types of bond – Mechanism of Bond Formation – Ionic Bond – Covalent Bond – Metallic Bond – Comparison of bonds – Secondary Bonds	1	4
	Mixed Bonds – Chemical Bonding and Properties of Solid Materials.	1	4
	Instructional Hours		**15**

IV	Semiconducting materials: Introduction-Types of semiconductors on the basis of Fermi level and Fermi Energy-Transistor-Piezo electricity and Ferroelectricity	1	13
	Organic materials: Introduction-Polymers- Mechanism of Polymerization-Addition in polymers-Polymer structure		12
V	Introduction and Classification: What is nanotechnology – Classification of Nanostructures - 1D, 2D and 3 D nanomaterials – Nanoscale Architecture.	2	2
		Instructional Hours	**15**
		Total Hours	**75**

Text Book(s):

1. G. K. Narula, K.S. Narula, V. K. Gupta, **Materials Science**, Tata McGraw Hill Publications. 2004.
2. William D. Callister, Jr., **Fundamentals of Materials Science and Engineering**, John Wiley & Sons, 2001.

Reference Book(s):

1. Murty, B.S., Shankar, P., Raj, B., Rath, B.B., Murday, J, **Textbook of Nanoscience and Nanotechnology**, Springer Publications, 2013.

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
5	5	6	3	3	3	25

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	M	H
CO4	M	M	M	H	H
CO5	M	M	H	H	H

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21 (Dr. S. Subashanmani)	12/8/21 Dr. P.T. Pratheesh	16/8/21 Convener CDC	16 AUG 2021

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21 (Dr. S. Subashanmani)	12/8/21 Dr. P.T. Pratheesh	16/8/21 Convener CDC	16 AUG 2021

Course Code	Course Title		
20U3BNP204	Core Paper IV Biochemistry Practical - I		
Semester: I / II	Credits: 4	CIA : 40 marks	ESE : 60 marks

Course Objective

Biochemistry Practical's allows the students to gain technical competence, and allow them to experience, and become skilled in planning experiments, and processing and presenting data

Course Outcomes (CO)

CO1	Recall and learn how to follow experimental protocols.
CO2	Understand how to use a particular apparatus, observe and record accurately.
CO3	Apply the fundamentals to process data and use statistical methods.
CO4	Analyze, plan experiments, validate assays, write protocols, be critical of data
CO5	Interpret the results with respect to biological systems.

Offered by: Biochemistry with Nanotechnology.

Course Content **Instructional hours/ week :5**

1. ANALYSIS OF SUGARS

a) **Monosaccharides**-Glucose, Fructose, Galactose, Mannose, Pentose.
b) **Disaccharides**-Sucrose, Maltose and Lactose.
c) **Polysaccharides**-Starch and Dextrin.

2. ANALYSIS OF AMINO ACIDS

a) Histidine b) Tyrosine c) Tryptophan d) Methionine e) Cysteine f) Arginine

3. DEMONSTRATION EXPERIMENTS

a) Preparation of buffer and its pH measurements using pH meter.
b) Separation of amino acids by TLC.
c) Separation of sugars by circular paper chromatography

Instructional hours :75

Text Book(s):

1. J. Jayaraman, **Laboratory Manual in Biochemistry**, New Age International Publishers, 2011.
2. Pattabiraman, **Laboratory Manual & Practical Biochemistry,** All India Publishers and Distributors, 4th Edition 2015.

Reference Book:

1. David T. Plummer, **An Introduction to Practical Biochemistry**., Tata McGraw-Hill Education 3rd Edition (1998).
2. GeethaDamodaran K, **Practical Biochemistry**, Jaypee- The Health Sciences Publisher,2nd Edition, 2016.
3. TiwariAnand, **Practical Biochemistry: A Student Companion**, Lambert Publications, 2015**.**

Tools for Assessment (40 Marks)

Practical's (total of 10)	Model I	Model II	Observation Note book	Attendance	Total
10	10	10	6	4	40

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	M	L
CO2	H	H	M	M	M
CO3	M	M	M	M	M
CO4	M	L	M	M	H
CO5	M	M	M	M	H

High; M-Medium; L-Low.

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21 Mrs. G. SUJITHA	12/8/21 Dr. P.T. Praveesh.	Convenor CDC	16 AUG 2021

Course Code	Title		
20U3BNC202	Allied Paper II Essentials of Basic Microbiology		
Semester: II	Credits: 3	CIA : 20 Marks	ESE: 55 Marks

Course Objective

Students will be able to acquire, articulate, retain and apply specialized language and knowledge relevant to microbiology.

Course Outcomes (CO)

CO1	Recollect the cellular, biochemical, and physiological aspects of microorganisms
CO2	Recognize and understand the similarities and differences between microbial groups
CO3	Understand /explain the processes used by microorganisms for their replication, survival, and interaction with their environment and host populations
CO4	Apply fundamental microbiology techniques to solve scientific problems.
CO5	Analyze the cultural use of microorganisms in food production, medicine, and waste treatment.

Offered by: Biochemistry with Nanotechnology

Course Content **Instructional Hours / Week: 4**

.Unit	Description	Text Book	Chapter
I	**Historical development of microbiology;** **Microscopy**: Principles and applications, dark field, bright field, resolving power, numerical aperture, chromatic aberration, phase contrast microscopy, fluorescent microscopy, electron microscopy.	1	1
	Control of microbes: Sterilisation, disinfection, antiseptic, tyndallisation, pasteurization: Physical- dry heat, moist heat, UV light, ionizing radiation, filtration, Chemical-phenol and phenolic compounds, (halogen aliphatic alcohol, formaldehyde, ethylene oxide, heavy metals) anionic and cationic detergents.	1	1
	Instructional Hours		**12**
II	**Types of growth media:** natural, synthetic, complex, enriched, selective- definition with example, pure culture methods (streak plate, spread plate, pour plate, stab culture, slant culture).	1	4

	Staining: Principles of staining, simple staining, negative staining, differential staining, Gram and acid fast staining, capsule and endospore staining.	1	4
		Instructional Hours	**12**
III	**Morphology of viruses,** classification of viruses; plaque assay. Phages: - T4 Phages stages – lifecycle; synthesis and assembly of protein. Lambda Phages – Life cycle.	2	16
	RNA viruses: - Retroviruses and life cycle- HIV.	2	16
		Instructional Hours	**12**
IV	**Microbial diseases**: - Normal human micro flora; host – parasitic interaction; epidemics; Exotoxins and Endotoxins. **Air borne diseases:** - Aetiology, symptoms and prevention of Tuberculosis, Diphtheria, Polio – myelitis and Influenza	2	34
	Food and Waterborne diseases: Aetiology, symptoms and pathogenesis of Typhoid, Cholera, Bacillary dysentery and Hepatitis.	2	34
		Instructional Hours	**12**
V	**Water Microbiology**: - Microbes in water - **Escherichia coli**, Vibrio, and **Salmonella**, Bacteriological examination of water; purification of drinking water. **Soil microbiology**: - Symbiotic and Non- symbiotic Nitrogen fixing organisms.	2	41
	Industrial Microbiology: Definition of fermentation, types of fermentations and fermenters and microbes producing ethanol, antibiotics (penicillin and streptomycin), enzymes (amylase and lipase) and organic acids (citric acid and acetic acid)	2	41
		Instructional Hours	**12**
		Total Hours	**60**

Text Book(s):

1. Pelczer J, R E. C. S John Noel R Krieg, **Microbiology**: MC Graw Hill Book Company, 5th, Edition, 2013.
2. Prescott L. M; J.H Harley and D. A Klein, **Microbiology**, Wiley Publications,9thEdition 2015.

Unit I : Text book 1, Chapter 01.
Unit II : Text book 1, Chapter 04.
Unit III : Text book 2, Chapter16.

Unit IV : Text book 2, Chapter 34.
Unit V : Text book 2, Chapter 41.

Reference Books:

1. Ronald M. Atlas, **Microbiology-Fundamentals and Applications**, Macmillan Publishing Company, New York, 1993.
2. Patrick R. Murray, **Basic Medical Microbiology**, 1st Edition, 2017.

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
4	4	5	2	2	3	20

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	M	L
CO2	M	H	H	M	M
CO3	M	H	H	M	M
CO4	M	M	M	L	L
CO5	M	M	M	M	M

High; M-Medium; L-Low.

H-High, M-Medium, L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21 Mrs. Ch. Sujitha	12/8/21 Dr. P.T. Prathees	Convenor CDC	16 AUG 2021

Course Code	Course Title		
18U3BNR203	Allied Paper III - Microbiology Practical		
Semester: II	Credits: 2	CIA : 20 marks	ESE : 30 marks

Course Objective: The student will be attaining practical skills in using tools, technologies and methods common in microbiology, and apply these scientific methods and hypothesis in design and execution of experiments.

Course Outcomes (CO)

CO1	Remember the basics of the microbiological practicals.
CO2	Understand the various procedures of staining and sterilization
CO3	Apply the fundamentals to process the sample given and report the results.
CO4	Analyze the microbiological concepts and basic research findings through description.
CO5	Analyze and interpret the microbial samples.

Offered by: Biochemistry with Nanotechnology.

Course Content **Instructional Hours/Week:3**

Unit	Description
1. STAINING TECHNIQUES a) Gram staining b) Simple staining c) Negative staining d) Fungal staining e) Endospore staining **2. GROUP EXPERIMENTS:** a) Handling of microscopes b) Growth curve profile of micro-organisms c) Preparation cultures and subcultures – Slant, Pour plate, Streak plate. d) Enumeration of microorganisms from water and soil.	
3. DEMONSTRATION a) Sterilization techniques – different types. b) Preparations of medium and nutrient broths c) Disposition of cultures and broths. d) Antibiotic sensitivity test.	

Instructional hours: 45

Text Book(s):

1. Gupte, **Practical Microbiology**, 2015.
2. Senthilkumar Balakrishnan and Zothansanga, **Practical Microbiology – A Laboratory Manual**, Panima Publishing Corporation, 1st Edition, 2013.

Reference Books:

1. James G. Cappuccino, Natalie Sherman,**Microbiology: A Laboratory Manual** 10th Edition, 2015.
2. Emanuel Goldman, Lorrence H Green, **Practical Handbook of Microbiology**, CRC Press, Third Edition, 2015.

Tools for Assessment (20 Marks)

Practical's (total of 10)	Model I	Model II	Observation Note book	Attendance	Total
5	5	5	3	2	20

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	M	L	L
CO2	H	M	M	M	M
CO3	H	M	L	L	M
CO4	H	H	M	M	M
CO5	H	H	L	H	H

H-High; M-Medium; L-Low.

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21	12/8/21 Dr. P.T. Praveen	Convenor CDC	16 AUG 2021

18U4HRC202	Ability Enhancement Compulsory Course - Human Rights and Constitution of India	
Semester: II	**Credit: 2**	**ESE: 50 Marks**

Offered by:

Course Content **Instructional Hours / Week: 2**

Unit	Description	
I	**Human Rights and Conceptual Background of Human Rights** Definition, Meaning Inherent, inalienable, Universal, indivisible Values: Dignity, liberty, equality and justice.	
	Instructional Hours	**6**
II	**Philosophical and Historical Perspectives** : Theories of Human Rights -Human Rights Movements- History of Human Rights Civilization	
	Instructional Hours	**6**
III	HR for target population: Refugees, War victims, Prisoners, Custodial Violence Women and Children, Senior Citizens.	
	Instructional Hours	**6**
IV	Human Rights and Duties in India Evolution : Independence Movement , Making of the constitution Indian Constitution : Fundamental Rights – directive Principles –Fundamental Duties.	
	Instructional Hours	**6**
V	Enforcement and Protection Mechanism of Human Rights in India. Judiciary, National Human Rights Commission and other Commissions and Committees. Non-Governmental Organizations, Information Media	
	Instructional Hours	**6**
	Total Hours	**30**

Text Book:

1. **"Human Rights and Constitution of India",** complied by the Department of Social Work, Nehru Arts and Science College.

Course designed by	Verified by	Checked by	Approved by
12/8/21 Dr. P.T. Prathees	12/8/21 Dr. Robert	Convenor CDC	16 AUG 2021

18U4HVY201	Value education - Human Values and Yoga Practice I		
Semester: I & II	Credit: 2	CIA: 25 Marks	ESE: 25 Marks

(Common to all UG programmes)

Course Objective:

- To help the students appreciate the essential complementarily between 'values' and 'skills' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings
- To prepare and distribute standardized Yoga teaching and training materials with reference to institute health

Course Outcome (CO):

At the end of the course, students are expected

CO 1	To inculcate in students, a sense of respect towards harnessing values of life and spirit of fulfilling social responsibilities.
CO 2	To inspire individuals to choose their own personal, social, moral and spiritual values and be aware of practical methods for developing and deepening.
CO 3	To inculcate cultural behavioral patterns
CO 4	To understand physical body and Health concepts

Course Content **Instructional Hours / Week: 1**

Unit	Description	
I	**Human Values**-Introduction-Definition of Ethics and Values-Character and Conduct -Nature and Scope of Ethics.	
	Instructional Hours	**6**
II	**Individual and Society**-Theories of Society-Social Relationships and Society-Empathy: Compassion towards other being - Environmental Ethics and Nature.	
	Instructional Hours	**6**
III	Cultural Education - Purity India - Patriotism - Time management. Greatness of Womanhood - Food is medicine- Individual peace - World Peace.	
	Instructional Hours	**6**
IV	Power of Meditation- Development of mind in stages - Mental Frequencies - Methods for Concentration. Meditation Practices - Surya namaskar.	
	Instructional Hours	**6**
V	Simplified Physical Exercise – Kayakalpa Practices - Training for Potentialising the Mind.	
	Instructional Hours	**6**
	Total Hours	**30**

Textbook:

1. **"Value Education",** compiled by Centre for Human Excellence, Nehru Arts and Science College.

Tools for Assessment (25 Marks)

CIAI	CIA II	Model	Assignment	Seminar	Attendance	Total
5	5	6	3	3	3	25

Course designed by	Verified by	Checked by	Approved by
12/8/21	12/8/21		
Dr. P.T. Prathesh	Dr. Rebecca	Convenor CDC	

16 AUG 2021

Course Code	Course Title		
20U3BNP204	Core Paper IV Biochemistry Practical - I		
Semester: I / II	Credits: 4	CIA : 40 marks	ESE : 60 marks

Course Objective

Biochemistry Practical's allows the students to gain technical competence, and allow them to experience, and become skilled in planning experiments, and processing and presenting data

Course Outcomes (CO)

CO1	Recall and learn how to follow experimental protocols.
CO2	Understand how to use a particular apparatus, observe and record accurately.
CO3	Apply the fundamentals to process data and use statistical methods.
CO4	Analyze, plan experiments, validate assays, write protocols, be critical of data
CO5	Interpret the results with respect to biological systems.

Offered by: Biochemistry with Nanotechnology.

Course Content **Instructional hours/ week :5**

1. ANALYSIS OF SUGARS

a) **Monosaccharides**-Glucose, Fructose, Galactose, Mannose, Pentose.
b) **Disaccharides**-Sucrose, Maltose and Lactose.
c) **Polysaccharides**-Starch and Dextrin.

2. ANALYSIS OF AMINO ACIDS

a) Histidine b) Tyrosine c) Tryptophan d) Methionine e) Cysteine f) Arginine

3. DEMONSTRATION EXPERIMENTS

a) Preparation of buffer and its pH measurements using pH meter.
b) Separation of amino acids by TLC.
c) Separation of sugars by circular paper chromatography

Instructional hours :75

Text Book(s):

1.J. Jayaraman, **Laboratory Manual in Biochemistry**, New Age International Publishers, 2011.
1. Pattabiraman, **Laboratory Manual & Practical Biochemistry,** All India Publishers and Distributors, 4th Edition 2015.

Reference Book:

1. David T. Plummer, **An Introduction to Practical Biochemistry**., Tata McGraw-Hill Education 3rd Edition (1998).
2. GeethaDamodaran K, **Practical Biochemistry**, Jaypee- The Health Sciences Publisher,2nd Edition, 2016.
3. TiwariAnand, **Practical Biochemistry: A Student Companion**, Lambert Publications, 2015**.**

Tools for Assessment (40 Marks)

Practical's (total of 10)	Model I	Model II	Observation Note book	Attendance	Total
10	10	10	6	4	40

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	M	L
CO2	H	H	M	M	M
CO3	M	M	M	M	M
CO4	M	L	M	M	H
CO5	M	M	M	M	H

High; M-Medium; L-Low.

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21 Mrs. G. SUJITHA	12/8/21 Dr. P.T. Praveen.	Convenor CDC	16 AUG 2021

18U4HRC202	Ability Enhancement Compulsory Course - Human Rights and Constitution of India	
Semester: II	**Credit: 2**	**ESE: 50 Marks**

Offered by:

Course Content **Instructional Hours / Week: 2**

Unit	Description	
I	**Human Rights and Conceptual Background of Human Rights** Definition, Meaning Inherent, inalienable, Universal, indivisible Values: Dignity, liberty, equality and justice.	
	Instructional Hours	**6**
II	**Philosophical and Historical Perspectives** : Theories of Human Rights -Human Rights Movements- History of Human Rights Civilization	
	Instructional Hours	**6**
III	HR for target population: Refugees, War victims, Prisoners, Custodial Violence Women and Children, Senior Citizens.	
	Instructional Hours	**6**
IV	Human Rights and Duties in India Evolution : Independence Movement , Making of the constitution Indian Constitution : Fundamental Rights – directive Principles –Fundamental Duties.	
	Instructional Hours	**6**
V	Enforcement and Protection Mechanism of Human Rights in India. Judiciary, National Human Rights Commission and other Commissions and Committees. Non-Governmental Organizations, Information Media	
	Instructional Hours	**6**
	Total Hours	**30**

Text Book:

1. **"Human Rights and Constitution of India",** complied by the Department of Social Work, Nehru Arts and Science College.

Course designed by	Verified by	Checked by	Approved by
12/8/21 Dr. P.T. Prathesh	12/8/21 Dr. Rebecca	Convenor CDC	16 AUG 2021

18U4HVY201	Value education - Human Values and Yoga Practice I		
Semester: I & II	Credit: 2	CIA: 25 Marks	ESE: 25 Marks

(Common to all UG programmes)

Course Objective:

- To help the students appreciate the essential complementarily between 'values' and 'skills' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings
- To prepare and distribute standardized Yoga teaching and training materials with reference to institute health

Course Outcome (CO):

At the end of the course, students are expected

CO 1	To inculcate in students, a sense of respect towards harnessing values of life and spirit of fulfilling social responsibilities.
CO 2	To inspire individuals to choose their own personal, social, moral and spiritual values and be aware of practical methods for developing and deepening.
CO 3	To inculcate cultural behavioral patterns
CO 4	To understand physical body and Health concepts

Course Content **Instructional Hours / Week: 1**

Unit	Description	
I	**Human Values**-Introduction-Definition of Ethics and Values-Character and Conduct -Nature and Scope of Ethics.	
	Instructional Hours	**6**
II	**Individual and Society**-Theories of Society-Social Relationships and Society-Empathy: Compassion towards other being - Environmental Ethics and Nature.	
	Instructional Hours	**6**
III	Cultural Education - Purity India - Patriotism - Time management. Greatness of Womanhood - Food is medicine- Individual peace - World Peace.	
	Instructional Hours	**6**
IV	Power of Meditation- Development of mind in stages - Mental Frequencies - Methods for Concentration. Meditation Practices - Surya namaskar.	
	Instructional Hours	**6**
V	Simplified Physical Exercise – Kayakalpa Practices - Training for Potentialising the Mind.	
	Instructional Hours	**6**
	Total Hours	**30**

Textbook:

1. **"Value Education",** compiled by Centre for Human Excellence, Nehru Arts and Science College.

Tools for Assessment (25 Marks)

CIAI	CIA II	Model	Assignment	Seminar	Attendance	Total
5	5	6	3	3	3	25

Course designed by	Verified by	Checked by	Approved by
12/8/21 Dr. P.T. Prathesh	12/8/21 Dr. Pratheesh	Convenor CDC	16 AUG 2021

Course Code	Title		
20U3BNC305	Core Paper V- Enzymology and Its Application		
Semester: III	Credits: 4	CIA : 25 Marks	ESE: 75 Marks

Course Objective

To enable the students to understand the basic knowledge about the relationship between properties and structure of the enzymes, their mechanism of action and kinetics of enzymatic reactions.

Course Outcomes (CO)

CO1	To learn and able to characterize the enzymes in each enzymatic class, examples of such enzymes and their application in practice.
CO2	Understand the regulatory mechanisms of enzyme activity, enzyme inducers and repressors.
CO3	To apply the presented use of enzymes in medicine, food, organic synthesis, genetics and other area sectors.
CO4	Understanding the functions of coenzymes and metalloenzymes
CO5	To analyse the applications of enzymes in the field of biosensors and immobilized systems.

Offered by: Biochemistry with Nanotechnology

Course Content **Instructional Hours / Week: 5**

Unit	Description	Text Book	Chapter
I	**Introduction to Enzymes** General introduction and historic background- General Terminology, Nomenclature and Classification of Enzymes. Specific activity. Enzyme units - Katal and IU. Definition of active sites - Lock and key model, induced fit model	1	1
	Enzyme as proteins Structure: Primary, Secondary, Tertiary and Quaternary structure.	1	2
	Instructional Hours		**15**
II	**Enzyme Kinetics and Inhibition** Enzyme kinetics: Derivation of Michalies-mentons equation, Km, Vmax, transformation of MM equation. Line-Weaver Burk plot and EadieHoffste plot. Effect of pH, temperature, enzyme activity, turn over number of enzymes.	1	7
	Enzyme Inhibition- Competitive, Non Competitive, Uncompetitive. Irreversible Inhibition- Suicide inhibition. Mechanism of action of Inhibitors - Iodoacetamide and DIPF.	1	8

	Instructional Hours		**15**
III	**Enzyme Regulation and Mechanism of enzyme action:** Regulatory enzymes, Feed forward stimulation, Feedback regulation, allosteric enzymes with reference to asparatetranscarbamoylase, Reversible, Covalent Modification and Proteolytic Activation. Isoenzymes, Ribozymes, Abzymes.	2	8
	Enzyme action: General acid base catalysis, covalent catalysis, proximity orientation. Mechanism of action – Chymotryspin& Lysozyme. Measurement of enzyme reactions: Spectrophotometry.	1	11
	Instructional Hours		**15**
IV	**Coenzymes:** Definition, Structure and functions of TPP, ATP, NAD, NADP, FAD, FMN, Coenzyme-A, Metal cofactors.Multienzyme Complex: Pyruvate dehydrogenase.	2	4
	Metalloenzymes and metal activated enzymes. Cofactors-metal cofactors & Prosthetic group.	1	11
	Instructional Hours		**15**
V	**Enzyme technology and Industrial Enzymes-** enzyme technology – Immobilized enzymes – Sources, techniques and applications. Effect of immobilization on enzyme activity. Biosensors - types & application	2	6
	Industrial Enzymes-amylases, lipases, proteolytic enzymes in meat and leather industry. Industrial uses of enzymes in Textile, Food and beverages and Environment.	2	8
	Instructional Hours		**15**
	Total Hours		**75**

Text Book(s):

1. Trevor Palmer, **Understanding Enzymes**. Ellis-HorwoodLimited.3rd Edition, 1999.
2. Chapline&Bucke, **Enzyme Technology**. Cambridge University Press, 1st Edition, 1990.

Unit I : Text book 1, Chapter 01 &02..
Unit II : Text book 1, Chapter 07 &08..
Unit III : Text book 2, Chapter 08 & Text book 1, Chapter 11.
Unit IV : Text book 1, Chapter 20 &Text book 2, Chapter 04.
Unit V : Text book 2, Chapter 06 &08..

Reference Book(s):

1. Dixon and Webb ,**Enzymes**, ACS Publications, 3rd Edition, 1980.
2. Alan Welshman, **Hand book of Enzyme Biotechnology**. 2nd Edition, 1995.

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
5	5	6	3	3	3	25

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	M	L	L
CO2	H	M	M	M	M
CO3	M	M	L	L	L
CO4	H	H	M	M	L
CO5	M	H	M	M	M

High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21 (Dr. S. Subashanmani)	12/8/21 Dr. P. T. Prathesh	Convenor CDC	16 AUG 2021

Course Code	Course Title		
20U3BNP407	Core Paper VII - Biochemistry Practical II		
Semester: III/IV	Credits: 4	CIA : 40 marks	ESE : 60 marks

Course Objective: To provide hands on practical on identification of biological compounds and become skilled in planning experiments.

Course Outcomes (CO)

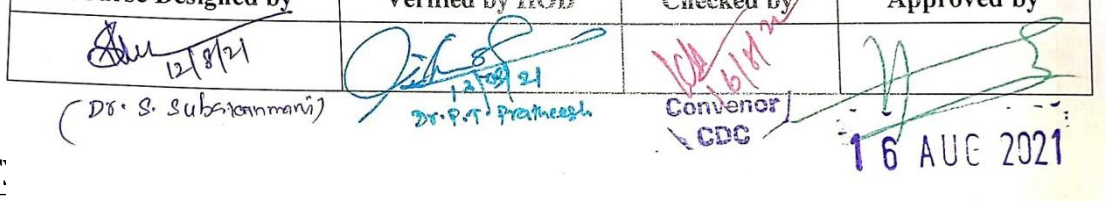
CO1	Recall basic tests of biological components
CO2	Understand the use a particular apparatus, observe and record accurately.
CO3	Understanding the preparation of stock and working standards
CO4	Apply the fundamentals to process data and use statistical methods.
CO5	Analyse and Interpret the results with respect to biological systems.

Department offered: Biochemistry with Nanotechnology.

Course Content **Instructional Hours/Week:3/4**

Description
I. Colorimetry: 1. Estimation of Glucose by O-Toluidine 2. Estimation of Urea by DAM-TSC method 3. Estimation of Uric acid by Carraway method 4. Estimation of Protein by Lowry's method 5. Isolation and quantification of DNA from onion.
II Enzymes: (Group Experiment) 1. Effect of pH, Temperature and Substrate concentration 2. Enzyme concentration- MM & LB Plot.
III Separation Techniques: (Demonstration) 1. Separation of serum protein by Paper electrophoresis 2. Column packing- Separation of leaf pigments
IV Nanoparticle synthesis(Demonstration) 1. Green Synthesis of silver nanoparticles and characterization

Instructional hours : 105



B.Sc. Biochemistr

Text book(s)

1. J. Jayaraman, Laboratory Manual in Biochemistry, New Age International Publishers, 2011.
2. Pattabiraman, Laboratory Manual & Practical Biochemistry All India Publishers and Distributors, 4th Edition 2015.
3. Sadasivam, S. and Manickam, A. Biochemical methods. 2nd Edition, New age International, New Delhi.

Reference Book:

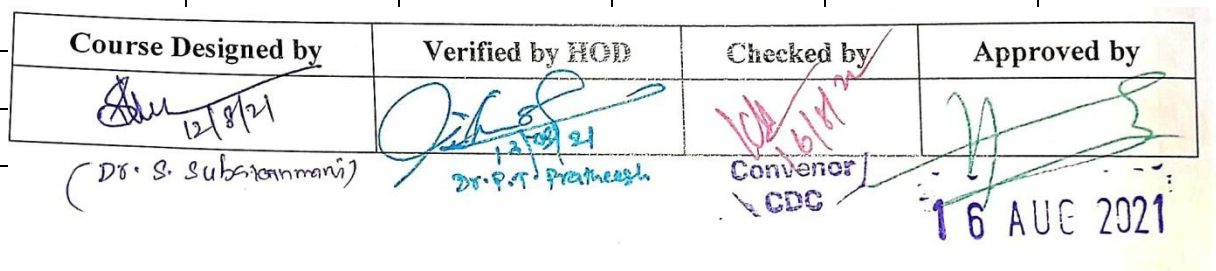
1. David T. Plummer, An Introduction to Practical Biochemistry. , Tata McGraw-Hill Education 3rd Edition (1998).
2. GeethaDamodaran K, Practical Biochemistry, Jaypee- The Health Sciences Publisher,2nd Edition, 2016.
3. Int Nano Lett (2016) 6:21–26 DOI 10.1007/s40089-015-0163
4. Dhaka Univ. J. Pharm,. Sci. **12**(1): 29-33, 2013 (June)

Tools for Assessment (40 Marks)

Instrument Handling	Spotters Identification	Mid Semester Test - I	Model II Test -II	Observation Note book	Attendance	Total
5	5	10	10	7	3	40

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	M	M	L
CO2	M	M	M	M	M



Course Code	Title		
20U3BNA304	Biostatistics		
Semester: III	Credits : 3	CIA: 20 Marks	ESE: 55 Marks

Course Objective:

This course introduces the basic Statistical concepts that are appliedin Biosciences to enable the students to learn the Statistical Measures and their Applications**.**

Course Outcome:

CO1	To understand the concepts of data collection and presentation
CO2	To remember the ideas of Measures of Central Tendency and Dispersion
CO3	To analyze different Statistical situations using Sampling Techniques and experimental designs
CO4	To gain the knowledge of analysis of Variance
CO5	To find the equation of a Straight Line using Correlation and Regression analysis

Offered by: Mathematics

Course Content **Instructional Hours / Week: 4**

Unit	Description	Text Book	Chapter
I	**Introduction to Biostatistics:** Definition–Application - Characteristics – Limitation - Data Collection – Classification - Tabulation and frequency distribution.	1	1, 3
	Diagrammatic and Graphical presentation of Data .	2	2,3
	Instructional Hours		**12**
II	**Measures of Central Tendency :**Mean, Median, Mode.	2	4
	Measures of Dispersion: Range, Standard Deviation, Quartile Deviation, Co-efficient of variation.	2	5
	Instructional Hours		**12**
III	**Sampling Techniques:**Introduction- Methods of Sampling- Sampling and Non-Sampling errors.	2	2
	Hypothesis : Definition, testing of Hypothesis- Test of significance for large sample- Single mean & Difference between two means- Test of significance for Small sample- Single mean & Difference between two means- Chi Square test- Goodness of fit- F-test.	1	12-15

	Instructional Hours		**12**
IV	**Analysis of Variance:** One way and Two way Classifications.	2	9
	Experimental Design: Introduction – Basic Concepts and Principles – Concepts of Randomized Design (CRD) – Randomized Complete Block Design (RCBD)	2	10
	Instructional Hours		**12**
V	**Correlation:** Introduction- Types Of Correlation- Scatter Diagram – Karl Pearson's Co-efficient of Correlation – Coefficient of Determination - Spearman's Rank Correlation.	1	8
	RegressionAnalysis: Regression Coefficients - Properties - Linear Regression.	1	9
	Instructional Hours		**12**
	Total Hours		**60**

Text Book:

1. Dr. P.N. Arora and Dr. P.K. Malhan, **Bio Statistics**, Himalaya Publishing House, Revised Edition, 2006
2. Irfan Ali Khan and AtiyaKhanum, **Fundamentals of Biostatistics**, **Ukaaz publications**, Second Revised Edition, 2004.

Unit I : Text Book 1, Chapter 1,Sections: 1.1,1.3 to 1.9, 1.11 to 1.13.
Chapter 3 Text Book 2, Chapter3.

Unit II : Text Book 2, Chapter 4, Sections: 4.1 to 4.4
Chapter 5, Sections: 5.1,5.2,5.3.1,5.3.3.

Unit III : Text Book 2, Chapter 2.
Text Book 1, Chapter 12-15.

Unit IV : Text Book 2, Chapter 9, Sections: 9.3 to 9.3.5
Text Book 2, Chapter 10, Sections: 10.1 to 10.4.2.3

Unit V : Text Book 1, Chapter 8 and 9

Reference Book:

1. Wayne W.Daniel, Chad L. cross, Biostatistics: A Foundation for Analysis in health sciences, John Wiley,10th Edition,2012.

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
4	4	5	2	2	3	20

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4
CO1	L	M	H	M
CO2	M	H	M	M
CO3	H	M	M	M
CO4	H	H	M	L
CO5	M	H	H	M

High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
Dr. K. Reena	(Dr. P. T. Prathesh)	Convenor CDC	16 AUG 2021

Course Code	Course Title		
18U4BNS301	Skill Based Paper I- Bioinformatics		
Semester: III	Credits: 3	CIA : 20 marks	ESE : 55 marks

Course Objective:
Upon successful completion the students shall have the knowledge about Biological databases, websites and methods of drug designing.

Course Outcomes (CO)

CO1	Enable the students to know about various websites, their databases and applications
CO2	Understand the Role of Bioinformatics tools in prediction of biological structures.
CO3	Applying the fundamentals and function of bioinformatics in protein & gene prediction
CO4	Analyse the applications and create specific tools for drug design and sequences.
CO5	Understanding the specific tools for structural prediction and molecular docking methods

Department offered: Biochemistry with Nanotechnology

Course Content **Instructional Hours/Week: 3**

Unit	Description	Text Book	Chapter
I	BioInformatics: Introduction, definition, objectives and scope. BioInformatics and Internet	1	1
	Useful BioInformatics sites on www. Application of BioInformatics.	2	1
	Instructional Hours		**9**
II	Biological databases: Primary protein database – SWISS PROT, TrEMBL, PIR, PDB.	1	7
	Primary nucleic acid database – EMBL, GEN BANK, DDBJ. Data mining of biological databases.	2	3
	Instructional Hours		**9**
III	Tools for database search: FASTA- Histogram, Sequence listing, Search and Programs.	1	9
	BLAST –MEGABLAST, PHI BLAST, PROTEIN BLAST, GRAPPED BLAST, PSI BLAST	2	6
	Instructional Hours		**9**
IV	Protein Primary structure analyses and prediction: Identification and characterization	1	12
	Gene Identification and prediction – pattern recognition, prediction method – laboratory based approaches –	2	5

	southern blotting, northern blotting, zoo blot, *In situ* hybridization.		
	Instructional Hours		**9**
V	BioInformatics and drug design: Introduction approaches – ligand based, target based. Methods of drug designing – CAMD, docking program	1 2	14 2
	Instructional Hours		**9**
	Total Hours		**45**

Text Book(s):

1. Rastogi.S.C, Namita – Mendiratta and Parag Rastogi, BioInformatics Concepts, Skills and applications. (2016)
2. Mani K and Vijayraja, BioInformatics – A practical approach, (2005)

Unit I : Text book 1, Chapter 01.
Unit II : Text book 1,2 Chapter 03,07.
Unit III : Text book 1,2 Chapter 09,06.
Unit IV : Text book 2, Chapter 05.
Unit V : Text book 1, 2, Chapter14,02.

Reference Book(s):

1. Westhead D.R, Parish J.H and Twyman R.M, Instant notes in BioInformatics, IstEdition,2003.
2. Attwood. T.K. Parry D.J. and Smith. Introduction to BioInformatics, IstIndian Report. 2001.

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Quiz	Attendance	Total
4	4	5	2	2	3	20

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	M	H
CO4	M	M	H	H	H
CO5	M	M	M	M	M

H-High; M-Medium; L-Low.

Course designed by	Verified by	Checked by	Approved by
12/8/21 Dr. P.T. Prathesh	12/8/21 Dr. Rebecca	Convenor CDC	16 AUG 2021

B.Sc. Biochemistry with Nanotechnology | NASC 2019

Course Code	Title	
19U4NM3GTS	Gandhian Thoughts	
Semester: III	Credits : 2	ESE: 50 Marks

Course Objective: To make them understand the philosophies of Gandhi better and fulfill their duties and responsibilities towards the society.

Course Outcome : To upgrade the knowledge and skills of the students in Gandhian Thoughts and to encourage patriotism among the new generation, to put light on social issues and value of life.

Course Content **Instructional Hours/Week: 02**

Unit	Description	
I	**Educational Philosophy of Gandhiji :** Definitions on Education - What is True Education? - Gandhiji's New Scheme of Education - Wardha Scheme of Education - Main Aims of Gandhian Education - Why Gandhiji's Scheme of Education was Called 'Basic Education?' - Features of the Wardha Scheme of Education - Features of Basic Education - The Methodology of Basic Education - The Content of Basic Education - Routine Work of a Basic School	
	Instructional Hours	**6**
II	**Gandhian Concept of Correlation of Studies -** Technique of Correlation - The Place of Teacher in Basic Education - Merits of Basic Education - Educational Scenario after Independence - Influences of Gandhiji on Education Commissions - Basic Schools in the Present Society - Education for Peace – A Gandhian View - Why Basic Education is called a Holistic Model	
	Instructional Hours	**6**
III	**Gandhiji's View on Truth and Non-Violence :** Gandhiji's Words about Truth - Meaning of Truth, Truth is God - Truth and God - The Importance of Truth in Human Life - Absolute and Relative Truth - Realisation of the Self - Liberation.	
	Instructional Hours	**6**
IV	**Mahatma Gandhi's Views on Women :** Status of Women in Pre Independence India - Gandhi's Perception of Women - Role of Women in Family – Perception of Gandhi - Value of Equality - Women in Politics - Gandhiji's Vision to Abolish Social Evils against Women - Role of Women as Envisaged by Gandhi.	
	Instructional Hours	**6**
V	**Gandhiji's View on Democracy (Gram Swaraj) :** City and Village - Gram Swaraj - Critique of Industrialisation - Critique of Machinery	
	Instructional Hours	**6**
	Total Hours	**30**

Text Book(s):

1. " Gandhian Thoughts", Compiled by Nehru Arts and Science College.

Course Code	Title	
19U4NM3WRT	Women's Rights	
Semester: III	Credits: 2	ESE : 50 Marks

Course Objective:

To facilitate the awareness on the social, economic, political, intellectual or cultural contributions of one or more women

Course Outcome:

- Examine the similarities and differences among women within and across cultures and at various moments
- Describe gender socialization and its consequences in a particular society
- Analyze how these factors with the privileges and disadvantages they confer have shaped one's own experiences, presumptions, viewpoints, and sense of identity
- Read and respond to feminist scholarship

Course Content **Instructional Hours/Week:2**

Unit	Description	Textbook	Chapter
I	**Laws, Legal System and Change** Definition - Constitutional law, CEDAW and International Human Rights - Laws and Norms – Laws and Social Context - Constitutional and Legal Framework	2	2
	Instructional Hours		**6**
II	**Politics of land and gender in India** Land as Productive Resources	1	5
	Locating Identities – Women's Claims to Land – Right to Property - Case Studies	1	6,7
	Instructional Hours		**6**
III	**Women's Rights:Access to Justice** Introduction – Criminal Law – Crime Against WomenDomestic Violence – Dowry Related Harassment and Dowry Deaths- Molestation – Sexual Abuse and Rape Loopholes in Practice – Law Enforcement Agency	3	**7**
	Instructional Hours		**6**
IV	**Women's Rights**		
	Violence Against Women – Domestic Violence The Protection of Women from Domestic Violence Act, 2005, The Marriage Validation Act, 1982 - The Hindu Widow Re-marriage Act, 1856- The Dowry Prohibition Act, 1961	3	5
	Instructional Hours		**6**

V	**Special Women Welfare Laws** Sexual Harassment at Work Places, Rape and Indecent Representation ,The Indecedent Representation (Prohibition) Act, 1986 , Immoral Trafficking , The Immoral Traffic (Prevention) Act, 1956 - Acts Enacted for Women Development and Empowerment , Role of Rape Crisis Centers. Protection of Children from sexual Offences Act 2012	3	9
			Instructional Hours6
		Total Instructional Hours	**30**

Text Books:

1. NityaRao **Good Women do not Inherit Land** Social Science Press and Orient Blackswan 2008
2. International Solidarity Network**Knowing Our Rights** An imprint of Kali for Women 2006
3. P.D.Kaushik **"Women Rights"**Bookwell Publication 2007 UN Centre for Human Rights, Discrimination against Women (Geneva: World Campaign for Human Rights,1994).

Reference Books:

1. ArunaGoal **Violence Protective Measures for Women Development and Empowerment,** Deep and Deep Publications Pvt. 2004
2. Monica Chawla **Gender Justice**, Deep and Deep Publications Pvt. Ltd.2006
3. Preeti Mishra **Domestic Violence Against Women,** Deep and Deep Publications Pvt. 2007
4. ClairM.Renzetti, Jeffrey L.Edleson, Raquel Kennedy Bergen, Source Book on **Violence Against Women** Sage Publications 2001

Course designed by	Verified by	Checked by	Approved by
12/8/21 Dr. P.T. Prathesh	12/8/21 Dr. Rebecca	16/8/21 Convenor CDC	16 AUG 2021

Course Code	Title		
18U4HVY402	Value Education: Human values and Yoga Practice II		
Semester: III & IV	Credit: 2	CIA: 25 Marks	ESE: 25 Marks

Course Objective

- To help the students appreciate the essential complementarily between 'values' and 'skills' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings
- To prepare and distribute standardized Yoga teaching and training materials with reference to institute health

Course Outcome (CO):

At the end of the course, students are expected

CO 1	To become more aware of their self and their relationships and would have better reflective and discerning ability.
CO 2	It is hoped that they would be able to apply what they have learnt to their own self in different ordinary day-to-day settings in real life with higher commitment and courage.
CO 3	To enable students to lead a practical life adding value to human relations.
CO 4	To have the basic Knowledge on Simplified Physical Exercises and Asanas and Meditation

Course Content **Instructional Hours / Week: 1**

Unit	Description	Text Book	Chapter
I	**Self-realization and Human Values-** Self-realization and Harmony-Rules and Regulations-Rights and Duties-Good and Obligation-Integrity and Conscience. **Obligation to Family-** Trust and Respect -Codes of Conduct -Citizens Charter - Emotional Intelligence.	1	1,4
	Instructional Hours		**6**
II	Impact of Modern Education and Media on Values: Impact of Science and Technology on Values; Effects of computer aided media on Values (Internet, e-mail, Chat etc.); Role of teacher in the preservation of tradition and culture;	1	5
	Instructional Hours		**6**
III	Eradication of worries - Maintaining youthfulness - Greatness of friendship – Refinement of worries - Neutralization of anger- Intelligent quotient (IQ), Emotional quotient (EQ), Spiritual Quotient (SQ)	1	2,3
	Instructional Hours		**6**
IV	Standing Posture: Tadasana, Padahastasana, Virabhadrasana;	2	4,5

	Sitting posture: Ustrasana, Ardha Matsyendrasana, Paschimottanasana.		
	Instructional Hours		**6**
V	Supine posture: Sarvangasana, Halasana, Chakrasana. Prone posture: Bhujangasana, shalabhasana; Dhanurasana; Balancing postures: Vrikshasana, Natarajasana, Utkatasana; Pranayama: Bhastrika, Bhramari, NadiShodhan.	2	6,9
	Instructional Hours		**6**
	Total Hours		**30**

Textbook(s):

1. Kiran, D.R. "Professional Ethics & Human Values", TATA McGraw Hill Education.
2. Chandrasekaran, 1999.Sound Health through yoga, Prem Kalyan Publications, Madurai.

Reference Books :

1. Vethathiri Maharishi, 2011,"Value Education", Vethathiri Publication, Erode
2. Thathuvagnani Vethathiri Maharishi, 2014, "Simplified Physical Exercises". Vethathiri Publications

Course designed by	Verified by	Checked by	Approved by
12/8/21	12/8/21		
Dr. P.T. Prathesh	Dr. Rebecca	Convenor CDC	16 AUG 2021

Course Code	Course Title		
19U3BNC406	Core Paper VI - Intermediary Metabolism		
Semester: IV	Credits: 4	CIA : 25 marks	ESE : 75 marks

Course Objective:

Provides much information related to carbohydrate, fat and protein metabolism that takes place in our body.

Course Outcomes (CO)

CO1	Understand the basic principles of bioenergetics and biological oxidation
CO2	Enable the students to know about Interrelationship between carbohydrate, fat and
CO3	Understand the basic functions, principles and concepts of metabolism.
CO4	Apply the fundamentals knowledge on regulations in metabolism
CO5	Analyze the applications and inter-relationship between metabolism and diseases.

Department offered: Biochemistry with Nanotechnology

Course Content **Instructional Hours/Week: 4**

Unit	Description	Text Book	Chapter
I	Bioenergetics: - The basic metabolic pathways, anabolic, catabolic and amphibolic pathways.	1	11
	Biological oxidation: - oxidation – reduction equilibria; redox potential, enzymes and coenzymes involved in oxidation and reduction. Electron transport chain: - Role of respiratory chain in mitochondria; in energy capture; respiratory control. Oxidative phosphorylation: -Mechanism of oxidative phosphorylation; Chemiosmotic theory; uncouplers of oxidative phosphorylation	1	12
	Instructional Hours		**12**
II	Fate of absorbed carbohydrates. Glycolysis: - Pathways and energetic.	2	14
	TCA Cycle: - Pathway and energetics; anapleroticreaction.Gluconeogenesis, Glycogenesis and glycogenolysis(pathway only)	1	15
	Pentose Phosphate Pathway (HMP shunt).Glucuronic Acid Cycle and glyoxylate cycle (Entner- Duodorfi pathway) Metabolism of other hexoses: - Fructose and galactose. (pathway only)	2	16
	Instructional Hours		**12**
III	Blood lipids and phase of dietary lipids. Oxidation of fatty		

	acids: - Carnitine cycle; beta oxidation. Alpha oxidation and omega oxidation.	2	19
	Biosynthesis of unsaturated fatty acids: - Monounsaturated and polyunsaturated fatty acids. Biosynthesis and degradation: - Lecithin, cephalin, inositol, phosphatidyl serine, cholesterol and plasma lipoproteins. (example should be included)	2	20
	Biosynthesis of glycolipids, Cerebrosides, Gangliosides and Spingolipids.		20
	Instructional Hours		**12**
IV	Fate of dietary proteins, metabolic nitrogen pool. Catabolism of amino acid: Oxidative deamination, non – oxidative deamination, transamination, amino – acid decarboxylation, phenyl alanine and tyrosine.	2	17
	Catabolism of carbon skeleton of amino acids.	1	25
	Instructional Hours		**12**
V	Interrelation between carbohydrates, fat and protein metabolism.	2	18
	Metabolism of purines and pyramidines: - de novo synthesis, salvage pathways.	1	30
	Instructional Hours		**12**
	Total Hours		**60**

Text Book(s):

1. Murray, K. Robert, et al., - Harper's Biochemistry. 32nd edition, 2016.
1. Lehninger, L.S., et al., - Principles of Biochemistry. 4th edition. CBS Publishers,2015

Reference Book(s):

1. Voet and Voet - Biochemistry..John Wiley and Sons, 4thedition 2016.
2. LubertStryer, Biochemistry, Freeman and Company, 7thEdition, 2016.

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
5	5	6	3	3	3	25

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	H	H	H	H
CO5	L	M	M	M	H

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21 (Dr. N. Vijaya Lakshmi)	12/08/21 Dr. P.T. Pratheesh	Convenor CDC	16 AUG 2021

Course Code	Course Title		
20U3BNP407	Core Paper VII - Biochemistry Practical II		
Semester: III/IV	Credits: 4	CIA : 40 marks	ESE : 60 marks

Course Objective: To provide hands on practical on identification of biological compounds and become skilled in planning experiments.

Course Outcomes (CO)

CO1	Recall basic tests of biological components
CO2	Understand the use a particular apparatus, observe and record accurately.
CO3	Understanding the preparation of stock and working standards
CO4	Apply the fundamentals to process data and use statistical methods.
CO5	Analyse and Interpret the results with respect to biological systems.

Department offered: Biochemistry with Nanotechnology.

Course Content **Instructional Hours/Week:3/4**

Description
I. Colorimetry: 1. Estimation of Glucose by O-Toluidine 2. Estimation of Urea by DAM-TSC method 3. Estimation of Uric acid by Carraway method 4. Estimation of Protein by Lowry's method 5. Isolation and quantification of DNA from onion.
II Enzymes: (Group Experiment) 1. Effect of pH, Temperature and Substrate concentration 2. Enzyme concentration- MM & LB Plot.
III Separation Techniques: (Demonstration) 1. Separation of serum protein by Paper electrophoresis 2. Column packing- Separation of leaf pigments
IV Nanoparticle synthesis(Demonstration) 1. Green Synthesis of silver nanoparticles and characterization

Instructional hours : 105

Text book(s)

1. J. Jayaraman, Laboratory Manual in Biochemistry, New Age International Publishers, 2011.
2. Pattabiraman, Laboratory Manual & Practical Biochemistry All India Publishers and Distributors, 4th Edition 2015.
3. Sadasivam, S. and Manickam, A. Biochemical methods. 2nd Edition, New age International, New Delhi.

Reference Book:

1. David T. Plummer, An Introduction to Practical Biochemistry. , Tata McGraw-Hill Education 3rd Edition (1998).
2. GeethaDamodaran K, Practical Biochemistry, Jaypee- The Health Sciences Publisher,2nd Edition, 2016.
3. Int Nano Lett (2016) 6:21–26 DOI 10.1007/s40089-015-0163
4. Dhaka Univ. J. Pharm,. Sci. **12**(1): 29-33, 2013 (June)

Tools for Assessment (40 Marks)

Instrument Handling	Spotters Identification	Mid Semester Test - I	Model II Test -II	Observation Note book	Attendance	Total
5	5	10	10	7	3	40

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	M	M	L
CO2	M	M	M	M	M
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO5	L	M	L	M	M

High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21 (Dr. S. Subasiammani)	12/8/21 Dr. P.T. Prathesh.	Convenor CDC	16 AUG 2021

Course Code	Title		
18U3BNA405	Allied Paper V : Basics of Computer Science		
Semester: IV	Credits: 3	CIA : 20 Marks	ESE:55 Marks

Course Objective

To make the students understand the basic concept of computer science.

Course Outcomes (CO)

CO1	Understand the essential concepts of Information Technology
CO2	Define document, formatting in word
CO3	Understand worksheet and workbook
CO4	Demonstrate slide presentation
CO5	Analyse the Data

Offered by: Computer Science

Course Content **Instructional Hours / Week: 4**

Unit	Description	Text Book	Chapter
I	**The Computer Era- An Introduction:** Introduction to Information concepts and processing – Data - Information – Need for Information – Human being as information processor - Need for Computerization – Information technology- Components of information technology – hardware – software – data – user – storage – communication	1	1
	Fundamentals of Computer System: What is a Computer? – Characteristics of a computer- Intangible benefits	1	2
	Instructional Hours		**12**
II	**Creating documents with Word:** Creating blank file – Saving a file – file formats. **Formatting:** Character formatting – formatting techniques- the font group – the font dialog box – page setup basics – Table setup basics – Inserting picture from a file	2	4, 5, 8, 9
	Instructional Hours		**12**

III	**Using Excel Worksheets and Work Book:** Understanding workbooks and worksheets – moving around a worksheet – Entering text – entering date – modifying cell content – applying number formatting. **Essential worksheet and cell range:** Learning the fundamentals of excel worksheet – working with rows and columns – understanding cells and range – copying or moving ranges	2	12,13,14
	Instructional Hours		**12**
IV	**Introducing formulas and functions:** Understanding formula basics – entering the formula – editing the formula – Basic counting formula – summing formula – **Getting started making charts** : What is a Chart? – Creating a Chart - Working with charts – Understanding chart types.	2	15,17, 18
	Instructional Hours		**12**
V	**Creating a Presentation, Slides and Text:** Starting a new presentation – Closing and reopening presentation – creating new slides – managing Slides . **Working with table and Charts** : Creating tables, Understanding Charts and chart types	2	21,23
	Instructional Hours		**12**
	Total Hours		**60**

Text Book(s):

1. Chetan Srivastava, "**Fundamentals of Information Technology**", Kalyani Publishers, New Delhi, Edition 2002.
2. John Walkenbach, Herb Tyson, et al., "Office 2007 Bible", Wiley India Pvt. Ltd, 2008

Unit I : Text Book 1, Chapter 1 (1-6), Chapter 2 (7 – 30)

Unit II: Text Book 2, Chapter 4 (81 – 84, 87 - 90) – 5 (112 – 123), 8 (159 – 170, 173 – 179), 9 (181- 189, 205-209)

Unit III: Text Book 2, Chapter 12 (277-281) – 13(289,290, 297-299), 14(303-327)

Unit IV: Text Book 2, Chapter 15 (337 – 348), 17(387-391), 18(411-423)

Unit V: Text Book 2, Chapter 21 (469 – 472,484-491,497 - 500), 23 (551-554, 573-577, 584)

Reference Book(s) :

1. John Walkenbach "**Excel 2007 Bible",** Wiley Publications, 2007
2. Amy Romanoff, Sherry Bonelli, "**Microsoft Office 2000 Complete Refernce"**, BPB Publication, New Delhi.
3. Sanjay Saxena "**MS Office 2007 in a Nutshell**", Vikas Publishing House, Noida, 2001.
4. Dinesh Maidasani, "**Learning Computer Fundamentals, Ms Office and Internet & Web Tech"** , Firewall Media, 2005

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Quiz	Attendance	Total
4	4	5	2	2	3	20

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	L	M	L	M
CO2	L	M	M	L	M
CO3	M	M	M	M	M
CO4	M	M	M	M	M
CO5	M	M	M	M	M

Prepared by	Verified by	Checked by	Approved by
12/8/21 (Subject Expert)	12/8/21 (Dr. Kavitha)	16/8/21 Convenor CDC	16 AUG 2021

Course Code:	Title :		
18U3BNR406	Allied Paper VI : Basic Computer Science Practicals		
Semester: IV	Credit: 2	CIA : 20 Marks	ESE: 30 Marks

Course Objective:

To make the students understand the formula, function and Chart in excel.

Course Outcome(CO)

CO1	Understand data entering concept
CO2	Understand the concept of cell and cell range
CO3	Apply built in functions and formulas
CO4	Use chart representation for data
CO5	Show slide presentation

Offered by: Computer Science

Course Content **Instructional Hours / Week: 2**

S. No.	List of Practical
1	Create a Ms – Word document to prepare your resume
2	Create a MS – Word Table to prepare student Mark list
3	Calculate the Mean, Median, Mode and Quartile for the given data using Microsoft Excel Worksheet.
4	Find the Range, Standard Deviation, Co-efficient of Variance and Skewness for the given data using Microsoft Excel Worksheet.
5	Find Pearson product moment correlation coefficient for the given data using Microsoft Excel Worksheet.
6	Find TTEST, ZTEST, FTEST and CHITEST for the given data using Microsoft Excel Worksheet.
7	Create a MS - Power point presentation to demonstrate Chart
8	Prepare a PowerPoint presentation. Presentation should contain 5 slides with proper heading and content (use picture, Table, Charts)
	TOTAL HOURS : 30

Tools for Assessment (20)

Demonstration	Program Execution	Test I	Test II	Observation	Attendance	Total
3	3	4	4	3	3	20

Mapping

PSO / CO	PS 01	PS 02	PS 03	PS 04
CO 1	M	M	M	M
CO 2	M	M	M	M
CO 3	M	M	M	M
CO 4	M	M	M	M
CO 5	M	M	M	M

S- Strong; H-High; M-Medium; L-Low.

Prepared by	Verified by	Checked by	Approved by
12/8/21	11/8/21	16/8/21	16 AUG 2021
(Asst. Professor Botany)	(Dr. Kavitha)	Convenor CDC	

Course Code	Course Title		
20U4BNS402	Skill Based Paper II - Biophysics		
Semester: III	Credits: 3	CIA : 20 marks	ESE : 55 marks

Course Objective: To provide knowledge in basics of biophysics.

Course Outcome:

CO1	Enable the students to and gain knowledge on basic tests of biological physics.
CO2	Understand the basic functions, principles ,concepts of various parts chemical bonds
CO3	Understanding the biological importance of water as a universal solvent
CO4	Apply the fundamental knowledge of thermodynamics in biological sciences.
CO5	Analyse and implement methods on prevention radiation induced lysis.

Department offered: Biochemistry with Nanotechnology.

Course Content **Instructional Hours/Week: 3**

Unit	Description	Text Book	Chapter
I	Structure of atom-Models & theories, Concept of bonding; molecular orbital theories, polar & non polar molecules; Secondary bonding: weak interactions, hydrogen bonding; dipole-dipole &dipoleinduced dipole interactions; London dispersion forces.	1	2
	Thermodynamics : Laws of thermodynamics, concept of free energy, unavailable energy and entropy, heat content of food, bomb calorimetry, chemical kinetics – rate, order, molecularity of reactions and energy of activation	1	2
	Instructional Hours		**9**
II	Structure & Bonding: Quantum mechanics: Pauli Exclusion Principle, Ionization energy, electron affinity and chemical binding, Electronegativity and strong bonds, secondary bonds.	1	3
	The electronics structure of atoms, Molecular orbital and Covalent bonds. Molecular interaction: strong and weak interactions. Stereochemistry and Chirality, Bond lengths& Bond energies , Bond angles.	1	3
	Instructional Hours		**9**

III	Physicochemical properties of water, Molecular structure, Nature of hydrophobic interactions, Water Structure. Aqueous Environment of the Cell, State of water in bio-structures & its significance, The Hydration Shell.	1	4
	Acid & Bases: Acid-Base theories, Mole concept, Molarity, Molality & Normality, Ampholyte, concept of pH,measurements of pH , Henderson–Hasselbatch equation , Titration curve &pK values, Buffers & Stability of their pH .	1	4
	Instructional Hours		**9**
IV	Cell membranes-diffusion-Fick's law of diffusion-passive diffusion-facilitated diffusion-factors affecting diffusion-diffusion across cell membranes-active transport osmosis-osmotic pressure-laws of osmosis-biological significance of osmosis.	2	6
	Microscopy: Electron microscopy: Electron optics-transmission electron microscopy (TEM) - scanning electron microscopy (SEM) preparation of specimen for electron microscopy-tunneling electron microscopy-atomic force microscopy.	2	6
	Instructional Hours		**9**
V	Radiolysis of water, Direct and indirect effects of radiation. Radiation chemical yield and G value, Target theory, Single hit & Multi hit theory, Effect of radiation on Nucleic acids, Proteins, Enzymes.	2	7
	Action of radiation on living system – Viruses, Prokaryotic & Eukaryotic cells Cellular effects of radiation, somatic & genetic effects, concept of LD_{50}, acute and chronic (whole body) effects of radiation.	2	7
	Instructional Hours		**9**
	Total Hours		**45**

Text Book(s):

1. Glaser, Roland,Biophysics- An Introduction, Springer Publications, 2nd Edition, 2012.
2. Hoppe, W., Lohmann, W., Markl, H., Ziegler, H.Biophysics,Springer Publications, 1st Edition, 1983.

Unit I : Text book 1, Chapter 02.

Unit II : Text book 1, Chapter 03.

Unit III : Text book 1, Chapter 04
Unit IV : Text book 2, Chapter 06.
Unit V : Text book 2, Chapter 07.

Reference Book(s):

1. Hughes W, Aspects of Biophysics, John Willey and Sons. 1979.
2. Dugas H. and Penney C, Bioorganic chemistry, Springer-Verlag. 1981.
3. Bio physics principles and techniques by M.A Subramanian, MJP publishers, Chennai, 2005
4. Basic biophysics for biologists by M. Daniel, Agrobios (India), Jodhpur, 2003. 5. Essential of biophysics by P. Narayanan, New age International (P) limited, New Delhi, 2005

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Quiz	Attendance	Total
4	4	5	2	2	3	20

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	L	M	L	M
CO2	L	M	M	L	M
CO3	M	M	M	M	M
CO4	M	M	M	M	M
CO5	M	M	M	M	M

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21	12/8/21	Convenor CDC	
(Dr. S. Subakanmani)	[illegible]		

16 AUG 2021

Course Code	Title	
19U4NM3BT2	BASIC TAMIL - II	
Semester: IV	Credits: 2	CIA : 50 Marks

(Common to all UG Programmes)

Course Objective: mw ,yf;fpaq;fis mwpKfg;gLj;jy

Course Outcomes:

1. mw ,yf;fpa mwpT ngWjy - rpW rpW fijfs; top r%f mwpT ngWjy;
2. nkhopiag; gpioapd;wpg; Ngr> vOj jpwd ngwr;nra;jy;.

Offered by : Tamil Department

Course Content **Instructional Hours / Week: 2**

Unit	Description	
I	**ePjp E}y;fs**	
	1. ghujpahh - Mj;jpr;#b – Kjy 12 thpfs; 2. nfhd;iwNte;jd; Kjy 7 thpfs;	
	Instructional Hours	**5**
II	**jpUf;Fws**	
	fLTs; tho;j;J - mfuKjy vdj njhLq;Fk... mj;. - 1 Fws; - 10 thd rpwg;G - ePhpd;w;p mikahJ cyF... mj;. - 2 Fws; - 10 md;GiLik - md;gpd; topaJ caph;epiy ...mj;. - 8 Fws; - 10 fy;tp - fz;ZiLahh; vd;gh ..... mj;. - 40 Fws; - 3 ,dpait $wy;-,dpa csthf ,d;dhj ... mj;. - 10 Fws; - 10	
	Instructional Hours	**10**
III	**ePjpf;fijfs**	
	Ky;yhtpd; Ntbf;iff fijfs> gPh;ghy; fijfs	
	Instructional Hours	**5**
IV	**fpuhkpaf fijfs**	
	1. gukhh;j;jf;FU fijfs; 2. ehL;Lg;Gwf; fijfs; mwpKfk	
V	**nkhopg; gapw;rp**	
	1. gpwnkhopr;nrhw;fSf;F jkpo;r;nrhy; vOJjy; 2. jd;tptuk vOJjy; 3. vq;fs; fy;Y}hp	
	Instructional Hours	**5**
	Total Hours	**30**

ghLj;njhFg;G :

,sq;fiy jkpo; khztHfSf;Fhpa ghL E}y **"mhpr;Rtb"**

njhFg;G: jkpo;j;Jiw> NeU fiy mwptpay; fy;Y}hp> Nfhak;Gj;J}H.

Course Designed by	Verified by	Checked by	Approved by
11/8/2021 Dr. Sridevi	11/8/2021 Dr. Sridevi	Convener CDC	16 AUG 2021

Course Code	Title	
19U4NM4AT2	ADVANCED TAMIL - II	
Semester: IV	Credits: 2	ESE : 50 Marks

(Common to all UG Programmes)

Course Objective: E}y;fspd top mwrrpe**jidfis** cUthf;Fjy; nrk;nkhopap**i**dr; nrk**i**kg;gL**j**;Jjy;.

Course Outcomes:
1. mwr;rpe;jidfs; ngW**jy** kw;Wk **,**yf;fz tof;F K**i**w**fis**g ngW**jy**;
2. nkhopiag; gpioapd;wpg; Ngr> v**O**j **j**pwd ngwr;nra;jy;

Offered by : **Tamil Department**

Course Content **Instructional Hours / Week: 2**

Unit	Description	
I	**gj**pnd**z** fPo;f;fzf;F E}y;fs;	
	jpU**f**;Fws 1. tha;ik 2. $Lh eL;G 3. nra;ed;wpawpjy;	
	Instructional Hours	**10**
II	rpW**fij**	
	G+dhj;j rpW**fijfs** - nt. **,i**wad;G 1. tpLfij 2. ez;gHfs;	
	Instructional Hours	**5**
III	v**O**j;Jg;gpio ePf;f **t**opfs;	
	1. nrhw;fisr; rhpahfg; gad;gL**j**;Jk K**i**w 2. **t**pidr; nrhw;fs;> ngaHr;nrhw;fs;	
	Instructional Hours	**5**
IV	**t**of;fwpjy	
	kuG> **,**ay;G> **t**of;F – **j**Fjp **t**of;F mwpjy;	
V	**gi**Lg;ghw;wy **g**apw;rp	
	ftpij – rpW**fij** – E}y kjpg;gPL vOJjy	
	Instructional Hours	**5**
	Total Hours	**30**

ghLj;njhFg;G :

,sq;fiy jkpo; khztHfSf;Fhpa ghL E}y "jpuL;L".
njhFg;G: jkpo;j;Jiw› NeU fiy mwptpay; fy;Y}hp› Nfhak;Gj;J}H.

ghHit E}y;fs;:

1. jpUf;Fws; – ghpNkyofH ciu› kzpthrfH gjpg;gfk› nrd;id.
2. m.fp. gue;jhkdhH – ey;y jkpo; vOj Ntz;Lkh? my;yp epiyak› nrd;id.
3. gtze;jp KdptH> ed;D}y; G+ypA+Hf;Nfrpfd; ciu› rhujh gjpg;gfk› nrd;id.
4. nt. ,iwad;G – G+dhj;jp› ftpjh gjpg;gfk› nrd;id.

Course Designed by	Verified by	Checked by	Approved by
11/8/2021 Dr. Sridevi	11/8/2021 Dr. Sridevi	Convener/ CDC	16 AUG 2021

Course Code	Title	
19U4NM4GEN	General Awareness	
Semester: IV	Credits : 2	ESE : 50 Marks

Course Objective:

Enable the students to learn General knowledge and prepare different competitive exams.

Course Outcome:

- Analysis the Verbal and Numerical Aptitude
- Understood the General Science and Technology and Education
- Gain Knowledge in Computer aids and Social Studies
- Develop Aptitude and problem solving skills

Course Content **Instructional Hours / Week : 2**

S. No.	Topics
1	Verbal Aptitude
2	Numerical Aptitude
3	Abstract Reasoning
4	Tamil and Other Literature
5	General Science and Technology
6	Computer
7	Economics and Commerce
8	History and Freedom Struggle
9	Sports
10	Current Affairs
	Total Hours : 30

Text Book : " General Awareness" , Compiled by Nehru Arts and Science College, Coimbatore

Course designed by	Verified by	Checked by	Approved by
12/8/21	12/8/21		
Dr. P.T. Prathesh	Dr. R. Babitha	Convenor CDC	16 AUG 2021

Course Code	Title		
18U4HVY402	Value Education: Human values and Yoga Practice II		
Semester: III & IV	Credit: 2	CIA: 25 Marks	ESE: 25 Marks

Course Objective

- To help the students appreciate the essential complementarily between 'values' and 'skills' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings
- To prepare and distribute standardized Yoga teaching and training materials with reference to institute health

Course Outcome (CO):

At the end of the course, students are expected

CO 1	To become more aware of their self and their relationships and would have better reflective and discerning ability.
CO 2	It is hoped that they would be able to apply what they have learnt to their own self in different ordinary day-to-day settings in real life with higher commitment and courage.
CO 3	To enable students to lead a practical life adding value to human relations.
CO 4	To have the basic Knowledge on Simplified Physical Exercises and Asanas and Meditation

Course Content **Instructional Hours / Week: 1**

Unit	Description	Text Book	Chapter
I	**Self-realization and Human Values-** Self-realization and Harmony-Rules and Regulations-Rights and Duties-Good and Obligation-Integrity and Conscience. **Obligation to Family-** Trust and Respect -Codes of Conduct -Citizens Charter - Emotional Intelligence.	1	1,4
	Instructional Hours		**6**
II	Impact of Modern Education and Media on Values: Impact of Science and Technology on Values; Effects of computer aided media on Values (Internet, e-mail, Chat etc.); Role of teacher in the preservation of tradition and culture;	1	5
	Instructional Hours		**6**
III	Eradication of worries - Maintaining youthfulness - Greatness of friendship – Refinement of worries - Neutralization of anger- Intelligent quotient (IQ), Emotional quotient (EQ), Spiritual Quotient (SQ)	1	2,3
	Instructional Hours		**6**
IV	Standing Posture: Tadasana, Padahastasana, Virabhadrasana;	2	4,5

	Sitting posture: Ustrasana, Ardha Matsyendrasana, Paschimottanasana.		
	Instructional Hours		**6**
V	Supine posture: Sarvangasana, Halasana, Chakrasana. Prone posture: Bhujangasana, shalabhasana; Dhanurasana; Balancing postures: Vrikshasana, Natarajasana, Utkatasana; Pranayama: Bhastrika, Bhramari, NadiShodhan.	2	6,9
	Instructional Hours		**6**
		Total Hours	**30**

Textbook(s):

1. Kiran, D.R. "Professional Ethics & Human Values", TATA McGraw Hill Education.
2. Chandrasekaran, 1999.Sound Health through yoga, Prem Kalyan Publications, Madurai.

Reference Books :

1. Vethathiri Maharishi, 2011,"Value Education", Vethathiri Publication, Erode
2. Thathuvagnani Vethathiri Maharishi, 2014, "Simplified Physical Exercises". Vethathiri Publications

Course designed by	Verified by	Checked by	Approved by
12/8/21	12/8/21		
Dr. P.T. Prathesh	Dr. Rathesh	Convenor CDC	16 AUG 2021

Course Code	Course Title		
20U3BNC508	Core Paper VIII - Human Physiology		
Semester: V	Credits: 4	CIA : 25 marks	ESE : 75 marks

Course Objective: Understand on all vital parts of human body its function, and its modulation during diseased state

Course Outcomes (CO)

CO1	Enable the students to gain knowledge on Anatomy and physiology of human
CO2	Understand the basic functions, of blood and digestive system
CO3	Understand the functions of respiratory and excretory system
CO4	Understand the functions of nervous and endocrine system
CO5	Enable the student to gain the knowledge in reproductive system

Department offered: Biochemistry with Nanotechnology.

Course Content **Instructional Hours/Week: 4**

Unit	Description	Text Book	Chapter
I	Blood and Body fluids: Composition and function, Red blood cells, Hemoglobin, white blood cells and platelets. Blood coagulation, blood groups and blood transfusion.	1	3
	Physiology of vision: Structure of eye, image formation and defects of the eye, Receptor mechanism of the eye, photopigments, Visual cycle and colour adaptation	1	2
	Instructional Hours		**12**
II	Respiratory system: Diffusion of gases in lungs, transport of oxygen from lungs to tissues through blood, factors influencing the transport of oxygen. Transport of CO_2 from tissues to lungs through blood, factors influencing the transport of CO_2.	1	4
	Digestive system: digestion and absorption of carbohydrates, proteins and fats.	1	5
	Instructional Hours		**12**
III	Male Reproductive system: Structure of testis, Spermatogenesis, hormone, functions of testis.	2	5

	Female Reproductive system: Ovarian cycle, Structure and hormones of ovaries, menstrual cycle, menopause, pregnancy and lactation.		
	Excretory System: Mechanism of formation of urine, composition of urine, Micturition	2	5
		Instructional Hours	**12**
IV	Skeletal Muscle: Structure of skeletal muscle, contraction of muscle fiber, chemical changes during muscle contraction, sources of energy of muscle contraction.	2	3
	Nervous system: Structure of neuron, resting potential and action potential, Propagation of nerve – impulses, Structure of synapse, synaptic transmission (electrical and chemical theory). Structure of Neuro muscular junction and mechanism of neuro muscular transmission, neuro transmitters.	2	3
		Instructional Hours	**12**
V	Endocrine system: Chemical nature of hormones, mechanism of action of hormones –intracellular receptor mechanism and second messenger mechanism (cAMP, cGMP, Ca^{2+})	2	6
	Hormones: Structure function and deficiency symptoms of hormones of pituitary, thyroid, parathyroid and adrenal glands. Functions of pancreatic hormones. hormone of the kidney.	2	6
		Instructional Hours	**12**
		Total Hours	**60**

Text Book(s):

1. Chatterjee, C., Human Physiology – Volume I & II.CBS Publishers, 7th Edition 2016.
2. Agarwal G.R &Agarwal B.P, Text Book of Biochemistry. (Agarwal Physiological chemistry)3rd Edition 1995.
3. Harrison endocrinology – 4 Edition

Unit I : Text book 1, Chapter 02, 03.
Unit II : Text book 1, Chapter 04, 05.
Unit III : Text book 2, Chapter 05.
Unit IV : Text book 2, Chapter 03.
Unit V : Text book 2, Chapter 06.

Reference Books:

1. Guyton, Text book of Medical Physiology, Saunders Co., 12th Edition 2014.
2. Stuart Fox, Human Physiology, McGraw-Hill Education; 13 edition, 2013.

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
5	5	6	3	3	3	25

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	H	H	H	H
CO5	H	L	M	M	M

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
(Ms. G. SUJITHA)	(Dr. P. T. Prathesh)	Convenor CDC	16 AUG 2021

Course Code	Course Title		
20U3BNC509	Core Paper IX - Clinical Biochemistry		
Semester: V	Credits: 4	CIA : 25 marks	ESE : 75 marks

Course Objective: This course will enable the students to understand the significance of diagnostic bio chemistry and its clinical interpretations.

Course Outcomes (CO)

CO1	Understand the imbalance of metabolism and disorders
CO2	Enable the students to gain knowledge on various clinical tests applied for
CO3	Understand the basis of Diagnosis for the treatment of diseases
CO4	Apply the fundamental knowledge of tests involved in diagnosis of diseases.
CO5	Analyse and implement methods to prevent pathogenesis.

Department offered: Biochemistry with Nanotechnology.

Course Content **Instructional Hours/Week:4**

Unit	Description	Text Book	Chapter
I	Disorders of Carbohydrate metabolism: Normal sugar level in blood, renal threshold and regulation of blood glucose concentration. Hypoglycemia; Definition and causes. Hyperglycemia; Definition and causes	1	2
	Diabetes mellitus; Introduction, Classification ,aetiology, , clinical pathology and diagnosis. Acute and chronic complications of Diabetes mellitus. Glycosuria- Differential diagnosis of glycosuria, Fructosuria, Pentosuria, Galactosemia and Glycogen storage diseases	1	2
	Instructional Hours		**12**
II	Disorders of Lipid metabolism: Introduction Hyperlipoproteinemia-Types I, II, III, IV and V. Alphalipoproteinemia. Hypolipoproteinemia- A beta lipoproteinemia, Hypo beta lipoproteinemia.	1	4
	Tangier`s disease and LCAT deficiency. Atherosclerosis, Fatty liver and hyper lipidemia. Hypercholesterolemia, Lipidosis and Xanthomatosis, Tay-Sach`s disease, Niemann-Pick disease.	1	4
	Instructional Hours		**12**
III	Disorders of Amino acid metabolism: Plasma protein abnormalities; Total plasma (Serum) protein, Fibrinogen, Albumin, Pre-albumin and Globulins. Abnormal non-protein nitrogen; Urea, Uric acid,	1	5

	Creatinine and Ammonia, Porphyria. Aminoacid metabolism: Cysteinuria, phenylketonuria, maple syrup disease, alkaptonuria, Albinism and Hartnup disease.		
	Disorders of Purine and pyrimidine metabolism: Disorders of Purine metabolism: Normal level of uric acid in blood and urine, miscible uric acid pool, hyper uricemia and Gout; Hypouricemia – Xanthinuria. Disorders of pyrimidine metabolism: Orotic acid urea.	1	5
	Instructional Hours		**12**
IV	Gastric function Test: Introduction, tests of gastric function – The insulin stimulation test, determination of Gastrin in serum and Tubeless gastric analysis.	2	6
	Pancreatic Function Test: Introduction, pancreatic function tests, serum amylase and lipase. Intestinal function: Introduction, test of monosaccharide absorption (xylose excretion test) and determination of total protein (Lowry's method).	2	6
	Instructional Hours		**12**
V	Liver function tests: Introduction, bilirubin metabolism and jaundice, liver function tests. Methods of conjugated and total bilirubin in serum (Diazo method). Thymol turbidity test, serum enzymes in liver disease – serum transaminases (SGPT & SGOT) and lactate dehydrogenase (LDH)(methods only).	2	5
	Kidney function test: Introduction, Renal blood flow and filtration fraction. Clearance tests; inulin clearance, Creatinine clearance test and urea clearance test.	2	5
	Instructional Hours		**12**
	Total Hours		**60**

Text Book(s):

1. Tietz Text book of Clinical Chemistry, Burtis A. Carl and Edward R. Ashwood, W.B. Saunders Company, 2nd edition, 1994.
2. Phlip. D. Mayne, Clinical Chemistry in Diagnosis and Treatment., ELBS Publication.2nd Edition2000.

Unit I : Text book 1, Chapter 02.
Unit II : Text book 1, Chapter 04.
Unit III : Text book 1, Chapter 05.
Unit IV : Text book 2, Chapter 06.
Unit V : Text book 2, Chapter 05

Reference Book(s):

1. Montgometry Conway, Spector. Biochemistry – A Case Oriented Approach, Mosby Publications,6st Edition1996.
2. .Nessar Ahmed, Clinical Biochemistry (Fundamentals of Biomedical Science), Oxford University Press, 1 edition, 2011.

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
5	5	6	3	3	3	25

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	H	H	H	H
CO5	M	M	M	M	M

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
Dr. N. Vijaya Lakshmi	(Dr. P. T. Prathaesh)	Convenor CDC	16 AUG 2021

Course Code	Course Title		
20U3BNC510	Core Paper X - Nano Biotechnology		
Semester: V	Credits: 4	CIA : 25 marks	ESE : 75 marks

Course Objective: This course will enable the students to know about basics of nanoparticles and its application in human health and welfare.

Course Outcomes (CO)

CO1	Enable the students to gain in biology inspired concepts
CO2	Enable the students to gain knowledge on nanobiometrics, nanocomposites,
CO3	Understand the basis on processing of nanoparticles and their functions.
CO4	Apply the fundamental knowledge on naturally occurring nanoparticles and its
CO5	Analyse the types of nanoparticles and its beneficial application in technology. .

.

Department offered: Biochemistry with Nanotechnology

Course Content **Instructional Hours/Week:4**

Unit	Description	Text Book	Chapter
I	Biological Inspired Concepts: Biological Networks – Biological Neurons – The Function of Neuronal Cell – Biological neuronal cells on silicon	1	1
	Modelling of Neuronal cells by VLSI circuits.	1	2
	Instructional Hours		**12**
II	Biological and Quantum Mechanical Computers: DNA Computer – Information	1	5
	Processing with Chemical reaction – Nanomachines – Parallel Processing – Quantum Computer.	1	6
	Instructional Hours		**12**
III	Nanobiometrics: Introduction – lipids as nano-bricks and morter- Self assembled nanolayers - the bits that do things - proteins – Structure is Information- DNA- Using DNA to build Nano-cubes and Hinges-DNA as wire template.	1	8
	Instructional Hours		**12**
IV	Natural nanocomposites : Introduction - natural nanocomposite materials – biologically synthesized nanostructures – protein based nanostructure formation	2	7
	Nanotechnology in Agriculture. Nanotechnology in waste water treatment	2	7
	Instructional Hours		**12**
V	Nanoanalytics: Quantum dots - Synthesis and Biolabelling	2	5

– Nanoparticle Molecular labels –AFM- priniciple and its applications – bio molecular structure analysis by AFM.	
Instructional Hours	**12**
Total Hours	**60**

Text Book(s):

1. K. Goser, P. Glosekotter, J. Dienstuhl Nano-electronics and Nano systems: From transistors to molecular devices. Overseas Press India Pvt. Ltd Springer.2008
2. Rohit Majumdar- Nanotechnology Basic science and Emerging Technologies 1st edition Cyber tech publications 2008.

Unit I : Text book 1, Chapter 01,02.
Unit II : Text book 1, Chapter 005,06.
Unit III : Text book 1, Chapter 08.
Unit IV : Text book 2, Chapter 07.
Unit V : Text book 2, Chapter 05.

Reference Books:

1. Mick Wilson, Kamali Kannagara, Geoff Smith, Michelle Simmons, Burkhard Raguse, Nanotechnology: Basic Science and Emerging Technologies, Overseas Press, 2008.
2. Bhushan, Bharat, Springer Handbook of Nanotechnology, 3rd Edition, 2010.

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
5	5	6	3	3	3	25

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	H	H	H	H
CO5	M	M	M	M	M

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
[signature] 12/8/21	[signature] 12/8/21	[signature]	[signature]
(Dr. S. Subakanmani)	Dr. Prabakaran P.	Convenor CDC	

16 AUG 2021

Course Code	Course Title		
20U3BNC511	Core Paper IX - Plant Biochemistry		
Semester: V	Credits: 4	CIA : 25 marks	ESE : 75 marks

Course Objective: The students shall study on the physiology, pathology and the associated mechanisms of plant cell function.

Course Outcomes (CO)

CO1	Understand the basic physiology of plants.
CO2	Understand the hormonal regulations involved in the growth of plants
CO3	Apply the knowledge of various processes of nutrients and its role in growth
CO4	Analyse the process in growth, deficiency status and maturation of plants.
CO5	Enable the students to gain knowledge in primary and secondary metabolites

Department offered: Biochemistry with Nanotechnology

Course Content **Instructional Hours/Week:4**

Unit	Description	Text Book	Chapter
I	Plant cell – Structure and function of extra cellular organelles. Transport mechanisms:- Diffusion, osmosis and imbibtion (definition only). Absorption and translocation of water – Mechanism, active absorption and passive absorption. Factors affecting absorption of water.	1	2
	Transpiration – Types, Mechanism of stomatal opening, factors affecting transpiration and guttation.	1	2
	Instructional Hours		**12**
II	Photosynthesis – Photosynthetic pigments; chlorophyll pigments, carotenoid pigments and phycobilins. Structure of chloroplast; light absorption. Light reaction; Mechanism; Two kinds of chemical system – Photosystem I and photosystem II. Dark Reaction or Blackman's reaction.	1	3
	C3 & C4 cycle and CAM	1	3
	Instructional Hours		**12**
III	Nitrogen fixation:- Symbiotic nitrogen fixation, non-symbiotic nitrogen fixation. Mechanism of nitrogen fixation, Sulfur cycle, Phosphorus cycle and carbon cycle.	2	5

	Plant nutrition:- Macronutrients: Carbon, hydrogen, nitrogen, sulfur, phosphorus, calcium, potassium, magnesium and iron. Micronutrients:- manganese, boron, copper, zinc, molybdenum and chlorine.	2	5
		Instructional Hours	**12**
IV	Plant growth regulators – Auxins and Gibberlins; biosynthesis, mode of action, bioassay and practical application.	2	2
	Cytokinins, Absicic acid and Ethylene - Chemistry, mode of action and physiological role. Plant growth inhibitors and retardation.	2	2
		Instructional Hours	**12**
V	Primary metabolites, Alkaloids, flavanoids, terpenoids, phenolics, steroids. Production of secondary metabolite in plants, stages of secondary metabolite production.	2	4
	Tissue culture techniques; Different type of media; Growth hormones its and applications.	2	4
		Instructional Hours	**12**
		Total Hours	**60**

Text Book(s):

1. P.K.Verma, Text Book of Plant Physiology, EMKAY Publications, 2nd Edition 2001.
2. John. W. Anderson and John Brardall, Molecular Activities of Plant Cell, An Introduction to Plant Biochemistry, Black well Scientific Publications.3rd Edition1996.

Unit I : Text book 1, Chapter 02.
Unit II : Text book 1, Chapter 03.
Unit III : Text book 2, Chapter 05.
Unit IV : Text book 2, Chapter 02.
Unit V : Text book2, Chapter 04.

Reference Books:

1. Bonner, Varner Plant Biochemistry, 2nd Edition, 1991.
2. Lea and Lea wood, Plant Biochemistry and Molecular Biology John Wiley and sons, 3rd Edition 1998.
3. Sharma, Plant Biochemistry,

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
5	5	6	3	3	3	25

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	H	H	H	H
CO5	L	L	M	M	M

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
Dr. N. Vijaya Lakshmi	(Dr. P. T. Perumal)	Convenor CDC	16 AUG 2021

Course Code	Course Title		
18U3BNP614	Core Paper XIV - Biochemistry Practical - III		
Semester: V / VI	Credits:4	CIA : 40 marks	ESE : 60 marks

Course Objective: To provide hands on practical on identification of tests for biological compounds.

Course Outcomes (CO)

CO1	Recall basic tests of biological components
CO2	Understand The basics of handling of biological samples.
CO3	Attain knowledge on use of novel kit methods in determinations of biological samples
CO4	Analyse the normal values of biological components
CO5	Interpretation of values and correlation of diseases

Department offered: Biochemistry with Nanotechnology.

Course Content **Instructional Hours/Week: 4 & 5**

Unit	Description
I. Urine& Blood Analysis:	1. Estimation of creatinine by picric acid method. 2. Estimation of Urea by DAM-TSC method method 3. Estimation of Uric acid by Carraway's method 4. Estimation of Calcium by Permanganate method 5. Estimation of Phosphorus by Fiske-Subbarow method 6. Estimation of Cholesterol in serum by Zak's method 7. Estimation of Glucose in serum by O- Toluidine method 8. Estimation of SGOT in serum 9. Estimation of SGPT in serum.
II Kit Method: (Demonstration Experiment)	1. Estimation of HDL 2. Estimation of LDL 3. Estimation of Total Cholesterol 4. Estimation of Triglycerides.

Instructional hours: 135

Text book(s)

1. J. Jayaraman, Laboratory Manual in Biochemistry, New Age International Publishers, 2011.

2. Pattabiraman, Laboratory Manual & Practical Biochemistry All India Publishers and Distributors, 4th Edition 2015.

Reference Book:

1. David T. Plummer, An Introduction to Practical Biochemistry. Tata Mc Graw-Hill Education 3rd Edition (1998).
2. Geetha Damodaran K, Practical Biochemistry, Jaypee- The Health Sciences Publisher, 2nd Edition, 2016.

Tools for Assessment (40 Marks)

Instrument Handling	Viva	Record	Test - I	Test- II	Attendance	Total
5	5	7	10	10	3	40

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	M	M	L
CO2	M	M	M	M	M
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO5	M	M	M	M	M

igh; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
Dr.P.T.Prathesh	Dr.P.T.Prathesh	Convenor CDC	16 AUG 2021

Course Code	Course Title		
19U3BNP615	Core Paper XV - Biochemistry Practical -IV		
Semester: V / VI	Credits: 3	CIA : 30 marks	ESE : 45 marks

Course Objective: To provide hands on practical on identification of tests for biological compounds.

Course Outcomes:

CO1	To learn about the preperation of enzyme exytracts for analysis
CO2	Understand the estimation methods in plant biochemistry and human physiology
CO3	Understand The basics on synthesis of nanoparticles.
CO4	Application of enzymes to determine its activity on various parameters
CO5	Analyse the properties of nanoparticles and its efficacy.

Department offered: Biochemistry with Nanotechnology.

Course Content **Instructional Hours/Week: 3 & 5**

Unit	Description
	I Enzymes : 1. Preparation of crude enzyme extract - acid phosphatase and catalase. Salivary amylase 2. Effect of pH, temperature enzyme concentration and substrate concentration.
	II Plant Biochemistry: 1. Estimation of Chlorophyll and Starch. 2. Estimation of Phenol.
	III Physiology: 1. Identification blood group 2. Enumeration of RBC 3. Enumeration of WBC 4. Bleeding time and clotting time determination.
	IV Nanotechniques: 1. Synthesis of Nano particles. 2. Estimation based on pH, Colour change and UV method. 3. Anti bacterial activity of Plant based nanoparticles.

Instructional hours: 120

Text book(s)

1. J. Jayaraman, Laboratory Manual in Biochemistry, New Age International Publishers, 2011.

2. Pattabiraman, Laboratory Manual & Practical Biochemistry All India Publishers and Distributors, 4th Edition 2015.

Reference Book:

1. David T. Plummer, An Introduction to Practical Biochemistry. , Tata McGraw-Hill Education 3rd Edition (1998).
2. Geetha Damodaran K, Practical Biochemistry, Jaypee- The Health Sciences Publisher, 2nd Edition, 2016.

Tools for Assessment (30 Marks)

Instrument Handling	Viva	Record	Test I	Test II	Attendance	Total
5	5	7	5	5	3	30

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	M	M	L
CO2	M	M	M	M	M
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO5	M	M	M	M	M

High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
Dr. N. Vijaya Lakshmi	(Dr. P.T. Prathaban)	Convenor CDC	16 AUG 2021

Course Code	Course Title		
20U4BNS503	Skill Based Course II Genomics and Proteomics		
Semester: V	Credits: 3	CIA : 20 marks	ESE : 55 marks

Course Objective: The student shall be enlightened on the basics of genomes and proteomics and its application

Course Outcome:

CO1	Understand the processing and applications in genomics and proteomics.
CO2	Understand and Learn about Human Genome Project.
CO3	Apply the knowledge in predicting the 3D structure of biological compounds
CO4	Analyse the process in in identification of biomolecule structures.
CO5	Identify and analyse the methods for creation of newer molecules for human

Department offered: Biochemistry with Nanotechnology

Course Content **Instructional Hours/Week: 3**

Unit	Description	Text Book	Chapter
I	Genome maps : Types of Genome maps and their uses: High and low resolution maps – Map elements – polymorphic markers, line sine, RFLP, SNP Types of Maps: Cytogenic – Linkage map, Transcript map Physical map – Comparative map, integrated map	1	2
	Practical uses of Genome maps: Locating Genomic regions, target identification, arrangement of genes, SMP diagnosis, Positional specific cloning, Predicting Gene function, identifying regulatory genes.	1	2
	Instructional Hours		**9**
II	Structural annotations – Locating coding regions and other structural elements of the gene.	1	3
	Various approaches in gene prediction – ORF prediction, gene prediction in prokaryotes and eukaryotes. Hidden Markov model, Pattern discrimination	1	3
	Instructional Hours		**9**
III	Human Genome and Genomic analysis: Size, features, composition and characteristics of human genome – Sequence repeats, transposable elements, gene structure and pseudogenes.	2	4
	Genome analysis – Gene order (Synteny), Chromosome rearrangement, compositional analysis,	2	4

	clustering of genes and composite genes.		
	Instructional Hours		**9**
IV	Proteomics: - Structural elements and terminology – phi and psi bonds, letter code for amino acids, helix, sheet strand, loop and coil.	2	5
	Protein structure prediction: Use of sequence pattern – Leucine zipper, coiled coil, transmembrane, signal peptide and cleavage site. Secondary structure prediction: Chou-Fasman/ GOR method, neural network, nearest neighbor method, tertiary structure prediction, threading, profile, contact potential and modeling	2	5
	Instructional Hours		**9**
V	Proteome-analysis: 2D Electrophoresis – Immobilized pH gradient, Sample preparation, first dimension criteria, second dimension criteria, stabilization.	2	6
	Data analysis – Mass spectrometry based methods for protein identification and analysis. Database for 2D gel. Application of proteome analysis in drug development and toxicology.	2	6
	Instructional Hours		**9**
	Total Hours		**45**

Text Book(s):

1. David W. Mount , Bio-informatics sequence and genome analysis, Cold Spring Harbor Laboratory Press, 2006.
2. Bio-informatics a practical guide to the analysis of genes and proteins, Ed. Andreas D.Baxewanis and Francis quellette, John Willey & Sons publications, 2006.

Unit I : Text book 1, Chapter 02.
Unit II : Text book 1, Chapter 03.
Unit III : Text book 2, Chapter 04.
Unit IV : Text book 2, Chapter 05.
Unit V : Text book2, Chapter 06.

Reference Books:

1. Westhead D.R, Parish J.H and Twyman R.M, Instant notes in BioInformatics, IstEdition, 2003.
2. Attwood.T.K. Parry D.J. and Smith. Introduction to BioInformatics, IstIndian Report. 2001.

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
4	**4**	**5**	**2**	**2**	**3**	**20**

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO5	M	H	H	H	H

High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21 Dr.P.T.Pratheesh.	12/8/21 Dr.P.T.Pratheesh.	Convenor CDC	16 AUG 2021

Course Code	Course Title		
20U3BNC612	Core Paper X - Molecular Biology		
Semester: VI	Credits: 4	CIA : 25 marks	ESE : 75 marks

Course Objective: This subject deals with the mechanism of synthesis of DNA, RNA and proteins, gene regulation and gene mutation. Techniques used in molecular biology

Course Outcomes (CO)

CO1	Understand the basics of synthesis and functions of the molecules of inheritance.
CO2	Understand the basic functions, principles, concepts of mutations and its role in inheritance
CO3	Apply the knowledge in learning in the process replication and translation.
CO4	Analyse the process of replication in identifying new products using genetic
CO5	Understand about gene organization and expression

Department offered: Biochemistry with Nanotechnology

Course Content **Instructional Hours/Week: 4**

Unit	Description	Text Book	Chapter
I	DNA Organization DNA as genetic material- Chromatin, Histones and nucleosomes – Organisation of the mammalian genome, Alteration and rearrangement of the genetic materials.	1	1
	DNA replication - Meselson and Stahl experiment, Replication in prokaryotes andeukaryotes, Structure and function of enzymes involved in DNA replication.DNA repair: Mismatch repair, excision repair.	1	7
	Instructional Hours		**12**
II	RNA Synthesis and Processing RNA synthesis-initiation, elongation and termination – Transcription Signals, Enzymes involved – Processing of mRNA, rRNA and tRNA –Reverse transcription. Inhibitors of Transcription – miRNA, siRNA	1	8
	Genetic code: - Experimental evidences; Features of genetic code. Composition of prokaryotic and eukaryotic ribosomes.	1	8
	Instructional Hours		**12**
III	Biosynthesis of Proteins	1	11

	Process of Protein Synthesis – initiation, elongation, termination – Protein processing – Inhibitors of Protein synthesis, Colinearity of the gene and polypeptide		
	Prokaryotic gene regulation: - Operon model; lac operon - positive and negative control; trp operon - repression and attenuation. Transposable elements - IS elements, composite and non-composite transposons, SINES and LINES.	1	13
	Instructional Hours		**12**
IV	Recombination in bacteria: - Transformation, Transduction and Conjugation. Recombination: Site specific recombination, forms of recombination, Holiday model for homologous recombination.	1	15
	Gene mutations: -Mutation and its types, Mutagens-Physical and chemical mutagenesis, DNA damage and repair.	2	15
	Instructional Hours		**12**
V	Applications of molecular biology: Molecular tools used in recombinant DNA technology, restriction endonucleases, Ligase, Plasmid and viral vectors.	2	13
	Molecular diagnostic techniques; Blotting and probing, Gel-electrophoresis, polymerase chain reaction(PCR), fluorescent in situ hybridization, Karyotyping and DNA microarrays	2	14
	Instructional Hours		**12**
	Total Hours		**60**

Text Book(s):

1. David Freifelder, Molecular Biology, Narosa Publishing House.2000
2. Hedrick, W. Philip Genetics,Weaver, F., Robert,Brown Publishers.2001
3. Verma, P.S and Agarwal, V.K., Molecular Biology, S.Chand, New Delhi. 2009

Unit I : Text book 1, Chapter 07.
Unit II : Text book 1, Chapter 08.
Unit III : Text book 1, Chapter 11.
Unit IV : Text book 2, Chapter 15.
Unit V : Text book2, Chapter 13, 14.

Reference Books:

1. Harvey Lodish, Arnold Berk, S Lawrence Zipursky, Paul Matsudaira, David Baltimore, and James Darnell-Molecular Cell Biology,New York: W. H. Freeman; 8th edition 2000.
2. David Clark Nanette Pazdernik, Molecular Biology, Academic Cell, 2nd Edition, 2012.

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
5	5	6	3	3	3	25

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	H	H	H	H
CO5	L	L	M	M	M

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
Dr. P. T. Prathesh.	Dr. P. T. Prathesh.	Convenor CDC	16 AUG 2021

Course Code	Course Title		
20U3BNC613	Core Paper XIII - Biomedical Applications of Nanotechnology		
Semester: VI	Credits: 4	CIA : 25 marks	ESE : 75 marks

Course Objective: To know various nanomaterials and their application in the field of medicine

Course Outcomes (CO)

CO1	Understand the medical applications of nanosensors, nanoparticles, nanocapsules and polymer micelles.
CO2	Identify the therapeutic uses of nanosensors
CO3	Application of fundamental knowledge in identifying the drug delivery
CO4	Analyse the possibility of devicing new drug delivery system using
CO5	Understand the role of nanocapsules and their applications

Department offered: Biochemistry with Nanotechnology

Course Content **Instructional Hours/Week:4**

Unit	Description	Text Book	Chapter
I	Nanomedicine : History of the idea – Nanomedicine Taxonomy – Bio Pharmaceuticals –Implantable Materials – Surgical Aids – Diagnostic Tools – Imaging.	1	2
	Instructional Hours		**12**
II	Nanosensors: Chemical and Molecular Sensors – Force Nanosensors – Pressure Sensing– Thermal Nanosensors – Electric and Magnetic Sensing – Cellular Bioscanning.	1	4
	Instructional Hours		**12**
III	Nanoparticle : Implications for Drug Delivery : Introduction – Background – Studies on nanoparticle Flow – Convection and Diffusion – Bifurcations – Nanoparticles with Surface Ligands	2	1
	Instructional Hours		**12**
IV	Polymer Micelles as Drug Carriers: Polymer Micelle Structures–Drug Loading and Release Pharmacokinetics and Biodistribution – Drug Delivery Applications – Clinical Trials	2	1
	Instructional Hours		**12**
V	Nanocapsules: Introduction – Preparation – Characterization – Drug Release – Applications.	2	8
	Nanorobotics in medicine Organic Nanoparticles, nanopatterns.	2	8
	Instructional Hours		**12**
	Total Hours		**60**

Text Book(s):

1. Nanomedicines, Ed. By Parag Diwan and AsishBharadwaj, Pentagan Press, 2005.
2. Nanoparticles as Drug Carriers, Ed. By Vladimir P Torchilin, Imperial CollegePress, 2004.

Unit I : Text book 1, Chapter 02.
Unit II : Text book 1, Chapter 04.
Unit III : Text book 2, Chapter 01.
Unit IV : Text book 2, Chapter 01.
Unit V : Text book2, Chapter 08.

Reference Books:

1. Mick Wilson, KamaliKannagara, Geoff Smith, Michelle Simmons, BurkhardRaguse, Nanotechnology: Basic Science and Emerging Technologies, Overseas Press, 2008.
2. Vinod Labhasetwar, Biomedical Applications of Nanotechnology, Wiley Publications, 2007.

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
5	5	6	3	3	3	25

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	H	H	H	H
CO5	M	M	M	M	M

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21 (Dr. S. Subathramani)	12/8/21	Convenor CDC	16 AUG 2021

Course Code	Course Title		
18U3BNP614	Core Paper XIV - Biochemistry Practical - III		
Semester: V / VI	Credits:4	CIA : 40 marks	ESE : 60 marks

Course Objective: To provide hands on practical on identification of tests for biological compounds.

Course Outcomes (CO)

CO1	Recall basic tests of biological components
CO2	Understand The basics of handling of biological samples.
CO3	Attain knowledge on use of novel kit methods in determinations of biological samples
CO4	Analyse the normal values of biological components
CO5	Interpretation of values and correlation of diseases

Department offered: Biochemistry with Nanotechnology.

Course Content **Instructional Hours/Week: 4 & 5**

Unit	Description
I. Urine& Blood Analysis:	1. Estimation of creatinine by picric acid method. 2. Estimation of Urea by DAM-TSC method method 3. Estimation of Uric acid by Carraway's method 4. Estimation of Calcium by Permanganate method 5. Estimation of Phosphorus by Fiske-Subbarow method 6. Estimation of Cholesterol in serum by Zak's method 7. Estimation of Glucose in serum by O- Toluidine method 8. Estimation of SGOT in serum 9. Estimation of SGPT in serum.
II Kit Method: (Demonstration Experiment)	1. Estimation of HDL 2. Estimation of LDL 3. Estimation of Total Cholesterol 4. Estimation of Triglycerides.

Instructional hours: 135

Text book(s)

1. J. Jayaraman, Laboratory Manual in Biochemistry, New Age International Publishers, 2011.

2. Pattabiraman, Laboratory Manual & Practical Biochemistry All India Publishers and Distributors, 4th Edition 2015.

Reference Book:

1. David T. Plummer, An Introduction to Practical Biochemistry. Tata Mc Graw-Hill Education 3rd Edition (1998).
2. Geetha Damodaran K, Practical Biochemistry, Jaypee- The Health Sciences Publisher, 2nd Edition, 2016.

Tools for Assessment (40 Marks)

Instrument Handling	Viva	Record	Test - I	Test- II	Attendance	Total
5	5	7	10	10	3	40

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	M	M	L
CO2	M	M	M	M	M
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO5	M	M	M	M	M

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
Dr.P.T.Prathesh	Dr.P.T.Prathesh	Convenor CDC	16 AUG 2021

Course Code	Course Title		
19U3BNP615	Core Paper XV - Biochemistry Practical -IV		
Semester: V / VI	Credits: 3	CIA : 30 marks	ESE : 45 marks

Course Objective: To provide hands on practical on identification of tests for biological compounds.

Course Outcomes:

CO1	To learn about the preperation of enzyme exytracts for analysis
CO2	Understand the estimation methods in plant biochemistry and human physiology
CO3	Understand The basics on synthesis of nanoparticles.
CO4	Application of enzymes to determine its activity on various parameters
CO5	Analyse the properties of nanoparticles and its efficacy.

Department offered: Biochemistry with Nanotechnology.

Course Content **Instructional Hours/Week: 3 & 5**

Unit	Description
	I Enzymes : 1. Preparation of crude enzyme extract - acid phosphatase and catalase. Salivary amylase 2. Effect of pH, temperature enzyme concentration and substrate concentration.
	II Plant Biochemistry: 1. Estimation of Chlorophyll and Starch. 2. Estimation of Phenol.
	III Physiology: 1. Identification blood group 2. Enumeration of RBC 3. Enumeration of WBC 4. Bleeding time and clotting time determination.
	IV Nanotechniques: 1. Synthesis of Nano particles. 2. Estimation based on pH, Colour change and UV method. 3. Anti bacterial activity of Plant based nanoparticles.

Instructional hours: 120

Text book(s)

1. J. Jayaraman, Laboratory Manual in Biochemistry, New Age International Publishers, 2011.

2. Pattabiraman, Laboratory Manual & Practical Biochemistry All India Publishers and Distributors, 4th Edition 2015.

Reference Book:

1. David T. Plummer, An Introduction to Practical Biochemistry. , Tata McGraw-Hill Education 3rd Edition (1998).
2. Geetha Damodaran K, Practical Biochemistry, Jaypee- The Health Sciences Publisher, 2nd Edition, 2016.

Tools for Assessment (30 Marks)

Instrument Handling	Viva	Record	Test I	Test II	Attendance	Total
5	5	7	5	5	3	30

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	M	M	L
CO2	M	M	M	M	M
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO5	M	M	M	M	M

igh; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
Dr. N. Vijaya Lakshmi	(Dr. P. T. Perumal)	Convenor CDC	16 AUG 2021

Course Code	Course Title		
20U4BNS503	Skill Based Course II Genomics and Proteomics		
Semester: V	Credits: 3	CIA : 20 marks	ESE : 55 marks

Course Objective: The student shall be enlightened on the basics of genomes and proteomics and its application

Course Outcome:

CO1	Understand the processing and applications in genomics and proteomics.
CO2	Understand and Learn about Human Genome Project.
CO3	Apply the knowledge in predicting the 3D structure of biological compounds
CO4	Analyse the process in in identification of biomolecule structures.
CO5	Identify and analyse the methods for creation of newer molecules for human

Department offered: Biochemistry with Nanotechnology

Course Content **Instructional Hours/Week: 3**

Unit	Description	Text Book	Chapter
I	Genome maps : Types of Genome maps and their uses: High and low resolution maps – Map elements – polymorphic markers, line sine, RFLP, SNP Types of Maps: Cytogenic – Linkage map, Transcript map Physical map – Comparative map, integrated map	1	2
	Practical uses of Genome maps: Locating Genomic regions, target identification, arrangement of genes, SMP diagnosis, Positional specific cloning, Predicting Gene function, identifying regulatory genes.	1	2
	Instructional Hours		**9**
II	Structural annotations – Locating coding regions and other structural elements of the gene.	1	3
	Various approaches in gene prediction – ORF prediction, gene prediction in prokaryotes and eukaryotes. Hidden Markov model, Pattern discrimination	1	3
	Instructional Hours		**9**
III	Human Genome and Genomic analysis: Size, features, composition and characteristics of human genome – Sequence repeats, transposable elements, gene structure and pseudogenes.	2	4
	Genome analysis – Gene order (Synteny), Chromosome rearrangement, compositional analysis,	2	4

	clustering of genes and composite genes.		
	Instructional Hours		**9**
IV	Proteomics: - Structural elements and terminology – phi and psi bonds, letter code for amino acids, helix, sheet strand, loop and coil.	2	5
	Protein structure prediction: Use of sequence pattern – Leucine zipper, coiled coil, transmembrane, signal peptide and cleavage site. Secondary structure prediction: Chou-Fasman/ GOR method, neural network, nearest neighbor method, tertiary structure prediction, threading, profile, contact potential and modeling	2	5
	Instructional Hours		**9**
V	Proteome-analysis: 2D Electrophoresis – Immobilized pH gradient, Sample preparation, first dimension criteria, second dimension criteria, stabilization.	2	6
	Data analysis – Mass spectrometry based methods for protein identification and analysis. Database for 2D gel. Application of proteome analysis in drug development and toxicology.	2	6
	Instructional Hours		**9**
	Total Hours		**45**

Text Book(s):

1. David W. Mount , Bio-informatics sequence and genome analysis, Cold Spring Harbor Laboratory Press, 2006.
2. Bio-informatics a practical guide to the analysis of genes and proteins, Ed. Andreas D.Baxewanis and Francis quellette, John Willey & Sons publications, 2006.

Unit I : Text book 1, Chapter 02.
Unit II : Text book 1, Chapter 03.
Unit III : Text book 2, Chapter 04.
Unit IV : Text book 2, Chapter 05.
Unit V : Text book2, Chapter 06.

Reference Books:

1. Westhead D.R, Parish J.H and Twyman R.M, Instant notes in BioInformatics, IstEdition, 2003.
2. Attwood.T.K. Parry D.J. and Smith. Introduction to BioInformatics, IstIndian Report. 2001.

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
4	**4**	**5**	**2**	**2**	**3**	**20**

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO5	M	H	H	H	H

High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
Dr.P.T.Prathesh.	Dr.P.T.Prathesh.	Convenor CDC	16 AUG 2021

Course Code	Course Title		
20U3BNC612	Core Paper X - Molecular Biology		
Semester: VI	Credits: 4	CIA : 25 marks	ESE : 75 marks

Course Objective: This subject deals with the mechanism of synthesis of DNA, RNA and proteins, gene regulation and gene mutation. Techniques used in molecular biology

Course Outcomes (CO)

CO1	Understand the basics of synthesis and functions of the molecules of inheritance.
CO2	Understand the basic functions, principles, concepts of mutations and its role in inheritance
CO3	Apply the knowledge in learning in the process replication and translation.
CO4	Analyse the process of replication in identifying new products using genetic
CO5	Understand about gene organization and expression

Department offered: Biochemistry with Nanotechnology

Course Content **Instructional Hours/Week: 4**

Unit	Description	Text Book	Chapter
I	DNA Organization DNA as genetic material- Chromatin, Histones and nucleosomes – Organisation of the mammalian genome, Alteration and rearrangement of the genetic materials.	1	1
	DNA replication - Meselson and Stahl experiment, Replication in prokaryotes andeukaryotes, Structure and function of enzymes involved in DNA replication.DNA repair: Mismatch repair, excision repair.	1	7
	Instructional Hours		**12**
II	RNA Synthesis and Processing RNA synthesis-initiation, elongation and termination – Transcription Signals, Enzymes involved – Processing of mRNA, rRNA and tRNA –Reverse transcription. Inhibitors of Transcription – miRNA, siRNA	1	8
	Genetic code: - Experimental evidences; Features of genetic code. Composition of prokaryotic and eukaryotic ribosomes.	1	8
	Instructional Hours		**12**
III	Biosynthesis of Proteins	1	11

	Process of Protein Synthesis – initiation, elongation, termination – Protein processing – Inhibitors of Protein synthesis, Colinearity of the gene and polypeptide		
	Prokaryotic gene regulation: - Operon model; lac operon - positive and negative control; trp operon - repression and attenuation. Transposable elements - IS elements, composite and non-composite transposons, SINES and LINES.	1	13
	Instructional Hours		**12**
IV	Recombination in bacteria: - Transformation, Transduction and Conjugation. Recombination: Site specific recombination, forms of recombination, Holiday model for homologous recombination.	1	15
	Gene mutations: -Mutation and its types, Mutagens-Physical and chemical mutagenesis, DNA damage and repair.	2	15
	Instructional Hours		**12**
V	Applications of molecular biology: Molecular tools used in recombinant DNA technology, restriction endonucleases, Ligase, Plasmid and viral vectors.	2	13
	Molecular diagnostic techniques; Blotting and probing, Gel-electrophoresis, polymerase chain reaction(PCR), fluorescent in situ hybridization, Karyotyping and DNA microarrays	2	14
	Instructional Hours		**12**
	Total Hours		**60**

Text Book(s):

1. David Freifelder, Molecular Biology, Narosa Publishing House.2000
2. Hedrick, W. Philip Genetics,Weaver, F., Robert,Brown Publishers.2001
3. Verma, P.S and Agarwal, V.K., Molecular Biology, S.Chand, New Delhi. 2009

Unit I : Text book 1, Chapter 07.
Unit II : Text book 1, Chapter 08.
Unit III : Text book 1, Chapter 11.
Unit IV : Text book 2, Chapter 15.
Unit V : Text book2, Chapter 13, 14.

Reference Books:

1. Harvey Lodish, Arnold Berk, S Lawrence Zipursky, Paul Matsudaira, David Baltimore, and James Darnell-Molecular Cell Biology,New York: W. H. Freeman; 8th edition 2000.
2. David Clark Nanette Pazdernik, Molecular Biology, Academic Cell, 2nd Edition, 2012.

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
5	5	6	3	3	3	25

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	H	H	H	H
CO5	L	L	M	M	M

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
Dr. P. T. Pratheesh	Dr. P. T. Pratheesh	Convenor CDC	16 AUG 2021

Course Code	Course Title		
20U3BNC613	Core Paper XIII - Biomedical Applications of Nanotechnology		
Semester: VI	Credits: 4	CIA : 25 marks	ESE : 75 marks

Course Objective: To know various nanomaterials and their application in the field of medicine

Course Outcomes (CO)

CO1	Understand the medical applications of nanosensors, nanoparticles, nanocapsules and polymer micelles.
CO2	Identify the therapeutic uses of nanosensors
CO3	Application of fundamental knowledge in identifying the drug delivery
CO4	Analyse the possibility of devicing new drug delivery system using
CO5	Understand the role of nanocapsules and their applications

Department offered: Biochemistry with Nanotechnology

Course Content **Instructional Hours/Week:4**

Unit	Description	Text Book	Chapter
I	Nanomedicine : History of the idea – Nanomedicine Taxonomy – Bio Pharmaceuticals –Implantable Materials – Surgical Aids – Diagnostic Tools – Imaging.	1	2
	Instructional Hours		**12**
II	Nanosensors: Chemical and Molecular Sensors – Force Nanosensors – Pressure Sensing– Thermal Nanosensors – Electric and Magnetic Sensing – Cellular Bioscanning.	1	4
	Instructional Hours		**12**
III	Nanoparticle : Implications for Drug Delivery : Introduction – Background – Studies on nanoparticle Flow – Convection and Diffusion – Bifurcations – Nanoparticles with Surface Ligands	2	1
	Instructional Hours		**12**
IV	Polymer Micelles as Drug Carriers: Polymer Micelle Structures–Drug Loading and Release Pharmacokinetics and Biodistribution – Drug Delivery Applications – Clinical Trials	2	1
	Instructional Hours		**12**
V	Nanocapsules: Introduction – Preparation – Characterization – Drug Release – Applications.	2	8
	Nanorobotics in medicine Organic Nanoparticles, nanopatterns.	2	8
	Instructional Hours		**12**
	Total Hours		**60**

Text Book(s):

1. Nanomedicines, Ed. By Parag Diwan and AsishBharadwaj, Pentagan Press, 2005.
2. Nanoparticles as Drug Carriers, Ed. By Vladimir P Torchilin, Imperial CollegePress, 2004.

Unit I : Text book 1, Chapter 02.
Unit II : Text book 1, Chapter 04.
Unit III : Text book 2, Chapter 01.
Unit IV : Text book 2, Chapter 01.
Unit V : Text book2, Chapter 08.

Reference Books:

1. Mick Wilson, KamaliKannagara, Geoff Smith, Michelle Simmons, BurkhardRaguse, Nanotechnology: Basic Science and Emerging Technologies, Overseas Press, 2008.
2. Vinod Labhasetwar, Biomedical Applications of Nanotechnology, Wiley Publications, 2007.

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
5	5	6	3	3	3	25

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	H	H	H	H
CO5	M	M	M	M	M

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21 (Dr. S. Subalakshmi)	Dr. P. T. Prathesh	Convenor CDC	16 AUG 2021

Course Code	Course Title		
18U3BNP614	Core Paper XIV - Biochemistry Practical - III		
Semester: V / VI	Credits:4	CIA : 40 marks	ESE : 60 marks

Course Objective: To provide hands on practical on identification of tests for biological compounds.

Course Outcomes (CO)

CO1	Recall basic tests of biological components
CO2	Understand The basics of handling of biological samples.
CO3	Attain knowledge on use of novel kit methods in determinations of biological samples
CO4	Analyse the normal values of biological components
CO5	Interpretation of values and correlation of diseases

Department offered: Biochemistry with Nanotechnology.

Course Content **Instructional Hours/Week: 4 & 5**

Unit	Description
I. Urine& Blood Analysis:	1. Estimation of creatinine by picric acid method. 2. Estimation of Urea by DAM-TSC method method 3. Estimation of Uric acid by Carraway's method 4. Estimation of Calcium by Permanganate method 5. Estimation of Phosphorus by Fiske-Subbarow method 6. Estimation of Cholesterol in serum by Zak's method 7. Estimation of Glucose in serum by O- Toluidine method 8. Estimation of SGOT in serum 9. Estimation of SGPT in serum.
II Kit Method: (Demonstration Experiment)	1. Estimation of HDL 2. Estimation of LDL 3. Estimation of Total Cholesterol 4. Estimation of Triglycerides.

Instructional hours: 135

Text book(s)

1. J. Jayaraman, Laboratory Manual in Biochemistry, New Age International Publishers, 2011.

2. Pattabiraman, Laboratory Manual & Practical Biochemistry All India Publishers and Distributors, 4th Edition 2015.

Reference Book:

1. David T. Plummer, An Introduction to Practical Biochemistry. Tata Mc Graw-Hill Education 3rd Edition (1998).
2. Geetha Damodaran K, Practical Biochemistry, Jaypee- The Health Sciences Publisher, 2nd Edition, 2016.

Tools for Assessment (40 Marks)

Instrument Handling	Viva	Record	Test - I	Test- II	Attendance	Total
5	5	7	10	10	3	40

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	M	M	L
CO2	M	M	M	M	M
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO5	M	M	M	M	M

High; M-Medium; L-Low.

Course designed by	Verified by	Checked by	Approved by
Dr. P.T. Prathesh 12/8/21	Dr. Rebecca 12/8/21	Convenor CDC 14/8/21	16 AUG 2021

Course Code	Course Title		
19U3BNP615	Core Paper XV - Biochemistry Practical -IV		
Semester: V / VI	Credits: 3	CIA : 30 marks	ESE : 45 marks

Course Objective: To provide hands on practical on identification of tests for biological compounds.

Course Outcomes:

CO1	To learn about the preperation of enzyme exytracts for analysis
CO2	Understand the estimation methods in plant biochemistry and human physiology
CO3	Understand The basics on synthesis of nanoparticles.
CO4	Application of enzymes to determine its activity on various parameters
CO5	Analyse the properties of nanoparticles and its efficacy.

Department offered: Biochemistry with Nanotechnology.

Course Content **Instructional Hours/Week: 3 & 5**

Unit	Description
I Enzymes :	1. Preparation of crude enzyme extract - acid phosphatase and catalase. Salivary amylase 2. Effect of pH, temperature enzyme concentration and substrate concentration.
II Plant Biochemistry:	1. Estimation of Chlorophyll and Starch. 2. Estimation of Phenol.
III Physiology:	1. Identification blood group 2. Enumeration of RBC 3. Enumeration of WBC 4. Bleeding time and clotting time determination.
IV Nanotechniques:	1. Synthesis of Nano particles. 2. Estimation based on pH, Colour change and UV method. 3. Anti bacterial activity of Plant based nanoparticles.

Instructional hours: 120

Text book(s)

1. J. Jayaraman, Laboratory Manual in Biochemistry, New Age International Publishers, 2011.

2. Pattabiraman, Laboratory Manual & Practical Biochemistry All India Publishers and Distributors, 4th Edition 2015.

Reference Book:

1. David T. Plummer, An Introduction to Practical Biochemistry. , Tata McGraw-Hill Education 3rd Edition (1998).
2. Geetha Damodaran K, Practical Biochemistry, Jaypee- The Health Sciences Publisher, 2nd Edition, 2016.

Tools for Assessment (30 Marks)

Instrument Handling	Viva	Record	Test I	Test II	Attendance	Total
5	5	7	5	5	3	30

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	M	M	L
CO2	M	M	M	M	M
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO5	M	M	M	M	M

High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
Dr. N. Vijaya Lakshmi	(Dr. P. T. Prathaesh)	Convenor CDC	16 AUG 2021

Course Code	Course Title		
20U4BNZ604	Skill Based Paper IV - Bioinformatics Practicals		
Semester: VI	Credits: 3	CIA : 30 marks	ESE : 45 marks

Course Objective: Upon successful completion the students shall have the knowledge about Biological databases, websites and methods of drug designing with hands-on- training through online.

Course Outcomes (CO)

CO1	Enable the students to know about various websites, their databases
CO2	Understand the Role of Bioinformatics tools in prediction of biological structures
CO3	Applying the fundamentals and function of bioinformatics in protein & gene prediction
CO4	Analyse the applications and create specific tools for sequencing.
CO5	Analyse the specific tools for drug designing

Department offered: Biochemistry with Nanotechnology.

Course Content **Instructional Hours/Week: 4**

Description
PRACTICAL I Working with MS-Office Packages One exercise each in Word, Excel, Power point and Access. • Biological Databanks Sequence Databases, Structure Databases, Specialized Databases. • Data retrieval tools and methods. • Database file formats. • Molecular visualization.
PRACTICAL II • Gene structure and function prediction (using Gen Scan, GeneMark). • Sequence similarity searching (NCBI BLAST). • Protein sequence analysis (ExPASy proteomics tools). • Multiple sequence alignment (Clustal Omega). • Analysis of protein and nucleic acids sequences • Sequence analysis using EMBOSS or GCG Wisconsin Package • 3D structure viewers (RasMol)

Instructional hours : 60

Text book(s)

1. J. Jayaraman, **Laboratory Manual in Biochemistry**, New Age International Publishers, 2011.

2. Pattabiraman**, Laboratory Manual & Practical Biochemistry** All India Publishers and Distributors, 4th Edition 2015.

3. Hands on practical Laboratory Manual Book

Unit I : Text book3, Chapter 01
Unit II : Text book 3, Chapter 02

Reference Book:

1. **Bioinformatics-concepts, skills, applications**. S.C. Rastogi, Namita Mendiratta, Parag Rastogi.
2. **Bioinformatics – A practical approach** 2004. K. Mani and N. Vijayaraj. Aparna publications.

Tools for Assessment (30 Marks)

Tool -I	Tool-2	Test -I	Test - II	Observation Note book	Attendance	Total
5	5	5	5	7	3	30

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	M	M	L
CO2	M	M	M	M	M
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO5	H	M	M	M	M

H- High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
Dr.P.T.Prathesh.	Dr.P.T.Prathesh.	Convenor CDC	16 AUG 2021

Course Code	Course Title		
20U3BNE501	Discipline Specific Elective I-A Immunology		
Semester: V	Credits: 3	CIA : 20 marks	ESE : 55 marks

Course Objective: To acquire knowledge in the field of infectious diseases and interaction with the host's immune system.

Course Outcome: The student should have

CO1	Learnt the basic terminology and techniques in microbiology and immunology.
CO2	The process of defense mechanism against pathogens by human system.
CO3	Diagnosis and treatment of immune based disorders.
CO4	Importance of antibodies and Antigen
CO5	Application of Vaccine based on disease

Department offered: Biochemistry with Nanotechnology

Course Content **Instructional Hours/Week: 4**

Unit	Description	Text Book	Chapter
I	Immunity –types- Innate and acquired immunity	1	1
	Antibody mediated and cell mediated response . Primary lymphoid organs and secondary lymphoid organs- Bone marrow, thymus,skin,bursa of fabricius,peyer patches, lymphnodes, spleen etc. Structure :T, B and NK cells. Receptors on the surface of lymphocytes.Structure and functions: neutrophils-phagocytosis and inflammation, Macrophages ,eosinophils and basophils	1	1
	Instructional Hours		**12**
II	**Antibodies**: Structure, classes and subclasses of immunoglobulins	1	2
	Properties specificity and distribution Antigen-antibody interaction – Precipitation and Agglutination. Definition and mechanism of formation of Complement component		2
	Instructional Hours		**12**
III	**Antigen**: Properties, Specificity and Cross reactivity, antigenicity, immunogenicity, antigen determinants Haptens, adjuvants, Self-antigens (MHC) an outline only,	2	3
	Types of antigen on the basis of source and immune response.	2	3

	Instructional Hours		**12**
IV	Allergy and Hypersensitivity – Type I, II, III and IV, their clinical manifestations. Immuno Disease: Rheumatoid arthritis, Myasthenia gravis. Immunity to bacteria and viruses.	2	4
	Instructional Hours		**12**
V	Transplantation: Allograft rejection: Graft Vs Host Diseases: Immuno-suppressors: mechanism of graft rejection. Resistant to tumors: NK Cells: Tumor immuno therapy: Lymphoid tumors. Tolerance	2	4
	Vaccination: Passive and active immunization: Recombinant vaccines: DNA vaccines. Benefits and adverse effects of vaccination	2	4
	Instructional Hours		**12**
	Total Hours		**60**

Text Book(s):

1. Tizzard R, Immunology – An introduction,2nd Edition 1997.
2. Kubey, Immunology – 3rd Edition1990.

Unit I : Text book 1, Chapter 02.
Unit II : Text book 1, Chapter 04.
Unit III : Text book 1, Chapter 05.
Unit IV : Text book 2, Chapter 06.

Reference Book(s):

1. RoittIvann, Jonathan Brastoff, David Male- Immunology – 4th Edition1996.
2. Ananthanarayanan. R. and YayaramanPanikar Text book of Microbiology –3rd edition 1996

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
4	4	5	2	2	3	20

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	M	H
CO4	M	M	M	H	H
CO5	M	M	H	H	H

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
(Ms. G. SUJITHA)	(Dr. P. T. Prathesh)	Convenor CDC	16 AUG 2021

Course Code	Course Title		
18U3BNE502	Elective Paper I -B Pharmaceutical Biochemistry		
Semester: V	Credits: 3	CIA : 20 marks	ESE : 55 marks

Course Objective: To study of drug design and development of various biological agents, chemistry and biology activities of natural products

Course Outcome:

CO1	Understand drug designing and development of various biological active
CO2	Understand the mode of action of drugs.
CO3	Apply the fundamental of drugs and its effect on human system.
CO4	Analyse the process of biotransformation of drugs and its methods.
CO5	Intrepret the details of drug manufacture and its effectiveness on various

Department offered: Biochemistry with Nanotechnology

Course Content **Instructional Hours/Week:4**

Unit	Description	Text Book	Chapter
I	Introduction and receptor concept; Introduction to drugs, classification of drugs, passage of drugs across biological membrane; absorption and distribution of drugs; binding of drugs to plasma proteins.	1	1
	Drug receptor interaction, G-protein coupled receptors, ion channel linked receptors, ligand-receptors theories.	1	1
	Instructional Hours		**12**
II	Drug metabolism and elimination: Drug metabolism, methods of study of drug metabolism, microsomal drug metabolism, metabolism via hydroxylation,conjugation deamination, N-Oxidation, azo and nitro reduction, non-microsomal oxidation, Oxidative deamination, purine oxidation, dehalogenation, hydrolysis, action of choline esterase. Elimination of drugs from the body with reference to renal system	1	1
	Instructional Hours		**12**
III	Chemotherapy: Mode of action of sulfonamides, anti-metabolites of folate, purines and pyrimidines. Antibacterials - mode of action and resistance to penicillin, streptomycin, tetracycline and chloramphenicol.Antiviral, antimalarial and anti TB drugs.	1	12

	Instructional Hours		**12**
IV	Molecular mechanism of cancer, DNA interacting drugs, cytotoxic drugs. Immunosuppressive drug therapy	1	12
	Cardio-vascular disease: Structure and mode of action of cardiac glycosides, heparin and coumarin.	1	7
	Instructional Hours		**12**
V	CNS – structure and mode of action of barbiturates, salicylates, MAO inhibitors and drugs for Parkinson's disease	1	6
	Drugs of plant origin, Drug dependents and abuse – management of self-poisoning	2	7
	Instructional Hours		**12**
	Total Hours		**60**

Text Book(s):

1. Satoskar, R.S. Bhandarkar, S.D and S.S. Ainapure, Pharmcologyand Pharamacotherapeutics, Popular Prakashnan, Bombay, 3rd edition,1995.
2. William Foye. Principles of Medicinal Chemistry,2nd edition,1995

Unit I : Text book 1, Chapter 01.
Unit II : Text book 1, Chapter 01.
Unit III : Text book 1, Chapter 12
Unit IV : Text book 1, Chapter 07.12.
Unit V : Text book 1, 2, Chapter 06,07.

Reference Book(s):

1. Patrick.L.Graham, An introduction to medicinal chemistry, Oxford University,3rd edition,1995.
2. Bertram G. Katzung, Anthony J. Trevor, Basic and Clinical Pharmacology, McGraw-Hill Professional Publishing, 13th Edition, 2014.

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
4	4	5	2	2	3	20

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO5					

H-High; M-Medium; L-Low.

Course designed by	Verified by	Checked by	Approved by
12/8/21	12/8/21	16/8/21	
Dr. P.T. Prathesh	Dr. Prathesh	Convenor CDC	16 AUG 2021

Course Code	Course Title		
18U3BNE503	Elective Paper I-C Nutritional Biochemistry		
Semester: V	Credits: 3	CIA : 20 marks	ESE : 55 marks

Course Objective: Students will learn how metabolic disorders lead to various diseases and the nutritional requirements**.**

Course Outcomes (CO)

CO1	To enable the students understand the nutritional aspects are linked to various metabolic pathways involved in the growth and development
CO2	Understand the role of metabolism and Metabolic disorders.
CO3	To apply the fundamentals to understand the basis of diseases of malnutrition.
CO4	To analyse and Create specific nutritional requirements for various human
CO5	Interpret the nutritional requirements and device specific nutrition for all.

Department offered: Biochemistry with Nanotechnology.

Course Content **Instructional Hours/Week:4**

Unit	Description	Text Book	Chapter
I	Nutritional value of foods and effect of processing. Energy content and its measurement in foods. Thermogenic effect of foods.	1	2
	Instructional Hours		**12**
II	Dietary requirements and source of carbohydrates, Classification – Available and Unavailable. Physico-chemical properties and the physiological role. Energy requirement and measurement of energy requirement: Direct and Indirect calorimetry. Factors affecting requirements; BMR, SDA and activity. BMR and relation of temperature regulation to basal metabolism.	1	4
	Instructional Hours		**12**
III	Role of Food Proteins: Requirements and allowances. Proteins as building material, amino acid inter relationships. Protein quality and methods of determination. Factors affecting protein metabolism, Nitrogen balance studies and factors affecting it. Protein and amino acid requirement at different stages of development.	1	6

	Instructional Hours		**12**
IV	Lipids: Nutritional classification of dietary lipids, sources and their physiological functions.	2	5
	Mineral nutrition: Essential – micro and macro mineral nutrients, distribution, sources, functions and abnormalities.		
	Instructional Hours		**12**
V	Vitamins – Definition, classification, sources, distribution, functions and abnormalities.	2	8
	Nutrition challenges of the future – food production and food storages, future foods, new protein foods, new fat foods and changing food habits.	2	9
	Instructional Hours		**12**
	Total Hours		**60**

Text Book(s):

1. Dr. M. Swaminathan Principles of Nutrition & Dietetics.. The Bangalore Printing& Publishing Company Limited.2nd edition, 2005
2. Dr. M. Swaminathan, Advanced Text Book on Food & Nutrition –1st edition Vol. I & II 2005

   Unit I : Text book 1, Chapter 02.
   Unit II : Text book 1, Chapter 04.
   Unit III : Text book 1, Chapter 06.
   Unit IV : Text book 2, Chapter 05.
   Unit V : Text book 2, Chapter 08,09.

Reference Book(s):

1. Corine Rohinson, Normal and Therapeutic Nutrition.2nd edition,2011.
2. Tom Brody, Nutritional Biochemistry, Academic Press, 2nd edition, 1998.

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
4	**4**	**5**	**2**	**2**	**3**	**20**

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO5	M	M	H	h	H

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21	12/8/21	Convenor CDC	
(Dr. S. Subakanmani)			

16 AUG 2021

Course Code	Course Title		
18U3BNE604	Elective Paper II-A Plant and Animal Biotechnology		
Semester: VI	Credits: 3	CIA : 20 marks	ESE : 55 marks

Course Objective: To provide knowledge on the methods of tissue culture and large scale production of recombinant proteins.

Course Outcome:

CO1	The students can understand the components of culture media and various tissue culture techniques
CO2	Understand the Role and function of . various types of cell cultures
CO3	To apply the fundamentals to understand the basis on transgenic plants and animals .
CO4	To analyse and identify various process involved in artificial cell cultures.
CO5	Identify various methods for production of transgenic plants and animals

Department offered: Biochemistry with Nanotechnology

Course Content **Instructional Hours/Week:4**

Unit	Description	Text Book	Chapter
I	Plant tissue culture: - Media composition, nutrients & growth regulators, MS medium & B5 medium. Callus & suspension culture. Initiation & differentiation of PTC.	1	3
	Micro propagation, Methods, Production of haploid plants, callus culture, haploid production, somatic embryogenesis, somatic hybridization and somaclonal variation.	1	4
	Instructional Hours		**12**
II	Mammalian cell culture:- Establishment of cell in culture: Requirements for in-vitrogrowth.	1	5
	Cell-lines; cell transformation – properties of transformed cells, cell separation, Mass cultivation of cells: suspension culture; immobilized cultivation. Stem cells.	1	6
	Instructional Hours		**12**
III	Protoplast technology: - Isolation, fusion of protoplasts, Electroporation, Regeneration of plants from protoplasts.Gene Transfer in plants:- Ti plasmid vectors, mechanism of T- DNA transfer, Vir genes.	2	5

	Transgenic plants:- Herbicide, Virus, Pest resistance plants, Male infertility, Geneticengineering of plant oils.	2	5
	Instructional Hours		**12**
IV	Genetic Engineering of Animal cells: - Mammalian cell culture in protein production.Gene transfer into mammalian cells.	2	4
	Selectable markers pSV plasmids; retroviral vectors;Expression vectors; reporter genes.	2	5
	Instructional Hours		**12**
V	Animal Biotechnology:- Artificial insemination and embryo transfer, Invitro fertilization(IVF): embryo cloning. Human embryo research, transgenic mice, Gene therapy	2	6
	Recombinant proteins from cell cultures: - Interferons, Viral vaccines, Hybridomatechnology- Monoclonal antibodies- production and applications	2	7
	Instructional Hours		**12**
	Total Hours		**60**

Text Book(s):

1. D. Balasubramanian, Concepts in Biotechnology, Universal Press India. 1998.
2. Razdan; Plant tissue culture; Oxford IBH publishers. 2004

Reference Books:

1. Harry Klee Paul Christou-Handbook of Plant biotechnology Wiley India Pvt Ltd Volume I,2010
2. Freshney; Animal cell culture; IRL press, 1999.

Unit I : Text book 1, Chapter 03, 04.
Unit II : Text book 2, Chapter 05,06.
Unit III : Text book 2, Chapter 05.
Unit IV : Text book 2, Chapter 04,05.
Unit V : Text book 2, Chapter 06,07.

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
4	4	5	2	2	3	20

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO5	M	M	H	H	H

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21 (Dr. S. Subakanmani)	12/8/21	Convenor CDC	16 AUG 2021

Course Code	Course Title		
18U3BNE605	Elective Paper- II - B: Genetic Engineering		
Semester: VI	Credits: 3	CIA : 20 marks	ESE : 55 marks

Course Objective: To provide knowledge on the methods of tissue culture and large scale production of recombinant proteins.

Course Outcome:

CO1	Students shall understand the technique of genetic engineering in plants and animals.
CO2	Understand The synthesis and applications of recombinant proteins from cell
CO3	To apply the fundamentals to understand the basis of genetic engineering.
CO4	To analyse and Create The process of genetic manipulation
CO5	Identify and interpret various vectors for genetic engineering.

Department offered: Biochemistry with Nanotechnology.

Course Content **Instructional Hours/Week: 4**

Unit	Description	Text Book	Chapter
I	Basis of gene cloning; Restriction endonucleases – types, features; ligations; linkers andadaptors. Vectors: Plasmid vectors – basic features – pBR 322; Bacterio phage vectors; cosmids.		3
		Instructional Hours	**12**
II	Introduction of DNA into bacterial cells:- Transformation of E. coli – selection oftransformed cells – identification of recombinants. Introduction of phage DNA intobacterial cell – identification of recombinant phage. Genomic library and cDNA library.Hybridization probes; Southern, Northern and Western blotting techniques	1	5
		Instructional Hours	**12**
III	DNA sequencing:- Outline of Sanger's and Maxam Gilbert method.DNA Techniques:- Genetic finger printing – applications. In vitro mutagenesis:- Oligonucleotide directed mutagenesis. PCR – Technique and application.	2	1
		Instructional Hours	**12**

IV	Expression vectors of E. coli:- Constituents; examples of promoters – expressioncassettes – problems caused in expression of eukaryotic genes; fusion proteins – Application of gene technology. Recombinant insulin; Safety aspects and hazards of genetic engineering.	2	4
		Instructional Hours	**12**
V	Gene transfer in plants: Ti plasmid vectors; mechanism of T-DNA transfer, virulencegenes. Electroporation and protoplast fusion. Application : Transgenic plants – herbicide resistance, male infertility, virus resistance,pest resistance	2	6
		Instructional Hours	**12**
		Total Hours	**60**

Text Book(s):

1. R.W. Old & S.B. Primrose Principles of Gene manipulation, , Blackwell Scientific Publications.1992
2. T.A. Brown Gene cloning – An introduction., Chapman and Hall.2005.

Unit I : Text book 1, Chapter 03.
Unit II : Text book 1, Chapter 05.
Unit III : Text book 2, Chapter 01.
Unit IV : Text book 2, Chapter 04.
Unit V : Text book 2, Chapter 06.

Reference Book(s):

1. Glazier, N. Alexander, Hiroshinkaido Microbial Biotechnology, , Freeman & Co., New York.2000
2. Glick, R.Bernard and Pasternak J. Jack Molecular Biotechnology, ASMPress,2000.

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
4	4	5	2	2	3	20

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO%	M	M	H	H	H

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21	12/8/21	Convenor CDC	16 AUG 2021
(Dr. S. Subbalakshmi)	Dr. Prabhakar		

Course Code	Course Title		
20U3BNE606	Elective Paper II - C: Plant Based Therapeutics		
Semester: VI	Credits: 3	CIA : 20 marks	ESE : 55 marks

Course Objective: To learn on various medicinal plants, and their metabolites, application.

Course Outcome:

CO1	The students will acquire the knowledge about value of medicinal plants.
CO2	Understand the process of disease induction
CO3	To apply the fundamentals oxygen toxicity in study of diseases.
CO4	To analyse the role of medicinal plants used in treatment of various diseases.
CO5	Analyse various plant based medicines for human pathologies

Department offered: Biochemistry with Nanotechnology

Course Content **Instructional Hours/Week: 4**

Unit	Description	Text Book	Chapter
I	Medicinal plants-bioactive principles in medicinal plants: methods of extraction, isolation, separation and screening.	1	1
	Pharmacologically active plants – CNS, CVS, Hypoglycemic.	2	1
	Instructional Hours		**12**
II	Hepatoprotective, nephroprotective, anti allergic, anticancer, antibacterial, antiviral and antimalarial, anti-inflammatory.	1	2
	Immunoactive properties of the medicinal plants, plants protecting against oxidative stress, chemotherapeutic products.	2	2
	Instructional Hours		**12**
III	Free radicals –types, sources, importance, production, free radicals induced damages, lipid peroxidation, measurement of free radicals, disease caused by radicals, reactive oxygen species.	1	3
	Antioxidant defence system, enzymic and non-enzymic antioxidants, role of antioxidants in prevention of diseases, phytochemicals asantioxidants.	2	3
	Instructional Hours		**12**
IV	Primary metabolites, Alkaloids, flavanoids, terpenoids, phenolics, steroids.	2	4

	Vitamins, minerals – Occurrence, distribution & functions.	1	4
		Instructional Hours	**12**
V	Production of secondary metabolite in plants, stages of secondary metabolite production. Plant growth hormones	1	3
	Applications of plant tissue culture techniques, elicitation, biotransformation- production of pharmaceutical compounds	2	5
		Instructional Hours	**12**
		Total Hours	**60**

Text Book(s):

1. Khan,I.A and Khanum.A . Role of Biotechnology in Medicinal & Aromatic Plants,Vol 1 and Vol 10, Ukkaz Publications, Hyderabad.2004
2. Singh.M.P and Panda .H .Medicinal Herbs with their Formulations, DayaPublishingHouse, Delhi. 2005

Unit I : Text book 1, Chapter 01.
Unit II : Text book 1,2 , Chapter 02.
Unit III : Text book 1,2, Chapter 03.
Unit IV : Text book 1,2, Chapter 04.
Unit V : Text book 1,2, Chapter 03,05.

Reference Book(s):

1. Slater.A. Scott.N.W and Fowler.M.R .Plant Biotechnology-The Genetic Manipulation of Plants,Oxford University Press,Oxford.2004.
2. Maria C Carpinella, M. Rai, Novel Therapeutic Agents from Plants, CRC Press, 2009.

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
4	**4**	**5**	**2**	**2**	**3**	**20**

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO5	M	M	H	H	H

igh; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
11/8/21 Dr. N. Vijaya Lakshmi	12/8/21 (Dr. P.T. Prathaban)	Convenor CDC	16 AUG 2021

Course Code	Course Title		
20U3BNE607	(Discipline Specific)Elective Paper III-A: Diagnostic Biochemistry		
Semester: VI	Credits: 3	CIA : 20 marks	ESE : 55 marks

Course Objective: The students will have the knowledge about the basic functions in clinical lab test and their interpretations.

.

Course Outcome:

CO1	Students shall understand on the various clinical tests.
CO2	Understand the significance of various test and interpretation in diseased conditions
CO3	Apply the fundamentals and understand the basis of clinical tests and its diagnostic
CO4	To analyse and interpret the values for both normal and disease conditions.
CO5	Understand the diagnostic manuals

Department offered: Biochemistry with Nanotechnology

Course Content **Instructional Hours/Week:4**

Unit	Description	Text Book	Chapter
I	Clinical chemical test- glycosylated haemoglobin, fructosamin. random blood sugar level	1	4
	GTT, uric acid, Ca, P, Fe, Cu, CSF analysis.	2	4
	Instructional Hours		**12**
II	Enzymes: Acid phosphatases, LDH, CPK, CPK-MB, Alpha amylase,	1	12
	Hormones – T3, T4, TSH, LH Immunoglobulins – IgA, IgM, IgE	2	4
	Instructional Hours		**12**
III	Serodiagnostic procedures – precipitation tests, VDRL test, Widal Test, (Slide and Tube method) Brucella agglutination test, ASO test, RA test, CRP test. RIA, ELISA, Flouresent antibody technique.	1	9
	Complement fixation test, skin test – Montaux test, Lepramin test.	1	9
	Instructional Hours		**12**
IV	Complete haemogram, - WBC, RBC, WBC, PCV, ESR. complete urine analysis.- Physical and chemical examination of urine , Fat test- Blood , fecal , Urine	1	23

	Complete motion analysis- Direct smear or wet mount, Concentrtion techniques, permanent staining, semen analysis.	1	23
		Instructional Hours	**12**
V	Blood bank – Blood group and Rh factor – Coomb'stest, coagulation studies, prothrombin test (PT), partial PT, Plasmafibrinogen.	1	3
	Test for aminoacidurias – test for phenyl ketonuria, DNPH test for keto acids, Cyanonitroprusside test for cystinuria and homocysteine.	1	12
		Instructional Hours	**12**
		Total Hours	**60**

Text Book(s):

1. Varley, H. , Practical clinical BioChemistry, 4th Edition, 1985
2. Tietz, N. Fundamentals of Clinical Chemistry W.B. SaundersCompany, 1982

Unit I : Text book 1, Chapter 04.
Unit I I : Text book 1,2, Chapter 12 , 04.
Unit III : Text book 1, Chapter 09.
Unit IV : Text book 1, Chapter 23.
Unit V : Text book 1,2, Chapter 03,12.

Reference Book(s):

1. Jacques Wallach,Interpretation of Diagnostic Test – A Synopsis, 5th Edition, Little brown andcompany, 1992
2. Joan Zilva and Pannall P.R., Clinical Chemistry and diagnosis and treatment, PG Publishing Pvt Ltd, 1995.

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
4	4	5	2	2	3	20

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO5	L	M	M	M	M

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
(Ms. G. SUJITHA)	(Dr. P. T. Prathesh)	Convenor CDC	16 AUG 2021

Course Code	Course Title		
18U3BNE608	Elective Paper III - B Sports Biochemistry		
Semester: VI	Credits: 3	CIA : 20 marks	ESE : 55 marks

Course Objective: The students will have the knowledge about the benefits of the sports in the human body.

Course Outcome:

CO1	To enable the students, understand the functioning of human physiology during sports and exercise
CO2	Understand the Physiological changes that occurs during sports.
CO3	To apply the fundamentals of various food components in role of sports.
CO4	To analyse about the Nutritional requirements for sports
CO5	Formulate new nutrition for sports persons.

Department offered: Biochemistry with Nanotechnology

Course Content **Instructional Hours/Week:4**

Unit	Description	Text Book	Chapter
I	Introduction, calisthenics, Gymnastics, combative and swimming; Yogasana and its importance – Padmasana,	1	1
	Track and field events – Running and Jumping Team events –Kabaddi.	1	2
	Instructional Hours		**12**
II	Skeletal muscle types; - relation with different types of activities; strength, power and endurance of muscles	1	5
	Muscle metabolic systems in exercise; Recovery of muscle metabolic systems after exercise.	1	6
	Instructional Hours		**12**
III	Muscle blood flow and cardiac output during exercise;	1	7
	Oxygen consumption and pulmonary ventilation in exercise; Hypoxia and hypercapnia	1	7
	Instructional Hours		**12**
IV	Body composition; body fat percentage by skin fold method	1	3
	BMI; Ideal weight and assessment of muscle mass.	1	3
	Instructional Hours		**12**
V	Nutritional considerations for sports person:- Carbohydrate: Energy source for sports and exercise; carbohydrates composition for pre-exercise, during	2	17

	and recovery period. Fat: Role as an energy source: effect of fasting and fat ingestion		
	Protein: Protein requirement during exercise, recovery process and protein supplement. Vitamins: Role of B-complex vitamins. Minerals: Role of Potassium and sodium.	1	5
		Instructional Hours	**12**
		Total Hours	**60**

Text Book(s):

1. B.N. Dash, Health and Physical Education ,Neelkamal Publications Pvt. Ltd. 1995.
2. M. Swaminathan, Essentials of Food and Nutrition Vol I –II.2001.

Unit I : Text book 1, Chapter 01, 02.
Unit II : Text book 1, Chapter 05, 06.
Unit III : Text book 1, Chapter 07.
Unit IV : Text book 1, Chapter 03.
Unit V : Text book 2, Chapter 17.

Reference Book(s):

1. Guyton, Human Physiology and Mechanism of Disease, 5thEdition, W. B. SaundersPublication.1991.
2. Kraure and Mohan,Food, Nutrition and Diet Therapy, 6thEdition, W. B. Sounders Company, London,2005.

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
4	4	5	2	2	3	20

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO5	M	H	H	H	H

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21	12/8/21	16/8/21	
(Dr. S. Subakanmani)	Dr. Prabhakar	Convenor CDC	

16 AUG 2021

Course Code	Course Title		
18U3BNE609	Elective Paper III – C - Public Health & Hygiene		
Semester: VI	Credits: 3	CIA : 20marks	ESE : 55 marks

Course Objective: The course has the relationship between Concepts of healthand nutrition related to environmental factors.

Course Outcome:

CO1	Understand and Creates awareness on maternal and child health.
CO2	Understand the Environmental factors that are involved in health.
CO3	Apply the fundamentals to understand on mental health and family planning.
CO4	Analyse and Create specific nutritional requirements stages of health.
CO5	Identify and interpret the mental health of persons

Department offered: Biochemistry with Nanotechnology.

Course Content **Instructional Hours/Week:4**

Unit	Description	Text Book	Chapter
I	Concepts of health:- Who definition of health; Positive health; Determinants of health; Responsibility for health. Health service philosophies:- Health case; Health system; Levels of health case.	1	1
	Concepts of disease and concept of causation – germ theory of disease; Epidemiological triad; Multifactorial causation; Web of causation	1	1
	Instructional Hours		**12**
II	Nutrition and Health – Food defined; Nutrition defined; Classification of foods; Nutrients – Sources and functions of Proteins, fats, carbohydrates; sources and functions of vitamins and minerals.	2	2
	Nutritional Profiles of principle foods; cereals, Millets, Vegetables, Fruits, Milk, and Milk products, Fish and meat, alcoholic beverages, egg, soft drink. Balanced Diet – PEM Malnutrition and its effects – Kwashiorkor and Marasmus.	2	2
	Instructional Hours		**12**

III	Environment and Health – Basic health requirements in the environment – Water – Sources and uses of water, Water pollution, Water related diseases and purification of water.	2	3
	Air – Composition and cause of discomfort; Air pollution – Source, Air pollutants, need for proper ventilation. Housing – Social goals of housing and criteria for healthful housing.	2	3
		1	5
	Instructional Hours		**12**
IV	Maternal and child Health:- Mother and child – one unit; Intranatal card; Post natal child care – care of the mother, complications of post portal period, restoration of mother to optimum health, Breast feeding; congenital malformations – Definition, incidence, Risk factors, Prenatal diagnosis and prevention	2	15
	Family planning methods – Family planning definition, Natural family planning methods–BBT Cervical mucous method. Artificial family planning methods – Hormonal contraceptives – go nodal steroids; oral pills, Depot formulations.	2	15
	Instructional Hours		**12**
V	Mental Health – Types and causes of mental illness – Preventive aspects; Alcoholism and drug dependence – Definition, agent factors, Host factors, symptoms, environmental factors, prevention, Treatment and Rehabilitation	1	5
	Health care programmes in India – National AIDS control programme and National Immunization programme.	1	5
	Instructional Hours		**12**
	Total Hours		**60**

Text Book(s):

1. Ashtekar. S., Health and Healing – A Manual of Primary Health Care, Orient Longmans Publishers. 2001.
2. DrBalaramJana,Community Medicine Preventive and Social, B.Jain Publishers, 2006.

Unit I : Text book 1, Chapter 01.
Unit II : Text book 2, Chapter 02.

Unit III : Text book 2, Chapter 03.
Unit IV : Text book 2, Chapter 15.
Unit V : Text book 1, Chapter 05.

Reference Book(s):

1. Rai Bahadur Jaising P. Elements of Hygiene and Public Health, Science Direct, 2nd Edition, 2017..
2. Thomas Stewart Blair, Public Hygiene, Volume 2, Palala Press, 2016.

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Attendance	Total
4	4	5	2	2	3	20

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO5	M	H	H	H	H

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
(Ms. G. SUJITHA)	(Dr. P. T. Prathesh)	Convenor CDC	16 AUG 2021

Course Code	Course Title		
20U4BN3ED1	EDC Paper I Basics of Nutrition		
Semester: III	Credits: 2	CIA : -	ESE : 50 marks

Course Objective: Students shall know the basics of nutrition and its policy matters.

Course Outcome:

CO1	Understand the nutritional aspects are linked to various metabolic pathways
CO2	Understand the nutrition in growth and development of the living systems.
CO3	Apply the fundamentals to understand the basis of Diseases of malnutrition.
CO4	Analyse the Policies involved in nutrition
CO5	Analyse the food safety measures

Department offered: Biochemistry with Nanotechnology

Course Content **Instructional Hours/Week:2**

Unit	Description	Text Book	Chapter
I	Introduction to Human Nutrition: A Global Perspective on Food and Nutrition.Measuring Food Intake.Food Composition.Quantitative analysis for confirmation of nutrition	1	1, 10
	Instructional Hours		**6**
II	Nutrition: Science for Consumers, Spreading Nutrition Misinformation, Critical Consumer of Nutrition Information, Requirements and Recommendations, Planning Nutritious Meals and Snacks, Making Sense of Food Labels. Neutraceticals	2	2,3
	Instructional Hours		**6**
III	Nutrition Throughout the Life Cycle : Nutrition During Pregnancy and Lactation Nutrition During Infancy, Childhood, and Adolescence. Nutrition for Adults: The Early, Middle, and Lateryears	2	2
	Instructional Hours		**6**
IV	Community Nutrition and Health Care :Community Food Supply and Health. Food Habits and Cultural Patterns. Weight Management Nutrition and Physical Fitness	2	3
	Instructional Hours		**6**
V	Food and Nutrition – FSSAI Policy and Regulatory Issues.Nutrition Research Methodology.Food Safety: A Public Health Issue of Growing Importance.	1	12, 14

	Instructional Hours	**6**
	Total Hours	**30**

Text Book(s):

1. Michael J. Gibney,Susan A. Lanham-New, Aedin Cassidy, Hester H. Vorster Introduction to Human Nutrition,. , Wiley-Blackwell Publication. 2nd Edition.2005
2. Staci Nix,Williams' Basic Nutrition & Diet Therapy, Mosby Publications.2006.

Unit I : Text book 1, Chapter 01, 10.
Unit II : Text book 2, Chapter 02, 03.
Unit III : Text book 2, Chapter 02.
Unit IV : Text book 2, Chapter 03.
Unit V : Text book 1, Chapter 12,14.

Reference Books:

1.1.Williams' Basic Nutrition & Diet Therapy.MsGraw – Hill Publications,14th Edition, 2001.
2.Wendy J. Schiff, Nutrition Essentials: A Personal Approach, MsGraw – Hill Publications.2008

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO5	M	M	M	M	M

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
(Ms. G. SUJITHA)	(Dr. P. T. Prathesh)	Convenor CDC	16 AUG 2021

Course Code	Course Title		
20U4BN3ED2	EDC Paper II Herbal Remedies		
Semester: III	Credits: 2	CIA : -	ESE : 50

Course Objective: The student shall know on some of the herbal remedies for diseases and it action.

Course Outcome:

CO1	Enable the students to gain the knowledge in classification and characterization of herbs
CO2	Understand the Use of medicinal plants for prevention and treatment of diseases
CO3	Understand about traditional and popular medicines.
CO4	Apply the fundamentals to understand the basis of use of Indigenous medicine.
CO5	Analyse Process of oxidant and antioxidant defense mechanism of body.

Department offered: Biochemistry with Nanotechnology.

Course Content **Instructional Hours/Week:2**

Unit	Description	Text Book	Chapter
I	Herbs for Everyone - Herbal garden - Drying, and Storing Herbs- Kitchen Medicine -- Healing with Spices- Preparation of Herbal Teas.	1	4,5,6
	Instructional Hours		**6**
II	A definition of a herb - Categorising herbs based on their usage - Categorising herbs based on their active constituents - How safe are medicinal herbs?	2	2
	Instructional Hours		**6**
III	Medicinal Plants used in treatment of Liver diseases: Pathophysiology of the Liver, Medicinal Plants - *Phyllanthusamarus, EmblicaOfficinalis, Glycyrrhizaglabra*	2	3, 4
	Instructional Hours		**6**
IV	Medicinal Plants in the treatment of Cancer: What Cancer Is, What Causes It, and How to Treat It. Medicinal Plants:*Catharanthus roses, Curcuma longa, OcimumBasillum*	2	2
	Instructional Hours		**6**
V	Antioxidants and its function in the human body. Antioxidants from Plants sources- Beneficial use of herbs as a food supplement- Preparation of herbal cookies.	1	1- 4
	Instructional Hours		**6**
	Total Hours		**30**

Text Book(s):

1. Zakim and Boyer's Hepatology Herbal Drugs: Ethnomedicine to Modern Medicine.2013
   (Sixth Edition). Defeat Cancer, 15 Doctors of Integrative and Naturopathic tell you how.
2. Chandan K. Sen Handbook of Oxidants and Antioxidants in Exercise.,Elsevier Publications. 2010.

Unit I : Text book 1, Chapter 04,5,6.
Unit II : Text book 2, Chapter 02.
Unit III: Text book 2, Chapter 03,04.
Unit IV: Text book 2, Chapter 02.
Unit V : Text book 1, Chapter 01 - 04.

Reference Books:

1. Michael T. Murray, Joseph Pizzorno.The Encyclopedia of Natural Medicine. Third Edition .2015
2. Christopher Hobbs Herbal Remedies For Dummies, , Wiley Publications.
   Ramawat, KishanGopal (Ed.).2010

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO5	H	M	M	M	M

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
12/8/21	12/8/21		
(Dr. S. Subakanmani)		Convenor CDC	

16 AUG 2021

Course Code	Course Title
18UBNSS01	(Self Study Paper) **Biofuels**

Course Objective: To learn on different methods of biofuel production, application, and their advantages.

Course Outcome:

CO1	Understand the knowledge of biofuel production technologies, and their applications
CO2	Understand about Biofuels from microbial sources.
CO3	Apply the fundamentals to understand the basis of use of Indigenous production of biofuels.
CO4	Analyse the process and policies in production of biofuels .
CO5	Develop newer methodologies for production of biofuels.

Department offered: Biochemistry with Nanotechnology.

Course Content

Unit	Description	Text Book	Chapter
I	Drivers for alternative fuels, security, cost and environmental considerations, carbon sequestration and the impact of biofuels, review of current processes for biofuel production from biomass.	1	2
	Instructional Hours		
II	Economic Models: Costing of current and future processes for biofuel production from biomass, biomass availability, models of biomass concentration and utilization.	1	3
	Instructional Hours		
III	Feedstock Chemistry: Chemistry of triglycerides and carbohydrates, Improving biomass yield and properties for easier processing and conversion, Pretreatment of biomass, Enzymatic hydrolysis, Processes and alternatives, Enzymes immobilization techniques.	1	11
	Instructional Hours		
IV	Fermentation: Processes and alternatives, Aqueous processing of sugars. Bio-Diesel and other alternative liquid fuels, Policy of biofuels, Biofuels around the world.	1	12
	Instructional Hours		

V	Biotechnological Methods to Produce Biodiesel: Enzymatic transesterification, Enzymatic esterification Hydroesterification. Biofuel from Algae	1	13

Text Book:

1. Ashok Pandey, Biofuels, Alternative Feedstocks and Conversion Processes. I Edition,2010.
2. Sunggyu Lee, Y.T. Shah, Biofuels and Bioenergy: Processes and Technologies, CRC Press, 2012.

Unit I : Text book 1, Chapter 02
Unit II : Text book 1, Chapter 03.
Unit III : Text book 1, Chapter 11.
Unit IV : Text book 1, Chapter 12.
Unit V : Text book 1, Chapter 13.

Reference Books:

1. Christian Larroche Steven Ricke Claude-Gilles Dussap Edgard Gnansounou, Biofuels, Academic Press, 2011.
2. Lisbeth Olsson, Biofuels, Springer Berlin Heidelberg Publications, 2007.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO5	M	M	H	H	H

H-High M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
Dr.P.T.Prathesh	Dr.P.T.Prathesh	Convenor CDC	16 AUG 2021

Course Code	Course Title
18UBNSS02	(Self Study Paper) Nutrition and Food Adulteration

Course Objective: The nutritional aspects are linked to various metabolic pathways involved in the growth and development of the living systems with the adulterants that are used in food items.

Course Outcome:

CO1	Understand about Nutritional requirements its adulterants and ways of prevention.
CO2	Understand about Menu planning for various stress states.
CO3	Apply the fundamentals to understand the basis of food and its safety.
CO4	Analyse about types of adulterants and its prevention.
CO5	Identify the laws and regulations in prevention of adulteration.

Department offered: Biochemistry with Nanotechnology.

Course Content

Unit	Description	Text Book	Chapter
I	**General nutrition**: Introduction and definition of food and nutrition, basic food groups, Energy yielding, body building and protective foods, Classification of food.	1	1
	Instructional Hours		
II	Role of various vitamins and minerals, Balanced diet for various groups. Assessment of nutritional status, Diet surveys for individuals and family**.**	1	2
	Instructional Hours		
III	**Menu planning and dietetics** : Diet during physiological stress, Diet in obesity and under weigh, Diet in fever, Diet in malnutrition	1	3
	Instructional Hours		
IV	**Food adulterants:** Definition, Food quality, safety and authenticity and testing and methods, Types of food adulterants and food items that are adulterated. Detection of adulteration.	2	14
	Instructional Hours		
V	Prevention of adulteration: People's awareness, laws (food standards), education, effect on health of various adulterants; Evaluation of food Quality : Quality management system, ISO 22000, HACCP, Codex	2 6	13

standards, PFA act, food laws and standards	
	Instructional Hours

Text Book(s):

1. Gordon M. Ward law, Anne M. Smith, Contemporary Nutrition, The Ohio State University, McGraw Hill Publications.2011.
2. B Srilakshmi Food Science, New Age InternationalPublication.2010.

Unit I : Text book 1, Chapter 01
Unit II : Text book 1, Chapter 02.
Unit III : Text book 1, Chapter 03.
Unit IV : Text book 2, Chapter 14.
Unit V : Text book 2, Chapter 13.

Reference Books:

1. Vidya & D.B. Rao-A Text Book of Nutrition, Discovery Publishing House, 1st edition, 1999
2. John C. Olsen, Pure Foods, Their Adulteration, Nutritive Value and Cost, Trieste Publications, 2017.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M
CO2	M	M	M	M	H
CO3	M	M	M	H	H
CO4	M	M	H	H	H
CO5	M	M	H	H	H

H-High; M-Medium; L-Low.

Course Designed by	Verified by HOD	Checked by	Approved by
Dr.P.T.Prathesh	Dr.P.T.Prathesh	Convenor CDC	16 AUG 2021