BHARATHIAR UNIVERSITY, COIMBATORE.
M. Sc. BIOINFORMATICS DEGREE COURSE WITH COMPULSORY DIPLOMA *(Affiliated Colleges)*
(Effective from the academic Year 2009-2010)
SCHEME OF EXAMINATIONS – CBCS PATTERN

Sem.	Study Components	Course title	Ins. hrs/ week	Exam				Credit
				Dur.Hr.	CIA	Marks	Total Marks	
	Paper I	Fundamentals of biological systems	5	3	25	75	100	5
I	Paper II	Structure and functions of Biomolecules	5	3	25	75	100	5
	Paper III	Computer programming in C	5	3	25	75	100	5
	Paper IV	Computational methods for sequence analysis	5	3	25	75	100	5
	Practical I	Computer programming	3	-	-	-	-	-
	Practical II	Biological databanks and sequence analysis	3	-	-	-	-	-
	Elective	Diploma Paper I	4	3	25	75	100	3
II	Paper V	Molecular interaction	5	3	25	75	100	5
	Paper VI	Systems biology	5	3	25	75	100	5
	Paper VII	Introduction to Visual basic with RDBMS	5	3	25	75	100	5
	Paper VIII	Mathematical methods and statistical techniques	5	3	25	75	100	5
	Practical I	Computer programming	3	3	40	60	100	3
	Practical II	Biological databanks and sequence analysis	3	3	40	60	100	3
	Elective	Diploma Paper II	4	3	25	75	100	3
III	Paper IX	Genomics	5	3	25	75	100	5
	Paper X	Proteomics	5	3	25	75	100	5
	Paper XI	Molecular modeling and computer aided drug designing	5	3	25	75	100	5
	Paper XII	Perl Programming for Bioinformatics	5	3	25	75	100	5
	Practical III	Perl programming	3	3	-	-	-	-
	Practical IV	Computer aided drug design	3	3	-	-	-	-
	Elective	Diploma Paper III	4	3	25	75	100	2
IV	Practical III	Perl programming	-	3	40	60	100	3
	Practical IV	Computer aided drug design	-	3	40	60	100	3
	Elective	Diploma Paper IV	-	6	40	60	100	4
	Project	Project work	-	-	-	-	200*	6
		Total					2200	90

* Project report - 160 marks; Viva-voce – 40 marks.

List of Group Elective/Diploma papers (Colleges can choose any one of the Group/Diploma papers as electives)

	GROUP A Diploma in Genome Technology	GROUP B Diploma in Pharmacogenomics	GROUP C Diploma in Systems Biology
Paper I/ Sem I	Biology of cloning vectors	Medicinal Chemistry	Proteomics
Paper II/ Sem II	Methods of gene transfer and genome sequencing	Pharmacogenomics-I	Struyctural Biology
Paper III/ Sem III	Applications of rDNA technology	Pharmacogenomics-II	Systems Biology
Paper IV/ Sem IV	Practical I - Molecular techniques Practical II - rDNA Technology	Practical	Practical - Molecular Modeling and Drug Design.

Notes :

1. The syllabus for the above papers (except compulsory Diploma B & C) be the same as prescribed for the academic year 2007-08.
2. The syllabus for the compulsory Diploma B & C are furnished below.

GROUP B - DIPLOMA IN PHARMACOGENOMICS
PAPER I - MEDICINAL CHEMISTRY

UNIT - I
Principles and practice of Indian traditional medicine Symptomology Diseases of Nervous system respiratory, cardiac and digestive organs.

UNIT - II
Important medicinal plants and products in the treatment of cancer, neural disorder, Cardio vascular diseases viral diseases and malaria.

UNIT - III
Pharmacology and Pharmacognosy of important medicinal plants- Azadirachta indica, Acorus chalamus, Zingiber officinale, Murraya koenigii, Carum copticum, Catharanthus roseus, Withania somnifera, Solanum trilobatum.

UNIT - IV
Role of chemical compounds in the treatment of diseases phenolic compounds, flavonoids, alkaloids, terpenoids, proteins.

UNIT - V
Phytochemistry :Secondary metabolites phytochemical investigation of herbal products, herbal medicines – regulation and practices.

References:
l. J.A.Duke, Handbook of medicinal herbs CRC press Florida.

2. R.P Rastogi and B.N. Mehrotra. Compodium of Indian medicinal plant. Central drug Research institute, Lucknow.

3. J.B.Harborne.2007.Phytochemical methods. Springer international edition.

4. R.N.Khory.2004. Principles and practice of Ayurvedic medicine Biotech b ooksN, ew Delhi.

5. HuangK, .C.1999T. heP harmacologoyf ChineseH erbs(SecondE dition).C RCP ress. New York.

GROUP B - DIPLOMA IN PHARMACOGENOMICS
PAPER II - PHARMACOGENOMICS – I

UNIT - I
Introduction to pharmacogenomics pharmacodynamics pharmacokinetics toxicokinetics and ADME properties, process of drug development-clinical traials phase I, II and III.

UNIT - II
Physiological drug distribution of protein binding : physiological factors, drug Distribution, clinical pharmacodynamics, clinical pharmacokinetics and toxicokinetics.

UNIT - III
Drug concentration, nature of cell membrane, physiological factors related to drug Absorption - drugs across cell membrane, route of drug administration, oral absorption and gastro intestinal tract absorption.

UNIT. IV
Metabolic changes of drugs and related organic compounds : General pathways sites of Drug biotransformation, oxidative biotransformation, reductive reactions, hydrolytic Reactions, conjugation reactions, factors affecting drug metabolism.

UNIT -V
Microarray and highthroughput screening : Microarray in herbal drug research, Microarray in pharmacodynamics, microarray in pharmacogenomics and microarray in pharmacognosy.

References:
l. J.H.Block and J .M.Beale Jr,2004. Organic medicinal and Pharmaceutical chemistry. Lippincott Williams and Wilkins, New York.

2. B.Patwaradhan, 2007. Drug discovery and development. New India publishing agency,
New Delhi.

3. L.Shargel and A.B.C.Yu.1999. Applied Biopharmaceutics and Pharmacology. McGraw-Hill, New York.

GROUP B - DIPLOMA IN PHARMACOGENOMICS
PAPER III - PHARMACOGENOMICS II

UNIT - I
Analyzing databases for Metabolic Pathways (WIT, KEGG, PathDB, BIOCARTA, PathCasep, PharmCKB). Metabolic and Cellular simulation :Gepasi, XPP, Virtual cell. Reconstruction of metabolic pathways (Biocyc, ASGARD).

UNIT - II
Factors affecting variability in drug response, drug metabolism, Ayugenomics (integration of Ayurveda & genomics) genetic analysis of human variation, Microsatellite for studying genetic variation, Ayugenomics for human population.

UNIT - III
Hereditary diseases – autoimmune diseases, neurodegenerative diseases, Gene Expression, Single Nucleotide Polymorphism, Personalised medicine.

UNIT - IV
Pharmacogenomics in the treatment of cancer, neurodegenerative diseases, Cardiovascular diseases.

UNIT - V
Pharmacogenomics in pharmaceutical industry, Ethical issues related to Pharmacogenomics, Pharmacogenomics and ethanopharmacology.

References:
l.B.Patwaradhan, 2007. Drug discovery and development. New India publishing agency, New Delhi.
2. D.M. Brown.2004. Drug delivery systems in Cancer therapy, Humana press, Totowa, New Jersey.
3. Rothstein, Pharmacogenomics : Social, ethical and clinical and imensions, Wiley Less.
4. Jin Xione. Essential Bioinformatics, Cambridge University Press.

GROUP B - DIPLOMA IN PHARMACOGENOMICS
PAPER IV : PRACTICAL

Medicinal Plant:
Extraction, Premilinary phytochemical analysis, Separation of compounds using Thin Layer Chromatography.

Insilico analysis:
Simulation of pathways related to diseases, structure similarity of ligands, Pharmacophore mapping, docking of ligands using autodock.

GROUP C : DIPLOMA IN SYSTEMS BIOLOGY
PAPER I: PROTEOMICS

UNIT 1
CATH,CLASSIFICATION BY CLASS ARCHITECTURE TOPOLOGY HOMOLOGY-SCOP, STRUCTURE CLASSIFICATION OF PROTEIN-F'SSPF, FOLD CLASSIFICATION BASED ON STRUCTURE ALIGNMENT-MMDB, MOLECULAR MODELING DATABASE

UNIT 2
1D 2D ELECTROPHORESIS-IMMOBILIZED PH GRADIENT-PROTEIN DETECTION-DIGITAL IMAGING-IMAGE ANALYSIS-QUANTIFICATION-DATABASE FOR 2D GEL

UNIT 3
MASS SPECTROMETRY-MALDI TOF ANALYZERS-TANDEM MASS ANALYZERS-TRIPLE QUADROPLE MASS ANALYZER-MS INSTRUMENT

UNIT 4
CHROMATOG RAPHY- ION EXCHANGE, AFFINITY-TLC-NMR

UNIT 5
INTEGRATED PROTEOME ANALYSIS-PHAGE ANTIBODY- AUTOMATION OF PROTEOMIC ANALYSIS

GROUP C : DIPLOMA IN SYSTEMS BIOLOGY
PAPER II : STRUCUTRAL BIOLOGY

UNIT I
TYPES OF AMINO ACIDS-PHYSICAL NATURE OF NONCOVALENT NTERACTIONSCONFORMATIONAL PROPERTIES OF PROTEINS-PRIMARY. SECONDARY, SUPERSECONDARTYE, TERTIARY, QUATERNARY STRUCUTRE – RAMACHANDRAN PLOT

UNIT 2
HOMOLOGY MODELING- THREADING-FOLD RECOGNITION-NEURAL NETWORK

UNIT 3
TYPES OF PROTEIN-GPCR, KINASES, CHANNEL, P ROTEINS, UBIQIUITIN

UNIT 4
X-RAY GENERATION-APPLICATION-ISOLATION AND PURIFICATION OF PROTEIN-UNIT CELL-CRYSTALLIZATION-BRAGG'S LAW-UNIT CELL-ATOMIC SCATTERING FACTOR – PHASE PROBLEM

UNIT 5
MOLECULAR REPLACEMENT-MULTIWAVELENGTH ANOMALOUS DIFFRACTION MULTIPLE ISOMORPHOUS REPLACEMENT-CALCULATION AND TNTERPRETATION OF ELECTRON DENSITY MAP-STRUCTURE REFINEMENT AND VALIDATION

GROUP C : DIPLOMA IN SYSTEMS BIOLOGY
PAPER III : SYSTEMS BIOLOGY

UNIT 1
MICROARRAY-TYPES, ANALYSIS, APPLICATIONS

UNIT 2
TRANSLATING BIOCHEMICAL NETWORKS INTO LINEAR ALGEBRA

UNIT 3
SIMULATION-PRINCIPLE-ECELL-VIRTUAL ERYTHROCYTES

UNIT 4
DETECTING PROTEIN- PROTEIN INTERACTION - PREDICTING LIGAND BINDING FUNCTION

UNIT 5
FLUX BALANCE ANALYSIS

GROUP C : DIPLOMA IN SYSTEMS BIOLOGY
PAPER IV : PRACTICAL - MOLECULAR MODELING AND DRUG DESIGN

1) HOMOLOGY MODELING

2) STRUCTURER EFINEMENT

3) STRUCTURVEA LIDATION

REFERENCE:
1) Crystallography Made crystal clear by Gale Rhodes

2) Crystallography for Biologists by David Blow

3) Introduction to Protein Structure by Carl Branden and John Tooze