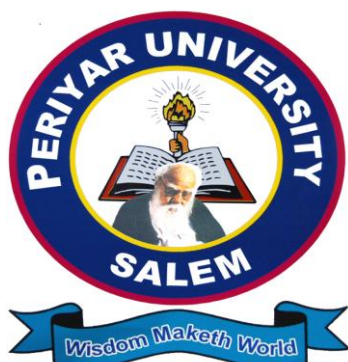


**PERIYAR UNIVERSITY
PERIYAR PALKALAI NAGAR
SALEM – 636 011**



**DEGREE OF BACHELOR OF
SCIENCE**

CHOICE BASED CREDIT SYSTEM

SYLLABUS FOR B.Sc. BIOINFORMATICS

**FOR THE STUDENTS ADMITTED FROM THE
ACADEMIC YEAR 2012 – 2013 ONWARDS**

REGULATIONS

1. ELIGIBILITY FOR ADMISSION

A candidate who has passed in Higher Secondary Examination with Biology or Pure Science (Academic stream or Vocational stream) as one of the subject under Higher Secondary Board of Examination, Tamilnadu as per norms set by the Government of Tamilnadu or an Examination accepted as equivalent thereto by the syndicate, subject to such conditions as may be prescribed thereto are permitted to appear and qualify for the **Bachelor of Bioinformatics degree examination** of this university after a course of study of three academic years.

2. DURATION OF THE COURSE

The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. COURSE OF STUDY

The course of study shall comprise instruction in the following subjects according to the syllabus and books prescribed from time to time. The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject. Part -I, Part-II, Part – III and Part – IV subjects are as prescribed in the scheme of examination.

4. EXAMINATIONS

The theory examination shall be three hours duration to each paper at the end of each semester. The candidate failing in any subject(s) will be permitted to appear for each failed subject(s) in the subsequent examination. The practical examinations for UG course should be conducted at the end of the even semester.

4.(a) Submission of record note books for practical examinations

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

5. Revision of Regulations and Curriculum

The University may revise /amend/ change the Regulations and Scheme of Examinations, if found necessary.

6(a). Passing Minimum – Theory

The candidate shall be declared to have passed the examination if the candidate secure not less than 40 marks out of 100 (**CIA – 10 marks out of 25 and EA – 30 marks out of 75**) in the University examination in each theory paper.

6(b). Passing Minimum – Practical

The candidate shall be declared to have passed the examination if the candidate secure not less than 40 marks put together out of 100 (**CIA – 16 marks out of 40 and EA – 24 marks out of 60**) in the University examination in each practical paper.

7. Question Paper Pattern

7.1 (a). THEORY - Question Paper Pattern [EA] (Total Marks: 75)

PART – A (10 x 2 = 20 Marks)

(Answer ALL questions), (Two questions from each unit)

PART – B (5 x 5 = 25 Marks)

(Answer ALL questions) & (One question from each unit with Internal Choice)

PART – C (3 x 10 = 30 Marks)

(Answer ANY THREE questions) & (Open Choice – 3 out of 5 questions)

7.1(b). THEORY - Internal Marks Distribution[CIA] (Total Marks: 25)

- Attendance :5 Marks
- Assignment :5 Marks
- Internal Examinations :15 Marks

7.2(a). PRACTICAL – Marks Distribution & Question paper Pattern

(Max. Marks: 100)

[External [EA]: 60 Marks & Internal [CIA]: 40 Marks]

8. Commencement of this Regulation

These regulations shall take effect from the academic year 2012-2013, i.e, for students who are to be admitted to the first year of the course during the academic year 2012-2013 and thereafter.

SEMESTER - I

Sem	Part	Sub Code	Subject	Credit	Marks			
					CIA	EA	Total	
I	I		Tamil - I	3	25	75	100	
	II		English - I	3	25	75	100	
	III			Cell Biology	4	25	75	100
				Practical - I (Cell Biology & Biophysics)	-	-	-	-
				Allied I : Basic Mathematics	4	25	75	100
				Value Education	2	25	75	100
			Total	16	125	375	500	

SEMESTER - II

Sem	Part	Sub Code	Subject	Credit	Marks			
					CIA	EA	Total	
II	I		Tamil - II	3	25	75	100	
	II		English - II	3	25	75	100	
	III			Biophysics	4	25	75	100
				Major Practical - I (Cell Biology & Biophysics)	6	40	60	100
				Allied II: Fundamentals of computer and office automation	4	25	75	100
				Allied Practical - I (Computer lab)	6	25	75	100
	IV		Env. Studies	2	25	75	100	
			Total	28	190	510	700	

SEMESTER - III

Sem	Part	Sub Code	Subject	Credit	Marks			
					CIA	EA	Total	
III	I		Tamil - III	3	25	75	100	
	II		English - III	3	25	75	100	
			Microbiology	4	25	75	100	
	III			NME-1 Fundamentals of Bioinformatics	2	25	75	100
				Allied III: Chemistry	4	25	75	100
				Total	16	125	375	600

SEMESTER - IV

Sem	Part	Sub Code	Subject	Credit	Marks			
					CIA	EA	Total	
IV	I		Tamil - IV	3	25	75	100	
	II		English - IV	3	25	75	100	
	III			Biostatics	4	25	75	100
				Allied IV : Biochemistry	4	25	75	100
				NME -2 Applications of Bioinformatics	2	25	75	100
				Major practical -II (Microbiology)	6	40	60	100
				Allied Practical - II (Biochemistry)	6	40	60	100
					Total	28	205	495

SEMESTER – V

Sem	Part	Sub Code	Subject	Credit	Marks		
					CIA	EA	Total
V	III		Molecular Biology	4	25	75	100
			Biological Data bank and their analysis	4	25	75	100
			Immunology	4	25	75	100
			Plant & Animal Biotechnology	4	25	75	100
			Relational Data Bases Management Systems (RDBMS)	4	25	75	100
		Total		20	125	375	500

SEMESTER – VI

Sem	Part	Sub Code	Subject	Credit	Marks		
					CIA	EA	Total
VI	III		Systemic evolution and Environmental Biology	4	25	75	100
			Drug and Molecular modelling	4	25	75	100
			Proteomics and Genomics	4	25	75	100
			Data mining and Warehousing	4	25	75	100
			Object oriented programming and C++	4	25	75	100
			Major Practical III: Lab in Molecular Biology and Plant Biotechnology	6	40	60	100
			Major Practical IV: Lab in Data base analysis, programming in PERL, C++ and molecular modelling	6	40	60	100
		Total		32	205	495	700

Total Credits: 140

Total Marks: 3600

SEMESTER – I

UBI 111- MAJOR PAPER- I

CELL BIOLOGY

UNIT I

Cell as a basic unit, classification of cell types, cell theory, organization of plant and animal cells, comparison of microbial, plant and animal cell.

UNIT II

Ultrastructure of cells, Biochemical composition of cells (nucleic acid, carbohydrate, protein and lipids).

UNIT III

Subcellular organization, cytosol, endoplasmic reticulum, nucleus, cytoskeleton, ribosomes, mitochondria, chloroplast, vacuoles, peroxisomes, lysosomes and cell wall.

UNIT IV

structure and function of cell membranes, Cell division (eukaryotic and prokaryotic), mitosis, meiosis and cell cycle.

UNIT V

Specialized cell, motile cells, nerve cells, muscle cells, cell death and apoptosis .

Recommended Books:

- De Robertis and De Robertis. 2005. 8th Eds. Cell and Molecular Biology. Lippincott Williams & Wilkins
- Lodish, Berk, Baltimore et al. 2000. 6th Eds Molecular Cell Biology. W.H. Freeman & Co.
- Gerald Karp, 2008. Cell and Molecular Biology: Concepts and Experiments, 5th Eds. Wiley
- Geoffrey Cooper, 2000. The Cell: A molecular approach. 2nd Eds. Sinauer Associates Inc.

SEMESTER II
UBI121-MAJOR PAPER-II
BIOPHYSICS

UNIT I

Energetics of a living body, sources of heat limits to temperature (qualitative treatment), heat dissipation to conservation, laws of thermodynamics. Nature of chemical bonds, intra and intermolecular interaction in biological systems.

UNIT II

Absorption spectroscopy- Beer-Lambert's law, Colorimetry to Spectrophotometry(single and double beam spectrophotometer), primary biophysical events in photosynthesis.

UNIT III

Spectroscopic techniques to find out molecular structure (quantitative techniques), general spectroscopy (UV, Visible, Fluorescence, Atomic absorption, IR to Raman spectra).

UNIT IV

Physical methods of imaging, intact biological structures (X-ray, CAT-Scan, ECG, EEG, NMR) and radioactive pollution- GM counter.

UNIT V

Structure of proteins – primary, secondary, tertiary and quaternary. X-ray crystallography

Physical methods for determining size and shape of macromolecules – diffusion to sedimentation, reverse osmosis, ultracentrifugation

Recommended Books:

Volkones, HV, General biophysics Vol I&II.

Pullman, B and M.Voino. Molecular biophysics.

SEMESTER -II

UBIP121- MAJOR PRACTICAL-I

CELL BIOLOGY & BIOPHYSICS

1. Cell types – Microbial, animal and plant morphometric measurements.
2. Fractionation of cellular components.
3. Cell membrane, separation and analysis of membrane components.
4. Cell staining: Cyto chemical methods for demonstration of cellular and sub cellular components. Protein, carbohydrate and lipids.
5. Enzymes: Assay of urease, demonstration catalytic activity.
6. Titration curve of amino acids.
7. Selection of complementary filters.
8. Beer- Lambert's law verification.

Allied paper - II (Semster – II)

FUNDAMENTALS OF COMPUTER AND OFFICE AUTOMATION

(This paper is introduced instead of Allied paper - II: Computer Fundamentals and Basic programming)

UNIT I

Introduction to Computers: – Characteristics of Computers. Classification of Computers – Programming Languages : Machine Language – Assembly Language – Input Devices- Keyboard – Mouse – Trackball – Out put Devices – Dot Matrix Printer – Inkjet – Laser Printer – LCD & LED Printers: Hard Disk – CD –DVD – primary memory

UNIT – II

Getting Started: Starting a Program – Identifying Common Screen Elements – Choosing Commands – Finding Common Ways to Work – Getting Help with Office.

UNIT – III

MS-WORD: Learning Word Basics – Formatting a Word Document – Working with Longer Document.

UNIT – IV

MS-EXCEL: Creating a Simple Spreadsheet – Editing a Spreadsheet – Working with Functions and Formula – Formatting Worksheets – Completing Your Spreadsheet – Creating Charts

UNIT – V

MS-POWERPOINT: Creating and Viewing Presentations – Editing a Presentation – Working with Presentation Special Effects

TEXT BOOKS

1. Fundamentals of computers science and Communication Engineering. **Alexis Leon & Mathews Leon**, Vikas Publishing House Pvt. Ltd., New Delhi (Unit-I)
2. Microsoft Office XP – fast & easy (UNIT II, III, IV & V), DIANE KOERS
Prentice Hall of India Private Limited, New Delhi, 2001

Allied Practical –I: Computer lab

(This practical lab is introduced instead of Allied Practical -I: Computer fundamentals and Basic programming)

Semester II: Lab exercise

MS Office

1. Create a document with tables, and do the following Formatting, tab setting, page setting for printing, and Header & Footer setting
2. Drawing flow chart using drawing toolbar, inserting picture and setting frames
3. Mail Merge in word (Creating main document, data source, inserting merge fields and
viewing merge data, viewing and printing merged letter, using main merge to print envelope creating mailing labels)
- 4.. Create a document, Format the document and edit the document as follows:
 - (i). Find and Replace options
 - (ii). Cut, Copy and Paste options
 - (iii). Undo and Redo options
 - (iv). Using Bold, Underline and Italic.
 - (v). Change Character size using the font dialog box.
 - (vi). Formatting paragraph: Center, Left aligns & Right aligns
 - (vii). Changing paragraph and line spacing Using Bullets and Numbering in paragraphs
 - (viii). Creating Hanging paragraphs

MS – EXCEL

1. Create a work sheet, moving / copying / inserting / deleting rows and Columns. (Usage of cut, paste commands, copying a single cell, copying a range of data, filling up a cell. Undo command, Inserting a row, column Deleting rows and columns.)
2. Create a worksheet and perform to date, time ,Math functions, and Logical and financial functions
- 3.a. Data base concept: Data base, Record field and field name – creating and sorting a data base and maintaining a data base (date form)
 - b. Using auto filter, advanced filter
 - c. Creating subtotals and grand totals – Using database functions

4. Creating charts (pie, Bar, Line)
 - a. Using chart wizard (five steps)
 - b. Changing the chart type (pie, Bar, Line)
 - c. Inserting titles for the Axes x, y
 - d. Changing colors
 - e. Printing charts

MS - POWER POINT

1. Creating a presentation using auto content wizard
2. Different views in power point presentation
3. Setting animation effects / grouping / ungrouping / cropping power/ point objects
4. Design to presentation to market the product using animation effects/ buttons/links

SEMESTER – II

Non Major Elective Courses

NME –I

Fundamentals of Bioinformatics

Unit –I

Bioinformatics-Definition, History, Scope and Applications.
Opportunities in Bioinformatics. Emerging areas of Bioinformatics

Unit II

Computers and Programming Languages. Internet, World Wide Web,
Browsers, Search Engines – Google, Yahoo

Unit III

Cell Structures and Cell Organelles. Introduction to Macromolecules like
DNA, RNA and Proteins

Unit IV

Introduction to Molecular Biology and genetics. Central dogma of life:
DNA – RNA - Protein. Role of Bioinformatics in Human Genome Project

Unit –V

Biological databases, Importance of databases, Nucleic acid sequence
databases, Protein databases and Structure databases

References

1. Basic Bioinformatics – S.Ignacimuthu (2005). Narosa Publishing House
2. Bioinformatics for Beginners – K.Mani and Vijayaraj (2002). Kalaikathir Achagam
3. Fundamentals of Bioinformatics – Irfan Ali Khan, Atiya Khanum (2003). Ukaaz publications.

SEMESTER – III
UBI211 MAJOR PAPER - III
MICROBIOLOGY

UNIT 1

Microbial study: Types of Microscopes (Light, Phase-contrast and Electron microscopy) –classification of microorganisms- viruses, bacteria, fungi, algae and protozoans.

UNIT II

Microbial physiology: Microbial growth- medium, Environmental factors affecting growth-nutritional classification of microbes. Microbial metabolism: glycolysis, Aerobic process-Photosynthesis- cyclic and non-cyclic Phosphorylation.

UNIT III

Viruses (Lytic and Lysogenic), Bacterial genetics: Plasmids and conjugation, transduction and transformation. Mutations, mutagenesis and recombination.

UNIT IV

Environmental & Agricultural microbiology: Biogeochemical cycle: Biodegradation and bioremediation. Biofertilizers.

UNIT V

Microbiology of human diseases- Bacteria - *Staphylococcus*, *Vibrio cholerae*, Virus-Pox-virus, Adeno virus, Fungus-*Aspergillus*, *Candida*. Medicine: Penicillin and Streptomycin.

Recommended Books

- Michael T. Madigan John M. Martin & Jack Parker, 1984. Biology of Microorganisms Prentice Hall International, Inc., London.
- Edward A. Birge, 1992. Modern Microbiology. Principles and application. W.M.C. Brown Publishers , Inc. U.S.A.
- Gerard J. Tortora, Berdell R. Funke, Christine & L. Case, 2001. Microbiology –An Introduction. Benjamin Cummings, U.S.A.
- Danial Lim, 1998. Microbiology, McGraw-Hill company, New York.

SEMESTER – III

UBIP221 MAJOR PRACTICAL - II

MICROBIOLOGY

1. Staining techniques - gram staining, negative staining, flagellar staining and spore staining.
2. Microscopic slide preparation- bacterial and fungal strains.
3. Various sterilization techniques – surface, glassware, media, dry heat, wet heat, radiation, chemicals and filtration.
4. Preparation of solid and liquid media.
5. Isolation of micro organisms from soil, air, plants and water by streak plate, pour plate and spread plate methods
6. Maintenance of cultures – soil stock, glycerol stock and lyophilisation
7. Biochemical test- starch hydrolysis, catalase production, milk curdling, fluorescence, acid and gas production by Durham tube, IMVIC.

SEMESTER – III

NME –II

Applications of Bioinformatics

Unit –I

Protein Structure prediction, Gene and Protein expression data. Protein interaction data, Similarity and database searching tools – FASTA, BLAST

Unit II

Protein sequence data banks, NBRF, PIR, SWISSPROT, Nucleic Acid Sequence Data Bank, EMBL & NCBI

Unit III

Sequence analysis and Phylogeny – sequence search alignment- pair wise and multiple sequence. Scoring matrices. Introduction to Phylogenetic Trees.

Unit IV

Introduction to drug discovery. Structure based drug design. Docking. Classical SAR / QSAR.

Unit V

Structure of commonly used drugs in medical field. New drug design for cancer. Identification of novel drug design with least side effect.

References

1. Introduction to Bioinformatics - S.Sundararajan and Balaji
2. Instant notes – Bioinformatics – Westhead, Howard parish and Twyman. Viva books Pvt. Limited. Chennai
3. Bioinformatics basic skills and applications - Rastogi

SEMESTER – IV
UBI221 MAJOR PAPER - IV
BIO STATISTICS

UNIT 1

Biostatistics- definition- statistical methods- basic principles. Variables- Measurements and functions. Limitations and uses of statistics.

UNIT II

Data - primary, secondary. Methods of data collection. Merits and limitations. Classification, tabulation and presentation of data.

UNIT III

Measures of Central tendency- Mean, Median, Mode, – merits and limitations. Measures of dispersion – range, standard deviation, mean deviation.

UNIT IV

Correlation and regression, similarities and dissimilarities of correlation and regression.

UNIT V

Statistical interference – hypothesis: simple hypothesis, Hypothesis testing. Student's t test, Chi-Square test, ANOVA.

Recommended Books

Daniel, W.W. 1987. Biostatistics, John Wiley Sons, New York.

Sundarrao, P.S.S. and Richards, J.2003. An Introduction to Biostatistics, 3rd Edition, CMC, Vellore.

Selvin, S. 1991. Statistical analysis of epidemiological data, University press, NY.

Bishop, O.N, 1983. Statistics for biology, Houghton, Boston.

Freedman, P, 1950.The principles of scientific research, Pergamon press,NY.

SEMESTER V
UBI311 MAJOR PAPER - V
MOLECULAR BIOLOGY

Unit I

Cell structure and function: Membrane architecture, membrane associated process, ATP synthesis and photosynthesis, subcellular organelles- mitochondria, chloroplast.

Unit II

Chromosomal structure: prokaryotes and eukaryotes. Gene transfer in bacteria- genetic mapping and its uses.

Unit III

Prokaryotic and eukaryotic replication: Gene expression-transcriptional and translational regulation in prokaryotes. Post translational modification in eukaryotes.

Unit IV

Mutations and mutant, Biochemical basis of mutation, types of mutation – spontaneous and conditional. Chemical and physical mutagens- point mutation.

Unit V

Transposons and insertion sequences: Types of transposons – prokaryotes and eukaryotes. DNA rearrangement mediated by transposons.

Recommended Books

- Lodish, Berk, Baltimore et al. 2000. Molecular Cell Biology. 6th Edition. W.H. Freeman & Co
- Twyman, R.M.2000. Advanced Molecular Biology. Garland/bios Scientific Publishers.
- Sandy B Primrose, 1991. Molecular Biotechnology. 2nd Edition.. Blackwell Scientific Publishers.
- Brown, T.A, 2002.Genomes. 2nd Edition. Wiley-Liss (New York).
- Larry Snyder, Wendy Champness, 2002. *Molecular Genetics of Bacteria* . 2nd Edition. . American Society for Microbiology.

SEMESTER V

UBI312 MAJOR PAPER - VI

BIOLOGICAL DATABANKS AND THEIR ANALYSIS

Unit I

DNA and protein sequence data banks, NCBI, EMBL, DDBJ, NBRF-PIR, SWISSPROT, signal peptide databank.

Unit II

Analytical tools for sequences databanks: BLAST, FASTA, Pairwise alignment- Multiple alignment- ClustalW, PRAS.

Unit III

Structural databanks: Protein databank (PDB), the Cambridge structural database, Genome databank, metabolic pathway databanks- KEGG and Meta Cyc.

Unit IV

Introduction to microbial strain data network, numerical coding system of microbes, hybridoma data bank structure, virus and cell line information system.

Unit V

Protein structure classification databases: SCOP and CATH, Human genome and diseases database – OMIM.

Recommended Books

- Adams, M. D., C. Fields, J. C. Venter. 1994. Automated DNA sequencing and analysis. Academic press, London.
- Bishop, M. J., C.J. Rawings. 1997. Nucleic acid and protein sequencing, A practical approach, IRI press, Oxford.
- Sushai, S, 1997. Theoretical and computational methods in genome research. Plenum press, NY.
- Hepsyba, S.G.H. and C.R. Hemalatha, 2009. Basic Bioinformatics, MJP Publishers, Chennai.

SEMESTER V

UBI313 MAJOR PAPER- VII

IMMUNOLOGY

UNIT I

Historical perspectives and overview of immune system: Innate and acquired immunity. Cells and organs of immune system. Inflammation.

UNIT II

Antigens, antigenicity. Immunogenicity. Complement system. Antigen-antibody interaction. Monoclonal antibodies.

UNIT III

Organization and expression of immunoglobulin genes. Major Histocompatibility Complex (MHC) and antigen.

UNIT IV

Cytokines: Structure, function and receptors, Cell mediated immunity. T-Cell maturation and activation. B-Cell activation and proliferation. Hypersensitive reactions – Types I, II, III and IV.

UNIT V

Immune regulation, Vaccines, autoimmunity, immune response to infectious and immuno-deficiency diseases.

Recommended Books

- Thomas J. Kindt, Barbara A. Osborne, Janis Kuby, Richard A. Goldsby, 2006. Immunology, Janis Kuby. W H Freeman & Co.
- Charles Janeway, Paul Travers, Mark Walport, Mark Shlomchik, Mark J. Shlomchik, 2004. Immunobiology: The Immune System in Health and Disease . Garland Pub.
- Abul K Abbas, Andrew K. Lichtman & Jordan S. Pober (Eds.), 1997. Cellular and Molecular Immunology, 3rd Edn. W.B.Saunders Company.

SEMESTER V

UBI314- MAJOR-PAPER-VIII

PLANT AND ANIMAL BIOTECHNOLOGY

UNIT I

Application of plant tissue culture, organogenesis and somatic embryogenesis. Protoplast culture and fusion. *Agrobacterium* mediated transformation in plants, production of secondary metabolites by cell culture.

UNIT II

In-vitro conservation of germplasm. Synthetic seeds. Transgenic plant – Bt, herbicides, resistance pests and pathogens .Biotic & Abiotic stresses.

UNIT III

Animal cell culture: historical perspectives and applications, manipulation of animal cells (microinjection, electroporation, liposome mediated transformation). Production of native and recombinant proteins- animal viral vectors.

UNIT IV

Embryo transfer technology and animal breeding. Micromanipulation and embryo splitting, *In vitro* fertilization- chromosome engineering. Stem cells and its applications.

UNIT V

Transgenic animals: gene targeting ,types of vaccines recombinant and DNA vaccines, production and its applications.

Re commended Books

- Kalyan Kumar De, 1992. Plant Tissue Culture , New Central Book Agency ,Calcutta
- Robert N. Trigiano, Dennis J. Gray, 1996. Plant Tissue Culture Concept and Laboratory Exercises, CRC Press, London.
- P.S. Srivasta, 1998. Plant Tissue Culture and Molecular Biology , Narosa Publishing House ,New Delhi.
- . R.Spier and J.Griffiths, 1994. Animal Cell Biotechnology. Academic Press.
- M .M. Ranga, 2000. Animal Biotechnology, Agrobios (India)

SEMESTER V

UBI315 MAJOR PAPER – IX

RELATIONAL DATABASES MANAGEMENT SYSTEMS

Unit I

Purpose of database systems-Entity relationship model: mapping constraints-primary keys-ER diagram.

Unit II

Relational model: Structure-formal query languages-relational Algebra-relational calculus-commercial query language.

Unit III

Relational database design: Pitfalls-Normalization using functional dependencies-Decomposition-Third and fourth normal form-normalization. .

Unit IV

Hierarchical data model: Tree structure diagram-data retrieval, Networks data model: Data structure diagram-DBTG CODASYL model, updating and set processing.

Unit V

Interpretation-equivalence of expressions-Query processing cost- query optimizer. Basic concepts of data base recovery-currency control, database security and integrity-distributed database.

Recommended Books

- Jeffery D. Ullman, 1998. Principles of database system, Galgotia Publishers.
- Jdate C.J., 1995. An Introduction to Database System, Third Ed. Narosa Publishing company.
- Henry F. Korth and Abraham Silberschatz, 2000. Database system concepts, Mc Graw Hill International Publication.

SEMESTER VI

UBI321- MAJOR PAPER – X

SYSTEMIC EVOLUTION AND ENVIRONMENTAL BIOLOGY

UNIT-I

Morphological classification of plants: Various systems, Binomial nomenclature; Cyto and chemotaxonomy.

UNIT-II

Morphology and Whittaker's five kingdom classification of animals, animal diversity, classification of chordates and non-chordates up to classes.

UNIT-III

Evolution: Origin of life, fossils, Carbon dating in fossils, Geological time scale. Palaeozoic, Mesozoic, Cenozoic life, Lamarkism, Neolamarkism, living fossils, modern concepts of evolution and speciation, variations, natural selection, isolation, mechanisms in evolution and speciation.

UNIT-IV

Environmental biology: Autoecology, synecology, ecosystem and its components, energy flow, primary productivity, food chain. Wild life preservation and management, water, air and noise pollution. Global warming and Marine pollution (Oil spills).

UNIT-V

Function of ecosystems. Vegetation pattern in South India. Pollution and soil conservation. Afforestation and social forestry. A general account of renewable and non renewable resources.

Recommended Books

- G.L.Chopra, 1976. Angiosperms. S.Nagin & Co, Delhi.
- C.L.Porter, 1969. Taxonomy of flowering plants. Eurasia Pub. house, Delhi.
- Hans-Joachim Jördening, Josef Winter, 2005. Environmental Biotechnology: Concepts and Applications. Wiley.
- S.K. Dwivedi , M.C. Kalita , Padmanabh Dwivedi.2007.Biodiversity and Environmental Biotechnology. (1st edition) Scientific Publishers.

- P.D.Sharma, 1994. Environmental Biology. Rastogi Publishers.
- Gary K.Meffe & .Ronald Carroll, C, 1994. Principles of Conservation Biology, Sinauer Associates, Inc., Massachusetts.

SEMESTER VI

UBI322-MAJOR PAPER – XI

DRUG AND MOLECULAR MODELLING

UNIT I

Classification of drugs, routes of drug administration. Absorption & Distribution of drugs. Role of kidney in drug interaction with biomolecules. Binding of drugs to plasma proteins.

UNIT II

Drug receptors: Drug-receptor interaction, Drug action not mediated by receptors. Structural based drug design, mechanism of their action. Lipinski's rule of 5, Clinical trials 1-4 phases.

UNIT III

Effect of drug doses on the rate of metabolism- mechanisms and importance of Phase I and Phase II biotransformation. Role of cytochrome p450. Enzyme inhibition strategies, enzyme induction and pharmacological activity, LD₅₀ and IC₅₀.

UNIT IV

Principles & mode of action cancer and HIV chemotherapy agents and target sites for cancer and HIV chemotherapeutic agents. antimetabolites, antibodies, plantibodies, radiation therapy and alkylating agents. PUBCHEM database.

UNIT V

Quantitative Structure Activity Relationship (QSAR). Types of descriptors-constitutional, topological, charge, quantum chemical, walk and path counts, geometric descriptors. Types of QSAR methods-In static contour plot, in electro static contour plots, 3D-QSAR.

Recommended Books

- Singh.H and Kapoor. V.K, 2002. Organic pharmaceutical chemistry. Vallabh prakashan publishers. New Delhi
- Andrew, R., 1998. Molecular modeling: principles and application. Leach. Harlow.
- Andrew, R., 1997. Molecular modeling: Basic principles and applications. Hans- X.

SEMESTER VI

UBI323-MAJOR PAPER-XII

PROTEOMICS AND GENOMICS

UNIT I

Algorithms and applications of proteomics: proteome mining, protein expression profiling, protein-protein interaction, protein modification and automation.

UNIT II

Protein digestion techniques, 2D Electrophoresis, Isoelectric focusing(IEF), High Performance Liquid Chromatography- Mass Spectroscopy (HPLC-MS).

UNIT III

Overview of genome, genome sequence acquisition and analysis, comparative homologies, evolutionary changes, Single Nucleotide Polymorphism (SNPs). Genetic analysis: linkage mapping and analysis; physical mapping, Microarrays; sequence specific tags, sequence tagged sites, ISH, FISH.

UNIT IV

DNA sequencing: Maxam and Gilbert method, Sanger method, Ladder, Fluorescent, Shotgun, Automation DNA sequencing. Implications of DNA sequencing.

UNIT V

Construction of cDNA and genomic DNA libraries; Polymerase Chain Reaction (PCR), Yeast two-hybrid system, SAGE Adaptation for Downsized Extract (SADE), ESTs,

Recommended Books

- Leibler DC. 2002. Introduction to proteomics, tools for the new biology. Humana press.
- Hunt SP, Livesey FJ, 2000. Functional genomics, Oxford University press.
- Cantor CR, 1999. Genomics. John Wiley, NY.
- Westermier R, Naven T, 2002. Proteomics in practice: A laboratory manual of proteome analysis. John Wiley- VCH

SEMESTER VI

UBI324 MAJOR PAPER – XIII

DATA MINING AND WAREHOUSING

(This paper is introduced instead of Major Paper-XIII: Parallel Computing and programming in PERL)

UNIT – I

Introduction: Data mining application – data mining techniques – data mining case studies- the future of data mining – data mining software -

Association rules mining: Introduction- basics- task and a naïve algorithm- apriori algorithm – improve the efficient of the apriori algorithm – mining frequent pattern without candidate generation

UNIT – II

Classification : Introduction – decision tree – over fitting and pruning - DT rules- estimation predictive accuracy of classification methods - other evaluation criteria for classification method – classification software

UNIT – III

Cluster analysis: cluster analysis – types of data – computing distances- types of cluster analysis methods - partitioned methods – hierarchical methods – density based methods – dealing with large databases – quality and validity of cluster analysis methods - cluster analysis software.

UNIT – IV

Web data mining: Introduction- web terminology and characteristics- locality and hierarchy in the web- web content mining-web usage mining- web structure mining – web mining software - **Search engines:** Search engines functionality- search engines architecture – ranking of web pages.

UNIT – V

Data warehousing: Introduction – Operational data sources- data warehousing - Data warehousing design – Guidelines for data warehousing implementation - Data warehousing metadata - **Online analytical processing (OLAP):** Introduction – OLAP characteristics of OLAP system – Multidimensional view and data cube - Data cube implementation - Data cube operations OLAP implementation guidelines

TEXT BOOK:

1. “Introduction to Data mining with case studies”, G.K. Gupta, PHI Private limited, New Delhi, 2008.

BI324 MAJOR PAPER – XIV

OBJECT ORIENTED PROGRAMMING AND C++

Unit I

Principles of object oriented programming (OOP): Software evolution-OOP paradigm-basic concepts of OOP-object oriented languages-applications of OOP.

Unit II

Introduction to C++, Tokens, keywords, Identifiers, Variables, Operators, Manipulators, Expressions and control structures in C++. Functions in C++-main function-function typing-call by reference-return by reference-function overloading-friend and virtual function.

Unit III

Classes and objects: constructors and destructors and operating overloading and type conversions.

Unit IV

Inheritance: Types – single, multilevel, hierarchical and hybrid inheritance. Pointers, virtual functions and polymorphism. Managing console I/O operations.

Unit V

Working with files: Classes for file stream operations-opening and closing a file-end of file (EOF), file detection-file pointers-updating a file-error handling during file operations-command line arguments.

Recommended Books

- Balagurusamy, E. 1995.Object oriented programming with C++, TMH.
- Herbert Schidt, 1995. C++ The complete Reference, 2nd Edition, Osborne, MGH.

SEMESTER-VI

UBIP321 – PRACTICAL III

LAB IN MOLECULAR BIOLOGY AND PLANT BIOTECHNOLOGY

1. Isolation of plasmid and analysis by Agarose gel electrophoresis
2. SDS-PAGE
3. Mutagenesis
4. Determination of molecular size of DNA
5. Restriction analysis of DNA
6. Ligation of DNA into vectors
7. Transformation
8. Preparation of culture medium and basic sterilization techniques
9. Organ culture
10. Callus induction
11. Shoot tip culture
12. Isolation of Plant DNA and analysis by Agarose gel electrophoresis
13. Biochemical test for identification of bacteria.

SEMESTER-VI

UBIP322 – PRACTICAL IV

LAB IN DATABASE ANALYSIS, PROGRAMMING IN PERL, C++ AND MOLECULAR MODELLING

1. PDB analysis of protein structure by RASMOL
2. NCBI, EMBL and DDBJ (accession of informations)
3. BLAST and FASTA search
4. Alignments – pair wise and multiple sequence alignment – Clustal W and X
5. Program for function , operation overloading
6. program for multiple constructors in a class
7. program for multiple handling
8. program for error handling
9. program for friend and virtual functions
10. Molecular mechanics and dynamics of nucleotides and proteins.
11. Molecular modelling using HEX.

SKILL BASED ELECTIVE COURSES

1. Microbial diversity
2. Medical Laboratory techniques
3. Recombinant DNA technology I
4. Recombinant DNA technology II
5. Microbial Biotechnology I
6. Microbial Biotechnology II

NON MAJOR ELECTIVE COURSES

1. Bioinstrumentation I
2. Bioinstrumentation II

PART IV

1. Environmental Studies
2. Value Education - Yoga

PART V

1. Extension Activities