VI SEMESTER

S.No	SUBJECT NAME	L	P	M
THEORY				
01	Enzyme technology	4	0	100
02	Structural Bioinformatics	4	0	100
03	Medical Informatics	4	0	100
04	System Biology	4	0	100
05	Java	4	0	100
06	Elective I	4	0	100
PRACTICALS				
01	Java Lab	0	3	100
02	Structural Bioinformatics Lab	0	3	100

ELECTIVE

1. Biopharmaceutical technology.
2. Neural Network and Numerical Analysis
3. Operations research.

BIOPHARMACEUTICAL TECHNOLOGY

Objective:
To make the students understand the concepts of bio-pharmaceuticals and their kinetics. The basic knowledge about the drug formulations, their production technology and quality control is also been acquainted. The mode of drug delivery and their applications in diseased conditions is also made to understand.

UNIT – 1: INTRODUCTION TO PHARMACEUTICALS 9 hours
Histroy & Introduction, Definition, development of drugs, sources of Drugs – Plants, Animals, Microbes and Minerals, Pharmacodynamics – Physico chemical principals & properties, drug receptors and physiological receptors: Structural & Functional families.

UNIT – 2: PHARMACOKINECTICS: 9 hours
Drug absorption, factors that affect the absorption of drugs, Distribution of drugs, Biotransformation of drugs, Bioavailability of drugs, Mechanisms of drug action, Drug manufacturing processes, standard of hygiene and good manufacturing practices, manufacturing facilities and production.

UNIT – 3: DRUG FORMULATIONS: 9 hours
Manufacturing principles, compressed tablets, wet granulation, dry granulation or slugging, direct compression, tablet presses, formation, coating, capsules sustained action dosage forms, parental solutions, injections, aerosols.

UNIT – 4: PHARMACEUTICAL PRODUCTS AND QUALITY CONTROL: 9 hours
Pharmaceutical products – analysis & control, production of therapeutic proteins, Hormones cytokines – Interferon, Interleukins I & II, Vitamins, cold remedies, laxatives, analgesics, external antiseptics, antacids, Antibiotics. Analytical methods and tests for various drugs & pharmaceuticals and preservation. Packing, Packaging techniques, quality control, recent advances in, manufacture of drugs using rDNA technology.

UNIT – 5: APPLICATIONS OF BIOPHARMATICALS AND DRUG DELIVERY SYSTEMS:
9 hours
Role of Biopharmaceuticals in treatment of various health disorders like diabetes, liver diseases, Neurodegenerative diseases, Kidney disorders and Schizophrenia. Controlled and sustained delivery of drugs, Biomaterial for the sustained drug delivery, liposome mediated drug delivery, Drug delivery methods for therapeutic proteins.

Prescribed Books:

1) Swarbrick Remington's Pharmaceutical Sciences, Mack Publishing and Co. 18 th eds. 1996
2) A C Guyton ,Text Books of Medical Physiology, WB Saunders, Hong Kong,1986

Reference:

1. Biopharmaceuticals: Biochemistry & Biotechnology, Gary Walsh (1998), John Wiley & Sons Ltd.
2. Remington's Pharmaceutical sciences, Mark Publications & Co.
3. Theory & Practice of Industrial Pharmacy, (3rd ed.) Leon Lachman, Lea & Febiger (1986)

Web sites:

http://www.selectscience.net/medicinal-chemistry/application-notes/
http://www.genomicglossaries.com/content/chapternotes.asp#more%20chem%20gen
http://www.nature.com/app_notes/nmeth/index.html?showcateg=app_c4-
http://jaxmice.jax.org/library/notes/496j.html
http://www.ut.ee/ARFA/tehnol/generic.pdf
http://www.sciencedaily.com/releases/2007/11/071102141704.htm
http://www.in-pharmatechnologist.com/news-by-product/indexbyCategory.asp?idCat=27

STRUCTURAL BIOINFORMATICS

UNIT I

Concept of molecular modeling: 9 hours

Potential energy surface, Molecular graphics, surfaces, Features of biomolecular mechanics, Force fields, Bonds, structure & bending angles, Unit of length and energy, molecular modeling literature, mathematical concepts.

UNIT II

Molecular mechanics: 9 hours

Introduction, some general features of molecular mechanics, Force fields, bond stretching, angle bending and force filed models for the simulation of liquid H_20, Derivation of Molecular mechanics Energy function. Calculating thermodynamics properties, Using a force Field. Force field parameterization, transferability of force field parameters. The treatment of delocalized $\prod$ systems, force fields for inorganic molecules, force field for solid-state systems, Empirical potential s for metals and semiconductors.

UNIT III

Energy Minimization and Related methods: 9 hours

Introduction; Non- derivative Minimization methods Introduction to Derivative minimization methods First order minimization methods second derivative methods The Newton- Raphson Methods, Quasi-Newton methods, Application of Energy minimization

UNIT IV

Molecular Dynamics Simulation Methods: 9 hours

Introduction, molecular Dynamics using Simple Methods, molecular Dynamics with Continuous potentials, molecular Dynamics at constant temperature and pressure, incorporating solvent Effects into Molecular Dynamics: Potentials of Mean Force and stochastic dynamics, conformational changes from molecular Dynamics simulations.

Monte Carlo simulation methods: introduction, Monte Carlo simulation molecules, Models used for Monte Carlo simulations of polymers.

UNIT V

Protein structure prediction, sequence Analysis and protein folding: 9 hours

Introduction, some basic principles of protein structures, First-principle models for predicting protein structure, Introduction to comparative model, Predicting protein structures by 'threading', A comparison of protein structure predicting methods: CASP, protein folding and unfolding.

Prescribed book:

1.)Molecular modeling and drug design – Andrew leech

Reference Books:

1.)Structural Bioinformatics- Philip E. Bourne , Helge Weissig

2.)Guidebook on Molecular Modeling in Drug Design. Edited by N. C. Cohen (Pharmaceutical Division of Ciba-Geigy Ltd, Basel) Academic Press: New York. 1996

Web reference:

http://cmt.dur.ac.uk/sjc/thesis_dlc/node6.html
http://www.wag.caltech.edu/publications/theses/alan/tableofcontents1_1.html
http://dissertations.ub.rug.nl/faculties/science/1996/h.bekker/
http://cmm.info.nih.gov/modeling/guide_documents/conformation_document.html

SYSTEMS BIOLOGY

Unit I Introduction to systems biology:

Scientific challenges in systems biology, bringing genomes to Life: The use of Genome, Scale in Silico models from gene expression to metabolic fluxes.

Unit II

Experimental Techniques for systems Biology: Methods for protein – protein Interaction, analysis, Reconstruction & structural analysis, of metabolic & regulatory networks, Handling & Interpreting Gene Groups, Location proteomics, Applications, Representations & Management of signaling pathway information, Sinpath project networks

Unit III Network & Kinetic Model:

Reconstruction signaling network, network clustering, modular decomposition of network identification of similarity pathway, Multiple network alignment & global network alignment, kinetic model of ex--- interaction, simulation of cell signaling pathways, network based orthology identification,

Unit IV Methods & software platform for systems Biology:

SMBL models & math SBML, cell Designer, DBRF – mico method, DBRF – MEGN method, Systemic Determination of Biological Network, Storing, Searching & Dissease inact Experimental Proteomic Data, Representing and analysis biochemical network using Biomage,

Unit V Virtual Biology Lab & Databases.

Modeling large biological systems from functional genomics data. Parameter estimation. Cellular simulation towards a virtual biology laboratory computational cell biology, and stochastic approach. E cell and V cell. Tools and databases in system biology, system biology work bench(SBW), and system biology mark up language(SBML).

Text Books

1. Sangdun Choi, Ph.D "Introduction to Systems Biology", Humana Press, Totowa, New Jersey,

Reference books:

1.) Systems Biology in Practice: Concepts, Implementation And Application- Klipp, E et al. John Wiley & Sons Inc. 2005

2.) Foundations of Systems Biology Kitano, H.(ed.) The MIT Press 2001-10-15

3.) Advances in Systems Biology (Advances in Experimental Medicine and Biology) Dubitzky, W. and Azuaje, F. (eds.), Kluwer Academic Publisher, 2005

Web References:

1. http://www.nature.com/ng/journal/
2. http://sbml.org/workshops/tokyotutorial/tutorial.htm
3. http://complex.upf.es/~ricard/SYSTEMS_BIOL.html
4. http://bcs.whfreeman.com/thelifewire/content/chp00/00020.html
5. http://www.sysbio.org/resources/tutorials/index.stm
6. http://sbml.org/index.psp

MEDICAL INFORMATICS

Unit 1: Introduction & Fundamentals of Medical informatics

Knowledge management, Data mining, and text mining, mapping medical informatics information research ethical and social challenges of electronic health information.

Unit 2: Data informatics

Data & information, data in computers, data from patients, patient centered information system, medical knowledge & decision support, Information retrieval & Digital libraries, Patient – Centered information system, Identification of Biological relationship from text documents.

Unit 3: Methods of information systems

Introduction – otitutional information system, Methodology of information processing, Methodology for information system, Medical Informatics as a profession, 3D medical informatics: Information science in multiple dimensions.

Unit 4: Infectious diseases and information

Introduction, Background & overview, Practical challenges & Research issues, Outbreak detection – Semantic interpretation for the Biomedical research literature, semantic text primary for patient records, creativity, modality & visualizing metabolic networks.

Unit 5: Clinic Trials

Pre clinical trails and clinical trials – a comparison, Introduction, How clinical trial works?, Clinical trial phases, economics, Performance of clinical trials, advantages, FDA Regulation relating to clinical trial, Drug Repositioning.

Reference books:

1. Connecting Medical Informatics And Bio-informatics: Proceedings of MIE2005 ... By Rolf Engelbrecht, Published 2005 IOS Press.

2. Medical Informatics: Knowledge Management And Data Mining in Biomedicine, By Hsinchun Chen, Published 2005, Springer

Web References:

http://www.medinfonews.com/clinicalinformatics.html

http://www.healthology.com/main/condition_centers.aspx

http://www.diabetes.org/home.jsp

ENZYME TECHNOLOGY

Objective:

To make the students understand the basics of enzyme technology and their applications and to relate them to the industrial processes and product.

Unit 1: Introduction to enzyme: - **-** 9 hours

Enzyme definition, history, nomenclature and Classification of enzymes-six main classes, Enzyme commission system and recommendation of nomenclature, specificity of enzyme action, monomeric and oligomeric enzymes.

Unit 2: Purification, characterization and mechanism of enzyme action:- 9 hours

Properties, isolation and purification of enzymes from plants, animals and microbial sources. Downstream processing, Methods of characterization of enzymes. Mechanism of enzyme action. Types of Inhibition, Regulation of enzyme action. Factors influencing enzyme action.

Unit 3: Enzyme kinetics: - - 9 hours

Concept of active site of enzyme catalyzed reactions- Micaelis Menten equation, Line weaver Burk plot Eadie- Hofstee and Hanes plot, Eisenthal & Cornish-Bowden plot kinetics of multi substrate enzyme catalyzed reactions- Ping & Pong, random order and compulsory order mechanisms, steady state kinetics and non-steady state kinetic methods.

Unit 4: chemical nature of enzyme catalysis: - **-** 9 hours

Co-factors, reaction of enzymes without co-factors metal activated enzyme and metallo enzymes co-enzymes in enzymes catalyzed reactions, allosteric enzymes in metabolic regulation, Immobilized enzymes- preparation properties and application.

Unit 5: Application of Enzymology:- - 9 hours

Preparation and assay of enzymes as analytical agents in medicine, as in born errors of metabolism, diagnostic application, Plasma enzymes, as reagents in cosmological and clinical chemistry, enzymes in food, beverage industries and enzyme as biosensors.

Prescribed text books:

1.) Palmer- Enzyme technology
2.) Dixon and Webb(2001) Enzymes

Reference text books:

1.) Tanber Heng- enzyme technology
2.) Tad AR&Wymer P.R.O(1996) Enzymes and their roles in Biotechnology Affiliated East West press- Biochem society
3.) Ingle MR(1986) Enzymes, Energy & metabolism Black Well Oxford.

Web Reference:

www.isbu.ac.uk\biology\enzymetechnology
www.isbu.ac.uk\biology\enzyme
www.actltd.com\tech
www.chipsbooks.com

JAVA

Aim

To know about the computer language JAVA and its application.

Objectives

To have the thorough knowledge about

- JAVA data types and statements
- OOP of JAVA
- JAVA file, JAVA Beans and BIOJAVA

Syllabus

UNIT I **9**

Introduction – benefits – Unicode character set – comments – Identifiers and reserved words – Primitive data type – Expression and operators – statements – methods – Class and objects – Array types.

UNIT II **9**

Package and namespaces – JAVA file structures – Defining and running JAVA program – difference between JAVA and C - Object Oriented Program in JAVA - Member of a Class – Creation – Initialization – Destroying and finalizing objects – Abstract class and methods – Interface.

UNIT III **9**

Inner class overview – static member class – local class – member class – Anonymous class - modifier – C++ features not in JAVA – JAVA platform : Overview – string and character – Number and math – data and time – Array – collection – types – Reflection and dynamic loading threads.

UNIT IV **9**

File and dir – I/O stream – Networking – Processes – Security – Cryptography – JAVA Security. JAVA BEANS : Bean basics – JAVA bean convention – Bean context and service – JAVA programming and Documentation

UNIT V **9**

BIOJAVA -Introduction BioJava: symbols & Symbol Lists, sequences & features, sequence I/O basics, Change Event overview, Change Event example using distribution objects, Implementing. – JAVA development tools – Applications of JAVA in Biological programming Changeable, Blast-like parsing (NCBI Blast, WU-Blast, HMMER.

TEXTBOOKS

1. "Java: How to Program," 3/e, H. M. Deitel & P. J. Deitel, Pearson Education Asia, 2001.
2. JAVA in an nutshell, David flanagam, OREILLY publishers, 3rd edition.

REFERENCES

1. "Java 2, The Complete Reference," 3/e, Patrick Naughton & Herbert Schildt, Osborne/McGraw-Hill.
2. "Java 2 Programming," Keyar Shah, Tata McGraw-Hill, 2002.
3. http://www.biojava.org/tutorials/index.html

JAVA LAB

Aim

To know about the computer language JAVA and its application.

Objectives

To have the thorough knowledge about

JAVA data types and statements
OOP of JAVA
JAVA file, JAVA Beans

Syllabus

1. Program to create 3 threads to find the given number is odd even, or prime numbers.
2. Program to read the byte code file and change the class name
3. To accept user name, password and verify the password
4. Program to implement file content viewer using text field and text area
5. Program to implement student information system using jdbc
6. A program to implement countdown applet
7. Resizing an existing image
8. File compression using Huffman coding
9. Simple decryption and encryption standard
10. Program to create an applet that contains the user name and password
11. Program to implement applet viewer
12. program to create simple package
13. Java Program to implement the student information system using vectors
14. Encrypt and decrypt using vinegar cipher
15. Encrypt and decrypt using hill cipher

STRUCTURAL BIOINFORMATICS LAB

1.) Calculating Bonded and Non-Bonded Interactions
2.) Molecular Interactions for Proteins and peptides.
3.) Effect of solvent on protein and nucleic acids.
4.) Simulation and Dynamics:
    1.) protein preparation
    2.) legand preparation
    3.) protein-protein interaction
    4.) protein-DNA interaction
5.) QSAR properties
6.) Molecular Modeling
7.) Docking.

Commercial software, Schrödinger package is recommended for the practical to be conducted.