

SEMESTER VII

S.No	SUBJECT NAME	L	P	M
THEORY				
01	Molecular modeling and drug design	4	0	100
02	Biomedical Instrumentation	4	0	100
03	Principles of Biotechnology	4	0	100
04	Environmental science and Engineering	4	0	100
05	Elective II	4	0	100
06	Elective III	4	0	100
PRACTICALS				
01	Molecular modeling & drug design Lab	0	3	100
02	Mini project	0	3	100

ELECTIVES

1. rDNA Technology.
2. Pharmacokinetics and Medicinal Chemistry
3. Nanotechnology
4. Microarray and data analysis.

BIOIMEDICAL INSTRUMENTATION

Aim and Objective:

The students are made to understand the working of the various instruments used in medical field. As they study the metabolism and physiology of organisms, they would have a better understanding if the technique behind is also learnt. Focus is been made on the recent biomedical instrumentation which enables the students to have a better approach in research.

UNIT I: ELECTRO-PHYSIOLOGY AND BIOPOTENTIAL RECORDING:

9 hours

The origin of biopotentials; biopotential electrodes; biological amplifier; ECG, EEG, EMG, PCG, EOG, lead systems and recording methods, typical waveforms and signal characteristics.

UNIT II: BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENTS: 9 hours

pH, pO₂, pCO₂, pHCO₃, Auto analyzer, cardiac output, Respiratory measurement, Blood pressure, Temperature, pulse, O₂ and CO₂ measurements.

UNIT III : ASSIST DEVICES, BLOOD FLOW AND BLOOD CELL COUNTING: 9 hours

Cardiac pacemaker, DC Defibrillators, Dialyzer, Heart-Lung machine, Hearing aids.

Electromagnetic and ultrasonic blood flow meter, indicator dilution method, thermo dilution method, manual and automatic counting of RBC, WBC and Platelets.

UNIT IV: PHYSICAL MEDICINE BIO-TELEMETRY 9 hours

Diathermies - short-wave, ultrasonic and microwave type and their applications, Medical stimulator, Telemetry principles, frequency selection, Bio-telemetry, radio-pill and tele-stimulation.

UNIT V: RECENT TRENDS IN MEDICAL INSTRUMENTATION: 9 hours

Thermograph, endoscopy unit, Laser in medicine, Surgical diathermy, cryogenic application, Electrical safety.

Prescribed Books:

1. John G. Webster, " Medical Instrumentation Application and Design", John Wiley and sons, New York, 1998.
2. Leslie Cromwell, "Biomedical instrumentation and measurement", prentice Hall of India, New Delhi, 1997.

References Books:

1. Khandpur, R.S, "handbook of biomedical instrumentation", prentice Hall of India, New Delhi, 1997.
2. Joseph J. Carr and John M. Brown, Instrumentation to biomedical equipment technology", John Wiley and Sons, New York, 1997.

WebSite Addresses:

1. http://www.adinstruments.com/products/hardware/research/Transducers*and*Accessories/Biopotential*-*ECG**EMG**EEG/.
2. <http://www.lyrichearing.com/offer/adwb/>
3. <http://www.koalaresearch.net.au/Macellari.pdf>
4. <http://www.springerlink.com/content/50c51k9ecm9cfmka/>
5. <http://www.ncbi.nlm.nih.gov/pubmed/12449359>

MICRO ARRAY DATA ANALYSIS

Aim:

To study about micro array data analysis and to know their applications.

Objectives:

- ❖ To study DNA microarray data analysis
- ❖ Statistical computing
- ❖ Biological data analysis and modeling

SYLLABUS

UNIT I

9

Statistical Analysis of DNA Microarray :Data; Statistical tools used to analyze microarray data. Explore data normalization, cluster analysis & prediction methods. Analytical protocol when working with microarray data. Analyze a microarray data set.

UNIT II

Clustering Methods:

9

Hierarchical(Single linkage,complete linkage,average linkage,Centroid linkage),Non-Hierarchical(K-means,SOMs).Relating expression data to other biological information-Predicting binding sites,Predicting protein interactions and protein functions,predicting functionally conserved modules,Reverse-engineering of gene regulatory networks .Robust estimation, and general maximum-likelihood methods.

UNIT III

9

Data Analysis of RNA Data: Sources of variability in microarray studies. Combining information on oligonucleotide arrays. An ontology of inferential methods. Identifying genes by testing hypotheses. Mining data through clustering - options, benefits, limitations. Dimension reduction through linear components models. Latent class models. Issues in experimental design. Quantitation adjustments in microarray data analysis. Forthcoming analytic developments for microarray studies.

UNIT IV

9

Statistical Genetics: Modeling meiosis, linkage mapping, pedigree analysis, genetic epidemiology. Clone libraries, physical mapping of chromosomes. Radiation hybrid mapping. DNA & protein sequence analysis, molecular evolution, sequence alignment, database searching. Analysis of microarray expression data.

UNIT V

9

Micro Array Informatics:

Representation of gene expression data. Databases: Stanford, Yale, GEO, Array EXPRESS. Distance Measures: Euclidean distance, Pearson Correlation Coefficient.

Prescribed books:

1. "DNA Array Image Analysis: Nuts & Bolts," Gerda Kamberova & Shishir Shah, DNA Press, October 2002 (ISBN: 0966402758).
2. "A Practical Approach to Microarray Data Analysis," D. P. Berrar, W. Dubitzky & M. Granzow, Kluwer Academic, December 2002.

Reference Books:

1. "Data Analysis Tools for DNA Microarrays," S. Draghici, Chapman & Hall/CRC Press, December 2002.
2. "Statistical Analysis of Gene Expression Microarray Data," Terry Speed, CRC Press, November 2002 (ISBN:1584883278).
3. "Computational and Statistical Approaches to Genomics," Wei Zhang & Ilya Shmulevich (Eds.), Kluwer Academic Publishers,

Website Addresses:

1. <http://www.pnas.org/cgi/content/abstract/99/20/12963>.
2. http://www.gersteinlab.org/courses/545/07-spr/proj/proj_rpt.Chong.pdf.
3. https://tele.engr.usu.edu/biophotonics_Fall_2006/Modules/Final_Papers/Papers/Dan-MicroarrayTech.pdf.
4. http://users.auth.gr/~gtzanis/files/pubs/Biological_Data_Mining.pdf.

MOLECULAR MODELLING AND DRUG DESIGNING

Aim and Objective:

The students are aware of a deep knowledge in the field of Molecular modeling and drug design. They are exposed to the kinetics behind the theory, simulation that governs the modeling. The discovery of new drugs and its design is learnt along with their QSAR properties aiming to invent new drugs.

Unit -1 Theories behind computational Chemistry:

Polar, Cartesian, Internal and Crystallographic Co-ordinates. Generation and Inter-Conversion of Co-ordinates, Forces acting on biomolecules, Born-Openheimer Approximations, Application of Hartree-Fock equations to Molecular systems, Approximate Molecular Orbital, Semi-empirical, ab initio & DFT methods, Hybrid techniques, Electrostatic potential maps.

Unit -2 Conformational Sampling and Kinetics simulation:

Locating the Global Minima: Stochastic & Monte-Carlo methods, simulated annealing: Genetic Algorithms clustering Algorithm and pattern recognition techniques, Diffusion methods, Distance Geometry Methods, Times averages, Ensemble averages, Free energy methods, Time-dependent methods: Classical Methods, Langevin methods, Quantum methods, Reaction Path Methods, protein structure stability & conformational changes, finding Transition structures, meso scale simulation.

Unit - 3 Molecular Modeling & Drug Discovery:

Mutation Studies through modeling, Reaction co-ordinates, reaction rate modeling. overview of drug discovery process, modern methods of drug discovery, various phases- Drug discovery, pipeline, economics of drug discovery, stages & strategies of drug discovery. steps in the development of new drug, Drug discovery cycle, ADME properties. Deriving and using the 3D-pharmacophore, constrained systematic research, Clique Detection Techniques, Maximum likelihood method.

Unit Drug Design:

Physicochemical concepts in drug design: physicochemical & biopharmaceutical properties: Lead optimization and De-novo design techniques: structure based drug design. Protein structure based drug design, X-ray structure based drug design, homology model based drug design, design of combinatorial libraries, role and Application of protein structure in drug discovery process. 3D databases search, Receptors, channels, transporters and enzymes as drug targets; CADD.

Unit - 5 Structural Activity Relationship and Molecular Docking:

QSARS & QSARS: QSARS- types (2D & 3D) & methodology, Various descriptors

in QSARS : Electronic: Topology: Quantum chemical based descriptors, use of Genetic Algorithms, neural networks & principle components analysis in QSARS equations, comparative QSAR, Screening of molecules: chemical libraries & ligands databases; Highthroughput screening and virtual screening; softwares used in screening, Molecular Docking - Flexible and Rigid Docking, scoring functions in Docking (Bumb Filter, Contact score, Energy score, Chemical Score & RMSD Score). Docking in protein binding sites, Autodock and other molecular docking programs.

Prescribed Books:

1. **Molecular Modelling Principles and Applications, Andrew R .Leech,11nd.2001.Prentice Hall.**
2. **Young D C Computational Chemistry, Wiley Publisher,2001,ISBN-0-471333-68-9.**
3. **Current protocols in Protein Science, Wiley Publishers,2005.**
4. **Modern Methods of Drug Discovery, Gerhard Edwin Seibold, Alexander Hillisch, Rolf Hilgenfeld Publisher.**
5. **Advanced Drug Design Development, Kourounakis Taylor & Francis.**

Reference Books:

1. **Introduction to Computational chemistry, Jensen F. Wiley ,1999.**
2. **Computational chemistry A Practical Gide for Applying Techniques to Real World Problems, David C. Young, Wiley 2003.**
3. **Pharmacokinetics and Metabolism in Drug Design, D.A.Smith, H.va de Waterbeemd & D.K.Walker eds., John Wiley & Sons.**
4. **Text book of Drug Design & Discovery, P.Krogsgaard-Larsen, T.Liljefors & U.Madsen eds., Taylor & Francis.**

Website Addresses:

1. <http://www.netsci.org/Science/Compchem/feature01.html>.
2. http://en.wikipedia.org/wiki/Computational_chemistry.
3. <http://scholar.google.co.in/scholar?hl=en&lr=&q=Conformation+sampling+and+kinetics+simulation>.
4. <http://www.sciencemag.org/cgi/content/abstract/sci;287/5460/1960>.
5. <http://pubs.acs.org/cgi-bin/abstract.cgi/jmcmr/2000/43/i13/abs/jm0000564.html>.
6. http://pubs.acs.org/cgi-bin/abstract.cgi/jcis8/1994/34/i04/f-pdf/f_ci00020a020.pdf?sessid=600613.

NANOTECHNOLOGY

UNIT 1: NANOSTRUCTURES:

9 hours

Introduction to Nanotechnology, nanoparticles - Characteristics, particle agglomeration carbon nanotubes, nanomanufacturing, nanostructured polymers, nanoparticulates, fabrication, structure-property relationships.

UNIT 2: DESIGN OF NANOPARTICLES:

9 hours

Zero dimensional nanostructures-Nanoparticles,One dimensional nanostructures-Nanowiresand nanorods,Two dimensional nanostructures-films,special nanomaterials,1 D nanofibres2 D nanolayered materials,3 D nanofeatures,nanocomposites.

UNIT 3: SELF ASSEMBLED NANOSTRUCTURES:

9 hours

Synthetic self-assembled materials,examples of nanoscale materials in nature,nanocrystal self-assembly,chemical & photochemical reactives of nanoarchitectures,properties of semiconductor,nanomaterials,optical,Electronic ,magnetic properties of nano materials, electrochemical properties of nanoparticle Assemblies.

UNIT 4: TECHNIQUES IN NANOPARTICLE ANALYSIS:

9

hours

Compositional surface analysis: UV and X-RAY photoelectron spectroscopy (XPS), Secondary ion mass Spectroscopy (SIMS), Contact angles, Cathodoluminescence(CL) and photoluminescence(PL), microscopy. Probe techniques: Scanning probe microscopy (SPM), Scanning tunneling microscopy (STM), Atomic force microscopy(AFM),Scanning optical probe microscopy(SOPM),Deep level transient spectroscopy(DLTS).

UNIT 5: NANOSCALE TECHNOLOGY IN BIOLOGICAL SYSTEMS: 9 hours

Sensors for measuring ionic flux in Live cells, synthesis in cell structures,Nanotechnologies and the DNA structure,single molecule optical trap studies and the Myosin family motors Biomineralisation,Tissue Engineering,nanotechnology andcancer,Nanotechnology in Organ Transplantation ,drug delivery systems,smart drugs.

Prescribed Books:

- 1) Nano Scale Technology in Biological Systems by Cooper, Springer Verlag.
- 2) Handbook of Nanotechnology, ed. Bhushan, Springer-Verlag, Berlin, Heidelberg, Germany.
- 3) Nanobiotechnology:Concepts,applications and perspectives, eds.CM Niemeyer, C MIRKIN, Wiley-VCH Verlag GmbH and co., KgaA, Weiheim.
- 4) Nano, The Next Revolution, Mohan Sundara Rajan, National Book Trust,India.
- 5) Self - Assembled Nano structures, G. Carotenuto.

Reference Books:

- 1) Nanocomposite science and Technology, eds. PM Ajayan, LS Schadler, PV Braun, Wiley-VCH Verlag, GmbH & Co., KGaA, Weinheim.
- 2) Nanostructures, & Nanomaterials : Synthesis properties and Applications by Guozhong Cao.
- 3) Hand book of Nanophase & Zhang Lin Wang Nanomaterials (Vol I & II) Springer.

Web Site:

- 1) <http://www.nanotech-now.com/multimedia.htm>
- 2) <http://www.crnano.org/whatis.htm>
- 3) <http://www.nanotechnology.com/>
- 4) http://www.nsti.org/Nanotech2006/symposia/Nano_Particles_Applications.html

PHARMACOKINETICS & MEDICINAL CHEMISTRY

Unit - 1

Physicochemical properties of Drugs: 9 hours.

pKa, Partition coefficient, Solubility, Solid State characterisation & physical behaviour of drugs, Reaction kinetics and mechanisms. Route of drug administration, absorption, bioavailability and drug actions. Dissolution: Theories of dissolution, release rates and constants, mechanisms of conventional release and controlled release, Dissolution data handling & correction factors, Dissolution equipments, IVIVC

Unit -2:

Metabolic Interactions of Drugs: 9 hours.

Complex events between drug administration & drug action; Metabolism and Biological activities of homologous series; drug receptor interaction, isothermism, forces involved and theories of interaction. Protein & tissue binding, factors affecting protein binding, kinetics of protein binding.

Unit - 3

Pharmacokinetic Characterisation of Drugs: 9 hours.

Absorption rate constants (Wagner Nelson, Loo-Reilman methods), limitations, Lag-time, pharmacokinetics in presence of lag-time; flip-flop model; concentration-time profile, Profility the date, different fluid compartments and blood flow rates compartment models. Significance of volume distribution, implications and invitro methodologies.

Unit - 4

Dosage of Drugs: 9 hours.

Pharmacokinetics of multiple dosing; dosage regimen design based on mean average, minimum, maximum plasma/ serum concentrations, limited fluctuation methods; repeated one-point method; dosage adjustment in disease patients. direct, linear and orbit, graph methods of dosing. Nonlinear pharmacokinetics-due to drug-protein binding.

Unit - 5

9 hours.

Chronopharmacokinetics:

Drug toxicity and forensic analysis; case study: Drug dosage in children, elderly and obese patient; Drug disposition, renal clearance, mechanisms of clearance, relationship between blood flow, intrinsic clearance, hepatic clearance and protein binding , different volumes of distribution, significance & integration kinetics.

Prescribed Books:

1. Handbook of essential pharmacokinetics, pharmacodynamics & Drug

- Metabolism for Industrial Scientist, Younggill Kwon, 2001 .
2. Formulation & Formulation, Mark Gibson, 2001.
 3. Principles of Medicinal Chemistry Vol I and Vol II by Kadam.
 4. Medicinal Chemistry by Austhoskar.
 5. Understanding Biopharmaceuticals : Manufacturing and Regulatory Grindley, Jill E. Ogden.

Reference Books:

1. Pharmaceutical Dosage Forms and Drug Delivery Systems, 8/e, Lloyd Allen, Nicholas Popovich & Howard Ansel, 2005.
2. Generic Drug Product Development: Solid Oral Dosage Forms, Leon Shargel & Izzy Kanfer Eds., 2004.

Web site Addresses:

- <http://www.ncbi.nlm.nih.gov/pubmed/8845810>
<http://pharmrev.aspetjournals.org/cgi/content/abstract/50/3/387>.
<http://linkinghub.elsevier.com/retrieve/pii/S0960982202013192>.
http://www.chestjournal.org/cgi/content/full/119/1_suppl/39S.
<http://www.ncbi.nlm.nih.gov/pubmed/8502120>.

PRINCIPLES OF BIOTECHNOLOGY

Objectives:

To understand the history, principles and advancements of Biotechnology. To impart the knowledge in various fields of Biotechnology & their applications in the present day.

Unit I

6 hours

Introduction to Biotechnology:

Definition, Scope, History, Overview & Importance - Origin & Definition - Fundamentals of Biotechnology - Global Impact of Biotechnology - Biotechnology in India. Interaction Centre for Genetic Engineering and Biotechnology (ICGEB); Need for future development; Achievements of biotechnology - Ethical Issues.

Unit II

7 hours

Recombinant DNA and Gene Cloning:

Cloning and Expression Vectors: Cloning vectors for recombinant DNA (plasmids, phages, cosmids, viruses, transposons, YAC, MAC, BAC, etc.); Expression vectors for high level of expression of cloned genes (use of promoters and expression cassettes including baculovirus); Binary and shuttle vectors.

Unit III

9 hours

Animal Biotechnology:

Requirements for animal cell, tissue and organ culture; Isolation of animal material (tissue); Disaggregating of tissue (physical and enzymatic methods); Establishment of cell culture - Immobilized cell culture - Somatic cell culture - Organ culture - Whole embryo culture - Valuable products from cell cultures - Transgenic animals - Strategies for gene transfer and knock out animals.

Unit IV

12 hours

Plant Biotechnology:

Culture of plant materials - Explant culture - Callus formation and its culture - Organogenesis - Root culture - Shoot culture and micropropagation - Cell culture - Benefits from cell culture - Somatic embryogenesis - Somaclonal variation - Protoplast culture - Isolation -Regeneration - Protoplast fusion and somatic hybridization - Fusion products - Methods of somatic hybridization. Applications: Applications in agriculture - Improvement of hybrids - Production of encapsulated seeds - Production of disease resistant plants - Production of stress resistant plants - Transfer of "nif" genes to eukaryotes - Transgenic plants - Selectable markers and their use in transformed plants and their applications - *nptII* gene, *lux* gene, *lacZ* gene.

Unit V

11 hour

Industrial and Microbial Biotechnology:

Enzyme engineering - Engineering of macromolecules - Cloning and expression of heterologous genes (for variety of purposes) redirecting metabolite flow - Limitation in metabolic engineering - Isolation and culture of micro-organisms - production of organic compounds by microbial fermentation - production of

enzymes by micro-organisms (alpha amylases, proteases, lipases) - production of antibiotics by micro-organisms Streptomycin and Penicillin - microbial transformations - single cell proteins (SCP) from micro-organisms.

Prescribed Books:

1. Sathyanarayana, "Biotechnology", Books & Allied (P) Ltd.
2. P.K.Gupta, "Biotechnology and Genomics", Rastogi publications.
3. Dubey, "Biotechnology", S.Chand & company Ltd.
4. Ignacimuthu, S., 1996. Applied Plant Biotechnology. Tata McGraw Hill.
5. Singh, B.D., 1998. Text Book of Biotechnology. Kalyani Publishers.
6. Ramadas, P. and Meera Rani, S., 1997. Text book of Animal Biotechnology. Akshara Printers.

Reference Books:

1. Sunil Maulik & Satel, "Molecular Biotechnology", Wiley Liss.
2. J.M. Walker & E.B.Gingold, "Molecular Biology & Biotechnology", Panima Publishing Company.
3. Mantal, S.H., Mathews, J.A. and Mickee, R.A., 1985, "Principles of Plant Biotechnology. An Introduction of Genetic Engineering in Plants", Blackwell Scientific Publication.
4. Spier, R.E. and Griffiths, J.B., 1998. Animal Cell Biotechnology", Academic Press.

Reference Websites:

1. <http://en.wikipedia.org/wiki/Biotechnology>
2. <http://dbtindia.nic.in/>
3. <http://www.webindia123.com/career/options/biotech/intro.htm>

ENVIRONMENTAL SCIENCE AND ENGINEERING

1. INTRODUCTION AND COMPONENTS OF ENVIRONMENT 9

Definition - Scope and Role of Environmental Engineer - Components - Water, air and land - Inter-relationship between components - Subcomponents; Ecosystem - Structure and functional components of ecosystem - Development and evolution of ecosystem - Energy flow and material cycling in ecosystem.

2. ENVIRONMENTAL IMPACTS OF DEVELOPMENT 9

Natural and man made impacts on water, air and land; Environment and development - Concept of sustainable development - Environmental impacts of Development - sustainable development - Environmental pollution - Water, Air and Land.

3. PLANNING FOR WATER SUPPLY AND SEWERAGE SYSTEMS 9

Public water supply and sewerage systems - Objectives - Design period - Population forecasting - Water demand - Sources of water - Source Selection - Water quality - Characterization - Water quality standards - Sources of wastewater - Quantity of sanitary sewage - Estimation of storm runoff - Characteristics and composition of sewage and their significance - Effluent standards.

4. CONVEYANCE SYSTEM

9

Water supply - intake structures - Pipe materials - Hydraulics of flow in pipes - Transmission main design - Laying, jointing & testing of pipes - appurtenances - Pumps - Sewerage - Hydraulics of flow in sewers - Design of sanitary and storm sewers - Computer applications - Laying, jointing & testing of sewers - appurtenances - Pumps.

5. WATER SUPPLY AND DRAINAGE IN BUILDINGS

9

Principles of design of water supply and drainage in buildings - House service connection - Sanitary fixtures and fittings - Systems of sanitary plumbing - House drainage - House sewer connection.

Total Hours = 45

Text Books:

1. Garg, S.K., Environmental Engineering, Vols. I and II, Khanna Publishers, New Delhi, 1994
2. C.S.Shah, Water Supply and Sanitation, Galgotia Publishing Company, New Delhi, 1994.

References:

1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
2. Manual on Sewerage and Sewage Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1993
3. H.S.Peavy, D.R.Rowe and George Tchobanoglous, Environmental Engineering, McGraw-Hill Book Company, New Delhi, 1995.

rDNA TECHNOLOGY

Aim and Objectives:

A complete understanding of molecular techniques like DNA sequencing, restriction mapping, PCR for the cloning and expression of genes implication can be obtained through the course. The successful application of biotechnology largely depends on these advanced molecular techniques.

Unit I:

Introduction of rDNA Technology:

Role of genes within the Cell; DNA - Genetic material; Elucidation of genetic code; splicing; Genetic elements that control Gene expression; Isolation of enzymes, DNA sequencing, synthesis and mutation, detection and separation, gene expression, cloning and patenting of life forms, genetic engineering guidelines.

Unit II:

Isolation of genomic and nuclear DNA :

Methods for creation of r-DNA technology; Isolation of cloned genes; Complexity of genomes, Controlling gene expression & Transposable genes. Restriction mapping of DNA fragments and map construction.

Unit III:

Cloning and subcloning strategies of DNA :

Alternative Cloning Strategies -cloning interacting genes, two and three hybrid Systems, cloning differentially expressed genes, nucleic acid micro arrays, Screening of recombinant clones. Nucleic acid hybridization Hybridization, Probe designing, Nucleic acid blotting, Western hybridization, In situ hybridization, FISH.

Unit IV:

Synthesis and Construction of cDNA:

cDNA synthesis and cloning -mRNA enrichment, reverse transcription, DNA primers, linkers, adaptors and their chemical synthesis, Construction of cDNA and Genomic libraries, Polymerase chain reaction-Principle, Components, Applications Primer designing, DNA sequencing- Dideoxy chain termination method, Automated DNA sequencing, Analysis sequence of data.

Unit V:

Enzymes in Genetic Engineering :

Tools in r-DNA technology - Restriction endonucleases, methyl-transferases, Ligases, Polymerases, Kinase, Phosphatase, Nucleases; DNA and RNA markers, Lambda and M 13 phage -molecular Biology, r-DNA & Evolution, r-DNA in medicine, DNA based diagnosis of genetic diseases-Genetic counseling.

Prescribed Books:

1. "Principles of Gene manipulation" by R.W. Old and S.B. Primrose Third Edition Blackwell Scientific Publication 1985.
2. "Genes VI" by B. Lewin.
3. "From Genes to Clones" by E.L. Winnecker.

Reference Books:

1. Anselm F.M, Brent R, Kingston R.E, Moore D.D, Current Protocols in Molecular Biology, Greena Publishing Associates, NY, 1988.
2. Berger S.L, Kimmer A.R, Methods in Enzymology, Vol 152. Academic Press, 1987.
3. D.S.T. Nicholl, An introduction to genetic engineering, Cambridge Univ. Press, 1996.
4. Sasspm, Biotechnologies in developing countries present and future, UNESCO Publishers.
5. Steinberg, M., Guyden, J., Calhoun, D., Coico, R. and Staiaino-Coico, L. "Recombinant DNA Technology: Concepts and Biomedical Applications", Prentice Hall Publication.
6. Guyden, "Techniques for Gene Cloning and Expression," in Recombinant DNA Technology Concepts and Biomedical Applications, Steinberg et al.

Website Addresses:

- <http://www.ncbi.nlm.nih.gov/pubmed/7522477>.
- <http://www.ncbi.nlm.nih.gov/pubmed/2525837>.
- <http://www.ncbi.nlm.nih.gov/pubmed/8231874>.
- <http://nar.oxfordjournals.org/cgi/content/abstract/26/14/3451>.
- <http://www.ncbi.nlm.nih.gov/pubmed/2744488>.

MOLECULAR MODELING AND DRUG DESIGNING LAB

AIM

To develop basic knowledge in programming and data base.

OBJECTIVES

- ❖ To work with various protein modeling and molecular dynamics
- ❖ Ligand designing and
- ❖ Molecular docking

SYLLABUS

- Protein Homology modeling.
- Use of Molecular modeling to discover and design of drugs.
- Molecular modeling in drug discovery; Deriving and using 3D pharmacophore.
- Molecular Docking; Structure based methods to identify lead compounds, de novo ligand design; molecular similarity; Quantitative structure - activity relationships.
- Molecular Mechanics of Hydroxyl group, H₂O₂, Methanol, Amino Acids using Insight/Charm.
- Ring Conformations of Dimethylhexanes
- Study of Binding. Predict Binding Constants of Activity.
- Design Drug that acts as Nicotinamide.
- Conformational Energetics of Oligosaccharides
- Drug design using the accelrys scientific software Accord, Catalyst, Cerius2 & Insight II
- Ligand-Based and Structure-Based Drug Design
- Pharmaceutical drug targets identification & validation
- Automatic homology model generation
- Modeling and simulation of biological compounds
- Pharmacophore model development
- QSAR and 3D-QSAR Methods
- Lead Optimization
- Docking Methods for Structure-Based Drug Design
- ADME/Tox Predictions