BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
INSTRUCTION DIVISION
FIRST SEMESTER 2015-2016
Course Handout (Part - II B)

Date: 03-08-2015

In addition to part I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : PHA G541
Course Title : Computer Aided Drug Design
Instructor-in-Charge : Dr. S. Murugesan
Instructors : Mr. Subhash Chander, Mr. S.N.C. Sridhar

1. Scope and Objective of the Course:
To develop an appreciation of inter- and intra- molecular energies and forces. To introduce the techniques of computational chemistry and to demonstrate their application to the design of drugs. To demonstrate the use of simulation as an alternative to experimental work. On completion the student should be aware of the scope and limitations of the various theoretical and computational tools available to the pharmaceutical scientist and of the application of these techniques in the design of novel drugs. The student will also have gained insight into the practical implementation of the methods of molecular and bio-molecular modeling.

2. Text Book:
1. Manfred E Wolff- "Burger's Medicinal Chemistry and Drug Discovery", Wiley-Interscience, Fifth Edition, N.Y., 1995, Vol. I - V.

3. Reference Book:
1. P.K.Larson, T.Liljefors & U.Madsen- "Textbook of Drug Design and Discovery", 1st edition, Indian edition, Chennai, 2004.

Besides the above relevant information on the topics are also available in the following:
1. Annual Reports in Medicinal Chemistry - Academic Press Inc, Various volumes.
2. Journal of Medicinal Chemistry-ACS-Different Volumes.
3. Chemical Reviews-ACS-Various Volumes
4. Journal of Molecular Modeling - Springer-Verlag.
5. Journal of computer-aided molecular design – Kluwer Academic Publishers

4. Course Plan:

Lect No.	Objective	Topics to be covered	Reference
1-3	Introduction	Drug design overview, reason for failures of drugs, stages where computational methods can be used	T.B.
4-6	Drug likeliness	Drug likeliness criteria, lead likeliness, hurdles in drug discovery	T.B.
7-12	Protein structure determination and analysis	Crystallography, 2D NMR, homology modeling, de novo design and protein folding	T.B and Ref.(1)
13-16	Homology model building	Concept of homology and similarity, steps involved in homology model building	Reference (2)
17-20	Compound library design	Targeted Vs diverse libraries, fragment Vs reactions approach, synthetic accessibility and compound selection techniques	T.B. and Ref.(1)

21-23	QSAR	2D QSAR, descriptors, process for generating equation, 3D QSAR process, 3D QSAR packages	T.B.
24-26	ADMET predictions	Oral bioavailability, plasma half life, BBB permeability, toxicity predictions using computational methods	Various sources
27-29	Pharmacophore modeling	Components of pharmacophore tool, creating pharmacophore model from active compounds and active site, searching databases, reliability of results	T.B. and Ref.(1)
30-33	Docking	Molecular mechanics, force fields, search algorithms, scoring, validation of results, comparison of existing docking programmes, preparation of target, design of ligands, analysis of results	T.B. and various databases
34-36	De novo and other AI techniques	De novo building of compounds and process adopted	Reference book 2
37-38	Drug design process for known target	Finding out initial hits, compound refinement procedures, ADMET and drug resistance mechanisms	Ref. (1)
39-40	Drug Design process for unknown and other targets	Initial hits, compound refinement and ADMET; DNA, RNA, receptors as targets, targets inside cells, CNS, etc	T.B and Ref.(1)

6. Evaluation:

Component	Duration	Weightage (%)	Date & Time	Remarks
Mid term	90 min	30	10/10 10:00 - 11:30 AM	CB
Continuous evaluation*		40		OB
Comprehensive Exam	180 min	30	12/12 AN	CB and OB

***** Components, number and weightage of continuous evaluation will be announced in the class. It may be consist of take home assignment, tutorials, laboratory, presentation, seminars, viva-voce etc.

Reading Assignments: Students are advised to read, collect additional information on the above mentioned topics from journals and other online sources.

Attendance: Although attendance is not compulsory, regularity in theory and practical classes will be decisive factor during make-up and grading, especially in borderline cases.

Chamber Consultation Hour: To be announced in the class.

Make-up policy: Generally make-up will be considered for regular students only and make-up's are not given as a routine. It is solely dependent on the "genuineness" of the circumstance under which a student fails to appear in a scheduled evaluation component. However, the make-up application should be personally given to Instructor-in-Charge and not slipped into the chamber of the Instructor-in-Charge.

Notices: Concerning this course will be displayed on Pharmacy N. B.

Instructor-in-Charge
PHA G541