BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus
AUGS/ AGSR Division

SECOND SEMESTER 2020-21
COURSE HANDOUT

Date: 3.04.2021

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 G539**
Course Title : **Principles of Drug Discovery**
Instructor-in-Charge : **Richa Shrivastava**

1. Course Description: Concepts of cellular mechanisms and processes involving cell surface receptors, membrane-bound enzymes, protein kinases, proteases, integrins, transporters and channels that facilitate drug discovery, with special emphasis on non-communicable diseases such as neurological, neuropsychiatric diseases and disorders, metabolic disorders, cancer. siRNA, anti-sense oligonucleotides, transgenic animals in drug discovery, long non-coding RNA, emerging trends in receptor - drug trafficking

2. Scope and Objective of the Course: Upon completion of the course, the student will have an in-depth understanding of various targets of drug discovery like receptors, enzymes, kinases transporters etc. They will also learn the use of siRNA, oligonucleotides, miRNAs, plasmids, sequencing techniques and transgenic animals in the process of drug development.

3. Text Books:
1. Ramarao Poduri "Drug Discovery and Development: From Targets and Molecules to Medicines" Springer Singapore; 1st edition 2021

4. Reference Books:

1. Terry P. Kenakin "Pharmacology in Drug Discovery: Understanding Drug Response" Elsevier; 1st edition 2012

2. Benjamin E. Blass "Basic Principles of Drug Discovery and Development" Elsevier; 1st edition 2015

5. Additional reading:

Emerging trends and updates have to be obtained from journals in the area of pharmacology and drug discovery. Some recommended journals are:

1. Nature Drug Discovery

2. Trends in Pharmacological Sciences

3. Pharmacological reviews

4. Frontiers in Pharmacology

5. Acta Pharmacologica Sinica

6. British Journal of Pharmacology

7. Expert Opinion on Therapeutic Targets

6. Course Plan:

Module No.	Lecture Session	Reference	Learning outcomes
1.	Process of drug discovery and	Class notes	Basics of drug discovery

Introduction	development. Identification of target and lead optimization (L: 1-2)	TB RB-1,2	process and changed perceptions of targets
2. Drug Targets	Target Discovery- Target type and Druggability. Therapeutic Targets: Progress of Their Exploration and Investigation of Their Characteristics. Role of Enzymes, Ion channels, Transporters, integrins and Receptors as drug targets. Signaling mechanisms associated with receptors and their deregulations in various diseases (L: 3-5)	Class notes TB RB 1,2	Characteristics of targets and concept of druggability. Role of enzymes and receptors along with their signaling pathways in diseases and disorders.
3. Enzymes as Drug Targets	Common therapeutic approach to enzyme regulation. Mechanistic basis of enzyme inhibitor drugs New Enzyme targets in different diseases. (L: 5-7)	Class notes TB RB 1,2	Understanding of enzyme kinetics and its inhibition. Approaches to identify new enzyme targets.
4. Ion Channels as drug Targets	Regulation of ligand gated and voltage gated ion channels. Identification and validation of ion channels as targets Role of ion channels in different diseases. (L: 7-9)	Class notes TB RB 1,2	Targeting of ion channels against different diseases.
5. GPCRs as Drug targets	Trends in GPCR drug discovery Biased signaling as a novel mechanism of functional selectivity Role of GPCR signaling in different diseases (L: 10-15)	Class notes TB RB 1,2	Development of GPCRs as most successful drug targets. Harnessing its selective signaling for targeting various diseases.
6. Enzyme linked receptors as drug targets	Receptor Tyrosine kinase as drug targets in different diseases. Receptor serine/threonine kinase as drug targets in different diseases Receptor tyrosine phosphatases as drug target in different diseases (L: 16-20)	Class notes TB RB 1,2	Development of Receptor tyrosine kinases (RTKs), as drug targets for different diseases
7. Nuclear receptors as drug targets	Nuclear receptors as drug targets: A historical perspective of modern drug discovery Targeting the nuclear receptor–cofactor interaction 3. Nuclear receptors as drug	Class notes TB RB 1,2	Drug discovery from nuclear receptor perspective. Modulating nuclear receptor signaling in different diseases.

	targets for different diseases. (L: 21-24)		
8. Proteases as drug targets	Emerging principles in protease-based drug discovery Development of proteases as drug targets in different diseases (L: 25-28)	Class notes TB RB 1,2	Discovery of various proteases inhibitors to target different diseases.
9. Integrins as drug targets	Physiological role of integrins and its signaling 2. Intregrins and diseases 3. Therapeutic strategies to target integrins in different diseases (L: 29-32)	Class notes TB RB 1,2	Understanding of integrin signaling cascades and its exploitation as drug targets different diseases
10. Transporters as drug targets	Drug transport and targeting SLC transporters as therapeutic targets in various diseases Emerging opportunities in channelizing transporters as drug targets (L: 33-36)	Class notes TB RB 1,2	Emergence of role of membrane transporter as drug targets. Development of Solute carrier transporters as drug targets for various diseases
11. Long non-coding RNA as drug targets	Basic principles of miRNA targeting Intronic RNA and Repetitive RNA as novel targets for different disease. Using RNAi to identify and validate novel drug targets in various diseases Use of antisense oligonucleotides in functional genomics and target validation (L: 37-39)	Class notes TB RB 1,2	Understanding of role of long non-coding RNAs in regulation of gene expression in physiology and pathology. Use of siRNAs and antisense nucleotides as tools to alter gene expression.
9. Emerging trends in receptor - drug trafficking	Moving targets, immuno-conjugates, resealed erythrocytes (L: 40)	Class notes RB	New trends in pharmacological research.

7. Evaluation Scheme:

Component	**Duration**	**Weightage (%)**	**Date & Time**	**Nature of component (Close Book/ Open Book)**
Mid-Semester Test	90 Min.	35	<TEST_1>	Closed Book
Comprehensive Examination	3 h	40	<TEST_C>	Closed/open book
Assignment/presentation and quizzes	Continuous	25	Continuous	Closed/Open book

Assignment topics will be announced during the class. Regularity in attendance will be one of the criteria in deciding the borderline cases at the time of final grading as well as make-up's.

8. Chamber Consultation Hour: As discussed in the class [Email: richa.shrivastava@pilani.bits-pilani.ac.in]

9. Notices: Notices pertaining to this course will be posted on Nalanda or send via emails.

10. Make-up Policy: Make-Ups are not given as a routine. It is solely dependent upon the genuineness of the circumstances under which a student fails to appear in a scheduled evaluation component. In such circumstances, prior permission should be obtained from the Instructor-in-Charge. The decision of the Instructor-in-Charge in the above matter will be final.

11. Note (if any):

Instructor-in-charge
Course No. PHA G539