

Subject Code: 1RI3000102	Subject Title: Essentials of Disciplinary Research Subject-1 Subject Sub-Title: 'O'-mics
Pre-requisite Subject	

Objectives of course:

Learning outcomes:

Teaching Scheme (Credit Distribution)				Assessment Scheme (Weightage)	
Lecture	Tutorial	Practical	Credit	Hall Exam	Continuous Evaluation
4	--	--	4	60%	40%

Continuous evaluation is based on assignments/quiz/presentation/small projects as per the supervisor instructions.

Subject Content			
Unit	Topic	No. of Lecture	Weightage %
1	Genomics: DNA sequencing: Maxam-Gilbert Method, Sange's Method, Shotgun sequencing, Bridge PCR, High throughput Methods: Massively parallel signature sequencing (MPSS), Polony Sequencing, 454 Pyrosequencing, Illumina (Solexa) Sequencing, Combinatorial probe anchor synthesis (cPAS), SOLiD sequencing, Ion-Torrent semiconductor sequencing, DNA nanoball sequencing, Single molecule real time(SMRT) sequencing, Nanopore DNA sequencing, Micro-fluidic systems, Heliscope single molecule sequencing, various software's used for analysis and annotation, Comparative genomics, functional genomics, structural genomics		25%
2	Transcriptomics: Differential gene expression (DDRT, SSH, RNASeq, Chip-seq, cDNA AFLP, single cell transcriptomics) Microarray technology: DNA Microarray, Protein Microarray, Peptide microarray, miRNA array and sequencing, Generation of cDNA expression library, robotic arraying, hybridization on DNA chips Genotyping/SNP detection technology, comparative transcriptomics, Various software's used for transcriptomics analysis		20%

3	Proteomics: Protein structure and function relationship, Protein motifs and domains, Analysis by 2D gel electrophoresis, spot visualization and pickup, Peptide fingerprinting (trypsin digestion and Mass spectrometry (various ion sources, analyzers and detectors), DGGE Protein-Protein interactions: Solid phase ELISA, pull down assay, Yeast two hybrid system, Phage display Protein array: Definition, applications, diagnostics, expression profiling, automated technologies to generate protein arrays and chips		30%
4	Pharmacogenomics: Basic concepts about genetics diseases. Personalized medicine- introduction and importance. The genetics of therapeutic targets and gene-based targets. Pharmacogenomics necessity in drug designing. Structural influence in the Drug response. pharmacokinetics and pharmacodynamics, Efficacy and metabolism of drugs. Pharmacogenomics vs. Structural Pharmacogenomics. Drug metabolism pathways and adverse drug reactions.		25%

List of References:

- Discovering Genomics, Proteomics and Bioinformatics, A,M, Campbell, C,S,H, Press, (2003). []
- Essential of Genomics and Bioinformatics C,W, Sensen, Wiley (2003). []
- Hand book of Comparative Genomics: Principle and Methodology by Cecilia Saccone, Graziano Pesole, Wiley-LISS publication (2003). []
- Proteomics: From protein sequencing to function by S.R. Pennington and M.J. Dunn, Viva Books, Private Ltd (2001).
- Introduction to Proteomics by Daniel C, Liebler, Humana Press.

Subject Code: 1RI3000103	Subject Title: Essentials of Disciplinary Research Subject-2 Subject Sub-Title: Metabolic Engineering
Pre-requisite Subject	

Objectives of course:

Learning outcomes:

Teaching Scheme (Credit Distribution)				Assessment Scheme (Weightage)	
Lecture	Tutorial	Practical	Credit	Hall Exam	Continuous Evaluation
2	--	--	2	60%	40%

Continuous evaluation is based on assignments/quiz/presentation/small projects as per the supervisor instructions.

Subject Contents			
Unit	Topic	No. of Lecture	Weightage %
1	Introduction to Metabolism and Metabolic Engineering, Enzyme Kinetics, Analysis of Sequences of Reactions, Methods to Alter Gene Expression, Regulation of Metabolic Networks, Bioinformatics for reconstruction of metabolic networks (KEGG), Systems biology frameworks for metabolic engineering		40%
2	Metabolic flux balance analysis: Determine, Under determine and over determined systems, Metabolic Control analysis, Engineering of the central metabolism of <i>Escherichia coli</i> , Metabolic engineering of <i>Escherichia coli</i> for the production of aromatic compounds, Metabolic engineering for Golden Rice, Metabolic engineering of Maize to achieve fungal resistance, Metabolic Engineering of Wheat (2-3 aspects) Metabolic engineering of lactic acid bacteria for the production of nutraceuticals		60%

List of References:

- Metabolic Engineering by Sang Yup Lee and Eleftherios T Papoutsakis.(Power engineering: 23). ISBN : 0-8247-4875-1. ¶
- Metabolic Engineering (Biotechnology and Bioprocessing Series) by Sang Yup Lee - Hardcover, 1st Edition, 450 pages, CRC (1999) ISBN: 082477390X . ¶

- Pathway Analysis and Optimization in Metabolic engineering by Eberhard O Voit
ISBN 0521800382.
- Metabolic Engineering -by E Terry Papoutsakis Marcel Dekker Inc publisher (ISBN:
9780824773908).
- Metabolic Engineering: Principles and Methodologies by Gregory Stephanopoulos,
Jens Nielsen, George Stephanopoulos Publisher: Elsevier Science & Technology
Books Date Published: 1998 ISBN-13: 9780126662603 ISBN: 0126662606.