SEMESTER II
LSM4241 FUNCTIONAL GENOMICS

Prerequisite: LSM3231
Workload: 30 lecture hours + 20 tutorial, self-study and presentation hours
This module aims to introduce selected topics on functional genomics. Areas covered include: the assignment of functions to novel genes following the genome-sequencing projects of human and other organisms; the principles underlying enabling technologies: DNA microarrays, proteomics, protein chips, structural genomics, yeast two-hybrid system, transgenics, and aspects of bioinformatics and its applications; and to understand the impact of functional genomics on the study of diseases such as cancer, drug discovery, pharmacogenetics and healthcare.

S/N	Topics	Lecture Hours
1.	**Introduction** Understanding the human genome project, history and its significance. Genome sequencing strategies. Post-genomic era: functional genomics and comparative genomics. Challenges of bridging genomics with advances in transcriptomics and proteomics. Comparison of 'Reverse Genetics' and 'Classical Genetics'. **Genome sequencing:** Physical and Genetic linkage maps**,** single nucleotide polymorphisms (SNPs) **Epigenetics**: Emergence of epigenetics as a new field. Strategies for epigenetics and reading the 'histone code'. DNA methylation, histone modifications, gene transcription hotspots **RNA modifications**: splicing, RNA processing, gene product turnover, RNA interference **Functional Genomics tools**: Gene knockouts, random and site-directed mutagenesis, transposon mutagenesis, chemical mutagenesis, knockdown, gene therapy and current trends	8 Ganesh
2.	**DNA microarray: technologies and applications** Oligonucleotide and cDNA microarrays Gene expression a analysis Array comparative genomic hybridization Chromatin immunoprecipitation microarray Microarray experimental design and data analysis **Pharmacogenomics** SNPs (single nucleotide polymorphism) HAPs (Haplotypes) Personlized medicine **Lipidomics** Technologies Applications in diseases	8 Qingsong
3.	**Proteomics Methods and applications** Introduction Gel –based proteomics :2DE, 2D-DIGE MS-based proteomics : iCAT, iTRAQ, SILAC Proteomic analysis of post-translationally modified (PTM) proteins (Modificomics) Protein chips (microarrays) : Functional and analytical arrays Yeast proteme chip, cell microarrays, and tissue microarrays (TMA) Interaction proteomics (interactome) : large scale studies of protein-protein interactions Localizome: large scale study of cellular localization of proteins **Structural genomics** High throughput protein expression and structural analysis using NMR and x-ray diffraction **Applications of functional proteomics in :** Disease detection (e.g. cancer) Drug discovery	14 Max

Total Lectures: 30 hrs **Tutorials, Project Presentation and CA: 8 hrs** **Self-Study: 12 hrs**	
Total hours:	50h

MODE OF ASSESSMENT: 2 CAs: 40% (20% each); Semestral examination: 60%

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Lecturers:

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