

## Syllabus for Pre-PhD PAPER III

### Unit I:

Chromatin, Histones, Nucleosome, Nucleosome Structure, Chromatin organization, different levels of chromatin organization from nucleosomes to chromosomal territories (including topologically associated domains)

### Unit II:

Relationship between Stress, aging and 3D genome organization. Integrated Stress Response, Mitochondrial stress, and Aging. Changes in genome organization, gene expression and nucleosome dynamics in response to stress and aging. Methods of studying stress and aging.

### Unit III:

Modulation of Chromatin Structure, ATP dependent chromatin remodelling, Histone modifications and the enzymes involved (Acetylation, Methylation, Phosphorylation). Remodeller families, Domain compositions: (SWI/SNF family remodelers, ISWI family remodelers, CHD family remodelers), Role of various histone-modifications and ATP-dependent chromatin remodellers in shaping 3D genome organization.

### Unit IV:

Methods for studying the 3D architecture of the genome: chromosome conformation capture (3C), Hi-C and FISH. Global gene expression by RNA-Seq, Chromatin immuno precipitation coupled to next generation sequencing (ChIP-Seq), Methods of studying nucleosome dynamics; ATAC-seq and MNase-seq.