Epigenetic regulation refers to the set of heritable changes in gene expression that do not involve alterations to the underlying DNA sequence. Instead, this regulation modifies how genes are turned on or off, often in a cell-type-specific or developmentally controlled manner.

Key mechanisms of epigenetic regulation include:

DNA methylation – addition of methyl groups to cytosine residues, often leading to gene silencing.

Histone modifications – chemical changes to histone proteins (e.g. acetylation, methylation) that alter chromatin structure and gene accessibility.

Chromatin remodeling – dynamic changes to nucleosome positioning that regulate access to DNA.

Non-coding RNAs – such as microRNAs and long non-coding RNAs, which can regulate gene expression post-transcriptionally or affect chromatin.