**Title: Nucleic Acids: 2-RNA**

**Course Objectives**

* Understand the structure and types of RNA.
* Explore the functions of RNA in cellular processes.
* Introduce RNA synthesis and processing.

**Course Outline**

**I. Introduction to RNA**

* A. Definition of RNA
* B. Comparison with DNA
* C. Importance of RNA in biological systems

**II. Structure of RNA**

* A. Composition of RNA
  1. Nucleotides (ribose sugar, phosphate, nitrogenous bases)
  2. Differences between RNA and DNA (single-stranded vs. double-stranded)
* B. Types of RNA secondary structures
  1. Hairpins and loops
  2. Pseudoknots

**III. Types of RNA**

* A. Messenger RNA (mRNA)
  1. Role in protein synthesis
  2. Process of transcription
* B. Transfer RNA (tRNA)
  1. Function in translation
  2. Structure and amino acid attachment
* C. Ribosomal RNA (rRNA)
  1. Role in ribosome structure and function
  2. Types of rRNA in prokaryotes and eukaryotes
* D. Other types of RNA
  1. Small nuclear RNA (snRNA)
  2. MicroRNA (miRNA)
  3. Long non-coding RNA (lncRNA)

**IV. RNA Synthesis (Transcription)**

* A. Overview of the transcription process
  1. Initiation
  2. Elongation
  3. Termination
* B. Role of RNA polymerase
* C. Promoters and regulatory sequences

**V. RNA Processing**

* A. Capping and polyadenylation of mRNA
* B. Splicing and the role of spliceosomes
* C. Differences in RNA processing between prokaryotes and eukaryotes

**VI. Functions of RNA**

* A. Role in protein synthesis (translation)
* B. Regulatory functions (gene expression regulation)
* C. Catalytic roles (ribozymes)

**VII. Techniques for Studying RNA**

* A. RNA extraction methods
* B. Northern blotting
* C. RT-PCR (Reverse Transcription PCR)
* D. RNA sequencing

**VIII. Applications of RNA Knowledge**

* A. RNA-based therapeutics (RNA interference, mRNA vaccines)
* B. Biotechnology applications
* C. RNA in diagnostics and research

**Conclusion**

* Summary of key points
* Importance of RNA in various biological processes and technologies