

**GOVT. DEGREE COLLEGE BARAMULLA  
(AUTONOMOUS)**

**SEMESTER 3<sup>rd</sup> (NEP)**

**MAJOR/MINOR COURSE**

**SUBJECT: BIOTECHNOLOGY**

**Title: (MOLECULAR BIOLOGY)**

**Code: BTG322M**

CREDIT: (4+2) THEORY: 04; PRACTICAL: 02

CONTACT HOURS: 64 (T) + 64 (L)

**Course Objectives:**

1. Understand the structure and replication of DNA, including the semi conservative nature, bi-directional replication, and the role of DNA polymerases.
2. Gain knowledge of different types of DNA damage, mechanisms of DNA repair, and the concept of homologous recombination.
3. Comprehend the process of transcription in prokaryotes and eukaryotes, including the role of RNA polymerases, promoters, and RNA processing.
4. Explore the regulation of gene expression in prokaryotes through the operon concept and understand the characteristics of the genetic code.
5. Understand the process of translation, including ribosome structure, tRNA charging, initiation, elongation, termination.

***Expected Learning Outcomes:*** Students will be able to

1. Explain the process of DNA replication, including the semi conservative nature, bidirectional replication, and the role of DNA polymerases.
2. Understand the mechanisms of DNA repair, including various pathways.
3. Describe the process of transcription in both prokaryotes and eukaryotes, including the role of RNA polymerases, promoters, and enhancers.
4. Explain the process of translation, including the role of ribosomes, tRNA charging, and the mechanisms of initiation, elongation, and termination.
5. Analyze the regulation of gene expression in prokaryotes through the operon concept and understand the characteristics of the genetic code and its role in translation.
6. Isolate genomic DNA, plasmid DNA and RNA from different sources.

**UNIT I: DNA Structure and Replication**

**16 Hours**

DNA as genetic material, Structure of DNA, Types of DNA, Replication of DNA in prokaryotes and eukaryotes: Semi conservative nature of DNA replication, Bi-directional replication, DNA polymerases, The replication complex: Pre-priming proteins, primosome, replisome, Rolling circle replication, Unique aspects of eukaryotic chromosome replication, Fidelity of replication. End replication problem and telomerase, replication inhibiting drugs.

**UNIT II: DNA Damage and Repair**

**16 Hours**

DNA damage and repair: Types of mutations (base substitution, mis-sense, non-sense, deletion, insertion, frameshift, silent mutations, spontaneous and induced mutations).

Chemical and physical mutagens. Mechanism of DNA repair: Photo reactivation, base excision repair, nucleotide excision repair, mismatch repair, translesion synthesis, recombination repair, non homologous end joining. Homologous recombination (brief idea).

### **UNIT III: Transcription and RNA Processing**

**16 Hours**

RNA structure and types of RNA, Transcription in prokaryotes: Prokaryotic RNA polymerase, role of sigma factor, promoter, Initiation, elongation and, termination of RNA chains (Rho dependent and Rho independent). Difference between prokaryotic and eukaryotic transcription. RNA splicing and processing: processing of pre-mRNA: 5' cap formation, polyadenylation, splicing.

### **UNIT IV: Regulation of Gene Expression and Translation**

**16 Hours**

Regulation of gene expression in prokaryotes: Operon concept (inducible and repressible system- lac and trp operon), Genetic code and its characteristics, Prokaryotic and eukaryotic translation: ribosome structure and assembly, Charging of tRNA, aminoacyl tRNA synthetases, Mechanism of initiation, elongation and termination of polypeptides, Fidelity of translation, Inhibitors of translation.

### **PRACTICAL (2 CREDITS)**

1. Preparation of buffer solutions for Molecular Biology experiments (CTAB buffer, TE buffer, etc)
2. Isolation of genomic DNA from different sources
3. Isolation of plasmid DNA
4. Isolation of RNA from animal tissue/mammalian cells
5. Demonstration of AMES test or reverse mutation for carcinogenicity
6. Visit to a Molecular Biology Lab

### **SUGGESTED READINGS**

1. Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments. VI Edition. JohnWiley & Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
3. Watson, J. D., Baker T.A., Bell, S. P., Gann, A., Levine, M., and Losick, R., (2008) Molecular Biology of the Gene (VI Edition.). Cold Spring Harbour Lab. Press, Pearson Pub.
4. Molecular Biology by David Friefelder
5. Fundamentals of Molecular Biology, (2009)- Pal J.K. and Saroj Ghaskadbi, OxfordUniversity Press. India.
6. Instant Notes on Molecular Biology by P.C.Turner
7. A manual of "Introductory Practical Biochemistry", (2000), S. K. Sawhney, Randhir Singh- Narosa, 2000.

**GOVT. DEGREE COLLEGE BARAMULLA  
(AUTONOMOUS)**

**SEMESTER 3<sup>rd</sup> (NEP)**

**SKILL COURSE**

**SUBJECT: BIOTECHNOLOGY (SKILL COURSE)**

**TITLE: FOOD, PHARMA AND BEVERAGE INDUSTRIES - III**      **Code: BTG322S**  
**CREDIT: (2+2) THEORY: 02; PRACTICAL: 02**      **CONTACT HOURS: 32 (T) + 32 (L)**

**Course Objective:**

1. The objective of this course is to provide students with a comprehensive understanding of the beverage industry, including the production, processing, packaging, and marketing of various beverages.
2. This course will cover the major categories of beverages such as tea, coffee, soft drinks, alcoholic drinks, and energy drinks.
3. The course will also focus on the current trends and challenges facing the industry, as well as the regulatory and ethical issues associated with beverage production and consumption.
4. Additionally, this course will provide students with hands-on experience in the laboratory setting to reinforce their theoretical knowledge.

**Course Outcome:** After completing this course, students will be able to:

1. Demonstrate an understanding of the beverage industry, including the different types of beverages, their production, processing, and packaging.
2. Explain the current trends and challenges facing the industry, as well as the regulatory and ethical issues associated with beverage production and consumption.
3. Analyze the market demand and consumer preferences for different beverages.
4. Demonstrate practical skills in the laboratory setting, such as sensory analysis, product development, and quality control of beverages.

**Unit I: Introduction to the Beverage Industry (1 Credit)**

- 1.1 Introduction to Beverages: Definition, Classification, and History
- 1.2 Overview of Beverage Production and Processing
- 1.3 Beverage Packaging and Labeling
- 1.4 Beverage Marketing and Distribution
- 1.5 Regulatory and Ethical Issues in Beverage Industry

**Unit II: Types of Beverages and their production (1 Credit)**

- 2.1 Tea and Coffee: Production, Processing, and Marketing
- 2.2 Soft Drinks: Types, Formulation, and Packaging
- 2.3 Alcoholic Beverages: Types, Production (Beer), and Marketing
- 2.4 Energy Drinks: Composition, Effects, and Controversies
- 2.5 Emerging Trends in Beverage Industry

**Laboratory Work (2 Credits)**

1. Product Development of Beverages
2. Quality Control of Beverages
3. Beverage Packaging and Labeling
4. Marketing and Distribution of Beverages

*Note: All above Laboratory Work can be done by mandatory industrial visit to local or national Beverage production and Distribution plant.*

**Recommended Books:**

1. Food and Beverage Service by R. Singaravelavan
2. Beverage Technology by H. Panda
3. Food and Beverage Management by Dr. V. K. Kapoor
4. Food and Beverage Management by Chandan Sharma and KanchanKumari
5. Food and Beverage Service by Sudhir Andrews

**DEPARTMENT OF BIOTECHNOLOGY  
GOVERNMENT DEGREE COLLEGE BARAMULLA**

**SEMESTER 1<sup>st</sup> (NEP)**

**MULTIDISCIPLINARY COURSE**

**SUBJECT: BIOTECHNOLOGY**

**TITLE: (INTRODUCTION TO BIOTECHNOLOGY AND HUMAN HEALTH)**

**Code: BTG022I**

**THEORY (3 CREDITS: 48 HOURS)**

*Objective: This open elective course is aimed to*

- *Introduce students to basic concepts of biotechnology,*
- *Describe application of biotechnology to agriculture, human and animal health*
- *Comprehend contributions of biotechnology to forensic sciences and biomedical fields, such as diagnostics, genomics and therapeutics*

*Expected Learning Outcomes:*

1. *Understanding of basic applications of biotechnology.*
2. *Understanding of some of the applications of biotechnology in agriculture.*
3. *Understanding of some of the applications of biotechnology in human health.*

**Unit – 1: Introduction to Biotechnology (16 Hours)**

Definition, Scope and Milestones in Biotechnology.

Traditional and Modern Biotechnology, Different branches of Biotechnology

**Unit – 2: Applications of Biotechnology in Agriculture (16 hours)**

Applications of biotechnology in Agriculture; Plant tissue culture, Concept of transgenic and GM crops (Bt cotton, Bt brinjal, golden rice); Increasing shelf life of fruits, Nutraceuticals and edible vaccines

**Unit -3: Biotechnology in Human health and forensics (16 hours)**

Introduction to vaccines; Use of Biotechnology in diagnosis, Gene therapy; Pre-natal diagnosis, genetic counseling; Forensic applications- Solving crimes of murder and rape

**BOOKS RECOMMENDED**

1. Biotechnology for Beginners: Reinhard Renneberg Academic Press Elsevier Inc.
2. Biotechnology Demystified: Sharon Walker
3. Biotechnology, Satyanarayana, Books & Allied Ltd.