



## Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

### Shri Vaishnav Institute of Science

#### Department of Life Science

#### B.Sc. (Major - Biotechnology)

#### SEMESTER IV

| COURSE CODE | Category | COURSE NAME                       | TEACHING & EVALUATION SCHEME  |                  |                         |                               |                         |    |   |   |         |
|-------------|----------|-----------------------------------|-------------------------------|------------------|-------------------------|-------------------------------|-------------------------|----|---|---|---------|
|             |          |                                   | THEORY                        |                  |                         | PRACTICAL                     |                         | Th | T | P | CREDITS |
|             |          |                                   | END SEM<br>University<br>Exam | Two Term<br>Exam | Teachers<br>Assessment* | END SEM<br>University<br>Exam | Teachers<br>Assessment* |    |   |   |         |
| BSCBT401    | Major    | Genetics and<br>Molecular Biology | 60                            | 20               | 20                      | 30                            | 20                      | 4  | - | 4 | 6       |

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

**\*Teacher Assessment shall be based following components: Quiz / Assignment / Project / Participation in Class, given that no component shall exceed more than 10 marks.**

#### Course Objectives:

1. Knowledge of basics in genetics and classical genetics covering prokaryotic / phage genetics to yeast and higher eukaryotic domains.
2. Concepts of Mendelian genetics, population genetics, quantitative genetics encompassing complex traits, clinical genetics and genetics of evolution.
3. Study of Genome Organization and its dynamics
4. Study of DNA replication, damage and repair
5. Study of transcription and translation


#### Course Outcomes:


1. Understanding of fundamental molecular principles of genetics and the relationship between phenotype and genotype.
2. Understanding the basics of genetic mapping and regulation of gene expression.
3. Understanding the basic genetic mechanisms at the molecular level
4. Understanding the molecular mechanism of mutation
5. Understanding the process of transcription and translation


#### Unit – I

##### A. Genetics

Mendelian Laws of genetics, Dominance, Segregation, Independent Assortment; Epistasis, Complementary ratio and supplementary ratio, Cytoplasmic inheritance; plastid and kappa particles.

  
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**BSCBT401 Genetics and Molecular Biology**

Linkage and crossing over (Coupling and repulsion hypothesis) Mechanism of crossing over and its significance.

Mechanism of sex determination (Chromosomal theory), sex linked inheritance.

**Unit-II**

Chromosome morphology, classification, karyotyping; Specialized chromosomes-Polytene and Lamp brush chromosome,

Structural and numerical chromosomal aberrations.

Chromosome related disorders: Klinefelter's syndrome, Turner's syndrome, Down's syndrome and Cri-du-chat syndrome

Mutations- Spontaneous and induced, Chemical and physical mutagens, Molecular basis of mutation.

**Unit-III**

**B. Molecular Biology**

Transformation, Conjugation and transduction in bacteria; Gene mapping in bacteria;

Prokaryotic and eukaryotic DNA replication and Transcription, Processing of m-RNA, Splicing, DNA and RNA polymerases

**Unit-IV**

Prokaryotic and Eukaryotic Translation - Mechanism of initiation, elongation and termination.

Gene regulation in Eukaryotic system – Promoters, enhancers elements and gene amplification.

**Unit –V**


Genetic Code and Translation


Correspondence of amino acid sequence in proteins; Properties of genetic code- universal code, degeneracy and redundancy, Wobble hypothesis;


Co- and post-translational modifications- Antisense RNA.

**PRACTICAL II [Genetics + Molecular Biology]**

1. Solving problems on monohybrid and dihybrid ratios, multiple alleles, epistasis.
2. Solving problems on quantitative inheritance.
3. Inheritance patterns in human – Pedigree analysis.
4. Solving problems on localization of genes

  
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5. Isolation of plasmid DNA.
6. Isolation of DNA from plant cells.
7. Isolation of DNA from human whole blood.
8. Determination of purity and concentration of DNA - Spectrophotometric method.


**BOOKS:**

1. Gardner, E. J., Simmons, M. J., & Snustad, D. P. (2006). Principles of Genetics. (8th Ed.). John Wiley & Sons.
2. Griffiths, A. J.F., Doebley, J., Peichel, C., & Wassarman, D. A. (2020). An introduction to Genetic Analysis. (12th Ed.). W.H. Freeman publication.
3. Hartl, D. L., & Jones, E. W. (1998). Genetics: Principles and Analysis. (4th Ed.). Sudbury, MA: Jones and Bartlett.
4. Alberts, B., Johnson, A. D., Lewis, J., Morgan D., Raff, M., Roberts, K., & Walter, P. (2015). Molecular Biology of the Cell. (6th Ed.). New York: Garland Science.
5. Brown, T. A. (2017). Genomes 4. (4th Ed.). Wiley Publishers (Asia Pvt Ltd).
6. Freifelder, D. (2012). Molecular Biology. (5th Ed.). Narosa Publishing House, India.
7. Krebs, J. E., Goldstein, E. S., & Kilpatrick, S. T. (2017). Lewin's Genes XII. (12th Ed.). Jones and Barlett Inc. USA.

  
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| BSCCH401    | Minor    | Applied Chemistry | 60                            | 20               | 20                      | 30                            | 20                      | 4  | - | 4 | 6       |

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#### Course Educational Objectives (CEOs):

After completion of this course the students are expected to demonstrate the following skills, knowledge, and attitudes.

1. Enable the students to apply basic concepts, and applications of Heavy inorganic chemicals.
2. To study the preparation and applications of different types of catalysts and solvents.
3. To provide the theoretical understanding of applied industrial techniques as Bio-transformation, MAOS and their practical applications.
4. The purpose of the course is to make the students to understand the determination of cations, anions, analysis of Water quality as DO, BOD, COD, and analysis of Oils, Fats, Paint.

#### Course Outcomes (COs):

After completion of this course the students are expected to demonstrate the following skills, knowledge, and attitudes. Student will be able to understand:

1. Theoretical understanding of microwave induced reactions, sonochemistry and applications
2. The preparation and industrial application of different catalysts and solvents.
3. The industrial manufacturing process, and applications of economically important heavy inorganic chemicals.
4. Sampling and analytical procedure of water and wastewater, oils, fats, paints.


#### Syllabus


##### Unit I: Heavy Inorganic Chemicals


Basic concept of heavy inorganic chemicals and manufacture of following with reference to: (i) Raw material, (ii) Production process, (iii) Quality control, (iv) Hazards and safety, of the following chemicals - Ammonium phosphates, super phosphate, triple super phosphate, carbon blacks, manufacture of graphite and carbon, calcium carbide, silicon carbide, sodium thiosulphate, borax and boric acid.

##### Unit II: Catalysts and Solvents

Introduction, preparation, synthetic application of the following catalysts - Raney Nickel,

  
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