



SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

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| DEPARTMENT OF BIOTECHNOLOGY | | |
| B.E/B.Tech/M.E/M.Tech : B.Tech - Biotechnology | | LP: BT22404 |
| Regulation | : 2022 | Rev. No: 00 |
| PG Specialisation | : NA | Date: |
| Sub. Code / Sub. Name | : BT22404 / GENETICS AND MOLECULAR BIOLOGY | 23/01/2024 |
| Unit | : 1 | |

Unit Syllabus: LAWS OF INHERITANCE**9h**

Laws of inheritance: Mendel's Laws - dominance, segregation, independent assortment; Chromosome theory of inheritance, Concept of alleles, types of dominance, lethal alleles, multiple alleles, test of allelism, complementation.

Objective: To explain the laws of inheritance.

| Session No * | Topics to be covered | Ref | Teaching Aids |
|--|---|---------------------------|-------------------------------|
| 1. | Laws of inheritance: Mendel's Laws - dominance | TB3 (1-2) | Blended Mode, Animations & BB |
| 2. | Laws of inheritance: Mendel's Laws - segregation | TB3 (2-5) | PPT & BB |
| 3. | Laws of inheritance: Mendel's Laws - independent assortment | TB3 (11) | Animations & BB |
| 4. | Chromosome theory of inheritance | TB3 (6-7) | PPT & BB |
| 5. | Concept of alleles | TB3 (7) | PPT & BB |
| 6. | Types of dominance | TB3 (7-10) | Animations & BB |
| 7. | Lethal alleles | TB3 (18-19) | PPT & BB |
| 8. | Multiple alleles | TB1 (18-20) RB2 (6-8) | PPT & BB |
| 9. | Test of allelism, complementation | TB2 (19-24) RB1 (7-11) | Animations & BB |
| Content beyond syllabus covered (if any): NIL | | | |

* Session duration: 50 minutes



Sub. Code / Sub. Name : **BT22404 / GENETICS AND MOLECULAR BIOLOGY**

Unit : 2

Unit Syllabus: LINKAGE, MAPPING AND CHROMOSOMAL CHANGES 9h

Epistasis, Linkage and Gene Mapping, Penetrance and Expressivity, Changes in Chromosome number and structure: Euploidy, Aneuploidy, chromosomal rearrangements - deletion, duplication, inversion, and translocation.

Objective: To explain the role of alleles, allelism and epistasis.

| Session No * | Topics to be covered | Ref | Teaching Aids |
|--------------|---|--------------------------------|-----------------|
| 10. | Epistasis | TB1 (7-9) RB1 (11-14) | PPT & BB |
| 11. | Linkage and Gene Mapping | TB1 (11-13) RB1 (16-19) | Animations & BB |
| 12. | Penetrance | TB3 (16-17) | PPT & BB |
| 13. | Expressivity | TB3 (18-19) | Animations & BB |
| 14. | Changes in Chromosome number and structure: Euploidy | TB1 (20-24) RB2 (8-12) | PPT & BB |
| 15. | Changes in Chromosome number and structure: Aneuploidy | TB2 (28-30) RB1 (11-14) | PPT & BB |
| 16. | Chromosomal rearrangements: Deletion | TB2 (44-46) RB2 (32-38) | Animations & BB |
| 17. | Chromosomal rearrangements: Duplication | TB2 (81-84) RB1 (69-72) | PPT & BB |
| 18. | Chromosomal rearrangements: Inversion and Translocation | TB2 (101-104) RB2 (121-124) | PPT & BB |

Content beyond syllabus covered (if any): NIL

* Session duration: 50 mins



Sub. Code / Sub. Name : **BT22404 / GENETICS AND MOLECULAR BIOLOGY**

Unit : 3

Unit Syllabus: DNA REPLICATION AND REPAIR MECHANISM

9h

DNA as a genetic material, Classical experiments by Griffith, Hershey and Chase, Avery, McLeod and McCarty. Biological significance, structure and physicochemical properties of elements in DNA and RNA. Overview of Central dogma- Organization of prokaryotic and eukaryotic chromosomes. DNA replication: Meselson & Stahl semiconservative replication, Bidirectional DNA replication, theta replication, rolling circle replication. DNA mutations and repair mechanism.

Objective: To explain about the principle of DNA replication.

| Session No * | Topics to be covered | Ref | Teaching Aids |
|--------------|---|------------------------------|-----------------|
| 19. | DNA as a genetic material | TB3 (107-110) RB2 (44-46) | Animations & BB |
| 20. | Classical experiments by Griffith, Hershey and Chase, Avery, McLeod and McCarty | TB3 (111-115) RB2 (47-48) | PPT & BB |
| 21. | Biological significance, structure, and physicochemical properties of elements in DNA | TB3 (116-117) RB2 (48-49) | PPT & BB |
| 22. | Biological significance, structure, and physicochemical properties of elements in RNA | TB3 (107-110) RB2 (50-51) | Animations & BB |
| 23. | Overview of Central dogma | TB3 (111-114) RB2 (51-53) | PPT & BB |
| 24. | Organization of prokaryotic and eukaryotic chromosomes | TB3 (114-115) RB2 (53-55) | PPT & BB |
| 25. | DNA replication: Meselson & Stahl semiconservative replication, Bidirectional DNA replication | TB3 (115-117) RB2 (56-58) | Animations & BB |
| 26. | Theta replication, Rolling circle replication | TB3 (114-119) RB2 (59-60) | PPT & BB |
| 27. | DNA mutations and repair mechanism | TB3 (120) RB2 (60-61) | PPT & BB |

Content beyond syllabus covered (if any): NIL

* Session duration: 50 mins



Sub. Code / Sub. Name : **BT22404 / GENETICS AND MOLECULAR BIOLOGY**

Unit : 4

Unit Syllabus: TRANSCRIPTION AND TRANSLATION

9h

Structure and function of mRNA, rRNA and tRNA, Initiation, elongation and termination of RNA synthesis, Basic concepts in RNA world: Ribozymes, RNA processing: 5'- Capping, Splicing- Poly 'A' tail addition and base modification, Genetic code, Codon degeneracy- Wobble hypothesis and its importance- Prokaryotic and eukaryotic ribosomes- Steps in translation: Initiation, Elongation and termination of protein synthesis- Inhibitors of protein synthesis- Post translational modifications and its importance.

Objective: To explain the steps involved in mRNA and protein production.

| Session No * | Topics to be covered | Ref | Teaching Aids |
|--------------|---|----------------------------|-----------------|
| 28. | Structure and function of mRNA, rRNA, and tRNA | TB3 (14-18) | Animations & BB |
| 29. | Initiation, elongation and termination of RNA synthesis | TB3 (18-19) RB2 (65) | Animations & BB |
| 30. | Basic concepts in RNA world: Ribozymes | TB3 (20-24) RB2 (66-67) | PPT & BB |
| 31. | RNA processing: 5'- Capping, Splicing- Poly 'A' tail addition and base modification | TB3 (25-27) RB2 (68) | PPT & BB |
| 32. | Genetic code, Codon degeneracy- Wobble hypothesis and its importance | TB3 (28-32) | PPT & BB |
| 33. | Prokaryotic and eukaryotic ribosomes | TB3 (33-37) RB2 (72-74) | Animations & BB |
| 34. | Steps in translation: Initiation, Elongation and termination of protein synthesis | TB3 (37-39) RB2 (75) | PPT & BB |
| 35. | Inhibitors of protein synthesis | TB3 (40-47) | PPT & BB |
| 36. | Post translational modifications and its importance | TB3 (47-49) RB2 (76-77) | PPT & BB |

Content beyond syllabus covered (if any): NIL

* Session duration: 50 mins



Sub. Code / Sub. Name : **BT22404 / GENETICS AND MOLECULAR BIOLOGY**

Unit : 5

Unit Syllabus: GENE REGULATION

9h

Organization of genes in prokaryotic and eukaryotic chromosomes- Hierarchical levels of gene regulation, Inducible, Repressible operon, Prokaryotic gene regulation- lactose (lac), tryptophan (trp) and arabinose (ara) operon- Regulation of gene expression with reference to λ phage life cycle.

Objective: To explain the mechanism of gene regulation.

| Session No * | Topics to be covered | Ref | Teaching Aids |
|--------------|--|------------------------------|-----------------|
| 37. | Organization of genes in prokaryotic chromosomes | TB3 (16-19) RB2 (21-27) | PPT & BB |
| 38. | Organization of genes in eukaryotic chromosomes | TB3 (21-27) RB2 (30-33) | PPT & BB |
| 39. | Hierarchical levels of gene regulation | TB3 (111-120) RB2 (35-38) | Animations & BB |
| 40. | Inducible operon | TB3 (121-124) RB2 (29-41) | Animations & BB |
| 41. | Repressible operon | TB3 (121-125) RB2 (42-44) | PPT & BB |
| 42. | Prokaryotic gene regulation: lactose (lac) operon | TB3 (114-119) | PPT & BB |
| 43. | Prokaryotic gene regulation: tryptophan (trp) operon | TB3 (128-131) RB2 (42-47) | Animations, BB |
| 44. | Prokaryotic gene regulation: arabinose (ara) operon | TB1 (121-125) RB2 (47-49) | PPT & BB |
| 45. | Regulation of gene expression with reference to λ phage life cycle | TB2 (119-121) | PPT & BB |

Content beyond syllabus covered (if any): NIL

* Session duration: 50 mins



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Sub. Code / Sub. Name : **BT22404 / GENETICS AND MOLECULAR BIOLOGY**

REFERENCES:**Text Books:**

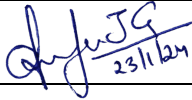

1. Klug W. S. and Cummings M. R, "Concepts of Genetics", 12th Edition, Prentice Hall, 2019.
2. Benjamin A Pierce, "Genetics-a Conceptual Approach", 7th Edition, W H Freeman & Company, 2019.
3. Krebs, J. E., Goldstein, E. S., Kilpatrick, S. T, Lewin's GENES XII. Japan: Jones & Bartlett Learning, 2017.

Reference Books:

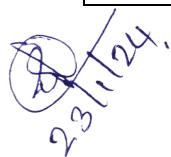
1. Freifelder, D., Cronan, J. E., Maloy, S. R Microbial genetics. Boston: Jones and Bartlett Publishers, 1994.
2. Lewis, J., Johnson, A., Alberts, B., Shamo, A. E., Khin-Maung Gyi, F. A., Raff, M., Hunt., Walter, P., Roberts, K, Molecular Biology of the Cell. United Kingdom: Garland Science, 2002.

YouTube Video:

1. <https://www.youtube.com/playlist?list=PLODKZZeKAWb8-X2nbdiO304TFKBZeWg8b>

| | Prepared by | Approved by |
|-------------|--|--|
| Signature |  23/1/24 |  23/1/24 |
| Name | Dr. Aswin Jen J G | Prof. E. Nakkeeran |
| Designation | Assistant Professor | Head - Biotechnology |
| Date | 23/01/2024 | 23/01/2024 |

Remarks: The same lesson plan will be followed in the subsequent semester.


23/1/24