



P.B. SIDDHARTHA COLLEGE OF ARTS & SCIENCE

Siddhartha Nagar, Vijayawada – 520 010
Autonomous - ISO 9001 - 2015 Certified

Title of the Paper: CELL BIOLOGY, CELLULAR METABOLISM, GENETICS, ORGANIC EVOLUTION AND ANIMAL BEHAVIOUR

Offered to: BSc.BZC with Program code US03

Course Type: Core (TH)

Year of Introduction: 2021 -2022

Year of Revision:

Percentage of Revision:

Semester: III

Credits: 4

Hours Taught: 60
Hours

Max. Time: 3

Course Prerequisites:

Basic knowledge of cytology, genetics, evolution acquired in Intermediate

Course Description:

This course will provide one with a basic and comprehensive understanding of Cell Biology. Enable the student with depth of topics and helps them to gain an appreciation of Cellular Metabolism. On the other hand, importance of understanding Genetics and Organic evolution, a part from these the student will be enhanced with the knowledge of Animal Behaviour.

OBJECTIVES

- To study cell as basic unit of life, different cell organelles and their metabolism.
- To understand the mechanism and patterns of evolution
- To study the manipulation of genetic material in living organisms. Application of genetics in improving the economically important animals, genetical relation between and amongst the animals.
- To study the behavioral patterns in various animals.

COURSE OUTCOMES:

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|------------|--|
| CO1 | <u>To understand the basic unit of the living organisms and to differentiate the organisms by their cell structure. Describe fine structure and function of plasma membrane and different cell organelles of eukaryotic cell.</u> |
| CO2 | <u>To understand the history of origin of branch of genetics, gain knowledge on heredity, interaction of genes, various types of inheritance patterns existing in animals</u> |

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|------------|--|
| CO3 | <u>Acquiring in-depth knowledge on various of aspects of genetics involved in sex determination, human karyotyping and mutations of chromosomes resulting in various disorders</u> |
| CO4 | <u>Understand the central dogma of molecular biology and flow of genetic information from DNA to proteins.</u> |
| CO5 | <u>Understand the principles and forces of evolution of life on earth, the process of evolution of new species and apply the same to develop new and advanced varieties of animals for the benefit of the society</u> |

Syllabus:

| | | |
|------------|---|---------------------|
| I | <u>Cell Biology</u> <u>1.1. Electron microscopic structure of animal cell. 2Hours</u> <u>1.2. Structure and functions of Golgi complex, Endoplasmic Reticulum and Lysosomes 3Hours</u> <u>1.3. Structure and functions of Ribosomes and Mitochondria 4Hours</u> <u>1.4. Structure and functions of Chromosomes (Polytene and Lamp brush chromosomes) 3Hours</u> <u>1.5. Structure and functions of Nucleus and its components 2Hours</u> | <u>14hrs</u> |
| II | <u>CELLULAR METABOLISM</u> <u>2.1. Biomolecules</u> <u>2.1.1. Carbohydrates - Classification of carbohydrates; Structure of glucose 3 Hours</u> <u>2.1.2. Proteins - Classification of proteins; General properties of amino acids 2 Hours</u> <u>2.1.3. Lipids - Classification of lipids 1 Hour</u> <u>2.2. Carbohydrate metabolism – Glycogen metabolism, Gluconeogenesis 2 Hours</u> <u>2.3. Protein metabolism - Transamination, Deamination and Urea Cycle 3 Hours</u> | <u>11hrs</u> |
| III | <u>GENETICS</u> <u>3.1. Gene interactions (lethal genes, Epistasis & Pleiotropy) 3Hours</u> <u>3.2. DNA damage and repair 3Hours</u> <u>3.3. Human karyotyping and amniocentesis 2Hours</u> <u>3.4. Autosomal and allosomal disorders (Klinefelter syndrome, Turner Syndrome, Down syndrome, Phenylketonuria, Alkaptonuria & Sickle cell anaemia) 3 Hours</u> | <u>11hrs</u> |
| IV | <u>ORGANIC EVOLUTION</u> <u>4.1. Modern synthetic theory of evolution 2 Hours</u> <u>4.2. Variations 1 Hour</u> | <u>10hrs</u> |

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| V | <u>4.3. Isolating mechanisms</u> <u>2 Hours</u> | <u>14hrs</u> |
| | <u>4.4. Types of natural selection (directional, stabilizing & disruptive)</u> <u>1 Hour</u> | |
| | <u>4.5. Artificial selection</u> <u>1 Hour</u> | |
| | <u>4.6. Speciation – allopatry and sympatry.</u> <u>1 Hour</u> | |
| | <u>4.7. Microevolution vs. Macroevolution (Example: Darwin finches)</u> <u>2 Hours</u> | |
| | <u>ANIMAL BEHAVIOUR</u> | |
| | <u>5.1. Ethology and its branches.</u> <u>1 Hour</u> | |
| | <u>5.2. Concepts of Ethology (motivation, fixed action patterns, releasers, learning)</u> <u>6 Hours</u> | |
| | <u>5.3. Biological clocks</u> <u>1 Hour</u> | |
| | <u>5.4. Biological rhythms (Circadian, Circalunar and Circannual)</u> <u>3 Hours</u> | |
| | <u>5.5. Sexual behaviour in animals (Intra sexual selection & Inter sexual selection)</u> <u>1 Hour</u> | |
| | <u>5.6. Colouration & Mimicry</u> <u>2 Hours</u> | |

Co-curricular activities (Suggested)

- Model of animal cell
- Working model of mitochondria to encourage creativity among students
- Photo album of scientists of cell biology
- Charts on plasma membrane models/cell organelles
- Observation of Mendelian / Non-Mendelian inheritance in the plants of college botanical garden or local village as a student study project activity
- Observation of blood group inheritance in students, from their parents and grand parents
- Karyotyping and preparation of pedigree charts for identifying diseases in family history
- Charts on chromosomal disorders
- Charts on central dogma/lac operon/genetic code
- Model of semi-conservative model of DNA replication
- Model of tRNA and translation mechanism
- Power point presentation of transcription or any other topic by students
- Draw geological time scale and highlight important events along the time line
- Chart on industrial melanism to teach directed selection, Darwin's finches to teach genetic drift, collection of data on weight of children born in primary health centers to teach stabilizing selection etc.

TEXT BOOKS:

1. Lodish, Berk, Zipursky, Matsudaria, Baltimore, Darnell 'Molecular Cell Biology' W.H.Freeman and company New York.
2. Cell Biology by De Robertis

3. Bruce Alberts, Molecular Biology of the Cell
4. Rastogi, Cytology
5. Varma & Aggarwal, Cell Biology
6. C.B. Pawar, Cell Biology

RECOMMENDED REFERENCE BOOKS

7. Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). Principles of Genetics. VIII Edition. Wiley India.
8. Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V Edition. John Wiley and Sons Inc.
9. Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics. X Edition. Benjamin Cummings.
10. Russell, P. J. (2009). Genetics- A Molecular Approach. III Edition. Benjamin Cummings.
11. Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. Introduction to Genetic Analysis. IX Edition. W. H. Freeman and Co.
12. Ridley, M. (2004). Evolution. III Edition. Blackwell Publishing
13. Molecular Biology by freifelder
14. Instant Notes in Molecular Biology by Bios scientific publishers and Viva Books Private Limited
15. Hall, B. K. and Hallgrimsson, B. (2008). Evolution. IV Edition. Jones and Bartlett Publishers
16. Campbell, N. A. and Reece J. B. (2011). Biology. IX Edition, Pearson, Benjamin, Cummings.
17. Douglas, J. Futuyma (1997). Evolutionary Biology. Sinauer Associates.
18. Minkoff, E. (1983). Evolutionary Biology. Addison-Wesley.
19. James D. Watson, Nancy H. Hopkins 'Molecular Biology of the Gene'
20. Jan M. Savage. Evolution, 2nd ed, Oxford and IBH Publishing Co., New Delhi.
21. Gupta P.K., 'Genetics

Course Delivery method: Face-to-face / Blended.

Course has focused on: Foundation

Websites of Interest:

Cytology:

<https://www.youtube.com/watch?v=URUJD5NEXC8&t=175s>

https://www.youtube.com/watch?v=ipa1vmQ7H_4

<https://www.youtube.com/watch?v=IA0DhWDTUpU>

<https://www.youtube.com/watch?v=AMVvVBTxszM>

Cellular Metabolism

<https://www.youtube.com/watch?v=lkoDv6ggRjE>

<https://www.youtube.com/watch?v=z2JEDeGkfCc>

<https://www.youtube.com/watch?v=-3TmDPzyBeY>

<https://www.youtube.com/watch?v=D5RdWVBAN1c>

<https://www.youtube.com/watch?v=wxDIYXCttU0>

Genetics:

<https://www.youtube.com/watch?v=0X4W9YspDQs>

https://www.youtube.com/results?search_query=genetic+disorders

https://www.youtube.com/results?search_query=epistasis

https://www.youtube.com/results?search_query=pleiotropy

Evolution:

https://www.youtube.com/results?search_query=origin+of+life+

https://www.youtube.com/results?search_query=lamarckism

https://www.youtube.com/results?search_query=genetic+drift

Animal Behaviour

https://www.youtube.com/results?search_query=ethology+and+its+branches

https://www.youtube.com/results?search_query=biological+clocks+and+circadian+rhythms+

https://www.youtube.com/results?search_query=kinesis+and+taxis

https://www.youtube.com/results?search_query=gene+expression

Signature of the Course In-charge

Ch. Venkateswarlu

Venkateswarlu

Ch.

Signature of the Program In-charge

HOD

Signature of the

SEE MODEL PAPER

Time: 3 Hours

Max. Marks: 75

Draw neat labeled diagrams wherever necessary.

SECTION –A

Answer and **FIVE** of the following

5x5=25 Marks

1. Lysosomes are called suicidal bags of the cell. Justify. **CO1,L5**
2. Describe the structure and functions of ribosomes **CO1,L2**
3. Explain urea cycle. **CO2,L2**
4. List out the general properties of amino acids **CO2,L1**
5. Analyse the cause and symptoms of Klinefelter syndrome **CO3,L4**

6. Industrial melanism is an example of directional natural selection. Justify. **CO4,L5**
7. Explain the significance of coloration in animals **CO5,L3**
8. Explain circadian rhythms with suitable examples. **CO5,L2**

SECTION – B

Answer any **FIVE** of the following **5X10=50 Marks**

9. Describe the structure and functions of mitochondria. **CO1,L1**
OR
Describe the structure and functions of Golgi complex. **CO1,L1**
1. Classify carbohydrates basing on their structure. **CO2,L2**
OR
Describe the various steps involved in glycogen metabolism. **CO2,L1**
2. Explain epistasis with suitable examples. **CO3,L2**
OR
Describe the process of human karyotyping. **CO3,L2**
12. Analyze the various aspects of Modern Synthetic Theory of evolution. **CO4,L4**
OR
Explain how the different isolating mechanisms support the formation of new species. **CO4, L4**
13. Explain how animals survive through their motivated behavior. **CO5,L2**
OR
Explain the significance of biological clocks in animals. **CO5,L2**



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**Title of the Paper: CELL BIOLOGY, CELLULAR METABOLISM,
GENETICS, ORGANIC EVOLUTION AND ANIMAL BEHAVIOUR**

Offered to: BSc BZC with Program code US03

Course Type: Practical

Year of Introduction: 2021 -2022

Year of Revision:

Percentage of Revision:

Semester: III

Credits: 2

Hours Taught: 30
Hours

Max.Time: 3

Course Prerequisites:

Basic knowledge of genetics, evolution acquired in Intermediate

Course Description:

This course will provide one with a basic and comprehensive understanding of Cell Biology. Enable the student with skill in depth of topics and helps them to gain an appreciation of Cellular Metabolism. On the other hand, importance of understanding Genetics and Organic evolution, a part from these the student will be enhanced with the knowledge of Animal Behaviour.

SYLLABUS

Learning Objectives:

- Acquainting and skill enhancement in the usage of laboratory microscope
- Hands-on experience of different phases of cell division by experimentation
- Develop skills on human karyotyping and identification of chromosomal disorders
- To apply the basic concept of inheritance for applied research
- To get familiar with phylogeny and geological history of origin & evolution of animals.

I. Cell Biology

- 1. Preparation of temporary slides of Mitotic divisions with onion root tips**
- 2. Observation of various stages of Mitosis and Meiosis using permanent slides**
- 3. Mounting of salivary gland chromosomes of *Chironomus***

II. Cellular Metabolism

- 1. Estimation of total proteins in given solutions by Lowry's method.**
- 2. Estimation of total carbohydrate by Anthrone method.**

III. Genetics

- 1. A, B, O blood typing. Problems based on Blood grouping.**
- 2. Karyotyping of human chromosomes [Human karyotype figure on paper should be cut in to different sets of chromosomes and students are asked to arrange them in an order and comment on the ideogram]**
- 3. Identification of genetic syndromes given on charts.**
- 4. Pedigree Analysis**

IV. Evolution

- 1. Study of fossil evidences**
- 2. Study of homology and analogy from suitable specimens and pictures**
- 3. Phylogeny of horse with pictures**
- 4. Darwin finches (pictures)**

V. Animal Behaviour

- 1. Protective behaviour**
 - **Protective colouration in *Octopus***
 - **Protective behaviour in *Sepia***
 - **Protective behaviour in *Chamaeleon***
- 2. Social behaviour**
 - **Social insects- honey bees and white ants**
 - **Parental care in fishes (*Hippocampus*)**
 - **Parental care in amphibians (*Ichthyophys*)**
 - **Migration in fishes (*Anguilla & Hilsa*)**
- 3. Nesting behaviour**
 - **Spider web**
 - **Bee hive**
 - **Bird nests**
- 4. Submission of a mini project on Animal Behaviour (05 marks)**

Suggested Manuals

1. Genetics Laboratory Manual - Earnst Brown Babcock, Julius Lloyd Collins
2. Genetics Laboratory Investigations - Thomas L Mertens, Robert L.Hammersmith.
3. Laboratory Manual for Practical Biochemistry -Shivaraja Shankara Y.M

Course Delivery method: Face-to-face / Blended.

Course has focused on: Skill Development

Websites of Interest:

Cell Biology:

- <https://www.youtube.com/watch?v=5-ur7bWqIDQ>
<https://www.youtube.com/watch?v=A-mFPZLLbHI>
<https://www.youtube.com/watch?v=sm3X6HThJNQ>

Cellular Metabolism

- https://www.youtube.com/watch?v=HRdWFsP_L2k
<https://www.youtube.com/watch?v=i3gNsLVW4qA>

Genetics:

- https://www.youtube.com/watch?v=3f_eisNppnc
<https://www.youtube.com/watch?v=wSKk1olojvo>
https://www.youtube.com/watch?v=mBq1ULWJp_M

Evolution

- <https://www.youtube.com/watch?v=iYr3sYS9e0w>
<https://www.youtube.com/watch?v=8Qc-8ZPqtnU>
<https://www.youtube.com/watch?v=HOhBZbjToAA>

Animal Behaviour

<https://www.youtube.com/watch?v=xmj-vz-TaK0>

<https://www.youtube.com/watch?v=4TkEUeDWWT4>

<https://www.youtube.com/watch?v=kol44rRh6fQ>

https://www.youtube.com/watch?v=xGaT0B_2DM

<https://www.youtube.com/watch?v=hcJfR6WdH3g>

<https://www.youtube.com/watch?v=GKQuON4qB2Q>

<https://www.youtube.com/watch?v=zNtSAQHNONo>

<https://www.youtube.com/watch?v=RewbGiiBFd4>

Co-curricular Activities:

- Observation of blood group inheritance in students, from their parents and grand parents
- Karyotyping and preparation of pedigree charts for identifying diseases in family history
- Charts on chromosomal disorders
- Charts on central dogma/lac operon/genetic code
- Model of semi-conservative model of DNA replication
- Model of tRNA and translation mechanism
- Power point presentation of transcription or any other topic by students
- Draw geological time scale and highlight important events along the time line

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SEE MODEL PAPER

Time: 2 Hrs
40M

Max. Marks

1. Describe ABO blood typing. Identify the given sample.

- i. Procedure: 05
- ii. Table: 03

10M

- iii. Report: 02

2. Human pedigree analysis

M

5

3. Identify, draw a labelled diagram and write classification and behavioural comments upon

A, B, C, D and E

5 X 3 =

15M

- A. Prophase
- B. Down's Syndrome
- C. Bird's wing
- D. Anguilla
- E. Bee hive

Identification : 1M
Diagram : 1M
Comments: 1M

3. Mini Project on Animal Behaviour

5M

4. Practical Record Book

5M