## SEMESTER S3

## BIOCHEMISTRY

| | | | |
|---|---|---|---|
| **Course Code** | **PCBBT302** | **CIE Marks** | 40 |
| **Teaching Hours/Week (L: T:P: R)** | 3:0:1:0 | **ESE Marks** | 60 |
| **Credits** | 4 | **Exam Hours** | 2 Hrs. 30 Min. |
| **Prerequisites (if any)** | Basic knowledge in biology and chemistry | **Course Type** | Theory |

**Course Objectives:**

1. To understand the structure of the various biomolecules and their metabolism
2. To understand the role of energy in the biochemical process in living organism.

## SYLLABUS

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| 1 | Biomolecules-Structure, chemistry and reactions<br>Carbohydrate: simple sugars and polysaccharides, complex carbohydrates<br>Lipids-: fatty acids, phospholipids and sphingolipid, cholesterol, steroids, prostaglandins<br>Proteins: primary, secondary, tertiary and quaternary structure of proteins, membrane proteins<br>Nucleic acids: primary structure, secondary, tertiary structure of DNA & RNA | 11 |
| 2 | Metabolism of Biomolecules<br>Overview of metabolism (aerobic, anaerobic, anabolic, catabolic). Techniques used in the study of metabolism (principle only -tracer, chromatography). Major metabolic Pathways:(Pathway and regulation) Glycolysis, TCA cycle, Gluconeogenesis, HMP pathway, Glycogen Metabolism: Glycogenesis, glycogenolysis. | 11 |
| 3 | Metabolism of Biomolecules<br>Biosynthesis of saturated fatty acids, β-oxidation pathway (only saturated fatty acids), ketone bodies, biosynthesis and degradation of aromatic amino acids, Transport of fatty acid into mitochondria, Carnitine shuttle: | 11 |

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| | | |
|---|---|---|
| | General reactions of amino acid metabolism: transamination, transdeamination, oxidative deamination and decarboxylation, Urea cycle and regulation. | |
| **4** | Bioenergetics:<br>Electron Transport Chain & Oxidative phosphorylation: sequence of electron carriers: sites of ATP synthesis, inhibitors of electron transport chain. Chemiosmotic theory, inhibitors and uncouplers, Malate aspartate and glycerol-3-phosphate shuttle. Photosynthesis: light reaction, cyclic and noncyclic photophoshorylation, dark reaction, fixation of $CO_2$ and formation of carbohydrate, C3 and C4 plants, photorespiration, CAM pathway | **11** |

**Course Assessment Method**
**(CIE: 40 marks, ESE: 60 marks)**

**Continuous Internal Evaluation Marks (CIE):**

| Attendance | Assignment/ Microproject | Internal Examination-1 (Written) | Internal Examination- 2 (Written) | Total |
|---|---|---|---|---|
| **5** | **15** | **10** | **10** | **40** |

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**End Semester Examination Marks (ESE)**

*In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions*

| Part A | Part B | Total |
|---|---|---|
| • 2 Questions from each module.<br>• Total of 8 Questions, each carrying 3 marks<br>**(8x3 =24marks)** | • Each question carries 9 marks.<br>• Two questions will be given from each module, out of which 1 question should be answered.<br>• Each question can have a maximum of 3 sub divisions.<br>**(4x9 = 36 marks)** | **60** |

## Course Outcomes (COs)

At the end of the course students should be able to:

| Course Outcome | | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Understand the structure and reactions of the cellular biomolecules. | **K2** |
| **CO2** | Describe biosynthetic pathways and understand the key aspects of metabolism. | **K3** |
| **CO3** | Explain cellular energy requirements and their production | **K4** |

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

## CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | | 2 | 2 | | 3 | 2 | | | | | 2 |
| **CO2** | 3 | | 2 | 2 | | 3 | 2 | | | | | 2 |
| **CO3** | 3 | | 2 | 2 | | 3 | 2 | | | | | 2 |

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Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

| Text Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Principles of Biochemistry | Albert Lehninger, David L Nelson, Michael M Cox, | CBS Publishers & Distributors, Delhi | Principles of Biochemistry |
| **2** | Biochemistry | Donald Voet, Judith G. Voet | Publisher: John Wiley & Sons | Biochemistry |
| **3** | Fundamentals of Biochemistry | J.L.Jain, Sanju Jain & Nitin Jain | Chand and Co Ltd | Fundamentals of Biochemistry |

| Reference Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Biochemistry | LubertStryer | W.H Freeman and Company, New York | Biochemistry |

| Video Links (NPTEL, SWAYAM…) | |
|---|---|
| **Module No.** | **Link ID** |
| **1** | https://archive.nptel.ac.in/courses/102/106/102106087/<br>https://archive.nptel.ac.in/courses/102/106/102106087/ |
| **2** | https://archive.nptel.ac.in/courses/102/106/102106087/ |
| **3** | https://youtu.be/DOy1fSRV5mU |
| **4** | https://archive.nptel.ac.in/courses/102/106/102106087/<br>https://archive.nptel.ac.in/courses/102/106/102106087/ |

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