

| GANPAT UNIVERSITY                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |                  |    |                                      |                            |                        |     |       |
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| FACULTY OF ENGINEERING & TECHNOLOGY |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |                  |    |                                      |                            |                        |     |       |
| Programme                           | Bachelor of Technology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |    |                  |    | Branch/Spec.                         |                            | Biomedical Engineering |     |       |
| Semester                            | II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |    |                  |    | Version                              |                            | 1.0.0.0                |     |       |
| Effective from Academic Year        | 2026-27                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |                  |    | Effective from the batch admitted in |                            | July 2026              |     |       |
| Course Code                         | 2BSC1103                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |    |                  |    | Course Name                          |                            | Biology for Engineers  |     |       |
| Course Category                     | Basic Science Courses (BSC)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |    |                  |    |                                      |                            |                        |     |       |
| Teaching Scheme                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |                  |    |                                      | Examination scheme (Marks) |                        |     |       |
| (Per week)                          | Lecture (DT)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |    | Practical (Lab.) |    | Total                                |                            | CE                     | SEE | Total |
|                                     | L                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | TU | P                | TW |                                      |                            |                        |     |       |
| Credit                              | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0  | 1                | 0  | 3                                    | Theory                     | 50                     | 50  | 100   |
| Hours                               | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0  | 2                | 0  | 4                                    | Practical                  | 25                     | 25  | 50    |
| Pre-requisites:                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |                  |    |                                      |                            |                        |     |       |
| Not Applicable                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |                  |    |                                      |                            |                        |     |       |
| Course Outcomes                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |                  |    |                                      |                            |                        |     |       |
| COs                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |    |                  |    |                                      |                            |                        |     |       |
| CO1                                 | <b>Explain</b> the organization of a human body, homeostasis and its maintenance, basic structure and functions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                  |    |                                      |                            |                        |     |       |
| CO2                                 | <b>Explain</b> about biomolecules its structure, function and their role in a living organism. <b>How</b> biomolecules are useful for human body.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |    |                  |    |                                      |                            |                        |     |       |
| CO3                                 | <b>Define</b> the cells, its structure and functions, and different types of cells and basis for classification of living organisms.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |    |                  |    |                                      |                            |                        |     |       |
| CO4                                 | <b>Understand</b> the structure and function of various types of tissues and their role.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |    |                  |    |                                      |                            |                        |     |       |
| Theory Syllabus                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |                  |    |                                      |                            |                        |     |       |
| Unit                                | Content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |                  |    |                                      |                            |                        |     | Hours |
| 1                                   | Body Environment & Control:<br>Definition: Anatomy, Physiology, Anatomical planes and directions, Level of structural complexity, Homeostasis: Negative feedback mechanism, Positive feedback mechanism, Survival needs of the body, Introduction to study of illness.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |    |                  |    |                                      |                            |                        |     | 5     |
| 2                                   | Biochemistry Of Life:<br>Overview Macromolecules and Micro molecules, <b>Protein:</b> classification, peptides, structure of protein and its type of bonds, globular protein (Haemoglobin), keratin protein and enzymes, functions of protein, <b>Carbohydrate:</b> structure of Carbohydrate, chemical and physical properties of Carbohydrates such as Monosaccharaides, Disaccharides and Polysaccharides, functions of Carbohydrate, <b>Lipids:</b> Define Phospholipid, Classification of Lipids, structure and functions of Fat, <b>Nucleic Acids:</b> Terms of Nucleotides & Nucleosides, structure of Nucleic acids, types of Nucleotides, structure of DNA and RNA and its functions.<br>Vitamins, Hormones, Electrolytes: basic introduction of vitamins, hormones and electrolytes, Acid, alkalis and pH, Movement of substances in body, Body fluid. |    |                  |    |                                      |                            |                        |     | 10    |
| 3                                   | The Cell:<br>Detailed Structure and functions of Cell, Cell Membrane, Cell organelle and Nucleus, Cell Membrane models, Membrane junctions, Membrane Transport, Endocytosis and Exocytosis, Cell Organelles such as Ribosomes, Endoplasmic Reticulum – role in Protein synthesis, Golgi apparatus, Lysosomes, Mitochondria, Cytoskeletal elements, Microtubules, and Microfilaments, functions of mitotic spindle, Cell Cycle, Cell Division, Cell cycle- Mitosis, meiosis and their significance.                                                                                                                                                                                                                                                                                                                                                               |    |                  |    |                                      |                            |                        |     | 10    |

|                                                                                                             |                                                                                                                                                                      |   |
|-------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 4                                                                                                           | The Tissue:<br>Definition of Tissue, Classification of tissue, Structure and functions of Epithelial tissue, Muscular tissue, Connective tissue, and Nervous Tissue. | 5 |
| <b>Practical and Self Learning Content</b>                                                                  |                                                                                                                                                                      |   |
| Practical, assignments, quiz, industrial visit, field survey and tutorials are based on the above syllabus. |                                                                                                                                                                      |   |
| <b>Text Books</b>                                                                                           |                                                                                                                                                                      |   |
| 1                                                                                                           | Anatomy and physiology in Health and Illness by Ross and Wilson, Pub: Churchill Livingstone 13e.                                                                     |   |
| 2                                                                                                           | Textbook of Medical Physiology By: Guyton and Hall, 12e.                                                                                                             |   |
| <b>Reference Books</b>                                                                                      |                                                                                                                                                                      |   |
| 1                                                                                                           | Cooper, G.M., Hausman, R.E. The Cell: A molecular approach. ASM Press and Sinauer Asso., 6e.                                                                         |   |
| 2                                                                                                           | De Robertis, E.D.P. Cell and Molecular Biology. Lippincott Williams and Williams, 8e.                                                                                |   |
| <b>ICT/MOOCs Reference</b>                                                                                  |                                                                                                                                                                      |   |
| 1                                                                                                           | BODY Software                                                                                                                                                        |   |
| 2                                                                                                           | Video Lecture & Presentation slides from physio.net                                                                                                                  |   |

| <b>Mapping of COs, POs, and PSOs</b> |     |     |     |     |     |     |     |     |     |      |      |      |      |      |
|--------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| COs                                  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
| CO 1                                 | 3   | 2   | 0   | 0   | 0   | 0   | 2   | 1   | 3   | 3    | 3    | 3    | 2    | 2    |
| CO 2                                 | 3   | 1   | 0   | 0   | 0   | 0   | 2   | 2   | 3   | 2    | 2    | 2    | 1    | 2    |
| CO 3                                 | 3   | 2   | 0   | 0   | 0   | 0   | 2   | 1   | 3   | 3    | 3    | 3    | 2    | 2    |
| CO 4                                 | 3   | 1   | 0   | 0   | 0   | 0   | 2   | 2   | 3   | 3    | 3    | 3    | 2    | 3    |

| <b>Bloom's Taxonomy Level</b> |                            |             |                |           |
|-------------------------------|----------------------------|-------------|----------------|-----------|
| Unit                          | Unit Title                 | Aligned COs | Learning Hours | BTL Level |
| 1                             | Body Environment & Control | C01         | 5              | R         |
| 2                             | Biochemistry Of Life       | C02         | 10             | R         |
| 3                             | The Cell                   | C03         | 10             | U         |
| 4                             | The Tissue                 | C04         | 5              | R         |

**Note:**

- Version 1.0.0.0 (First Digit= New syllabus/Revision in Full Syllabus, Second Digit=Revision in Teaching Scheme, Third Digit=Revision in Exam Scheme, Forth Digit= Content Revision)
- 1 Hour Lecture = 1 Credit, 1 Hour Tutorial = 1 Credit, 2 Hours Practical = 1 Credit, 2 Hours Internship/Project/Seminar = 1 Credit
- Bloom's Taxonomy Level (BTL) : R: Remember, U: Understand, A: Apply, N: Analyze, E: Evaluate, and C: Create