

Written Test Syllabus for M. Tech. (Biomedical Engineering) Admission

AY 2026-27

The written test will consist of two sections. All candidates must attempt both:

- **Section A: Mathematics**
- **Section B: One of the following (choose exactly one):**
 - **B1: Physiology, or**
 - **B2: Biology**

Candidates are **not** allowed to attempt both B1 and B2.

Each candidate must specify one section as their **Primary** section and the other as their **Secondary** section. The following combinations are allowed:

- Primary A, Secondary B1
- Primary A, Secondary B2
- Primary B1, Secondary A
- Primary B2, Secondary A

Marks will be weighted as follows:

- **Primary section:** 75% of the total score
- **Secondary section:** 25% of the total score

Each section will contain **10 multiple-choice questions**, with:

- **+2 marks** for each correct answer
- **-1 mark** for each incorrect answer (negative marking)

Use of a **basic scientific calculator (Casio FX-82MS or an equivalent/lower model)** is permitted. Candidates must bring their own calculators.

Mobile phones, smart watches, and other electronic devices are strictly prohibited.

The syllabus for each section will be comparable in level to **GATE 2026** or an equivalent national examination. The detailed syllabus for each section is provided below.

Section A: Engineering Mathematics (GATE BME)

- Linear Algebra: Matrix algebra, systems of linear equations, eigenvalues and eigenvectors.
- Calculus: Mean value theorems, theorems of integral calculus, partial derivatives, maxima and minima, multiple integrals, Fourier series, vector identities, line, surface, and volume integrals, Stokes', Gauss', and Green's theorems.
- Differential Equations: First-order linear and nonlinear differential equations, higher-order linear differential equations with constant coefficients, method of separation

of variables, Cauchy's and Euler's equations, initial and boundary value problems, and solution of partial differential equations.

- Analysis of Complex Variables: Analytic functions, Cauchy's integral theorem and integral formula, Taylor's and Laurent's series, residue theorem.
- Probability and Statistics: Sampling theorems, conditional probability, mean, median, mode, and standard deviation, random variables, discrete and continuous distributions: normal, Poisson, and binomial distributions; tests of significance, statistical power analysis, and sample size estimation; linear regression and correlation analysis.
- Numerical Methods: Matrix inversion, numerical solutions of nonlinear algebraic equations, iterative methods for solving differential equations, numerical integration.

Section B1: Human Anatomy and Physiology (GATE BME)

Basics of cell, types of tissues and organ systems; homeostasis; basics of organ systems – musculoskeletal, respiratory, circulatory, excretory, endocrine, nervous, gastrointestinal and reproductive.

Section B2: Biology (GATE BT)

- Biochemistry: Biomolecules – structure and function; biological membranes – structure, membrane channels and pumps, molecular motors, action potential and transport processes; basic concepts and regulation of metabolism of carbohydrates, lipids, amino acids and nucleic acids; photosynthesis, respiration and electron transport chain.
- Enzymes – classification, catalytic and regulatory strategies; enzyme kinetics – Michaelis–Menten equation; enzyme inhibition – competitive, non-competitive and uncompetitive inhibition.
- Microbiology: Bacterial classification and diversity; microbial ecology – microbes in marine, freshwater, and terrestrial ecosystems; microbial interactions; viruses – structure and classification; methods in microbiology; microbial growth and nutrition; nitrogen fixation; microbial diseases and host–pathogen interactions; antibiotics and antimicrobial resistance.
- Immunology: Innate and adaptive immunity; humoral and cell-mediated immunity; antibody structure and function; molecular basis of antibody diversity; T cell and B cell development; antigen–antibody reaction; complement; primary and secondary lymphoid organs; major histocompatibility complex (MHC); antigen processing and presentation; polyclonal and monoclonal antibodies; regulation of immune response; immune tolerance; hypersensitivity; autoimmunity; graft-versus-host reaction; immunization and vaccines.
- Genetics and Evolutionary Biology: Mendelian inheritance; gene interaction; complementation; linkage, recombination, and chromosome mapping; extra-chromosomal inheritance; microbial genetics – transformation, transduction and conjugation; horizontal gene transfer and transposable elements; chromosomal

variation; genetic disorders; population genetics; epigenetics; selection and inheritance; adaptive and neutral evolution; genetic drift; species and speciation.

- Cell Biology: Prokaryotic and eukaryotic cell structure; cell cycle and cell growth control; cell–cell communication; cell signalling and signal transduction; post-translational modifications; protein trafficking; cell death and autophagy; extracellular matrix.
- Molecular Biology: Molecular structure of genes and chromosomes; mutations and mutagenesis; regulation of gene expression; nucleic acids – replication, transcription, splicing, translation and their regulatory mechanisms; non-coding and microRNA; RNA interference; DNA damage and repair.