

GUJARAT UNIVERSITY

Ahmedabad – 380009,

Gujarat,

India.



SYLLABUS

M. Phil.

In

BIOMEDICAL TECHNOLOGY



GUJARAT UNIVERSITY

DEPARTMENT OF ZOOLOGY, BMTC & HG

University School of Sciences

Ahmedabad – 380009, Gujarat, India.

M. Phil. in Biomedical Technology (BMTC)

The recent advances in biological Sciences have proved that the present training is inadequate for any meaningful research in present scenario, as all living systems are directly and indirectly interdependent. Interdisciplinary and integrated approach is very necessary for any significant contribution in modern Sciences in general and in Life Sciences in particular. Hence the course which was started in 1982 with same aim, revised regularly according to latest developments and discoveries, which will impart a broad training in various disciplines of Life Sciences, so that a student passing this course will be well equipped to meet challenges of academic and research of Life Sciences. These students will be able to pursue careers in pharmaceutical industries, research laboratories, clinical research organizations, school, colleges and Universities.

M. Phil. Syllabus

Effective from June 2012

1. There shall be four papers each of four hours (3+1) duration and dissertation.
2. The major emphasis of this Course is to motivate students for improvement through regular internal assessment .They should be encouraged for self study and seminar according to allotted times of the course per week.
3. Each theory paper is divided into five units. Each unit will have equal weightage of teaching and while setting question paper.
4. Question or its sub question including the options will be set from the same unit.
5. The elective papers will be offered as per availability of the expert faculty and feasibility of the department and schedule of teaching.
6. There shall be at least one study tour during the span of two years of P.G. study, pertaining to different Life Sciences/ Microbiological/ Environmental/ Biotechnological/ Pharmaceutical industries/ research institutes/ various ecosystems, even outside Gujarat State. The study tour is highly essential for study various concepts, processes and technology pertaining to Life Sciences.

| Course No. | Course Name | Hours Per Week | Credits | Marks | | |
|------------------------|--|----------------|-----------|-----------|------------|------------|
| | | | | Internal | External | Total |
| Paper I (601) | Research Methodology | 60 | 4 | | 75 | 75 |
| Paper II (602) | Immunology & Haematology | 60 | 4 | | 75 | 75 |
| Paper III (603) | Biotechnology & its Applications | 60 | 4 | | 75 | 75 |
| Paper IV (604) | Practical / Projects / Experiments / Field work / Seminar / Review | 60 | 4 | 75 | | 75 |
| Paper v (605) | Dissertation | | 8 | | 80 + 20 | 100 |
| Total | | | 24 | 75 | 325 | 400 |

M. Phil Syllabus

BMT 601 PAPER-I: RESEARCH METHODOLOGY (75 Marks)

(Computer Skill, Writing of Research Proposal and Project)

UNIT- I: RESEARCH METHODS and RESEARCH PROPOSAL

- **INTRODUCTION:** Meaning, objectives and types of research, significance of research. Definition and identification of a research problem, justification, theory of hypothesis.
- **RESEARCH DESIGN:** Features of a good design, concepts of variables, experimental and control groups. Hypothesis testing.
- **REPORTING:** Significance of report writing, steps in report writing and types of reports, writing of research proposal.

UNIT- II: SEPARATION TECHNIQUES

- **CENTRIFUGATION:** Preparative and Analytical Centrifuge, Ultracentrifuge
- **SPECTROSCOPY:** UV, IR, Atomic absorption and Mass spectroscopy, MALDI - PAGE
- **ELECTROPHORESIS:** SDS-PAGE, 2-D gel electrophoresis, Agarose gel electrophoresis
- **CHROMATOGRAPY:** Types of Column chromatography, HPTLC, GC, HPLC.

UNIT- III: MOLECULAR BIOLOGY and IMMUNOTECHNIQUES AND MICROSCOPY

- **Tracer based techniques: RIA, IRMA, ELISA, Autoradiography, PCR and its variations**
- **Blotting techniques, RFLP, RAPD, AFLP, ISSR, SSR, FISH and GISH**
- **PET, CAT, Micro CT, MRI**
- **Phase Contrast Microscopy, DIC, Fluorescence Microscopy, Confocal Microscopy**
- **TEM, SEM, STEM, Special Techniques**
- **Specimen preparation for Light and Electron Microscopy**
- **Flow cytometry and its applications.**

UNIT – IV: BIOSTATISTICS and BIOINFORMATICS

- **Biological database, Proteomics, Genomics, Applications of Bioinformatics**
- **Mean, Median and Mode; Standard Error and Standard deviation**
- **T-test, Chi-square test (χ^2), Regression**
- **Sampling distribution, Variance and Co-variance, ANOVA**
- **Probability distributions (Binomial, Poisson & Normal)**
- **Difference between parametric & non-parametric statistics.**

BMT 602 PAPER-II: IMMUNOLOGY and HAEMATOLOGY

(75 Marks)

UNIT- I: IMMUNOLOGY and IMMUNOTECHNOLOGY

- Genetic basis of antibody diversity and antibody engineering, Clonal selection
- Primary and secondary immune modulation
- Inflammation, Congenital and acquired immunodeficiencies, Autoimmunity
- Immune Response: MHC, HLA Complex,
- Complement fixation pathway
- Cytokines, Toll like receptors
- Types of Vaccines, Transplantation immunology
- Monoclonal and Polyclonal antibody
- Haematopoiesis and Control
- Blood groups and its applications
- Types of Anaemia, Blood bank.

UNIT- II: CELL and CELL CULTURES

- Laboratory, equipments and conditions for animal cell culture
- Establishment of primary cell culture (Measurement of viability and cytotoxicity, growth parameters); Culture media for animal cell culture and their requirements.
- Cell synchronization of animal cells and characterization.

- Mass cultivation, Cell bank, Applications of Stem cells
- Cell differentiation
- Cell Organelles
- Cell Aging
- Cell cycle and its Regulation
- Cancer
- Transgenic animals.

UNIT- III: TOXICOLOGY

- Types of toxicity and toxic effects, Factors influencing toxicity.
- Toxicants and classification of toxicants, Teratogenesis, Pesticides, Food additives, contaminations; Air, water and soil pollutants.
- Estimation of toxicity: LD50, LC50; Genotoxicity.

UNIT- IV: CLINICAL PATHOLOGY

- Disorders of Cell and Tissue
- Disorders of Blood cells and Heart
- Disorders of Respiratory tract
- Disorders of Digestive tract
- Disorders of Excretory systems
- Disorders of Nervous system
- Disorders of Reproductive system
- Disorders of bones, joints and cartilages
- Autoimmune disorders
- Disorders of skin, muscles.

BMT 603 PAPER-III: Biotechnology and its Applications

(75 Marks)

UNIT- I: MOLECULAR ENDOCRINOLOGY

- Cell junctions, Cell-Cell interaction and Communications
- G-Protein coupled receptors and its regulation, Secondary messengers
- Mechanism of Signal Transduction
- Reactive Oxygen Species (ROS), Antioxidants and its mechanism
- Drug trial and basics of clinical research
- Endocrine glands and their disorders.

UNIT- II: BIOTECHNOLOGY and GENETICS

- Basics of genetic engineering- molecular tools of genetic engineering, Host cells,
- DNA isolation and purification
- Cloning vectors and gene cloning, Recombinant DNA technology, Gene therapy
- Human Genome project and future perspective
- Genetic disorders and its management

UNIT- III: MICROBIOLOGY and PARASITOLOGY

- Microbial fermentations: Organic acid (citric acid), Amino acid (glutamic acid)

- **Types of fermenters**
- **Biofertilizers, Microbial production of biogas**
- **Bioremediation, biotransformation and biodegradation**
- **GMO's and their impacts.**
- **Parasites and their life history, diagnosis and treatment.**

UNIT- IV: REPRODUCTIVE TECHNOLOGIES

- **Male and female reproductive systems**
- **Fertilization**
- **ART methods**
- **Sperm function and Testing**
- **Infertility in male and female**
- **Fertility regulation**
- **Prenatal diagnosis**
- **Hormones and reproduction.**

BMT 604 PAPER-IV: Seminar, Field work and Review Writing
(75 Marks)

SEMINAR: Seminar to be delivered on a relevant theme

FIELD WORK: Visit to industry/National institute and interaction with experts
(Report to be submitted)

REVIEW: Preparation and submission of review article based on research papers addressing a contemporary research problem.

OTHER ACTIVITIES: Attending National / International workshop / Symposium / Conferences or participation for oral / poster presentation or interaction with M.Sc students for problem solving approaches / Work of Nobel laureates in last ten years in Science.

BMT 605 PAPER-V: DISSERTATION (100 Marks)