

Syllabus for M. Phil., Biotechnology



Since 1951

PG & Research Department of Biotechnology

JAMAL MOHAMED COLLEGE

College with Potential for Excellence

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Tiruchirappalli – 620 020.

PG & RESEARCH DEPARTMENT OF BIOTECHNOLOGY
JAMAL MOHAMED COLLEGE (AUTONOMOUS)
TIRUCHIRAPPALLI-620020
M.PHIL COURSE PATTERN FROM 2012-2013

SEM	SUBJECT CODE	COURSE	SUBJECT TITLE	HRS/ WEEK	CREDIT	INTERNAL	EXTERNAL	MARKS
I	12MPBT01	CORE-I	Research Methodology	4	4	40	60	100
	12MPBT02	CORE-II	Molecular Biotechnology	4	4	40	60	100
	12MPBT03	CORE-III	Paper on Topic of Research (Guide Paper)	4	4	40	60	100
	12MPBT04	CORE-IV	Communication skills and Teaching technology	4	4	40	60	100
TOTAL				16	16	160	240	400
II	12MPBT05		Project Work		8	150	50	200
TOTAL					24			600

Semester I

Course Code - 12MPBT01

Research Methodology

Hours: 4

Credits: 4

Unit-I

Selection of a research problem- experimental approach and research design, library and research documentation- literature review- sources of information- technical papers- peer reviewed journals-e-journals- citation index- impact factor- H-index - reference collection from internet- index card and arrangement of reference collected, Thesis writing- components of a thesis, preparation of research documents (abstracts, papers etc). Thrust areas and research priorities in biotechnology at National and International levels. Planning of research: Research proposals, time scheduling of research, available sources and generation of funds and facilities.

Unit- II

Principles and applications of confocal microscope. Separation Techniques - Principles and application of thin layer chromatography, gel exclusion chromatography, ion exchange chromatography, affinity chromatography, Gas chromatography, high performance liquid chromatography and reverse phase chromatography. Principles and applications of UV-Vis- FTIR- NMR- Mass spectroscopy, X – Ray Diffraction (XRD).

Unit –III

Principles and applications of SDS- PAGE, 2D- gel electrophoresis, MALDI-TOF, gel documentation, Immunoelectrophoresis, Immunodiffusion, Immunoprecipitation – agglutination techniques. Southern, Northern and Western blotting techniques, Molecular techniques - PCR, RFLP, RAPD, AFLP, DNA finger printing and DNA sequencing.

Unit – IV

Introduction to IPR, Types of IP - Patents, Trademarks, Copyright and Related Rights, Industrial Design, Traditional Knowledge and Geographical Indications. Importance of IPR – patentable and non patentables, patenting life, legal protection of Biotechnological inventions. Objectives of the patent system - Basic, principles and general requirements of patent law. Biotechnological inventions and patent law - Legal development - Patentable subjects and protection in Biotechnology. **Introduction to ethics and bioethics. Ethical limits of Animal use.**

Unit –V

Principles and practice of statistical methods in biotechnological research; collection and tabulation of data; graphical and diagrammatic representation of data; basic statistics; Simple Correlation and regression analyses; significance tests: Chi- square test, student's t-test, ANOVA, Duncan's Multiple Range Test. Bioinformatics: BLAST N and P, Gene discovery using EST. Genbank Database- NCBI, EMBL and DDBJ. Protein sequence Database- Swiss Prot and PDB.

REFERENCES:

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2. Conference of Biological Editors., (2000). Style manual for Biological Journals, American Institute of Biological Science, Washington, D.C.
3. Research Methodology for Biological Sciences, (2007). N. Gurumani, MJP publisher.
4. Instrumental methods of chemical analysis (2007). Gurdeep R Chatwal, Sham K Anand, 2nd Edition; Himalaya Publishing House.
5. Principles and techniques of practical - Biochemistry (1999). (5th Edition), Wilson.K; Walker.J, Cambridge University Press.
6. Bioinformatics: Sequence and Genome Analysis, (July 1, 2004). David W. Mount, 2nd Edition, CSHL press.
7. Physical Biochemistry: Applications to Biochemistry and Molecular Biology (August 15, 1982). - 2nd Edition David Freifelder, W.H.Freeman and Co Ltd.
8. Biostatistical Analysis (October 18, 1998). (4th edition) Jerrold H. Zar, Prentice Hall publishers.
9. Fundamentals of Biostatistics, (2006). Veer Bala Rastogi, Ane Books India, New Delhi.
10. Bioinstrumentation, (2006). Veerakumar, L., MJP Publishers, Chennai.
11. Prem S. Mann, (2004). Introductory Statistics. Fifth Edition. John Wiley and Sons (ASIA) Pvt. Ltd.

Molecular Biotechnology

Hours: 4

Credits: 4

Unit – I

Fundamentals of Biotechnology:

Molecular Biotechnology Revolution, Emergence and Commercialization of Molecular Biotechnology, Concerns and Consequences, Prokaryotic and Eukaryotic Organisms, *E.coli*, *Saccharomyces cerevisiae*, Secretion pathways in prokaryotic and Eukaryotic organisms, Eukaryotic cells in culture.

Unit II

Human Genetics:

Modes of human inheritance, Genetic linkage and gene mapping, Comprehensive human linkage maps, Radiation Hybrid mapping, Human genome sequence, Determining gene function- Functional gene cloning, Positional candidate gene cloning, cDNA Microarray, Two hybrid system.

Unit –III

Protein Engineering:

Adding Disulfide Bonds – T4 Lysozyme, Xylanase, Human Pancreatic ribonuclease. Changing Asparagine to other amino acids, Reducing the number of free sulfhydryl residues, Modifying metal cofactor requirements, Decreasing protease sensitivity, Modifying protein specificity, Antibodies, Altering multiple properties - Subtilisin, peroxidase.

Unit IV

Regulating the use of Biotechnology:

Regulating the use of Biotechnology, Regulating Recombinant DNA Technology – Regulating Food and Food ingredients – Chymosin, Tryptophan, Bovine Somatotropin; Deliberate Releases of GMOs. Development of a policy for somatic cell gene therapy, Accumulation of Defective genes in future generations, Human germ line gene therapy.

Unit – V

Stem cells and Nanobiotechnology:

Stem Cells – types- Gene therapy. Cloning of animals. Stem cell therapy – reproductive cloning. Nanobiotechnology – self assembly, Molecular motors. Biologically inspired nanotechnology – single molecule assays, atomic force microscopy, optical Tweezers, The good side of the viruses: Nature's Nanotechnology. Design issues of nanobiological devices – imaging using nanotherapeutic contrast agents, magnetic resonance imaging (MRI), Nanoparticle contrast agents, nanobiotechnological contrast agent design. Nanomedicine emerging area in nanobiotechnology.

References :

1. James D. Watson, Michael Gilman, Jan A. Witrowski, Mark Zoller (1992). An Overview of recombinant DNA technology and surveys advances in recombinant molecular genetics , Experimental methods and their results.
2. Bernard R. Glick, Jack , Pasternak (2010). Molecular Biotechnology.
3. James D. Watson. (1976). Molecular Biology of the gene.
4. William J. Thieman, Michael Angelo Palladio (2004).Introduction to Biotechnology.
5. William S. Klug, Michael R. Cummings (1986). Concepts of genetics.
6. John Wiley and Sons (2006). An introduction to Molecular Biotechnology.
7. John Wiley and Sons (2007). Fundamental Molecular Biology.
8. Toby Freedman (2008). Career Opportunities in Biotechnology and drug Development.
9. Cynthia Gibas and Per Jumbuck (2004). Development Bioinformatics Computer Skills. O' Reily and Associates.
10. Jin Xions (1998). Essential Bioinformatics. Cambridge University Press.
11. Ashok K. Chauhan and Ajit Varma, (2009). I.K. International Publishing House Pvt. Ltd. New Delhi and Bangalore.
12. Culture of Animal cells, 3rd Edition, R. Ian Freshney. A John Wiley & Sons, Inc., publications.

Semester I

Course Code - 12MPBT04

Communication skills and Teaching technology

Hours: 4

Credits: 4

Unit – I

Computer application skills: Internet –meaning – importance-types of networking-LAN, WAN, MAN-internet- website and webpage's, internet connectively – Browsing the internet-Browsing software-URL addresses, search engines, exploring websites and downloading materials from websites, power point-creating a presentation – slide preparation-popular websites for data collection in Biotechnology, MS Excel- Statistical packages – SPSS.

Unit – II

Communication and Interaction: The theory of communication-communication cycle-Types of communication, communication and language, communication in the class room, Lecture and Lecture demonstration as communication. Interaction methods –Interaction analysis, observation schedule and record. Bale's interaction process categories – Flander's system of interaction analysis – verbal interaction category system. Reciprocal category system – Equivalent talk categories.

Unit – III

Education skill: Psychology – Definition-Nature- Meaning of educational Psychology – Definition – Nature – Scope. Teaching and learning – meaning – characteristics – effective teaching – concept of learning – comparison between teaching and learning. Mental health –Frustration – concept of adjustment – Defence mechanism – Mental hygiene.

Unit – IV

Uses of teaching strategies: Group methods of instruction – lecture – demonstration – seminars – workshops – case analysis – panel discussion – team teaching - individual approaches – Teleconferencing – Video conferencing – Description – Advantages – Micro teaching – Characteristics of Micro teaching – Teaching skills – Programmed Instruction – ICT enabled teaching – Language Laboratory.

Unit – V

Educational Technology: Educational technology – definition – objectives – teaching technology – characteristics of teaching technology – behavioural technology – pedagogy of teaching – General advantage of using teaching aids – Broad classification of teaching aids – Hardware and software in teaching aids. Instructional media – media attribution – multimedia and instructional development – Multimedia centre – uses and abuses of multimedia.

References:

1. Modern teaching methods and techniques ((2006) – Zikr – ur Rahman – Anmol Publication Pvt. Ltd. New Delhi,
2. Educational technology and management models media and methods, (2007). Dr. R. A. Sharma, R. Lall Book Depot. Meerut (UP),
3. Educational technology (2004) Dr. Vanaja, Neel Kamal Publication Pvt. Ltd. Hyderabad.
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6. Methods and Techniques of Teaching (2004). S.K. Kochhar, Sterling Publisher Pvt. Ltd.
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8. Fundamentals of Education Psychology (2008). 2nd ed., - S. Robinson, Ane Books Pvt. Ltd.
9. Use of Computers and Multimedia in Education (2002). T.M. Srinivasan, Aavisakar Publication, Jaipur.
10. Internet (1998) K. Sundararajan, Kannadhasan Publications, Chennai.