JAMAL MOHAMED COLLEGE (*Autonomous*)

College with Potential for Excellence

Re-accredited (3rd Cycle) with 'A' Grade by NAAC

(Affiliated to Bharathidasan University)

Tiruchirappalli – 620 020

P.G. & RESEARCH DEPARTMENT OF MICROBIOLOGY

CHOICE BASED CREDIT SYSTEM

(2017 - 2018)

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Sem	*Course Code*	*Course*	*Course Title*	*Hours / Week*	*Credit*	*Internal Marks*	*External Marks*	*Marks*
I	17MPMB1C1	Core I	Research Methodology	4	4	40	60	100
	17MPMB1C2	Core II	Applied Microbiology	4	4	40	60	100
	17MPMB1C3	Core III	Research Topic in Microbiology (Guide Paper)	4	4	40	60	100
	17MPMB1C4	Core IV	Teaching and Learning Methodology	4	4	40	60	100
	TOTAL			**16**	**16**	**160**	**240**	**400**
II	17MPMB2PW	Project Work	Dissertation	-	8	-	-	200
	GRAND TOTAL			**-**	**24**	**-**	**-**	**600**

SEMESTER I: CORE I
RESEARCH METHODOLOGY

Course Code : 17MPMB1C1 **Max Marks : 100**
Hours/Week : 4 **Internal Marks: 40**
Credit : 4 **External Marks: 60**

Objectives:

1. To develop a research orientation among the scholars and to acquaint them with fundamentals of research methods.
2. To understand the issues involved in planning, designing, executing evaluating and reporting research.

UNIT I **12 hours**

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 thesis, preparation of research documents (abstracts, papers etc). #Thrust areas and research priorities in microbiology at international level#. Planning of research: Research proposals, time scheduling of research, available sources and generation of funds and facilities. Biostatistical analysis of research Data- one way Anova, two way Anova and T-test.

UNIT II **12 hours**

Microscopy: Basic Principles of Confocal, Fluorescent and Electron Microscopes. Centrifugation: Basic principles, sedimentation coefficient, centrifugal forces. Types of centrifuges - clinical, high speed, refrigerated, ultra. Types of centrifugation: rotar types, density gradient, differential centrifugation. Electromagnetic radiation: definition, components, biological effective wavelength (UV and visible), #Spectrophotometer - principles and application - IR, NMR, Mass spectroscopy and X ray diffraction#.

UNIT III **12 hours**

Chromatography- Principle, types and working function and Applications of Paper chromatography, TLC, GC, GC-MS and HPLC. Electrophoresis: Principle, types and methods-Horizontal, vertical, PAGE, Agarose electrophoresis, SDS PAGE, 2DSDS PAGE, MALDI-TOF and Pulse Field gel electrophoresis (PFGE). #Gel documentation and molecular weight analysis#.

UNIT IV **12 hours**

Molecular Techniques - Amplification of 16S rRNA or specific genes using PCR techniques, RAPD, STRR and LTRR analysis using PCR, RFLP analysis. DNA sequencing - Sanger's Dideoxy and Maxam and Gilbert's methods. Automated DNA sequencing. Steps in Phylogenetic analysis. Databases in Bioinformatics- Genbank: Genbank flat file format-ASN.1, GCG, FASTA, EMBL, NBRF, PIR, SWISSPROT sequence formats, PDB format - NCBI, EMBL, DDBJ, UniGene, SGD, EMI Genomes. protein databases-PIR, SWISSPROT, TrEMBL, Prosite, PRINTS -#Structural databases-PDB, SCOP, CATH, PDB, SELECT, PDBSUM, DSSP, FSSP, DALI, PRODOM#.

UNIT V **12 hours**

Applications: Gene Annotations; Gene silencing; Human Genome Project; Legal aspects of rDNA technology and cloning. Development of gene functions. #Recombinant DNA products and applications - Insulin, Hepatitis B antigen vaccine#, Growth hormones. Quality Procedure - Pre Requisite Programme - Good Hygiene Procedure (GHP), Good Manufacturing Practices (GMP), Good laboratory Practices (GLP), ISO-9000 - HACCP; Nanobiologics - Bioactive peptides as hormones, antimicrobials, vaccines, drug carriers and therapeutics.

#--- # Self study

Text Books

1. David W Mount, "Bioinformatics: Sequence and Genome Analysis", 2nd Edition, CBS Publishers. (2004).

2. Gerd Gellissen. Production of Recombinant Proteins: Novel Microbial and Eukaryotic Expression Systems. Viley VCH Publishers (2005).

3. Gurumani, N. Research Methodology for Biological Sciences, MJP Publishers. (2007).

Books for Reference

1. Irfan A. Khan and Atiya Khanum. Fundamental of Biostatistics, Ukaaz publishers, India. (1994).

2. Keith Wilson and Goulding, K.H. A biologists guide to principles and techniques of practical biochemistry, ELBS, London. (1986).

3. Keith Wilson and John Walker. Practical Biochemistry - principles and techniques, Cambridge Press, New York. (1994).

4. Kothari, C.R., 1988. Research Methodology, Wiley Eastern Ltd., New Delhi. (1988).

5. Patki, L.R., Bhalchandra, L. and Jeevaji, I.H. An introduction to microtechniques, S. Chand and Company Ltd., New Delhi. (1989).

6. Pennington S.R, Dunn M.J. "Proteomics from Protein Sequence to Function", Viva Books Ltd, (2002).

7. Wrigglesworth, J.M. Biochemical research technique - a practical introduction. John Wiley, New York.(1984).

8. Anderson, J., Durosn, B.H. and Poole, M. Thesis and assignment writing, Wiley Eastern Ltd., New Delhi. (1986).

9. Bailey, N.T. J. Statistical Methods in Biology .English Univ. Press (2010).

Books for Study

UNIT I	Text Book 3	Chapter 1-4&6
UNIT II	Text Book 3	Chapter 9-11&14
UNIT III	Text Book 3	Chapter 12&13
UNIT IV	Text Book 1	Chapter 2,6,7,10&11
UNIT V	Text Book 2	Chapter 13,15&16

SEMESTER I: CORE II
APPLIED MICROBIOLOGY

Course Code : 17MPMB1C2 **Max Marks : 100**
Hours/Week : 4 **Internal Marks: 40**
Credit : 4 **External Marks: 60**

Objectives:

1. To help the scholars to execute techniques and methods involved in enzymatic, Chemotherapeutic and bioconversion.
2. To develop the Knowledge about vaccines, genetically engineered foods and biogas.

UNIT I **12 hours**

Strategies in Bioconversion: Utilization of farm wastes and residues in agriculture – Microorganisms as a source of nutritive protein– SCP and Mushroom. Bioconversion of lignocelluloses into protein – rich food and feed. #Composting of organic wastes, Production of biogas#. Properties of compostable wastes- Microbial characteristics of composting process, Compost systems - Batch and continuous. Bioremediation-definition-Efficacy testing- side effects testing. Approaches to Bioremediation. Environmental modification. Microbial seeding. Bioengineering approaches to the bioremediation of pollutants.

UNIT II **12 hours**

Vaccines Preparation and chemotherapeutic drugs: Vaccines; Vector vaccines; Naked DNA Vaccines; Biosynthetic and Chemically Synthesized vaccines; Subunit vaccine; Anti Idiotype vaccines; Fussion vaccines; Mixed Particle vaccines; Human Mucosal vaccines; Combination vaccines , Polynucleotide as vaccines . #Preparation of Hepatitis B vaccine and Tissue Culture derived rabies vaccine and AIDS vaccine#. Properties and mode of action of Antibacterial drugs: Sulpha drugs, Penicillins, Cephalosporins, Streptomycin, Tetracyclines, Chloramphcnicol.

UNIT III **12 hours**

Genetic Engineering of Bacteria and Fungi: Methods for the genetic manipulation of Bacilli- gene expression. Genetic engineering of *Streptomyces* – methods of gene manipulation – gene expression –use of *Streptomyces* as a host for excretion of heterologous products. Genetic engineering of yeast. Molecular techniques for gene manipulation of *Saccharomyces cerevisiae*. #Molecular transformation – selection markers – vectors – Expression of Heterologous proteins#. Genetic Engineering of Filamentous fungi for industrial application - antibiotics and enzymes.

UNIT IV **12 hours**

Application of Microbes in Food industry: Starter cultures and their biochemical activities. Production and application of Bakers Yeast, Bread, Cheese, Yoghurt and Soy sauce fermentation by Moulds. Fermented vegetables – Sauerkraut. Fermented Meat – Sausages Fermented beverages: Vinegar, Beer and wine. #Application of microbial enzymes in food industry. Genetically engineered foods#.

UNIT V **12 hours**

Application of Enzymes and immunological method: Immobilization of Microbial enzymes- Properties, Methods, membrane confinement and their analytical, therapeutic and industrial applications. Biomedical application of immobilized enzyme. #Microbial enzymes in textile, leather, wood industries, detergents and clinical diagnostics#. Applications of immunological methods in bacteriology, virology, mycology, protozoology. Applications of immunological techniques to the study of the tumour- host relationship- Gene therapy for malignant disease- diagnostic evaluation of HIV.

#--- # Self study

Text Books

1. Forster C. F. and D.A., John Wase. Environmental Biotechnology. Edited by Ellis Horwood Ltd. Publication.(2008)

2. Lansing, M. Prescott, John P.Harley and Donald A.Klein. 2011. Microbiology, 8th edn McGraw Hill Publishing company Ltd.(2011).

Books for Reference

1. Methods in Enzymology. Volume 22 - Enzyme purification and related techniques.Edited by William B. Jakoby. Academic Press, New York. (1988).

2. Old, R.W and Primbrose S.B. Principles of gene manipulation-An introduction to genetic engineering. 5th edition. Blackwell scientific publications. London. (1995).

3. Soli J. Arceivala. Waste water treatment for pollution control. 2nd edition. Tata McGraw Hill publishing company Ltd. (1998).

4. Subba Rao, N.S. Advances in agricultural microbiology. Oxford and LBH publishing Co. (1982).
5. Atlas, A.M. and R. Bartha. Microbial ecology. Fundamentals and applications. An imprint of Addison Wesley Longmann Inc.(1998)

6. Biodegradation and Bioremediation. Academic Press, San Diego.(2009)

7. Gregory G. Vaccines: New generation Immunological Adjuvants. Series A: LifeSciences, Volume: 282.(1995).

Books for Study

UNIT I	Text Book 2	Chapter 40& 41
UNIT II	Text Book 1	Chapter 8
UNIT III	Text Book 1	Chapter 3
UNIT IV	Text Book 1	Chapter 11
UNIT V	Text Book 1	Chapter 5, 8 & 9

SEMESTER I: CORE IV
TEACHING AND LEARNING METHODOLOGY

Course Code : 17MPMB1C4 **Max Marks : 100**
Hours/Week : 4 **Internal Marks: 40**
Credit : 4 **External Marks: 60**

Objectives:

1. To understand the educational skills, computer application and teaching strategies.
2. To help the scholars to develop the communicational skills, teaching technology and application of internet.

UNIT – I **12 hours**

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 Microbiology#, MS Excel – Statistical packages - SPSS.

UNIT – II **12 hours**

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 **12 hours**

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 – Defense mechanism – #Mental hygiene#.

UNIT – IV **12 hours**

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 **12 hours**

Educational Technology: Educational technology – definition – objectives – teaching technology – characteristics of teaching technology – #behavioral 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.

#--- # Self study

Text Books

1. Kochhar, S.K. Methods and Techniques of Teaching –Sterling Publisher Pvt. Ltd. Publications New Delhi. (2004).
2. Sambasiva Rao, P. Bhaskar Rao, D. Techniques of Teaching Psychology. (2006).
3. Sampath, K. Panner selvam ,A. and Santhanam, S. Introduction to Educational Technology, 4th revised ed., Sterling Publisher Pvt. Ltd.(2000).

Books for Reference

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

Books for Study

UNIT I Text Book 3 Chapter 9,13 &14
UNIT II Text Book 3 Chapter 3
UNIT III Text Book 2 Chapter 1&2
UNIT IV Text Book 2 Chapter 6
UNIT V Text Book 1 Chapter 7-9&12