BHARATHIDASAN UNIVERSITY

TIRUCHIRAPPALLI – 620 024

M. Phil. Microbiology (FT / PT) Programme

(For the candidates admitted from the academic year 2009-2010 onwards)

Semester I	Title of the Course	Marks			Credits
		IA	UE	Total	
Course -I	Research Methodology	40	60	100	4
Course - II	Microbial Genomics and Technology	40	60	100	4
Course- III	Paper on Topic of Research (Guide will prepare the syllabus and it will be sent to the COE)	40	60	100	4
Course – IV	Teaching and Learning skills (Common Paper)	40	60	100	4
Semester II					
	Dissertation and Viva-Voce Viva Voce 50 marks Dissertation 150 marks	--	--	200	8

Question paper pattern for Course I - III

10 questions compulsory 10 x 01 = 10 Marks (2 from each unit)

5 questions 05 x 04 = 20 Marks (either or type, one from each unit)

3 questions from 5 03 x 10 = 30 Marks (one question from each unit)

Total 60 Marks

Question paper pattern for Course IV

5 Questions 05 x 12 = 60 Marks (either or type, one from each unit)

CIA components

Tests (2x10) - 20 Marks

Term Paper – 10 Marks

Seminar - 10 Marks

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Course I - Research Methodology

Unit 1 : Scientometrics

Introduction – Classical criteria for measurement of scientific achievements. Evaluation of the discipline of Scientometrics – Citation Index (CI), Journal Impact Factor (JIF /IF). Concept, definition and calculation of IF. Criticisms of Impact Factor and Citation Index. Suggestions for improving IF methodology. Alternative to JIF and Citation Index. h- index, Downloading Index, Competitions to the Science Citation Index (SCI) of Web of Science (WOS). Future of JIF and CI

Unit – II: Microscopy

Bright field, Dark field, Phase contrast, Fluorescent and Polarization microscopes - Electron microscopy – TEM & SEM – principle structure and applications – specimen preparation of electron microscope. Ultra thin sectioning of specimens using microtomes - Confocal microscope , Atomic force microscope (AFM).

Unit – III: Analytical instrumentations

Atomic absorption spectrophotometer, NMR, Mass spectrometry, GC & MS, MALDI ToF, IR spectrum, X-ray crystallography, X Ray Diffractometer. FT-IR, Microbial Identification System Measurement of radioactivity – X –ray film, GM counter & scintillation counting methods. Application of Radioisotopes in biological sciences.

Unit – IV: Separation techniques

Centrifugation - preparative and analytical, ultra centrifugation, density gradient centrifugation. GC & HPLC - Electrophoresis – Principle, types and applications - PAGE (proteins), Agarose (Nucleic acids), Pulse field Gel Electrophoresis (PFGE), Two dimensional electrophoresis (IEF), DGCE, TGGE and TRFLP.

Unit – V: rDNA techniques

Restriction mapping - RFLP, Cloning strategies, DNA sequencing – manual and automated methods. Southern, Northern, Western and Dot blotting & hybridization. Polymerase Chain Reaction – principles, types and applications, Single locus and multi locus DNA finger printing, PCR based DNA finger printing - RAPD, AFLP, STRR and LTRR analysis. DNA sequencing – manual and automated methods.

References:

1. Krishnamurthy, K.V (2007) Scientometrics. BDU Journal of Science & Technology Vol.I (2) 153 – 168.
2. Gurumani, N. 2007 – Research Methodology. MJP Publishers, Chennai – 600 005.
3. Ramadass, P. and A. Wilson Aruni 2009. Research and Writing - Across the Disciplines. MJP Publishers, Chennai – 600 005
4. John G Webster(2004).Bioinstrumentation .Student edition, John Wiley &sons, Ltd.
5. Keith Wilson& John Walker (2003) Practical Biochemistry Principles & techniques.5th edition,Cambridge university press.
6. Grumani N (2006) Research methadology for biological sciences.1st Edition , MJP Publishers, A unit of Tamilnadu Book House .
7. Jogdand SN (2004) Gene Biotechnology Published by Himalaya Publishing House,Mumbai.
8. Palanivelu P (2001)Analitical biochemistry and separation Techniques A Laboratory maual. 2nd edition ,Published by Tulsi Book Centre, Madurai, Tamilnadu.
9. Karp, G. 1999. Cell and Molecular Biology – Concepts and experiments. 2nd edn.
10. Kleinsmith, L. J. & Kish, V.M. 1995. Principles of Cell and Molecular Biology. 2nd edn., McLaughlin, S., Trost, K., Mac Elree, E. (eds.)., Harper Collins Publishers, New York.

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COURSE II - MICROBIAL GENOMICS AND TECHNOLOGY

Unit I : Structural Genomics

Prokaryotic and eukaryotic microbial diversity - Isolation, cultivation and preservation of microorganisms, Microbial symbiosis - Criteria for classification and identification of microorganisms – morphological, physiological & biochemical. Numerical taxonomy. Molecular Taxonomy - DNA finger printing methods - RFLP, 16S rRNA in taxonomy & phylogeny. DNA sequencing. RAPD, STRR & LTRR, Blotting and hybridization. DNA Bar Coding , Microarrays/Chips

Unit I : Functional Genomics

Functional metagenomics – Heterologous expression – Search for potential producers – Polyketide synthases. White biotechnology – Elusive metabolites - High throughput screening – Environmental Gene Tags (EGTs) - Multiparameter footprint analysis – screening for industrial enzymes – Bioactive molecules – synthons – Putative gene products. Single Cell Metagenomics

Unit III: Microbial Technology

Production of useful products through microbial & recombinant microbes – insulin, vaccines, antibiotics, SCP (Spirulina & Mushroom) and Biofertilizers (Cyanobacteria, Azospirillum & VAM). Biodegradation of organic wastes and xenobiotic compounds – heavy metals, pesticides, insecticides. Microbial leaching. Microbial Biofuels - hydrogen production. Biodiesal - biodegradation of oils and petroleum products. IPR & Patenting biological materials. National & International patent laws. Biosafety regulations and Bioethics.

Unit IV : Nanobiotechnology

History of nanobiotechnology; Terminologies of nanobiotechnolgy; Nanoparticels; Nanotubes; Nanowires; Microbial production of nanoparticles – Silver, Gold, and Cadmiun. Therapeutic application of nanoparticles. Siderophores and magnetosomes. Social and ethical implication of nanoscale sciences

Unit V *: in silico* methods

Genome sequence comparison, alignment and data base searching. GenBank – NCBI, EMBL & DDBJ – retrieving sequences. Tools used for phylogenetic analysis – Ribosomal Database Project, FASTA, BLAST, Phylip. RNA structure prediction, Restriction enzyme patterns. Designing primers & probes. DNA barcoding. Submission of rDNA sequences – Bankit & Sequin guidelines

Reference

1. Doolittle RF. (1990). Molecular evolution. Computer Analysis of Protein and Nucleic acid Sequences Methods in Enzymilogy. Academic Press, New York.
2. Glick BR, Pasternak JJ (1998) Molecular Biotechnology - Principles and Applications of Recombinant DNA, ASM Press, Washington DC
3. Higgins D, Taylor W. (2000). Bioinformatics, sequence, structure and databanks A practical approach. Oxford University Press.
4. Glazer AN, Nikaido H. (1994) Microbial Biotechnology – Fundamentals of Applied Microbiology WH Freeman and Company, New York.
5. Baxevanis AD and BFF Ouellette, Wiley O. (ed) (2001) Bioinformatics – A practical guide to the analysis of genes and proteins. Interscience, New York,
6. Brendan Wren (Editor), Nick Dorrell (2002) Functional Microbial Genomics (Volume 33) (Methods in Microbiology), Academic Press, UK.
7. Sandy B. Primrose Richard M. Twyman (2005) Principles of Genome Analysis and Genomics, Blackwell Publishing, USA.
8. Principles of Gene Manipulation and Genomics - Page xviii by Richard M. Twyman, Sandy Blackadder Primrose - Science - 2006 - 644 pages
9. Groombridge, B (Ed.) 1992. Global Biodiversity – Status of the Earth's Living Resources. Chapman & Hall, London.
10. Brenden Wren and Nick Dorrell, Functional Microbial Genomics (Volume 33) (Methods in Microbiology), Academic Press
11. Alexander Hillisch and Rolf Hilgenfeld. Modern Methods of Drug Discovery, Birkhauser, Switzerland
12. NanoBiotechnology Protocols (Methods in Molecular Biology) (2005) by Sandra J Rosenthal, David W. Wright Humana press publisher.
13. Nanobiotechnology II: More Concepts and Applications (2007) by Chad A. Mirkin, Christof M. Niemeyer 1st edition Wiley-VCH Publisher

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COURSE –IV – TEACHING AND LEARNING SKILLS

Objectives:

- acquaint different parts of computer system and their functions
- understand the operations and use of computers and common Accessories
- develop skills of ICT and apply them in teaching learning context and Research
- appreciate the role of ICT in teaching, learning and Research
- acquire the knowledge of communication skill with special reference to its elements, types, development and styles
- understand the terms communication Technology and Computer mediated teaching and develop multimedia / e-content in their respective subject
- understand the communication process through the web
- acquire the knowledge of Instructional Technology and its Applications
- develop different teaching skills for putting the content across to targeted audience

Unit I – Computer Application Skills

Computer system: Characteristics, Parts and their functions – Different generations of Computer – Operation of Computer: switching on / off / restart, Mouse control, Use of key board and some functions of key – Information and Communication Technology (ICT): Definition, Meaning, Features, Trends – Integration of ICT in teaching and learning – ICT applications: Using word processors, spread sheets, Power point slides in the classroom – ICT for Research: On-line journals, e-books, Courseware, Tutorials, Technical reports, Theses and Dissertations

Unit II – Communication Skills

Communication: Definitions – Elements of Communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication: Spoken and written; Non-verbal communication – Intrapersonal, Interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and writing – Methods of developing fluency in oral and written communication – style, Diction and Vocabulary – Classroom communication and dynamics

Unit III – Communication Technology

Communication Technology: Bases, Trends and Developments – Skills of using Communication Technology – Computer Mediated Teaching: Multimedia, E-content – Satellite-based communication: EDUSAT and ETV channels, Communication through web: Audio and Video applications on the Internet, interpersonal communication through the web.

Unit IV – Pedagogy

Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a lecture – Narration in tune with the nature of different disciplines – Lecture with power point presentation – Versatility of lecture technique – Demonstration, Characteristics, Principles, Planning Implementation and Evaluation – Teaching – Learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion – Models of teaching: CAI, CMI and WBI

Unit V – Teaching Skills

Teaching skill: Definition, Meaning and Nature – Types of Teaching skills: Skill of Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing Questions, Skill of Black Board writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills

References:

1. Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi
2. Don Skinner (2005), Teacher Training, Edinburgh University Press Ltd., Edinburgh
3. Information and Communication Technology in Education: A Curriculum for Schools and programme of Teacher development, Jonathan Anderson and Tom Van Weart, UNESCO, 2002
4. Kumar K.I (2008) Educational Technology, New Age International Publishers, New Delhi
5. Mangal, S.K. (2002) Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana
6. Michael D. and William (2000), Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New York
7. Pandey S.K. (2005) Teaching Communication, Commonwealth Publishers, New Delhi
8. Ram Babu A. and Dandapani S (2006) Microteaching (Vol.1&2) Neelakamal Publications, Hyderabad
9. Singh V.K. and Sudarshan K.N. (1996) Computer Education, Discovery Publishing Company, New York
10. Sharma R. A. (2006) Fundamentals of Educational Technology, Surya Publications, Meerut
11. Vanaja. M. and Rajasekar S. (2006) Computer Education, Neelkamal Publications, Hyderabad.

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