

BHARATHIAR UNIVERSITY, COIMBATORE
M.Phil./Ph.D. LIFE SCIENCES (DIBER)
(For the students admitted from the academic year 2014-15 onwards)

PAPER-I: RESEARCH METHODOLOGY, BIOSTATISTICS AND RESEARCH ETHICS

UNIT I: SCIENTIFIC RESEARCH

Meaning and characterization of scientific research, Various types of research, Essential steps in research, Defining a research problem, Types of problems, Hypothesis and its types, Literature collection and citations, Research reports- thesis, dissertation, manuscript, research article, review monographs, bibliography and reference

UNIT II: EXPERIMENTAL DESIGN AND SAMPLING

Basic principles of experimental design, Factorial experiments, CRD, RBD, SPD, LSD (Latin Square Design), Sampling and its types, Requisites of good sampling methods, Sample size, Sampling error, Types of scales and measurements

UNIT III: STATISTICAL METHODS

Measures of central tendency and dispersion, Parametric and non parametric statistics, Confidence intervals, Levels of Significance; t-test, Z-test, F-test, ANOVA, Correlation and regression, χ^2 test

UNIT IV: PROBABILITY DISTRIBUTIONS

Binomial, Poisson and Normal distribution

UNIT V: RESEARCH ETHICS

Introduction to Moral theory, Data 'ownership' and 'stewardship', Conflict of Interest, Honesty, Compromise and Integrity in Research, Research regulation and self regulation, Research ethics, Authorship, Plagiarism, Data fabrication, Peer review.

Reference

1. Alley M (1996) The Craft of Scientific Writing. III Ed. Springer.
2. Broota, KD (2003) Experimental Designs in Behavioral Research, New Age International.
3. Kothari CR (2004) Research Methodology, Methods and Techniques. II Ed. New Age International Pvt. Ltd
4. Penslar, RL. (ed.) (1995), Research Ethics. Cases and Materials, Bloomington, Indiana: University of Indiana Press.
5. Singh AK (2009), Tests Measurements and Research Methods in Behaviour Sciences, Bharti Bhavan
6. Zar JH (1999) Biostatistical Analysis. Prentice Hall International Inc. Press.

PAPER-II: RESEARCH TRENDS IN LIFE SCIENCE

UNIT I: BIOLOGICAL DIVERSITY

Kingdoms of life, Concepts of Germplasm, Genetic Diversity and Genetic Resources, Inter-alia interactions, Microbial diversity, Crop Genetic Resources, Centers of Diversity and Centers of Origin, Taxonomic tools, Species concept, Animal genetic resources, Biodiversity estimations, Molecular tools for screening biodiversity, Convention of Biological Diversity

UNIT II: STRESS BIOLOGY

Biotic vs. Abiotic Stress, Biotic stress and resistance in bacteria, Immune system in animals, Genetic mechanism of plant resistance, Biochemical and molecular mechanism of plant resistance, Signal crosstalk in Plant stress response, Abiotic stress to animals- Hypoxia, Abiotic stress tolerance in animals, Signal transduction mechanisms, Improvement of stress tolerance

UNIT III: BIOENERGY

Concept and utility of bioenergy, 1st, 2nd and 3rd generation of biofuels and bioenergy crops, Algal biofuels, Bioenergy from dairy waste, Biodiesel from fungi and other sources, By-products of transesterification and pyrolysis processes including gasification, biomethanation, etc., Value addition to by-products and waste products, Performance Enhancers

UNIT IV: BIOENTERPEUNERSHIP

Intellectual property rights- Patents, copyrights, trademarks, PBRs, PVPs, Farmer Rights, Traditional Knowledge, Geographical Indications, WTO, TRIPS, GATT, Carbon Credits, GMOs, Post Harvest and Food Processing Technologies, Polysachharide nanofilms for improvement of food quality

UNIT V: INTERDISCIPLINARY STUDIES

Basics of nanobiotechnology and bioinformatics, Statistical software, Systems biology, Hydroponics and Aeroponics, Concepts of Biosafety and Good Laboratory Practices, Ethics in Life Sciences

Reference

1. Aarestrup FM (2005) Antimicrobial resistance in Bacteria of Animal Origin. ASM Press.
2. Arif M and Ahmed Z (2009) Bio Diesel: *Jatropha curcas* as a promising source. Satish Serial Publishing House.
3. Attwood TK and Parry-Smith DJ (2002) Introduction to Bioinformatics, Pearson Education, Singapore
4. BCIL (2002) Biosafety Issues Related to Genetically Modified Organisms (GMOs). Biotech Consortium of India Limited.
5. Chazzallani VK (2010) Biodiversity and Conservation: International Perspectives. Manglam Publishers
6. Das HK (2004) A Textbook of Biotechnology. John Wiley & Sons.
7. Harwood CS, Demain AL and Wall JD (eds) (2008) Bioenergy. ASM Press.
8. Khanal SK, Surampalli RY, Zhang TC, Lamsal BP and Tyagi RD (2010) Bioenergy and Biofuel from Biowastes and Biomass. American Society of Civil Engineers.
9. Odagiri H, Goto A, Sunami A and Nelson RR (2012) Intellectual Property Rights Development and Catch Up: An International Comparative Study. Oxford University Press.
10. Talaro M and Talaro P (2011) Foundations in Microbiology. McGraw-Hill.
11. Van Liere EJ and Stickney JC (1963) Hypoxia. University of Chicago Press.
12. Yoshioka K and Shinozaki K (ed.) (2009) Signal Crosstalk in Plant Stress Responses. Wiley-Blackwell.

PAPER- III Microbiology

Unit 1- Introduction to microbiology:

Microscope, Spontaneous generation versus Biogenesis, Fermentation, The Germ Theory Of Disease, Laboratory techniques and pure culture, Morphological characteristics, Chemical characteristics, Cultural characteristics, Pathogenicity, Scope of Microbiology.

Unit2- Microorganisms- Bacteria, fungus and viruses

Classification and Morphology of Bacteria, Fungus and Viruses; Cultivation of Bacteria and fungus; Reproduction and Growth, General characteristics of Gram- positive and Gram-negative Bacteria.

Unit3- Control of Microorganisms:

Control of Microorganisms by Physical agents, Chemical agents, Antibiotics and other Chemotherapeutic Agents.

Unit 4- Microbial Genetics:

Conjugation, Transformation, Transduction

Unit 5- Immunotechniques:

Precipitation reaction, Agar disk diffusion method, Agglutination reaction, Immuno- diffusion, ELISA, RIA, PCR, Electrophoresis, PAGE, SDS-PAGE, Blotting Techniques : Southern , Northern, Western, Eastern blotting, Hybridization techniques.

Unit 6- Applied Microbiology:

Application of microbiology in agriculture, industrial and human welfare.

References:

1. Pelczar et. al. (1993) Microbiology, fifth ed., Mc. Graw Hill.
2. Prescott Microbiology, second ed.,(1993) Wm. C. Brown
3. Brock Biology of Microorganisms, 12th ed.,(2000)
4. Moat, A.G.,(1970). Microbial physiology. John Wiley and Sons.
5. Krieg, N.R. (1984). Bergey's Manual of Systemic Bacteriology, Vol. 1
6. Sykes, G. (1965). Disinfection and Sterilization, second ed., Lippincott, Philadelphia.