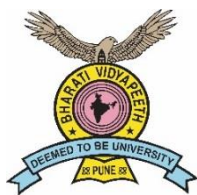


[Type here]



**BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE, INDIA**

M.Sc. Microbiology (CBCS 2018 COURSE)

Semester –II

PG MB 201:– FERMENTOR DESIGN AND MICROBIAL BIOTECHNOLOGY

Total Credits: 04

Total Lectures: 60

Course Outcomes:

At the end of this course the students will be able to:

1. Understand designs of fermenter.
2. Know commercial production of biomolecules.

Course contents:

UNIT I FERMENTOR DESIGN	15
1.Design of a Fermentor	
2.Basic functions of a fermentor	
3.Aseptic operation and containment	
4.Body construction	
5.Parts of the fermentor and their functions: Impellers, Baffles, Sparger.	
6.Achievement and maintenance of aseptic conditions: - Sterilization of fermentor and its parts.	
7.Different methods of sterilization.	
8.Valves and steam traps: Role in maintaining aseptic conditions.	
9.Alterations in the fermentor design for ‘Animal cell culture’ and ‘Plant cell culture’	
UNIT II OTHER DESIGNS OF A FERMENTOR	05
1. The Waldhoff-type fermentor.	
2.Acitators and cavitators.	
3.The tower fermentors.	
4.Cylindro conical vessels.	
5.Airlift fermentors.	
6.The deep jet fermentor.	
7.The cyclone column	
8.The packed tower.	
9.Rotating-disc fermentor.	
UNIT III AERATION AND AGITATION	10

[Type here]

1. The oxygen requirements of industrial fermentations
2. Oxygen supply.
3. Determination of K_{La} value.
4. Fluid Rheology
5. Factors affecting K_{La} value in fermentation vessels.
6. Scale-up and scale-down.

UNIT IV MICROBIAL BIOTECHNOLOGY.

30

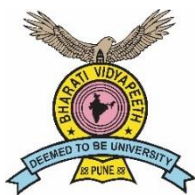
1. Commercial production of

- Amino acids
- Polysaccharides.
- Antibiotics
- Solvents
- Enzymes
- Steroids
- Nucleotides
- SCP
- Organic acids
- Vitamins

References:

1. Casida. L.E. (2003) reprint Industrial Microbiology Publ: New Age International (p) Ltd. New Delhi.
2. Grace E.S. (1997) Biotechnology unzipped. Promises and Realities Joseph. Henry Press Washington D.C.
3. Kumar. H.D. (1993) Molecular Biology and Biotechnology 2nd revised edition Vikas Publishing house Pvt. Ltd.
4. Mukhopadhyay. S.N. (2001) Process Biotechnology Fundamentals viva Books Pvt. Ltd.
5. Patel. A.H. (2003 reprint) Industrial Microbiology Publ: Macmillan. India Ltd. New Delhi.
6. Pepler. H.J. and D. Perlman (1979) Microbial Technology Vol. I & II Academic Press Inc.
7. Prescott. S.C. and C.G. Dunn (2002) Industrial Microbiology. Publ. Agrobios. India Jodhpur.
8. Ratledge. C. and B. Kristiansen. (2001) Basic Biotechnology 2nd Edn. Cambridge University Press .
9. Schmauder. H.P.; M Schweizer. (1997) Methods in Biotechnology. Taylor and Francis publisher.
10. Stanbury; P.F. and A. Whitaker (1984) Principles of fermentation Technology. Pergamon. New York.
11. Trehan. K. (1990). Biotechnology. New Age International New Delhi..
12. Borem A. Santos R. and D.E. Bowen (1998) Understanding Biotechnology.

[Type here]



**BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE, INDIA**

M.Sc. Microbiology (CBCS -2018 COURSE)

Semester-II

PGMB 202: ANALYTICAL TECHNIQUES

Total Credits: 04

Total Lectures: 60

Course Outcomes:

At the end of this course the students will be able to:

1. Understand different analytical techniques used in labs and industries.
2. Learn to handle radioactive isotopes for research and diagnostic purpose.

Course contents:

UNIT I. RADIOACTIVE ISOTOPES & THEIR USE	10
1. Radioactive decay.	
2. Measuring radioactivity.	
3. Autoradiography.	
4. Biological applications.	
5. Working practices when using radioactive isotopes.	
6. Safety and procedural aspects.	
UNIT II. CENTRIFUGATION.	10
1. How to calculate centrifugal acceleration.	
2. Centrifugal separation methods.	
3. Types of centrifuge and their uses.	
4. Rotors.	
5. Centrifuge tubes.	
6. Safe practice.	
UNIT III. CHROMATOGRAPHY.	14
1. Types of chromatographic systems.	
2. Separation methods.	
3. Detectors.	
4. Recording & Interpreting chromatograms.	
UNIT IV. ELECTROPHORESIS.	12
1. Basic apparatus.	
2. Using a supporting medium.	

[Type here]

3. Types of supporting media.
4. Post electrophoretic procedures.

UNIT V. SPECTROPHOTOMETER.

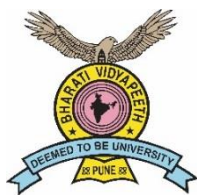
14

1. Principles.
2. UV spectrophotometer
3. Visible spectrophotometer
4. Fluorescence spectrophotometer.
5. Atomic spectroscopy.

References:

1. Boyer. R. (2000) Modern Experimental Biochemistry. 3rd Edition. Pearson Education Asia.
2. Lehninger. A.L. (1984) Principles of Biochemistry.
3. Mathews C.K. and K.E. Van Holde (1996) Biochemistry. The Benjamin Cunnings publishing Co. Inc. 2nd Edition.
4. Pattabiraman T.N. (1993) Principles of Biochemistry Gajanan Publisher.
5. Reed, R; Homes, D; Weyers, J. and A. Jones. Practical skills in Biomelecular Sciences. Addison Wesley Longman Limited.
6. Satyanarayana (1999) Biochemistry. Books & Allied (p) Ltd.
7. Wilson and Walker (2000) 5th edition Practical Biochemistry principles and techniques, Cambridge Univ. Press

* Students are supposed to refer to “Current Contents” and periodicals for recent & additional information.



BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE, INDIA
M.Sc. Microbiology (CBCS-2018 COURSE)
Semester II

PGMB 203: QUANTITATIVE BIOLOGY

Total Credits: 04

Total Lectures: 60

Course Outcomes:

At the end of this course the students will be able to:

1. Learn different methods and aspects of biostatistics.
2. Understand statistical analysis of genetic data and different aspects of Mendelian genetics.
3. Understand population genetics and its use during pursual of research.

Course contents:

UNIT I BIostatistics 16

1. Introduction -

- What is statistics- Definition, population & universe, sample & population? Statistical inference, Parameter & Statistics Designing simple experiments, Arithmetic mean and Standard deviation.

2. Handling of Bulky data

- Construction and interpretation of a Histogram, Normal distribution. Estimating the mean and standard deviation of a large sample, representing normal curve as a straight line, Uncertainties in estimating a mean.

3. Proportion data :

- Examples of proportion data (MPN, Sterility testing of medicines, animal toxicity, therapeutic trials of drug and vaccines, animal toxicity, infection and immunization studies eg LD50, ED50, PD50), Statistical treatment of proportion data, Chi-Square test, goodness of fit to normal distribution.

4. Count data :

- **Examples of count data:** Bacterial Cell count, radioactivity count, colony and plaque count etc.
- **Statistical treatment to count data:** Poisson distribution, standard error, confidence limits of count .

5. Analysis of variance :

- Introduction, procedure,

[Type here]

- F & T test.

6. Correlation regression & line fitting through graph points :

- Standard curve, correlation, linear, regression. (Fitting the best straight through the series of Points), Standard curves & interpolation of unknown Y value.

7. Statistical basis of biological assays:

- Standard line interpolation assay, parallel line assay (4 point, 6 point assay) slope ratio assay.

UNIT II MENDELIAN GENETICS

16

1. Monohybrid crosses and Mendel's principle of segregation.
2. Dihybrid crosses and Mendelian principle of independent assortment.
3. Statistical analysis of Genetic data. The chi-square test.
4. Multiple alleles – ABO blood groups.
5. Modification of Dominance relationships.
6. Gene interactions and modified Mendelian ratios.
7. Essential genes and lethal genes.
8. The environment and gene expression.

UNIT III POPULATION GENETICS

16

1. Difference in genotype frequencies amongst population. Hardy – Weinberg principle.
2. Random mating.
3. Polymorphic genes and DNA typing.
4. Inbreeding.
5. Genetic change in species leads to evolution.
6. Introduction of new alleles in population.
7. Natural selection.
8. Random changes in allele frequency.

UNITIV PROBLEM SOLVING

12

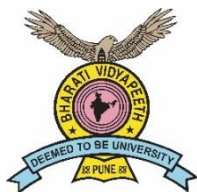
References:

1. Bailey N.T.J (1995) Statistical Methods in biology 3rd Edition. Cambridge lowprice Edition Cambridge university press.
2. Dixit J.V. (1996) Principles & Practice of Biostatistics 1st Edn. M/s. Banarasidas Bhanot (Publisher).
3. Frank H. Stephenson (2003) Calculations for Molecular Biology and Biotechnology. A guide to Mathematics in the laboratory Academic Press an imprint of Elsevier.
4. Gardner E.J., Simmons, M.J and D.P. Snustad. (1991) Principles of Genetics. 8th Edition. John Willey & Sons. Inc.
5. Hartl. D.L. and E.W. Jones. (1999) Essential Genetics. Second Edition. Jones and Bartlett Publisher.
6. Irwin H. Segel (1976) Biochemical Calculations 2nd Edition John Wiley & Sons.
7. Khan And Khanum
8. Pranab Kr. Banerjee (2006) Problems on Genetics, Molecular Genetics and Evolutionary Genetics. New Central Book Agency (P) Ltd. Kolkata.

[Type here]

9. Pierce.B.A, (2005) Genetics A Conceptual Approach.2nd Edition.W.H.Freeman and Company,New York
10. Russel. P. (1998) Genetics Fifth edition. Addison. Wesley Longman Inc.
11. Snyder. L. and W. Champress. (1997) Molecular Genetics of Bacteria. ASM Press. Washington. D.C.
12. T. Bhaskararao (2002) Methods of Biostatistics. Paras Publishing.
13. Wardlaw A.C. (1985) Practical statistics for experimental Biologists John Wiley & Sons. Ltd.

[Type here]



**BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE, INDIA
M. Sc. Microbiology (CBCS 2018 COURSE)**

SEMESTER-II

PGMB 204: MICROBIAL METABOLISM

Total Credits: 04

Total Lectures: 60

Course Outcomes:

At the end of this course the students will be able to:

1. Understand basic concepts of metabolism.
2. Understand bioenergetics, aerobic respiration and anaerobic respiration.
3. Know metabolism of carbohydrates, lipids and nucleic acids.

Course contents:

UNIT I INTRODUCTION TO METABOLISM. 05

1. Catabolism
2. Anabolism
3. Types of metabolic reactions
4. Methods employed to study metabolism.
5. Metabolic control mechanisms. Control of enzyme levels.
 - Control of enzyme activity.
 - Compartmentation.
 - Hormonal regulation.

UNIT II BIOENERGETIC CONSIDERATIONS. 08

1. Membrane Potential
 - Generation & maintenance.
 - Energetics of proton motive force.
2. Oxidation as a Metabolic enzyme source –
 - Biological oxidations.
 - Reductions.
 - Oxidation -
 - a. Reduction potentials and standard electrode potential.
 - b. Redox couple.
 - c. Nernst equation.

[Type here]

- High energy compounds – ATP, GTP, CTP, PEP, NAD, NADP, FAD, FMN.
- Hormonal regulation.

UNIT III AEROBIC RESPIRATION 08

1. Bacterial Electron transport chain
2. Mitochondrial ETC –
 - Structure of mitochondria
 - Mitochondrial ETC
 - Shuttle systems across mitochondrial membrane.
 - Citric acid cycle and oxidative phosphorylation.

UNIT IV ANAEROBIC RESPIRATION 05

1. Concept.
2. Sulfur Compounds, Nitrate & CO₂ as electron acceptors.
3. ETC in SO₄ reducers and NO₃ reducers.

UNIT V CARBOHYDRATE METABOLISM: (Major pathways of carbohydrate metabolism) 15

1. Concept of fermentation with respect to -
 - Homo & heterolactic, bacteria.
 - Saccharolytic *Clostridia* & proteolytic *Clostridia*.
 - Enzymes, intermediates, cofactors & regulation of glycolysis.
 - Gluconeogenesis.
 - HMP pathway.
 - ED pathway.
 - TCA cycle & glyoxylate bypass.
2. Metabolism of –
 - Starch.
 - Glycogen.

UNIT VI METABOLISM OF LIPIDS 10

3. Fatty acid oxidation – stages and tissues.
4. Oxidation of odd carbon chain fatty acid.
5. Oxidation of unsaturated fatty acids –
 - Alpha (α)
 - Beta (β)
 - Omega (ω).
4. Biosynthesis of fatty acids.
5. Synthesis of Triacylglycerols.
6. Metabolism of phospholipids.

UNIT VII NUCLEIC ACID METABOLISM 09

1. Synthesis and Catabolism of purines and pyrimidines – *De novo* biosynthesis.

[Type here]

2. Regulation of steps.
3. Purine degradation and clinical disorders of purine metabolism.
4. Pyrimidine metabolism.
5. Deoxyribonucleotide biosynthesis and metabolism.
6. Inhibitors of nucleotide biosynthesis.

References:

1. Agarwal G.R., Agarwal O. P. Agarwal K. Text book of Biochemistry, Goel publishing house Meerut, 8th Edition 1995.
2. Conn, E.E. P.K. Stumpf, G. Bruening and R.H. Dol. (1995). Outlines of Biochemistry. 5th Edition John Wiley and Sons.
3. Doelle, H.M. (1975), "Bacterial metabolism". Academic Press Inc. Ltd. London.
4. Foster. R.L. (1980) The Nature of Enzymology Croon Helm Ltd. London.
5. Kachel. P. W. & G. B. Ralstion (2003) Schaum's outlines. Biochemistry – II Edition. Tata McGraw Hill Edition.
6. Lehninger. A. L; Nelson, M. M. Cox (1992) Principles of Biochemistry 2nd Edition, CBS Publishers and Distributors.
7. Mathews C.K., K.E. van Holde, Kevin G. Ahern, Biochemistry Third Edition (2003), Published by Pearson Education (Singapore) Ltd. Delhi.
8. Palmer. T. (1995) – Understanding enzymes. 4th Edition. Ellis Horwood Ltd. Publishers P. John Wiley & Sons. New York. Chichester, Brisbane Toronto.
9. Satyanarayana U. Biochemistry (2001) Books and Allied Pvt. Ltd., Calcutta.
10. Sheeler P, D. E. Bianchi (1987) Cell and Molecular Biology. Third, Edition, John Willey and sons.
11. Simpson R. J. (2004) Purifying Proteins for proteomics – A laboratory manual – Cold Spring Harbor laboratory press.
12. Stanier. R.Y. J.N. Ingraham, M.L. Wheelis & P.R. Painter (1995) – General Microbiology, 5th Ed. Mac Millan Press Ltd.
13. Stryer L – (1995) Biochemistry, 4th Edition W.H. Freeman & Company New York.
14. Subbarao N.S. (1979), Recent advances in biological nitrogen fixation: Oxford & IBH Publishing Co. Private Ltd. New Delhi.

* Students are supposed to refer to "Current Contents" and periodicals for recent & additional information



**BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE, INDIA**

M.Sc. Microbiology (CBCS- 2018 COURSE)

SEMESTER –II

PGMB-205: PHYSIOLOGY AND METABOLISM

Total Credits: 04

Total Lectures: 60

Course Outcomes:

At the end of this course the students will be able to:

1. Understand structure and functions of proteins and vitamins
2. Know details of photosynthesis process.
3. Understand details of lipid metabolism and metabolism of nitrogenous compounds.

Course contents:

UNIT I STRUCTURE AND FUNCTIONS OF PROTEIN

15

1. Protein Structure

- Factors determining protein structure
- Tertiary structure of globular proteins and functional diversity
- Dynamics of globular protein structure
- Methods of protein detection Dicroism (CD) Nuclear Magnetic Resonance (NMR), X-ray crystallography.

2. Protein Function and evolution

- Actin– Myosin, structure of muscle, mechanism of mocontraction, role of calcium
- Microtubule system
- Oxygen Transport-Haemoglobin
- Changes in haemoglobin structure on oxygen binding
- Haemoglobin variants
- Evolution of Haemoglobin and Myoglobin

3. The diversity of enzymatic function

- Protein enzymes
- Non prorein enzyme
- The regulation of enzyme activity- substrate level, feed back control,
- Allosteric enzymes -

UNIT II VITAMINS–OCCURRENCE, STRUCTURE AND BIOCHEMICAL FUNCTION 08

1. Water soluble vitamins.
2. Fat soluble vitamins.

UNIT III PHOTOSYNTHESIS 08

1. Energy considerations of photosynthesis.
2. Light energy and photolysis of water.
3. Photo chemical centers.
4. Uphill flow of electrons.
5. Electron carriers in photosynthesis.
6. Cyclic photophosphorylation – Light reaction.
7. Non cyclic photophosphorylation.
8. Regulatory aspects of photosynthesis.
9. Dark reactions – The Calvin cycle
10. Photosynthesis –
 - C₃, C₄, & CAM plants.
 - Photorespiration.

UNIT IV LIPIDS METABOLISM AND PHYSIOLOGICAL FUNCTION 16

1. Steroid metabolism

- Structure of steroids
- Biosynthesis of cholesterol
- Bile acids
- Other isoprenoid compounds

2. Eicosanoid metabolism

- Structure
- Biosynthesis and catabolism
- Biological action

3. Phospholipid metabolism

- Structure
- Biosynthesis of phospholipids in bacteria
- Glycerophospholipid metabolism in eukaryotes.

4. Hormones in regulation of metabolism.

- Classification of hormones –
 - a. Based on the chemical nature.
 - b. Based on mechanism of action.
- Mechanism of hormone action –
 - a. Synthesis.
 - b. Signal transduction.
 - c. Steroid and thyroid hormones.
 - d. Endocrine glands & their secretion.

UNIT V METABOLISM OF NITROGENOUS COMPOUND (AMINO ACIDS, NEUROTRANSMITTERS) 06

1. Nitrogen metabolism – Glutamate dehydrogenase, Glutamate synthase & glutamine synthetase.
 - Biosynthesis and regulation of amino acids.
 - Catabolism of amino acids.
2. Amino acids related to citric acid cycle.
3. Amino acids and their metabolites as Neurotransmitters and biological regulators.

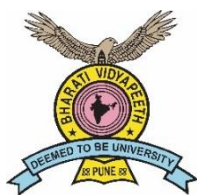
UNIT VI Tools in Biochemistry

07

References :

1. Agarwal G.R., Agarwal O. P. Agarwal K. Text book of Biochemistry, Goel publishing house Meerut, 8th Edition 1995.
 2. Conn, E.E. P.K. Stumpf, G. Bruening and R.H. Dol. (1995). Outlines of Biochemistry. 5th Edition John Wiley and Sons.
 3. Doelle, H.M. (1975), "Bacterial metabolism". Academic Press Inc. Ltd. London.
 4. Foster. R.L. (1980) The Nature of Enzymology Croon Helm Ltd. London.
 5. Kachel. P. W. & G. B. Ralstion (2003) Schaum's outlines. Biochemistry – II Edition. Tata McGraw Hill Edition.
 6. Lehninger. A. L; Nelson, M. M. Cox (1992) Principles of Biochemistry 2nd Edition, CBS Publishers and Distributors.
 7. Mathews C.K., K.E. van Holde, Kevin G. Ahern, Biochemistry Third Edition (2003), Published by Pearson Education (Singapore) Ltd. Delhi.
 8. Palmer. T. (1995) – Understanding enzymes. 4th Edition. Ellis Horwood Ltd. Publishers P. John Wiley & Sons. New York. Chichester, Brisbane Toronto.
 9. Satyanarayana U. Biochemistry (2001) Books and Allied Pvt. Ltd., Calcutta.
 10. Sheeler P, D. E. Bianchi (1987) Cell and Molecular Biology. Third, Edition, John Willey and sons.
 11. Simpson R. J. (2004) Purifying Proteins for proteomics – A laboratory manual – Cold Spring Harbor laboratory press.
 12. Stanier. R.Y. J.N. Ingraham, M.L. Wheelis & P.R. Painter (1995) – General Microbiology, 5th Ed. Mac Millan Press Ltd.
 13. Stryer L – (1995) Biochemistry, 4th Edition W.H. Freeman & Company New York.
 14. Subbarao N.S. (1979), Recent advances in biological nitrogen fixation: Oxford & IBH Publishing Co. Private Ltd. New Delhi.
-
1. Students are supposed to refer to "Current Contents" and periodicals for recent & additional information

[Type here]



**BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE, INDIA
M.Sc. Microbiology (CBCS-2018 COURSE)**

SEMESTER II

PGMB 211:- PRACTICAL COURSE-3

Total Credits: 02

Total Lectures: 120

Course Outcomes:

At the end of this course the students will be able to:

1. Understand different methods for analysis of data.
2. Develop skills for enzyme purification and fermentation.

Course contents:

1. Biostatistics:	12 P
• Mean, mode, median.-3	
• Variance & correlation.-3	
• T – Test, F-Test. r^2 test.-3	
• Use of computers in Biostatistical analysis.-3	
2. Fermentor design	1 P
3. Production of citric acid by surface and submerged culture.	2 P
4. Production of ethanol by shake flask culture and in fermentor	2 P
5. Enzymes – Enzyme purification.	1 P
• Ammonium sulfate precipitation.	
• Organic solvent precipitation.	
• Gel filtration.	
6. Determination of K_m and V_{max} values of Invertase and amylase.	2 P
7. Spectrophotometric analysis of nucleic acid and protein	2 P

	22 P

[Type here]

References:

1. Bailey N.T.J. (1995) Statistical Methods in Biology 3rd Edition. Cambridge lowprice Edition Cambridge university press.
2. Dixit J.V. (1996) Principles & Practice of Biostatistics 1st Edn. M/s. Banarasidas Bhanot (Publisher).
3. Frank H. Stephenson (2003) Calculations for Molecular Biology and Biotechnology. A guide to Mathematics in the laboratory Academic Press an imprint of Elsevier
4. Goldsby R.A. Kindt. T.S. and B.A. Osborne (2000) Kuby Immunology Fourth Edition W.H. Freeman & Co New York.
5. Khan And Khanum, (2008), Fundamentals of Biostatistics, 3rd Revised Edition, Ukaaz Publication, Hyderabad.
6. Reed R, Holmes; D; Weyers. J & A Jones (1998) Practical skills in Biomolecular sciences. Adison Wesley Longman Ltd.
7. Stanbury; P.F. and A. Whitaker (1984) Principles of fermentation Technology. Pergamon. New York
- 8 T. Bhaskararao (2002) Methods of Biostatistics.Paras Publishing.
- 9 Wardlaw A.C. (1985) Practical Statistics for experimental Biologists JohnWiley & Sonhs. Ltd

* Students are supposed to refer to “Current Contents” and periodicals for recent & additional information.

[Type here]



**BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE, INDIA**

**M.Sc. Microbiology (CBCS- 2018 COURSE)
SEMESTER II**

PGMB 212:- PRACTICAL COURSE-4

Total Credits: 02

Total Lectures: 120

Course Outcomes:

At the end of this course the students will be able to:

1. Perform statistical analysis of genetic data.
2. Develop skills to conduct different genetic experiments.

Course contents:

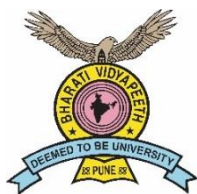
1. Calculation of Mendelian Ratios	2 P
2. Statistical analysis of Genetic data.	2 P
3. Problems on Hardy – Weinberg principle	2 P
4. Determination of vitamin C/A/B2 in natural sources	2 P
5. Measurement of activity NAD dependant enzymes	2 P
6. Isolation of nucleic acid and characterization by gel Electrophoresis	2 P
7. Recombination in bacteria – Preparation of competent cells and transformation of plasmid DNA in <i>E. coli</i> .	2 P
8. Conjugation in bacteria.	2 P
9. Plasmid curing using different agents	2 P
10. Protoplast fusion	1 P
11. Determination of mutation rate – natural and induced	
12. Gene Cloning – Demonstration	3 P

	22 P

References:

1. Frank H. Stephenson (2003) Calculations for Molecular Biology and Biotechnology. A guide to Mathematics in the laboratory Academic Press an imprint of Elsevier.
2. Gardner E.J., Simmons, M.J and D.P. Snustad. (1991) Principles of Genetics. 8th Edition. John Willey & Sons. Inc.
3. Hartl. D.L. and E.W. Jones. (1999) Essential Genetics. Second Edition. Jones and Bartlett Publisher.
4. Irwin H. Segel (1976) Biochemical Calculations 2nd Edition John Wiley & Sons.
5. Lewin B. (2004) Genes VIII – International Edition. Pearson. Prentice Hall. Pearson Education International
6. Pierce.B.A, (2005) Genetics A Conceptual Approach.2nd Edition.W.H.Freeman and Company,New York
7. Pranab Kr. Banerjee (2006) Problems on Genetics, Molecular Genetics and Evolutionary Genetics. New Central Book Agency (P) Ltd. Kolkata.
8. Primrose. S.B. and R.M. Twyman and R.W. Old (2003). Principles of Gene Manipulation. 6th Edn. Blackwell Science.
9. Reed, R; Homes, D; Weyers, J. and A. Jones. Practical skills in Biomelecular Sciences. Addison Wesley Longman Limited
10. Russel. P. (1998) Genetics Fifth edition. Addison. Wesley Longman Inc.
11. Sambrook. J and D.W. Russel. (2001) Molecular cloning. A Laboratory Manual. 3rd Edn. Vol. 1,2,3. Cold Spring Harbor laboratory Press..
12. Snyder. L. and W. Champress. (1997) Molecular Genetics of Bacteria.
 - a. ASM Press. Washington. D.C.
13. Watson J.D. Baker T.A., Bell S.P. Gann A, Levine M. and R. Losick. 2004) Molecular Biology of the Gene.5th Edn.Low Price edition. Pearson

[Type here]



**BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE, INDIA**

M.Sc. Microbiology (CBCS- 2018 ABILITY ENHANCEMENT COURSE)

SEMESTER II

PGAEC 201: SCIENTIFIC WRITING

Total Credits: 02

Total Lectures: 30

Course Outcomes:

At the end of this course the students will be able to:

1. Understand concept of scientific writing.
2. Know presentation skills.

Course contents:

UNIT I. SCIENTIFIC WRITING

- 1. General aspects: 4**
Organising time, Organizing information and ideas eg. writing - adopting a scientific style, Developing technique, Getting Started Revising your text with the help of words and phrases, sentences, paragraphs, using dictionaries, using a thesaurus, using guides for written English.
- 2. Review writing: 4**
Organizing time, making a plan Construct possible content and examples, construct an outline, Start writing, Reviewing your write-up.
- 3. Reporting practical and project work: 6**
Practical & project reports Thesis Structure of reports of experiment works - Title, Authors & their institution, Abstract Summary, List of Contents. Abbreviations, Introduction, Materials and Methods Results Discussion / conclusions, Acknowledgements, Literature cited (Bibliography) Production of a practical report choose the experiment, make up plants, write, Revise, prepare final version. Submit Producing a Scientific paper Assessing potential content, choosing a journal, writing, submitting. Responding to referees comments checking proofs & waiting for publication.
- 4. Writing literature surveys: 5**

[Type here]

Selecting a topic Scanning the literature and organizing references, Deciding on Structure and content Introduction, Main body of the text, conclusion, References, Style of literature surveys.

- 5. Organizing a poster display:** **5**
Preliminaries, Design, Layout, Title Text, Sub titles and headings, Colour Content. Introduction, Materials and Methods, Results and conclusion. The poster session.
- 6. Giving an oral presentation.** **4**
• Preparation - Preliminary information, Audio - Visual aids, Audience. Content - Introductory remarks, the main message. Concluding remarks on presentation.
- 7. Writing research paper:** **2**
• Title, Authors and address, Abstract, Key words, Introduction, Materials and Methods, Results & Discussion / conclusions, Acknowledgements, Literature cited (Bibliography)

Literature Cited

1. Day Robert A. : How to write and publish a scientific paper.
2. Gibaldi Joseph: MLA handbook for Writers of Research Papers.
3. Kothari R. C. : Research Methodology, Methods and Techniques, 2nd revised edition, New Age International.
4. Ranjit Kumar: Research Methodology.
5. Reed, R. Homes, D; Weyers, J. and A. Jones. Practical skills in Bimolecular Sciences. Addison Wesley Longman Limited
6. Bailey N.T.J (1995) Statistical Methods in biology 3rd Edition. Cambridge low price Edition Cambridge university press.
7. Baxevanis A. D. and B.F. F. Ouellette, Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins.
8. Bergeron. B. (2003). Bioinformatics and Computing. Prentice Hall Inc. Eastern Economy Edition.
9. Bergey's Manual of Systematic bacteriology (2nd Ed.), Volume, 1 Springer.
10. Campbell R.C. : Statistics for Biologists, Cambridge University Press.
11. Day Robert A. : How to write and publish a scientific paper.
12. Dixit J.V. (1996) Principles & Practice of Biostatistics 1st Edn. M/s. Banarasidas Bhanot (Publisher).
13. Dixit M. (1999) Internet: an Introduction, Tata McGraw-Hill Series.

[Type here]

14. Dwyer. R.A. (2003) Genomic Perl. From Bioinformatics: Basics to working code. Cambridge University Press.
15. Frank H. Stephenson (2003) Calculations for Molecular Biology and Biotechnology. A guide to Mathematics in the laboratory Academic Press an imprint of Elsevier.
16. Gibaldi Joseph: MLA handbook for Writers of Research Papers.
17. Irwin H. Segel (1976) Biochemical Calculations 2nd Edition John Wiley & Sons.
18. Khan And Khanum, (2008), Fundamentals of Biostatistics, 3rd Revised Edition, Ukaaz Publication, Hyderabad.
19. Khan Imtiaz Alam : Elementary Bioinformatics, Pharma Book Syndicate.
20. Kothari R. C. : Research Methodology, Methods and Techniques, 2nd revised edition, New Age International.
21. Prescott. S.C. and C.G. Dunn (2002) Industrial Microbiology. Publ. Agrobios. India Jodhpur
22. Ranjit Kumar: Research Methodology.
23. Reed, R. Homes, D; Weyers, J. and A. Jones. Practical skills in Bimolecular Sciences. Addison Wesley Longman Limited.
24. Simpson R.J. (2004) Purifying Proteins for Proteomics. A laboratory Manual. Cold spring Harbor laboratory press.
25. Sneath, P.H.A. Mair : N. S. Sharpe : M.E. and J. G. Holt (Eds) (1986), Bergey's Manual of Systematic bacteriology Vol. II Williams and Wilkins, Baltimore, London, Tokyo.
26. T. Bhaskararao (2002) Methods of Biostatistics. Paras Publishing.
27. Wardlaw A.C. (1985) Practical statistics for experimental Biologists John Wiley & Sons. Ltd.
28. Wayne Daniel: Biostatistics - A Foundation for Analysis of Health Sciences, John Wiley and Sons, Inc.
29. Wayne Goddard and Stuart Melville: Research methodology – An Introduction.
30. Westhead. D.R., Parish J.H and R.M. Twyman (2003) Instant notes in 'Bioinformatics' Viva Books Private Ltd.