

**MASTER OF PHILOSOPHY (M. Phill.)
IN
BIOTECHNOLOGY**



**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY,
PATAN**

Preamble

Biotechnology is the science of today and tomorrow. It has applications in all major service sectors. i.e. health, agriculture, industry, environment etc. Biotechnology as an application science has taken firm footing in many countries, abroad where a number of transgenic crops, genetically modified food and recombinant therapeutic molecules for human and animal health are available in the market. Biotechnology as a science of service to human society is yet to make inroads in India.

Biotechnology offers an opportunity to identify the new diseases in the field of medicine. It produces vaccines and drugs to prevent and cure the diseases with advanced techniques; to identify genetical disorders in human beings, plants and animals. Our research covers a wide spectrum, from whole organism biology upto molecular biology and modeling, where molecular ecology forms the bridge between many of our diverse interests.

The coming together of Biotechnology and informatics is paying rich dividends. Genome projects, drug design and molecular taxonomy are all becoming increasingly dependent on informatics. The cost of products through a biotechnological process is always less than that produced through a chemical synthetic route.

Main objective of this one year M. Phil. Degree course conducted in association with GSBTM has been designed for enabling the Master's Degree holders to acquire expert knowledge of research methodology and other advanced topics for being prepared to get registered in the Ph.D. Degree in the relevant Faculties.

To keep this goal in first and last aim, we introduce a M Phill course in Biotechnology at Department of Biotechnology, Hemchandracharya North Gujarat University, Patan with collaboration with Gujarat State Biotechnology Mission (GSBTM), Gandhinagar.

ABOUT COURSE

Course Name: M. Phil. In Biotechnology

Course duration: One (1) year

Eligibility: Candidate must have Master's Degree in Biotechnology, Biochemistry, Bioinformatics, Microbiology, Genetics, Botany, Zoology, Environment science and any subject in Life Sciences.

Admission Process:

Through Entrance Test conducted by University / GSBTM. All the students from Universities within Gujarat state will be eligible and will be give equal weightage. 5 % seats will be reserved for students from Universities other than Gujarat State. Advertisement will be given by University / GSBTM Admission committee.

Intake capacity: 5 students / Faculty

Medium of Instruction: The medium of instruction shall be English

Distribution of Papers: There are three papers in M.Phil. Degree besides an M.Phil. Thesis to be submitted. Examinees will appear in First Semester Examination having one paper i.e. Research Methodology and in Second Semester Examination having two papers concerned with the Biotechnology subject.

M.Phil. Examination pattern: Theory examination will be done by MCQ – online examination. Three questions bank will be prepared by panel of examiners for each paper. No students will have the same question paper. Dissertation report will be reviewed by the examiners and viva will be organized by panel of examiners.

Fee Structure: As per University rules

Accommodation: The University has hostel for boys and girls. The hostel accommodation will be subjected to university rule.

Attendance: As per University rules

Outline of Syllabus

Module No.	Module Title	Marks	Credit
Semester – I			
Module – I	Research Methodology – I	70	4
Module – II	Advanced & Applied Biotechnology – I	70	4
Module – III	Advanced & Applied Biotechnology – II	70	4
Internal	Assignments, Seminars and Problem based learning	90	
Semester – II			
Module – I	Research Methodology – II	70	4
Module – II	Advanced & Applied Biotechnology – I	70	4
Module – III	Advanced & Applied Biotechnology – II	70	4
Internal	Assignments, Seminars and Problem based learning	90	
Module IV	M. Phill Thesis	300	16
	Viva-voce	100	
Total		1000	40

M.Phil. Biotechnology**SEMESTER – I****Module – I: Research Methodology (70 marks)****Unit- I**

Basic Concepts of Computer
Computer applications in Biology

Unit- II

Biostatistics:
Quantitative Techniques

Unit -III

Scientific Writing

An Insight into Research:

- a) Definition and kinds of scientific documents
- b) Components of a research
- c) Dealing with publishers
- d) Oral and poster presentation of research papers in conferences/symposia.
- e) Preparation and submission of research project proposals to funding agencies

Unit- IV

Research Techniques

Suggested readings:

1. Biostatistics : A foundation for Analysis in the Health Sciences 7/E Wayne W. Daniel, Wiley Series in Probability and Statistics.
2. Introductory Statistics. Fifth Edition. (2004) Prem S. Mann. John Wiley and Sons (ASIA) Pvt. Ltd.
3. Bioinformatics Methods and Applications Genomics, Proteomics, and Drug Discovery (S. C. Rastogi, N. Mendiratta, and P. Rastogi).
4. Introduction to Bioinformatics, (Atwood, T. K. and Parry-Smith, D. J).
5. Protein Purification by Robert Scopes, Springer Verlag Publication, 1982
6. Tools in Biochemistry David Cooper
7. Methods of Protein and Nucleic acid Research, Osterman Vol I – III
8. Centrifugation D. Rickwood
9. Practical Biochemistry, V th edition, Keith Wilson and Walker.
10. Bioinformatics by David Mound
11. Practical Biochemistry, Vth edition, Keith Wilson and Walker.
12. Protein Purification by Robert Scopes, Springer Verlag Publication, 1982
13. Tools in Biochemistry David Cooper
14. Methods of Protein and Nucleic acid Research, Osterman Vol I – III
15. Centrifugation D. Rickwood

M.Phil. Biotechnology

SEMESTER – I

Module – II Advanced & Applied Biotechnology – I (70 Marks)

Unit I

Basic techniques in tissue culture

Unit II

Plant cell culture

Plant transformation technology & its applications.

Unit III

Plant secondary metabolites

Genetic engineering in Plants

Applications of genetic engineering

Unit IV

Animal cell culture and tissue engineering

Use of Animal Cells in Culture

Suggested readings

1. An introduction to Plant Tissue Culture 2nd edn. Razdan, M. K, Science Publishers, USA.
2. Textbook of plant biotechnology, Chawla P.K.2002,Oxford&IBH,New Delhi.
3. Bhojwani, S. S. and M. K. Razdan 1996.Plant Tissue Culture: Theory and Practice, Elsevier Pub.
4. Chrispeels, M. J. 2002.Plant Tissue Culture:Genetical Aspects. Jones and Bortlett Publishers, International.
5. Chopra V. L. et al 1999. Applied Plant biotechnology. Science Publishers Inc.
6. Verpoorte, R. and A.W. Alfermann (Eds) 2000.Metabolic Engineering of plant secondary metabolism, lower Academic Publisher.
7. Kuchler, R.J., Biochemical Methods in cell culture and Virology, Dowden, Huchinson and Ross,Inc. Strausberg, USA, 1977
8. Morgan, S. I. Animal cell culture, 1993,Bio Scientific Publishers Ltd, Oxford.
9. Freshney,R.I.Culture of Animal cells:A Manual of Basic Technique, 1994, John Wiley and Sons Inc. Publication, USA.

10. Butler, M. Mammalian, cell Biotechnology: A Practical Approach (1991), IRL Press, Oxford.
11. Jenni P. Mather and David Barnes, eds; Animal cell culture Methods, Methods in cell Biology, vol.57, Academic Press.
12. Cell Culture: Methods in enzymology, Vol-58, Academic Press 1979 or recent.

M.Phil. Biotechnology

SEMESTER – I

Module - III: Advanced & Applied Biotechnology- II (70 marks)

Unit I

Gene Technology

Unit II

Immunology

Unit III

Tissue culture Techniques

a) Animal Culture:

b) Plant tissue culture:

Unit IV

Bio fertilizers

Recent advances in Biotechnological research

Suggested readings:

1. Bergey's Manual of Systematic Bacteriology (2nd Ed.), Volumes 1 to 4 Springer
2. The Search for Bioactive Compounds from Microorganisms by S. Omura
3. Continuous Culture (Vol. 8) by A. C. R. Dean, D. C. Ellwood and C. G. T. Evans
4. Annual Reviews in Microbiology Volumes 46 & 48 by L. N. Ornston, A. Balows and E. P. Greenberg (eds). Academic Press
5. Biotechnology: Current Progress Volume 1 by P. N. Cheremisinoff and L. M. Ferrante. Technomic Publishing Co. Inc
6. Advances in Applied Microbiology volumes 6, 10, 17 by D. Perlman and Umbreit (eds). Academic Press.
7. The Physiology and Biochemistry of Prokaryotes by D. White. Oxford University Press
8. Sambrook J, Fritsch E. F. and Maniatis (1989) Molecular cloning, vol. I, II, III, 2nd edition, Cold spring harbor laboratory press, New York.

9. DNA Cloning : A practical approach D.M. Glover and D.B. Hames, RL Press, Oxford, 1995
10. Molecular and cellular methods in Biology and Medicine, P.B. Kaufman, W. Wu , D. Kim and L.J. Cseke, CRC Press Florida 1995
11. Methods in Enzymology Guide to Molecular Cloning Techniques, Vol. 152 S.L. Berger and A. R. Kimmel, Academic Press Inc, San Diego, 1996
12. Methods in Enzymology Gene Expression Technology, Vol. 185D. V. Goedel, Academic Press Inc, San Diego, 1990
13. DNA Science: A First Course in Recombinant Technology, D. A. Mickloss and G. A Freyer, Cold Spring Harbor Laboratory Press, New York, 1990
14. Molecular Biotechnology, 2nd Ed. S. B. Primrose, Blackwell Scientific publishers, Oxford, 1994
15. Route Maps in Gene Technology, M. R. Walker, and R. Rapley, Blakwell Science, Oxford, 1997
16. Genetic Engineering : An Introduction to Gene Analysis and Exploitation in Eukaryotes, S. M. Kingsman, Blackwell Scientific Publications, Oxford, 1998
17. Kuby : Immunology; RA Goldsby, Thomas J. Kindt, Barbara A. Osborne.
18. Immunology by Roitt I. M., Brostoff J. and Male D. Gower medical publishing London.
19. Fundamentals of immunology 4th ed., Paul 1999, Lippencott Raven.

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SEMESTER - II

Module – I: Research Methodology – II (70 marks)

UNIT I

Microscopy and different techniques in Microscopy

UNIT- II

Electrophoresis

Applications of different electrophoresis techniques

UNIT - III

Principles and techniques of hybridization.

Principles and applications of PCR

Unit - IV

Applications of Biostatistics in Modern Biology

Basic Bioinformatics and software used in Biology.

Suggested readings:

1. Biostatistics : A foundation for Analysis in the Health Sciences 7/E Wayne W. Daniel, Wiley Series in Probability and Statistics.
2. Prem S. Mann, 2004. Introductory Statistics. Fifth Edition. John Wiley and Sons (ASIA) Pvt. Ltd.
3. S. C. Rastogi, N. Mendiratta, and P. Rastogi. Bioinformatics Methods and Applications Genomics, Proteomics, and Drug Discovery.
4. Introduction to Bioinformatics, (Atwood, T. K. and Parry-Smith, D. J).
5. Protein Purification by Robert Scopes, Springer Verlag Publication, 1982
6. Tools in Biochemistry David Cooper
7. Methods of Protein and Nucleic acid Research, Osterman Vol I – III

8. Joseph Sambrook & David W. Russell, Molecular Cloning – A laboratory Manual (Third Edition) – Cold Spring Harbor laboratory Press, Cold Spring Harbor, New York.
9. M. Prakash, C.K. Arora, Laboratory Instrumentation, – Anmol Publications Pvt Ltd.,
10. Charles N. Rely, Donald T. Sawyer, Robert E. Krieger Huntington Experiments of Instrumental methods, A Laboratory Manual, New York.
11. Hobart, H. Willard, Lynne L. Meritt J.R. John Dean, Instrumental Methods of Analysis, East West Press Pvt Ltd.
12. Gelvin, Plant Molecular Biology, A Laboratory Manual, Kluwer Academic Press.
13. P.N. Arora and P.K. Malhotra, Biostatistics
14. Norman T.S. Bailey, Statistical Methods in Biology. Cambridge University Press, UK

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SEMESTER - II

Module - II: Advanced & Applied Biotechnology - I (70 marks)

Unit I

Forensic Biotechnology

Unit II

Molecular Markers

Marker assisted selection for improvement

Unit III

Embryo transfer technology.

In-vitro fertilization.

Unit IV

Ethics in Biotechnology

Recommended Books

1. Ralf Pörtner, 2007. Animal Cell Biotechnology: Methods and Protocols (Methods in Biotechnology). 2nd Edition. Humana Press.
2. R.Spier and J.Griffiths, 1994. Animal Cell Biotechnology.. Academic Press.
3. D.C. Darling and S.J. Morgan, 1994. Animal Cells Culture and media, BIOS Scientific Publishers Limited.
4. Jennie P. Mather and David Barnes, 1998. Methods in Cell Biology, Volume 57: Animal Cell Culture Methods Academic Press.
5. Robert N. Trigiano, Dennis J. Gray, 1996. Plant Tissue Culture Concept and Laboratory Exercises , CRC Press , London.
6. P.S. Srivasta, 1998. Plant Tissue Culture and Molecular Biology , Narosa Publishing House ,New Delhi.
7. David W. Galbraith, Hans J. Bohnert and Don P. Bourque, 1995. Methods in Plant Cell Biology, Academic Press, New York.
8. Singh, S.K. & Srivastava, Seema. 2006.Plant Tissue Culture Eastern Book Corporation, India
9. Narayanaswamy, S, 1994. Plant Cell And Tissue Culture Tata McGraw Hill Publishers
10. John M Butler, 2009. Fundamental of Forensic DNA typing, Academic Press, USA.
11. Alan Gunn, 2006. Essential Forensic Biology (2nd Edition). Wiley Blackwell Publishers, UK.
12. S. Srivastava, 2004. Plant Biotechnology and Molecular Markers (1st Edition). Springer.

13. William Goodwin, Adrian Linacre, Sibte Hadi, 2007. An Introduction to Forensic Genetics. John Wiley & Sons. UK.
14. Ethics and Law in Biological Research (1st Edition), Springer.
15. Jonathan Morris, 2005. The Ethics of Biotechnology. Chelsea House Publications.

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SEMESTER - II

Module - III Advanced & Applied Biotechnology (70 Marks)

Unit I

Enzymes and enzyme technology in the diagnosis of Disease

Unit II

Blood chemistry

Unit III

Major Diseases of Humans

Unit IV

Cancer Biology

Genetic disorders

Suggested Readings:

1. Immunology – A Short Course by Benjamin and others Wiley – Liss Inc.
2. Immunology by Roitt. Published by Mosby
3. Lecture notes on Epidemiology and Community Medicines by Farner and Miller
4. Handbook of Practical Immunology by D. W. Weir Volumes 2 & 3
5. Basic and Clinical Immunology by Stites and others (eds). Lange Medical Publications
6. Mycoplasmas by J. Maniloff (ed). American Society for Microbiology
7. Biotechnology: Current Progress Volume 1 by P. N. Cheremisinoff and L. M. Ferrante. Technomic Publishing Co. Inc
8. Medical Bacteriology and AIDS by N. C. Dey and T. K. Dey

M. Phil Thesis

Thesis submission marks: 300 Marks

Viva-voce: 100 marks