HEMCHAND YADAV VISHWAVIDYALAYA, DURG (C.G.)

Website -www.durguniversity.ac.in, Email - durguniversity@gmail.com

SCHEME OF EXAMINATION

&

SYLLABUS

of

M.Sc. (BIOTECHNOLOGY) Semester Exam

UNDER

FACULTY OF SCIENCE

Session 2021-22

(Approved by Board of Studies)

Effective from June 2021

HEMCHANDYADAV VISHWAVIDYALAYA, DURG (C.G.)

Biotechnology

Semester IV

Scheme of Examination

Paper Code	Title of Theory/Practical Paper	Marks		
		External	Internal	**Total**
13	Basic Concept of Bioinformatics & Nano-biotechnology	80	20	100
14	Advance techniques in Biotechnology	80	20	100
15	Animal Biotechnology	80	20	100
16	Functional Genomics & Proteomics	80	20	100
Lab Course 7	Based on paper 13 & 14	80	20	100
Lab Course 8	Based on paper 15 & 16	80	20	100
	Total Marks			**600**

HEMCHANDYADAV VISHWAVIDYALAYA, DURG (C.G.)

Biotechnology

Semester IV

Paper 13: Basic Concept of Bioinformatics and Nanobiotechnology

M.M. 80

Unit —1
Bioinformatics: Introduction, History, Scope of Bioinformatics, Biotechnology and Bioinformatics, BTIS network in India, Application of Bioinformatics.

Unit — II
Types of Sequences- Genomic DNA, cDNA, EST, STS, Biological database: Introduction, primary, secondary and tertiary biological database; Information sources with special reference to NCBI, EMBL, DDBJ, Gene bank.

Unit-III
Bioinformatics software tools- BLAST, MMDB, VAST, PDB Chemoinformatics, Pharmacogenomics, Bioinformatics in Drug discovery, Human Genome Project

Unit-IV
Nanobiotechnology: General Introduction, Nanotechnology and Nanobiotechnology; Nanoscale; Nanomicroorganisms-Nanovirus, Nanobacteria; Application of Nanobiotechnology.

NOTE: Each theory paper will have five questions of equal marks. First question will be based on complete syllabus with no internal choice, whereas rest questions will be unit-wise.

Books:-

1. David W. Mount (2004) Bioinformatics: sequence and genome analysis; CSHL press
2. C.S.V. Murthy (2003) Bioinformatics. First Edition, Himalaya Publishing House.
3. Dov Stekel (2005) Microarray bioinformatics. Cambridge University Press.
4. S.C. Rastogi, Namita Mendiratta, Parag Rastogi (2003) Bioinformatics: Concepts, Skills and Applications, CBS Publishers and Distributors, New Delhi.
5. Andreas D. Baxebanis. B.F. Francis Ouellette (2001) Bioinformatics: A practical Guide to the Analysis of genes and proteins. Wiley Interscience.
6. C. Subramanian (2004) A Text Book of Bioinformatics. Dominant Publishers and Distributors, New Delhi.
7. Sandra J. Rosenthal, David W. Wright (2005) Nanobiotechnology Protocols. Humana Press Inc. 999 Riverview Drive, Suite, 208, Totowa, New Jersery.
8. David W. Mount (2005) Bioinformatics: sequence and genome analysis. Second edition. CBS Publishers and Distributors, New Delhi, Bangalore (India).
9. B.D. Singh, (2004) Biotechnology. Expending Horizons. First Edition. Kalyani Publishers, Ludhiana.
10. U. Satyanarayana (2005) Biotechnology. Books and Allied (P) Ltd., Kolkata.
11. PC Trivedi (2008) Nanobiotechnology; Pointer Publishers

List of Practical:

1. To extract protein / nucleotide database of phosphoprotein P of [Swine parainfluenza virus 3]
2. To find out and study the human nucleotide sequence records associated with cancer
3. To find out the location of particular target gene on human chromosome map
4. To study sequence alignment through BLAST
5. To study multiple sequence alignment
6. To find out protein modelling through MMDB.
7. To study how to develop primer (F+R) from given nucleotide sequences

Biotechnology

Semester IV

Paper 14: Advanced techniques in Biotechnology

M.M. 80

Unit I

1. Principles and application of: Centrifugation, Chromatography (Paper, thinlayer, column) Electrophoresis.
2. Principles and application of: Colorimetry, Spectrophotometry and densitometry
3. RIA and autoradiography in biology, ELISA

Unit II

1. Principle & Application of microscopy – Confocal, Scanning and Electron] Phase Contrast & Fluorescence.
2. PCR - Principle, types and applications.

Unit III

1. Principles and application of DNA micro array
2. Fluorescence spectroscopy
3. NMR and X- ray diffraction

Unit IV

1. Principles and application of Cytophotometry
2. Flow cytometry
3. Southern, Northern, and Western Blotting.
4. DNA sequencer

NOTE: Each theory paper will have five questions of equal marks. First question will be based on complete syllabus with no internal choice, whereas rest questions will be unit-wise.

Books:-

1. K. Wilson and J. Walker: Principle and Techniques of Biotechnology and Molecular Biotechnology.
2. Upadhya and Upadhya: Biophysical Chemistry.
3. David, L. Nelson and Michael, M. Cox: Lehniger: Principal of Biochemistry. 4th Edition. W.H. Freeman and Company, New York.
4. Anthony J.F. Griffiths, William M. Gelbart, Richard C. Lewontin and Jeffrey H. Miller; Modern Genetic Analysis; Publisher: W. H. Freeman
5. Ralf Pörtner; Animal cell biotechnology: methods and protocols; Humana Press

List of Practical:-

1. Preparation of different culture media for culture of various microorganisms, like – Bacteria, Fungi, Yeast.
2. Perform the various culture techniques for microbial culture
3. Perform various laboratory techniques-

   A. centrifugation- Normal and ultracentrifugation

   B. chromatography- paper,TLC, Ion exchange chromatography

   C. spectrophotometery,

   D. electrophoresis- agarose gel, acrylamide gel
4. Pure culture techniques of microbes from various sources
5. Perform the advance biotechnological techniques, like – ELISA, PCR, Southern blotting, SDS PAGE etc.

Biotechnology

Semester IV

Paper 15: Animal Biotechnology and Bioethics

M.M. 80

Unit I

1. Animal cell: Structure and organization
2. Equipments and materials for animal cell culture
3. Primary and established cell line cultures.
4. Constituents of culture media and their application
5. Application of animal cell culture

Unit II

1. Biology and characterization of the cultured cells, measuring parameters of growth
2. Basic techniques of mammalian cell culture *in vitro*; disaggregating of tissue and primary culture; maintenance of cell culture; cell separation
3. Scaling - up of animal cell culture.
4. Cell synchronization: Cell growth stages
5. Cell transformation: Characteristics of transformed cells

Unit III

1. Stem cell cultures, embryonic stem cells and their applications.
2. Cell culture based vaccines: General introduction, Vaccines for Malaria and AIDS
3. Transgenic animals: Mice, Sheep and Fish.
4. Tissue engineering: Elementary idea of tissue engineering, Artificial skin, artificial cartilage.

Unit IV

1. Ethical Issues in Biotechnology – Gene Manipulation & Research; experiments in-Animal & Human.
2. Animal Rights; Protection of Biodiversing.

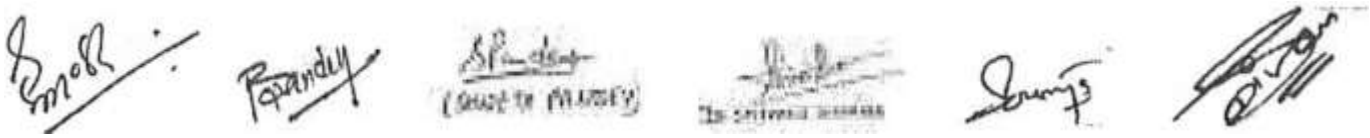
NOTE: Each theory paper will have five questions of equal marks. First question will be based on complete syllabus with no internal choice, whereas rest questions will be unit-wise.

Books:-

1. Animal Cell Culture, Practical Approach: RW Masters; Oxford University Press 2000
2. Animal cell biotechnology: Ralf Pörtner; Humana Press 2007
3. Animal Cell Culture Techniques, M Clynes.
4. Animal Cell Biotechnology methods and Protocols. Nigel Jenkins. Humana Press, Totowa, New Jersey.
5. B.D. Singh, (2004) Biotechnology. Expending Horizons. First Edition. Kalyani Publishers, Ludhiana.
6. U. Satyanarayana (2005) Biotechnology. Books and Allied (P) Ltd., Kolkata.

Practical:

1. Extraction and estimation of DNA from blood
2. Extraction and estimation of DNA from spleen
3. Extraction and estimation of DNA from muscle tissue
4. Cell viability test
5. Blood cell - smear formation and staining
6. Separation of serum and plasma from blood.



Biotechnology

Semester IV

Paper 16: Functional Genomics & Proteomics

M.M. 80

UNIT – I

Genomics – General introduction, Types of genomics, Structural genomics, Functional genomics, Comparative genomics, Genome sequencing, Genome mapping, Future of genomics.

Genomics in medicine: Gene medicine, Disease models, The impact of genomics on medicine.

UNIT – II

Methods of gene sequencing: - Random shotgun sequencing. Whole genome shotgun sequencing, Genome prediction and gene counting, Single nucleotide polymorphisms (SNPs)

Comparative Genomics: Sequence comparison, Comparative genomics in bacteria, Comparative genomics in Eukaryotes & organelles

UNIT – III

Proteomics – general concept, genes and proteins, types of proteomics – structural and functional proteomics. Analysis of protein structure, Method of study of protein – protein array, practical application of proteomics.

UNIT – IV

Future of proteomics, protein chips, synthetic biology, Protein-protein interaction. Protein database – Swiss prot and uniprot. Global analysis of protein, expression analysis and characterization of protein.

NOTE: Each theory paper will have five questions of equal marks. First question will be based on complete syllabus with no internal choice, whereas rest questions will be unit-wise.

Books:-

Principles of Gene Manipulation and Genomics; by Primrose & Twyman

Gene cloning and DNA analysis: An introduction; by TA Brown

Genomics, Proteomics & Vaccines; by Guido Grandi

Genomics: Application in Human biology; by Primrose & Twyman

Introduction to molecular Genetics and Genomics; JBH Publication

Proteomics by Timothy Palzkill

U. Satyanarayan: Biotechnology. Books and Allied (P) Ltd. Kolkata

P.K. Gupta: Biotechnology and Genomics. Rastogi Publication

Practical:

1. Study of whole genome of virus using database.

2. Study of structure of protein (XRD, NMR) using databases.

3. Retrive Protin Form SWISS-PORT

4. Retrive Human Nitocbondrial Geneme using Gene bank database.

5. Find out similar Protein structure using VAST^{+}

Lab. Course 7

Based on Theory Papers 13, 14

Time: 6 hrs **Total Marks – 100**

Q.1 Experiment based on Theory paper 13 (one major & one minor)	30
Q.2 Experiment based on Theory paper 14 (one major & one minor)	30
Q.3 Spotting based on Theory papers	10
Q.4 Viva Voce.	10
Q.5 Sessional	20

Lab. Course 8

Based on Theory Papers 15 and 16

Time: 6 hrs **Total Marks – 100**

Q.1 Experiment based on Theory paper 15 (one major & one minor)	30
Q.2 Experiment based on Theory paper 16 (one major & one minor)	30
Q.3 Spotting based on Theory papers	10
Q.4 Viva Voce.	10
Q.5 Sessional	20

PROJECT

Project Work	External	Internal	Total
Dissertation	240	60	300
Seminar based on project	160	40	200
Viva-voce	80	20	100
Total			**600**

1. A student of IV semester will have the option to opt for project work in lieu of four theory papers and two lab courses provided he/she secures at-least 65% or more marks in aggregate in semester I and II.

2. The project has to be carried out in recognized national laboratories or UGC recognized universities. No student will be allowed to carry out project in private laboratories/ college/ institutions, excluding the colleges recognized as research centers by the RDC of Durg university, Durg CG

3. The valuation of all the projects will be carried out by the external examiner and HoD of UTD or its nominee at the UTD Centre.

The project work should be related to the field of Biotechnology. The project report should include declaration by the candidate, certificate by the supervisor, acknowledgement, title and introduction along with the following points:

1. Introduction
2. Review of Literature
3. Materials and Methods
4. Results & Discussions
5. Summary
6. Bibliography

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