

M.D.UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATION
4th YEAR B. TECH. IN BIOTECHNOLOGY,
SEMESTER VII
EFFECTIVE FROM THE SESSION 2012-13

S. No	Course No.	Subject	Teaching Schedule				Examination Schedule				Duration of exam
			L	T	P/D	Total	Th.	Work	P/VV	Total	
1.	BT 401-F	Concepts of Bioinformatics	3	1	-	4	100	50	-	150	3
2.	BT403-F	Metabolic Engineering	3	1	-	4	100	50	-	150	3
3.	BT 405-F	Intellectual Property Rights in Biotech	3	1	-	4	100	50	-	150	3
4.	BT 407F	Bioentrepreneurship	3	1	-	4	100	50	-	150	3
5.	BT- 409F	Concepts of Biofuels and Bioenergy	3	1		4	100	50	-	150	3
6.		Elective	3	1		4	100	50	-	150	3
7.	BT – 411F	Bioinformatics Lab	-	-	3	3	-	50	50	100	3
8.	BT– 413F	Bioenergy Lab	-	-	3	3	-	50	50	100	3
9.	BT– 415F	Metabolic Engg. Lab	-	-	3	3	-	50	50	100	3
		Total	18	6	9	33	600	450	150	1200	

Electives:

- BT-417-F Stem Cells in health care
- BT-419F Bioethics and Biosafety
- BT–425F Virology
- BT–427F Energy and Environment
- BT–429F Genomics & Proteomics
- BT–437F Fundamentals of Nanobiotechnology

M.D.UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATION
4th YEAR B. TECH. IN BIOTECHNOLOGY,
SEMESTER VIII
EFFECTIVE FROM THE SESSION 2012-13

Sl. No.	Course No.	Subject	Internal Marks	External Marks	Total Marks
1.	BT- 402F	Industrial Training/Institutional Project Work	150	150	300

Note:

The students are required to undergo Industrial Training or Institutional Project Work of duration not less than 4 months in a reputed organization or concerned institute. The students who wish to undergo industrial training, the industry chosen for undergoing the training should be at least a private limited company. The students shall submit and present the mid-term progress report at the Institute. The presentation will be attended by a committee. Alternately, the teacher may visit the Industry to get the feedback of the students.

The final viva-voce of the Industrial Training or Institutional Project Work will be conducted by an external examiner and one internal examiner appointed by the Institute. External examiner will be from the panel of examiners submitted by the concerned institute approved by the Board of Studies in Engg. & Technology. Assessment of Industrial Training or Institutional Project Work will be based on seminar, viva-voce, report and certificate of Industrial Training or Institutional Project Work obtained by the student from the industry or Institute.

The internal marks distributions for the students who have undergone Industrial Training consist of 50 marks from the industry concern and 100 marks by the committee members consisting of faculty members of concerned department of the parent institute.

The teachers engaged for Institutional Project work shall have a workload of 2 hours per group (at least 4 students) per week.

MAHARSHI DAYANAND UNIVERSITY
B. TECH. BIOTECH. 7TH SEM

CONCEPTS OF BIOINFORMATICS

Sub. Code: BT -401F

Periods/week

L:3 T:1

Duration of Ext. Exam: 3 Hrs

MAX. MARKS :150

Sessional:50

External:100

Instructions for setting of paper: Nine questions are to be set in total. First question will be short answer question covering whole syllabus and will be compulsory to attempt. Next eight questions will comprise of two questions each from the four sections. Student will be required to attempt four questions selecting one from each section. Each question will be of 20 marks.

SECTION A

Introduction to Bioinformatics, Databanks – Nucleotide databanks – Genbank, NCBI, EMBL, DDBJ, protein databanks –Sequence databanks – PIR, SWISSPROT, TrEMBL; Structural databases – PDB, SCOP, CATH, PDB; Sequence storage – Sequence accuracy – EST, STS

SECTION B

Sequence analysis: Analysis tools for sequence data banks, Dynamic programming: Needleman and Wunsch algorithm, Smith Waterman algorithm; Global and local alignment, Database searches: BLAST, FASTA, Multiple sequence alignment.

SECTION C

Predictions: Chao-Fasman algorithm, Hidden Markov model, Neural Networking, Protein classification, Fold recognition (threading), homology detection, SRS-Access to biological data banks and integrated data analysis tools.

Phylogenetic Analysis: Fundamental of Phylogenetic model, Tree interpretation – Paralogues and orthologues, Tree building and tree evaluation, Phylogenetic software.

SECTION D

Managing Scientific data: Introduction, challenges faced in integration of Biological information, SRS/MRS, Kleisli Query System and TAMBIS, for a Bioinformatics Database.

Text / Reference Books

1. Developing Bioinformatics Computer Skill by Gibes & Jombeck, Shroff publication
2. Bioinformatics by David W. Mount
3. Bioinformatics by Higgins & Taylor
4. Bioinformatics by Lacroin & Critchlow

MAHARSHI DAYANAND UNIVERSITY
B. TECH. BIOTECH. 7TH SEM

METABOLIC ENGINEERING

Sub. Code: BT – 403F

Periods/week

L:3 T:1

Duration of Ext. Exam: 3 Hrs

MAX. MARKS :150

Sessional:50

External:100

Instructions for setting of paper: Nine questions are to be set in total. First question will be short answer question covering whole syllabus and will be compulsory to attempt. Next eight questions will comprise of two questions each from the four sections. Student will be required to attempt four questions selecting one from each section. Each question will be of 20 marks.

SECTION-A

Basic concepts of Metabolic Engineering - Overview of cellular metabolism; Different models for cellular reaction for primary and secondary metabolites (with reference to polyketide, flavonoid).

SECTION B

Metabolic flux & modelling - Intergration of anabolism and catabolism, metabolic flux distribution analysis bioprocess, material, kinetic types, equilibrium reaction. Experimental determination method of flux distribution, metabolic flux analysis and its applications, Thermodynamics of cellular processes.

SECTION C

Metabolic Profiling & Transcription Factors for metabolic Engineering Metabolic Engineering to improve tolerance of plants to abiotic factors,/ climate change.

Metabolic engineering. with Bioinformatics, Metabolic pathway modeling, Analysis of metabolic control and the structure, metabolic networks, metabolic pathway synthesis algorithms.

SECTION D

Applications of metabolic Engineering - in pharmaceuticals, chemicals bioprocess food technology, nutraceuticals, agriculture, biofuels, environmental bioremediation and biomass conversion.

Text Books

1. Gregory N. Stephanopoulos, Aristos A. Aristidou, Metabolic Engineering – Principles and Methodologies, 1st Edition, Jens Nielsen Academic Press, 1998
2. Relevant research papers
3. Gerhard Gottschalk, Bacterial Metabolism, 2nd Edition, Springer Verlag, 1986
4. S. A. Teukolsky, W. T. Vetterling, B. P. Flannery, W. H. Press, Numerical Recipes in C, Cambridge University Press, 1993

MAHARSHI DAYANAND UNIVERSITY
B. TECH. BIOTECH. 7TH SEM

INTELLECTUAL PROPERTY RIGHTS IN BIOTECH

Sub. Code: BT – 405F

Periods/week

L:3 T:1

Duration of Ext. Exam: 3 Hrs

MAX. MARKS :150

Sessional:50

External:100

Instructions for setting of paper: Nine questions are to be set in total. First question will be short answer question covering whole syllabus and will be compulsory to attempt. Next eight questions will comprise of two questions each from the four sections. Student will be required to attempt four questions selecting one from each section. Each question will be of 20 marks.

SECTION-A

Intellectual property rights: Meaning,-Evolution-Classification and forms, Rationale for protection of IPRs- Importance of IPRs in the field of science and technology.

Scientific and Commercial breakthroughs of Biotechnology at national and intellectual level.

SECTION-B

Intellectual Property: A Copy Right & Industrial Properties, Trademarks, Designs, Geographical Indications; IPR & Technology transfer, Role of patentee & Licensor, Breakthroughs of IPR at National and International level.

SECTION-C

Patents-Concepts and principles of patenting-Patentable subject matter; Procedure of obtaining patents- Rights of patents- Infringement of patent rights; Remedies for infringement of patent rights- Patentability and emerging issues.

Patentability of life forms with special reference to Microorganisms, Pharmaceutical industries

Biodiversity, naturally occurring substances.

SECTION-D

Human genome and IPR, in Public-Private partnership, Government Policies at National and International level in patenting IPR. Availability of Patent facilitating funds, Subtentative Patent Law Treaty, (SPLT), Word Patent, European Patent.

Text / Reference Books

The law and Strategy of Biotechnology Patents, Sibley Kenneth.

MAHARSHI DAYANAND UNIVERSITY
B. TECH. BIOTECH. 7TH SEM

BIOENTREPRENEURSHIP

Sub. Code: BT-407F

Periods/week

L:3 T:1

Duration of Ext. Exam: 3 Hrs

MAX. MARKS :150

Sessional:50

External:100

Instructions for setting of paper: Nine questions are to be set in total. First question will be short answer question covering whole syllabus and will be compulsory to attempt. Next eight questions will comprise of two questions each from the four sections. Student will be required to attempt four questions selecting one from each section. Each question will be of 20 marks.

SECTION-A

Introduction: Creativity & Entrepreneurial personality and Entrepreneurship in Biotechnology, Concept and theories of Entrepreneurship, Entrepreneurial traits and motivation, Nature and importance of Entrepreneurs, Government schemes for commercialization of technology (Eg. Biotech Consortium)

SECTION-B

Project management: Search for a business idea, concept of project and classification, project identification, project formulation, project design and network analysis, project report, project appraisal.

SECTION-C

Financial analysis: Ratio analysis, Investment process, Break even analysis, Profitability analysis, Budget and planning process.

Sources of finance: Source of development finance, Project financing, Institutional financing to Entrepreneurs, Financial institutions, Role of consultancy organizations.

SECTION-D

Marketing channels: Methods of marketing, marketing channels, Marketing institutions and assistance.

Biotech enterprises: Setting up Small, Medium & Large scale industry, Quality control in Biotech industries, Location of an enterprise, steps for starting a small industry, incentives and subsidies, exploring export possibilities.

Text/References:

1. Innovation and entrepreneurship in biotechnology: Concepts, theories & cases by D. Hyne & John Kapeleris, 2006.
2. The Business of Biotechnology: From the Bench of the Street: By Richard Dana Ono Published Butterworth-Heinemann, 1991.
3. Entrepreneurship in Biotechnology: Managing for growth from start-up By Martin Grossmann, 2003.
4. Best Practices in Biotechnology Education: By Yali Friedman, Published by Logos Press, 2008. 356 pages.
5. Plant Development and Biotechnology: by Robert Nicholas Trigiano, Dennis John Gray; Published by CRC Press, 2004, 358 pages.
6. Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya Publishing House, 2005.
7. Projects: Planning Analysis, Selection, Implementation & Review, Prasanna
8. Chandra, Tata Mc Graw-Hill Publishing Co. 12997.

MAHARSHI DAYANAND UNIVERSITY
B. TECH. BIOTECH. 7TH SEM

CONCEPTS OF BIOFUELS AND BIOENERGY

Sub. Code: BT – 409F

Periods/week

L:3 T:1

Duration of Ext. Exam: 3 Hrs

MAX. MARKS :150

Sessional:50

External:100

Instructions for setting of paper: Nine questions are to be set in total. First question will be short answer question covering whole syllabus and will be compulsory to attempt. Next eight questions will comprise of two questions each from the four sections. Student will be required to attempt four questions selecting one from each section. Each question will be of 20 marks.

Section A

Current energy consumption, overview of biofuel/bioenergy and biorefinery concepts.

Fundamental concepts in understanding biofuel/bioenergy production. Alternate source of energy, Biomass as source of energy; Biofuels; Bioethanol and biohydrogen; Solid waste management Renewable feedstocks and their production.

Section B

Feedstocks availability, characterization and attributes for biofuel/bioenergy production
Biomass preprocessing: drying, size reduction, and densification, Various biofuels/bioenergy from biomass, Biomass conversion to heat and power: thermal gasification of biomass, anaerobic digestion

Section C

Biomass conversion to biofuel: thermochemical conversion, syngas fermentation, Biochemical conversion to ethanol: biomass pretreatment, Different enzymes, enzyme hydrolysis, and their applications in ethanol production.

Section D

Biodiesel production from oil seeds, waste oils and algae Environmental impacts of biofuel production, Energy balance and life-cycle analysis of biofuel production, Value-added processing of biofuel residues and co-products; Field visit to a biofuel/bioenergy plant.

**MAHARSHI DAYANAND UNIVERSITY
B. TECH. BIOTECH. 7TH SEM**

BIOINFORMATICS LAB

Sub. Code: BT -411F

Periods/week

**L T P
 3**

Duration of Ext. Exam: 3 Hrs

MAX. MARKS :100

Sessional:50

External:50

Laboratory work to be carried out as per BT-401F

**MAHARSHI DAYANAND UNIVERSITY
B. TECH. BIOTECH. 7TH SEM**

BIOENERGY LAB

Sub. Code: BT -413F

Periods/week

**L T P
 3**

Duration of Ext. Exam: 3 Hrs

MAX. MARKS :100

Sessional:50

External:50

Laboratory work to be carried out as per BT-409.F

**MAHARSHI DAYANAND UNIVERSITY
B. TECH. BIOTECH. 7TH SEM**

METABOLIC ENGINEERING LAB

Sub. Code: BT -415F

Periods/week

**L T P
 3**

Duration of Ext. Exam: 3 Hrs

MAX. MARKS :100

Sessional:50

External:50

Laboratory work to be carried out as per BT-403F.

MAHARSHI DAYANAND UNIVERSITY
B. TECH. BIOTECH. 7TH SEM

STEM CELLS IN HEALTH CARE

Sub. Code: BT – 417F

Periods/week

L:3 T:1

Duration of Ext. Exam: 3 Hrs

MAX. MARKS :150

Sessional:50

External:100

Instructions for setting of paper: Nine questions are to be set in total. First question will be short answer question covering whole syllabus and will be compulsory to attempt. Next eight questions will comprise of two questions each from the four sections. Student will be required to attempt four questions selecting one from each section. Each question will be of 20 marks.

SECTION-A

Cell Diversification in the Early Animal Embryo: Early development of *Xenopus*, Spatial Segregation, Inductive Interactions, Complex Pattern of Cell Responses, Cellular response to a signal, the role of an Intracellular clock, early mammalian embryo development, Control of mammalian embryonic stem cells on pathways of development.

SECTION-B

Renewal by Stem Cells: Epidermis: Division of Stem cells, epidermal stem cells, differentiation of epidermal cells and synthesis of keratins, epidermal stem cells as a subset of basal cells, regulation of basal cell proliferation, secretory cells in the epidermis and their population kinetics.

SECTION –C

Genesis, Modulation and Regeneration of skeletal muscle: New skeletal Muscle cells form by the fusion of myoblasts, muscle cells can vary their properties by changing the protein isoforms that they contain, some myoblasts persists as Quiescent stem cells in the adult summary

Fibroblast and their Transformations: Connective tissue cell family, Fibroblasts and their character in response to signals in the extracellular matrix, its influence on connective tissue cell differentiation, action of signaling molecules on regulation of cell production, Remodling of bone, Osteoblasts secretion of bone matrix, Erosion, Cartilage development, bone structure stabilization by connective tissue framework and selective cohesion of cells.

SECTION –D

The concept of the Hemopoietic stem cell: Hemopoietic Stem cell disorders, Classification and manifestations, Aplastic and myelodysplastic disorders, Clinical applications of colony stems, complications of gene therapy, Replacement therapy, marrow transplantation, Immunological principles, Preservation and clinical use of blood and blood components.

Texts/References

1. Ann A. Kiessling, Human Embryonic Stem Cells: An Introduction to the Science and Therapeutic Potential, Jones and Bartett, 2003.
2. Peter J. Quesenberry, Stem Cell Biology and Gene Therapy, 1st Edition, Willy-Less, 1998.
3. Robert Lanja, Essential of Stem Cell Biology, 2nd Edition, Academic Press, 2006.
4. A.D.Ho., R.Hoffiman, Stem Cell Transplantation Biology Processes Therapy, Willy-VCH, 2006.
5. C.S.Potten, Stem Cells, Elsevier, 2006.

MAHARSHI DAYANAND UNIVERSITY
B. TECH. BIOTECH. 7TH SEM

BIOETHICS AND BIOSAFETY

Sub. Code: BT – 419F

Periods/week

L:3 T:1

Duration of Ext. Exam: 3 Hrs

MAX. MARKS :150

Sessional:50

External:100

Instructions for setting of paper: Nine questions are to be set in total. First question will be short answer question covering whole syllabus and will be compulsory to attempt. Next eight questions will comprise of two questions each from the four sections. Student will be required to attempt four questions selecting one from each section. Each question will be of 20 marks.

SECTION-A

Introduction- causes of unethical acts, ignorance of laws, codes, policies and Procedures, recognition, friendship, personal gains, Professional ethics-professional conduct. Ethical decision making, ethical dilemmas good laboratory practices, good manufacturing practices, laboratory accreditation.

SECTION-B

Social- genetic discrimination: insurance and employment, human cloning & its impact on feticide sex determination Artificial Insemination, In Vitro Fertilization (IVF), Gamete Intrafallopian Transfer (GIFT) & Zygote Intrafallopian Transfer (ZIFT), Surrogacy, Involuntary Sterilization, Drug abuse during Pregnancy. Transplantation and Xenografting: Fetal Tissue Transplantation. Xenografts.

SECTION-C

Ethical: Eugenics, Genetic Disease and Genetic Screening. Somatic and germ line gene therapy, clinical trials, the right to information, ethics committee function. Social and ethical issues. AIDS: Disclosure, Transmission-Health Care Industry. Euthanasia (Right to Die): Advance Directives, Living Wills, Resuscitate Orders. Physician Assisted Suicide vs. death due to withdrawing/ withholding treatment.

SECTION-D

Biosafety- Definition, Requirement, Containment facilities, biohazards, genetically modified organisms (GMOs) living modified organisms (LMOs), Biosafety for human health and environment designing and management of laboratory and culture room as per the norm of GLP, GMO and FDA. Social and ethical aspects of biological weapons. The Cartagena Protocol on Biosafety. Biosafety Management: environmentally responsible use of biotechnology.

Text / Reference Books

1. Moral Matters: Ethical Issues in Medicine and the Life Sciences (1995) by Caplan, A, John Willey & Sons, Inc.
2. In the Name of Eugenics (1995) by Kevles, D., Cambridge: Harvard University Press.
3. Altered fates Gene Therapy and retooling of Human Life (1995) by Lyon, J. & Gorner, P., New York: W.W. Norton & Co., Inc
4. Case Studies in Bioethics (1995) by Yashon, R., R.J. Publications.
5. Cartagena Protocol in Biosafety, January (2000)
6. Biological warfare in the 21st century (1994), by M.R. Dano, Brassies London.
7. Safety Considerations for Biotechnology (1992) OECD, Paris.
8. *Biosafety Management* (2000) by P.L. Traynor. Virginia Polytechnic Institute's Publication.

MAHARSHI DAYANAND UNIVERSITY
B. TECH. BIOTECH. 7TH SEM

VIROLOGY

Sub. Code: BT –425F

Periods/week

L:3 T:1

Duration of Ext. Exam: 3 Hrs

MAX. MARKS :150

Sessional:50

External:100

Instructions for setting of paper: Nine questions are to be set in total. First question will be short answer question covering whole syllabus and will be compulsory to attempt. Next eight questions will comprise of two questions each from the four sections. Student will be required to attempt four questions selecting one from each section. Each question will be of 20 marks.

SECTION A

General Virology

Brief outline on discovery of viruses, nomenclature and classification of viruses; distinctive properties of viruses; morphology & ultrastructure; capsids & their arrangements; types of envelopes and their composition-viral genome, their types and structures; virus related agents(viroids, prions).

SECTION B

General Methods of Diagnosis and Serology.

Cultivation of viruses in embryonated eggs, experimental animals, and cell cultures; primary & secondary cell cultures; suspension cell cultures and monolayer cell cultures; cell strains, cell lines and transgenic systems; serological methods - haemagglutination & HAI; complement fixation; immunofluorescence methods, ELISA and Radioimmunoassays; assay of viruses -physical and chemical methods (protein, nucleic acid, radioactivity tracers, electron microscopy)-Infectivity assay (plaque method,end point method) – Infectivity assay of plant viruses.

SECTION C

Bacterial Viruses

Bacteriophage structural organization; life cycle; one step growth curve; transcription; DNA replication; eclipse phase; phage production; burst size; lysogenic cycle; bacteriophage typing; application in bacterial genetics; brief details on M13,Mu,T3,T4, and Lamda P1.

SECTION D

Plant Viruses

Classification and nomenclature; effects of viruses on plants; appearance of plants; histology, physiology and cytology of plants; common virus diseases of plants; paddy, cotton, tomato, and sugarcane; viruses of cyanobacteria, algae, fungi; life cycle; type species of plant viruses like TMV, Cauliflower Mosaic Virus and Potato Virus X; transmission of plant viruses with vectors (insects, nematodes, fungi) and without vectors (contact, seed and pollens); diagnostic techniques in seeds; seed stocks and diseased plants (seed morphology, seedling; symptomatology, indicator plants, serological methods, histochemical tests and fluorescent microscopy); prevention of crop loss due to virus infection-virus-free planting material; vector control.

Animal Viruses

Classification and nomenclature of animal human viruses; epidemiology, lifecycle, pathogenicity, diagnosis, prevention and treatment of RNA Viruses Picorna.Ortho myxo, Paramyxo, Toga and other arthropod viruses, Rhabdo. Rota, HIV and other Oncogenic viruses; DNA viruses; Pox, Herpes, Adeno, SV 40; Hepatitis viruses, viral vaccines (conventional vaccines, genetic recombinant vaccines used in national immunisation programmes with examples, newer generation vaccines including DNA Vaccines with examples) interferons, and antiviral drugs.

Text Books

1. Morag C and Timbury M.C (1994) Medical virology-X Edition. Churchill Livingstone, London.
2. Dimmock NJ, Primrose SB (1994). Introduction to Modern Virology, IV Edition, Blackwell Scientific Publications, Oxford
3. Conrat HF, Kimball PC and Levy JA (1994) Virology-III Edition Prentice Hall, Englewood cliff, New Jersey.
4. Mathews, RE.,(1992) Functionals of Plant virology, Academic press, San Diego.
5. Topley and Wilson's (1995) Text Book on Principles of Bacteriology, Virology and Immunology. Edward Arnold, London.
6. Lennetter, EH (1984) Diagnostic procedures for Viral and Rickettsial diseases. American Public Health association, NY.
7. William Hayes (1985) The genetics of Bacteria and their Viruses. Blackwell Scientific Publishers, London.

MAHARSHI DAYANAND UNIVERSITY
B. TECH. BIOTECH. 7TH SEM

ENERGY AND ENVIRONMENT

Sub. Code: BT -427F

Periods/week

L:3 T:1

Duration of Ext. Exam: 3 Hrs

MAX. MARKS :150

Sessional:50

External:100

Instructions for setting of paper: Nine questions are to be set in total. First question will be short answer question covering whole syllabus and will be compulsory to attempt. Next eight questions will comprise of two questions each from the four sections. Student will be required to attempt four questions selecting one from each section. Each question will be of 20 marks.

SECTION A

Fundamental Concepts of Energy: Laws of thermodynamics as applied to energy transformations, Heat transfer and insulation.

SECTION B

Energy Sources: Conventional - Fossil fuel, Hydro-power and nuclearpower, Non conventional - Solar, geothermal and ocean, flow and fund energy resources.

SECTION C

Energy Conversion Systems: Fuels and combustion processes, Environmental aspects and their management in energy conversion systems - Thermal power plants, nuclear power plants and hydel power plants, Fuel cell technology.

SECTION D

Non-Conventional Energy Resources: Solar energy conversion systems, Solar photo-voltaic and solar thermal, Ocean thermal energy conversion (OTEC) Systems. Wind farms, Tidal energy conversion, Mini and micro hydel power plants, Energy storage technology.

Energy Management - Problems and Prospects: Energy management strategies both at generation and demand ends, Need for appropriate technologies, Strategies for energy conversion, Energy efficiency, Energy management in domestic, industrial sector, commercial establishments and transport sector. Energy Audit as a tool for energy efficiency and conservation.

MAHARSHI DAYANAND UNIVERSITY
B. TECH. BIOTECH. 7TH SEM

GENOMICS AND PROTEOMICS

Sub. Code: BT -429F

Periods/week

L:3 T:1

Duration of Ext. Exam: 3 Hrs

MAX. MARKS :150

Sessional:50

External:100

Instructions for setting of paper: Nine questions are to be set in total. First question will be short answer question covering whole syllabus and will be compulsory to attempt. Next eight questions will comprise of two questions each from the four sections. Student will be required to attempt four questions selecting one from each section. Each question will be of 20 marks.

SECTION A

Introduction: Structural organization of genome in Prokaryotes and Eukaryotes; Organelle DNA mitochondrial, chloroplast; DNA sequencing principles and translation to large scale projects; Recognition of coding and non-coding sequences and gene annotation; Tools for genome analysis-RFLP, DNA fingerprinting, RAPD, PCR, Linkage and Pedigree analysis-physical and genetic mapping; Physical mapping of genome: Conventional cytogenetics, Physical mapping by restriction hybridization analysis, FISH and related techniques, Chromosome painting and microdissection, Long range physical mapping Contig assembly, Chromosome walking and map-based cloning.

SECTION B

Genome sequencing projects

Microbes, plants and animals; Accessing and retrieving genome project information from web; Identification and classification using molecular markers-16S rRNA typing/sequencing, EST's and SNP's.

Comparative-genomics

Introduction, comparative genomics of plants, cereal and legume comparative genomics Evolutionary Genomics

Introduction to genome evolution, Acquisition of new genes, Evolution of non-coding regions, Molecular phylogenetics and applications, Evolution of multigene families in the genome

SECTION C

Proteomics

Protein analysis (includes measurement of concentration, aminoacid composition, N-terminal sequencing); 2-D electrophoresis of proteins; Microscale solution isoelectricfocusing; Peptide fingerprinting; LC/MS-MS for identification of proteins and modified proteins; MALDI-TOF; SAGE and Differential display proteomics, Protein-protein interactions, Yeast two hybrid system.

SECTION -D

Pharmacogenetics

High throughput screening in genome for drug discovery identification of gene targets, Pharmacogenetics and drug development

Functional genomics and proteomics

Introduction, Strategies to find functional genes in the genome, Gene tagging strategies and application. ESTs and its utility in genomics, Differential gene profiling methods, DNA chips/Microarrays, SAGE and SNPs analysis, Protein and peptide microarray-based technology; PCR-directed protein *in situ* arrays; Structural proteomics

Texts/References:

1. Voet D, Voet JG & Pratt CW, Fundamentals of Biochemistry, 2nd ed. Wiley 2006
2. Brown TA, Genomes, 3rd ed. Garland Science 2006
3. Campbell AM & Heyer LJ, Discovering Genomics, Proteomics and Bioinformatics, 2nd ed. Benjamin Cummings 2007
4. Primrose S & Twyman R, Principles of Gene Manipulation and Genomics, 7th ed, Blackwell, 2006
6. Glick BR & Pasternak JJ, Molecular Biotechnology, 3rd ed, ASM Press, 1998

**MAHARSHI DAYANAND UNIVERSITY
B. TECH. BIOTECH. 7TH SEM**

FUNDAMENTALS OF NANOBIO TECHNOLOGY

Sub. Code: BT -437F

Periods/week

L:3 T:1

Duration of Ext. Exam: 3 Hrs

MAX. MARKS :150

Sessional:50

External:100

Instructions for setting of paper: Nine questions are to be set in total. First question will be short answer question covering whole syllabus and will be compulsory to attempt. Next eight questions will comprise of two questions each from the four sections. Student will be required to attempt four questions selecting one from each section. Each question will be of 20 marks.

SECTION A

Introduction, History and basic concepts of Nanotechnology; Man made and natural nano-materials; future scopes of nanotechnology
Nanomaterials, Metal nanocluster, Semiconducting nanoparticles. Molecular clusters; DNA nanowires; Methods for synthesis
Carbon nanocluster; Nanotube; Mechanism and applications

SECTION B

Methods of measuring properties; Atomic structure, particle size determination, surface structure, Microscopy (TEM, SEM and Field Ion), Spectroscopy (IR, Raman and X-ray)

SECTION C

Nanobiotechnology- Catalysis: Nanocrystals; Biological building blocks; Nucleic acids; Biological nanostructures Nano-medicine; synthesis; drug delivery; application
Biomolecular Design and Biotechnology : Molecular Modelling and Biomolecular structure determination.
Functional Principles of Bionanotechnology : Information driven nano assembly, Energetics , chemical transformation, regulation,

SECTION D

Biomolecular motors, Biomolecular motors, Biomolecular sensing, self replication and machine - phase Bionanotechnology.
Bionanotechnology Today and Future : basic capabilities, Nanomedicine today, DNA computers, hybrid materials, artificial life and biosensors.