FACULTY OF LIFE SCIENCES

Syllabus

For

Interdisciplinary Course in Bio-Technology (PG)

Examinations: 2019–20

Guru Nanak Dev University Amritsar

INTERDISCIPLINARY COURSE IN BIO-TECHNOLOGY (PG)

Course No. BTL 051: Tools and Techniques in Biotechnology

Credits (4-0-0)

Time: 3 Hrs.

Max. Marks : 100
Mid Semester Marks : 20
End Semester Marks : 80

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION–A
Techniques in Microbial Biotechnology: Techniques in bacterial and viral metagenomics, functional metagenomics, synthetic genomics and metabolic engineering; microbial sequencingprojects.
Fermentation Techniques: Basic Bioreactor designing, different types of bioreactors, tubular,airloop reactors, microbial, plant and abnnimal bioreactors. Basic concepts of Bioreactors Kinetics, batch bioreactors, Plug flow bioreactor, continuous stirred tank bioreactors, Fed batch bioreactors, Aeration and agitation system.

SECTION–B
Bioinformatics Tools: Introduction to Bioinformatics: History Genome sequencing Projects, objectives and applications of Bioinformatics, Introduction to databases: Type and kind of databases, e.g. PUBMED, MEDLINE, Nucleic acid and protein databases: GenBank, EMBL, DDBJ, SWISS PROT, INTERPRO, UNIPROT. Data Format, Sequence alignment**:** Scoring matrices, Local and global alignment concepts; Dynamic programming; Needleman- Wunch algorithm, Smith-Waterman algorithm, Database searches for homologous sequences, BLAST,PSSM searching, PSI-BLAST, Multiple sequence alignment.

SECTION–C
Animal Tissue Culture Techniques: Aseptic techniques in ATC; design and layout of ATC lab,Equipment for ATC lab, Primary cell culture - monolayer and suspension culture techniques,Tissue culture media, detection of contamination, preservation, storage and shipment of cells.

SECTION–D
Plant Tissue Culture and Genetic Engineering : Fundamentals of plant tissue culture, plant regeneration: organogenesis. Somatic embryogenesis; somaclonal variation, its genetic basis and application incrop improvement. Cell/callus line selection for resistance to herbicide, stress and diseases. Roleof tissue culture in rapid clonal propagation, production of pathogen – free plants and "syntheticseeds". Secondary metabolites for commercial purpose Industrial application.Type II restriction enzymes; development of plasmids asvectors, enzymes for ligation of DNA, in vitro applications of E.coli DNA polymerase I andklenow fragment, alkaline phosphatase.

INTERDISCIPLINARY COURSE IN BIO-TECHNOLOGY (PG)

Reference Books:

1.   Principles of Fermentation Technology by A Whitkar, SJ Hall & P.F. Stanbury, (2004)AdityaBooks (P.) Ltd.

2.   Mount D.W. (2004) Bioinformatics & Genome Analysis Cold Spring Horbor Lab. Press

3.   Culture of Animal Cells : A Manual of Basic Technique R. Ian Freshney

4.   Bhojwani, S.S. and Razdan, M.K. (1996). Plant Tissue Culture. Theory and Practice, Elsevier.

5.   Relevant Research Paper.

INTERDISCIPLINARY COURSE IN BIO-TECHNOLOGY (PG)

Course No. BTL 052: Fundamentals of Biotechnology

Credits (4-0-0)

Time: 3 Hrs. **Max. Marks : 100**
Mid Semester Marks : 20
End Semester Marks : 80

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION–A

Structural Biology: Protein sequence analysis tools, secondary structure prediction, tertiary structure prediction homology modelling, fold recognition, ab initio methods structure visiualization and analysis tools, rasmol chimera spdviwer, Structure analysis Structural databases: PDB, PDBsum, NDB etc. SCOP, CATH

SECTION–B
Bioprocess Engineering: Down Stream processing, Recovery and purification of fermentation products,, foam separation, precipitation, filtration, centrifugation, cell disruption, liquid-liquid extraction, aqueous two phase separation, super eritical fluid extraction effluent treatment.

SECTION–C
Tissue Engineering: Introduction to tissue engineering, organotypic and histotypic cultures for tissue engineering, scaffolds and matrix for tissue engineering, cell therapy, regenerative medicine and tissue and organ replacement therapy, Stem cell based therapy

SECTION–D
Genetic Engineering: Fundamental concepts of heterologous expression of genes; codon optimization; comparative merits and demerits of different host systems for heterologous production of proteins, Genes silencing approach in crop improvement

Reference Books:
1. Principles of Fermentation Technology by A Whitkar, SJ Hall & P.F. Stanbury, (2004) Aditya Books (P.) Ltd.
2. Mount D.W. (2004) Bioinformatics & Genome Analysis Cold Spring Horbor Lab. Press.
3. Culture of Animal Cells : A Manual of Basic Technique R. Ian Freshney.
4. Tissue Engineering Bernhard O. Palsson, Sangeeta N. Bhatia.
5. Relevant Research Papers.