REGULATIONS GOVERNING ADD-ON COURSES

P.G. Diploma in Biotechnology

Eligibility:

Degree in any branch of biological sciences with a minimum of 45% of marks in the qualifying degree (for PH/SC/ST a mere pass in the qualifying examination is sufficient) is eligible for admission. Candidates studying regular P.G. courses in the University Departments and fourth or fifth year of integrated courses of the University are also eligible.

Admission: Based on merit considering the marks secured in the qualifying degree examination

Intake: Twenty students

Medium of Instruction: English

Duration of the course: Two Semesters (One Year).

Hours of Instruction: Two hours a day for five days from 5.30 PM to 7.30 PM

Attendance: Minimum 70% of attendance is required for attending the examination.

Maximum duration to complete the course: Two Years

Total credits: Twenty (10 credits / semester)

FEE:

	Admission fee	**Tuition fees**	**Library fee**	**Exam fee/semester**
University students and employees	Rs. 200	Rs. 1, 200	N/A	Rs. 300
Others	Rs. 500	Rs. 2, 500	Rs. 1000*****	Rs. 300

*****Library fee Rs. 1000/- (**Optional for others who desires to use the University Library (for reference only).**

DEPARTMENT OF BIOTECHNOLOGY
PONDICHERRY UNIVERSITY

POSTGRADUATE DIPLOMA IN BIOTECHNOLOGY

COURSE CONTENT AND SYLLABUS

TOTAL CREDITS = 20
TOTAL HOURS = 320

SEMESTER-I **TOTAL CREDITS – 10**
TOTAL HOURS – 160

S. NO.	SUBJECT CODE	SUBJECT	CREDITS
1.	PGD BIOT 301	BIOLOGICAL CHEMISTRY	2
2.	PGD BIOT 302	MICROBIAL BIOTECHNOLOGY	2
3.	PGD BIOT 303	MOLECULAR BIOLOGY	2
4.	PGD BIOT 304	IMMUNOBIOLOGY	2
5.	PGD BIOT 305	BIOTECHNOLOGY LABORATORY I	2

SEMESTER-II **TOTAL CREDITS – 10**
TOTAL HOURS – 160

S. NO.	SUBJECT CODE	SUBJECT	CREDITS
1.	PGD BIOT 306	RECOMBINANT DNA TECHNOLOGY	2
2.	PGD BIOT 307	FERMENTATION TECHNOLOGY	2
3.	PGD BIOT 308	ADVANCED ANIMAL BIOTECHNOLOGY	2
4.	PGD BIOT 309	PLANT GENETIC ENGINEERING	2
5.	PGD BIOT 310	BIOTECHNOLOGY LABORATORY II	2

PGD BIOT 301 BIOLOGICAL CHEMISTRY CREDIT-2

UNIT I 6h

Biochemical basis of life. Significance of macromolecules - Carbohydrates, proteins, lipids and nucleic acids.

UNIT II 6h

Carbohydrates - Structure and function of monosaccharides, Oligosaccharides and Polysaccharides; Description and integration of major metabolic pathways.

UNIT III 6h

Lipids - Structure and functions of triglycerides, phospholipids, glycolipids. Significance of PUFA, Cholesterol and its derivatives; Fatty acids metabolism.

UNIT IV 6h

Protein - Structure and properties of amino acids; transamination, oxidative deamination, decarboxylation, disposal of ammonia. Organization of protein structures; Enzyme classification, mechanism, Michealis - Menton kinetics and allosteric enzymes

UNIT V 6h

Nucleic acids - Structure and function of DNA and RNA; Purine and Pyrimidine base structure, degradation and synthesis, inborn errors of nucleotide metabolism.

TEXT BOOKS

1. Lehninger AL, Nelson DL and Cox MM (2002), Principles of Biochemistry. Mac Millan Worth Publishers Inc. (CBS Pub. & Distributors, New Delhi)

2. Stryer L (2002). Biochemistry, Freeman & Co.

REFERENCE BOOK

1. Martin DW, Jr., Mayer, PA and Rodwell, VW (2002). Harper's Review of Biochemistry 25th Edition, Maruzen Asian Ed: Lange Med. Pub.

2. Sambrook, J., Fritsch, E.F., and T. Maniatis. Molecular Cloning. A Laboratory Manual. 2nd Ed. Cold Spring Harbor Laboratory Press, New York,1989.

PGD BIOT 302 MICROBIAL BIOTECHNOLOGY` CREDIT– 2

UNIT I 6h

History of Microbiology. Microscopy and applications. Microbial diversity – Bacteria, fungi, viruses, protozoa. Microbial nutrition and growth. Microorganisms as factories for the production of novel compounds.

UNIT II 6h

Biotechnological potentials of microalgae in food, feed, colorants and fuel. Cultivation methods of algae with reference to *Dunaliella.* Production of microbial biofertilizers – *Diazotrophs,* VAM and Cyanobacteria. Edible Mushroom cultivation.

UNIT III 6h

Microbial bioconversion of cellulosic and non-cellulosic wastes. Biopolymers and ioplastics. Bioremediation of wood, fuels, lubricants, rubber, Plastics. Microbiology of degradation of xenobiotics in environment: oil pollution, surfactants, pesticides

UNIT IV 6h

Biological control of insects, bacterial, fungal and Viral diseases. Mode of action of biological control involved in different biocontrol agents. Genetics of antimicrobial metabolite production in biocontrol bacteria.

UNIT V 6h

Waste utilization: Waste water treatment - Aerobic and Anaerobic processes, Treatment schemes for waste waters of dairy, distillery, tannery, sugar, Antibiotic industries. Sewage disposal, compost making, methane generation.

TEXT BOOKS

1. Bernad R. Glick and Jack J. Pasternak. Molecular Biotechnology Principles and Applications of Recombinant DNA. WCB, 2002

2. Glazer, A.N. and Nikaido, H. Microbial Biotechnology: Fundamentals of Applied Microbiology 2nd edn. Cambridge University Press, 2007.

3. R.C. Dubey. Text Book of Biotechnology. S. Chand & Co., New Delhi. 2008.

REFERENCE BOOKS

1. Prescott and Dunn. Industrial Microbiology. 4th Ed, 1992

2. Watson, JD, Hopkins NH, Roberts JW, Steitz JA, Weiner AM. Molecular Biology of the Gene. The Benjamin Cummings, 1987. 30

PGD BIOT 303 MOLECULAR BIOLOGY CREDIT-2

UNIT I 6h

Experiments of Griffith, Avery, Macleod and McCarty, Hershey and Chase, Lederburg and Tatum, Chemical nature of DNA and RNA, Chargaff's principles, Primary structure of DNA and RNA, Alternative forms of DNA double helices.

UNIT II 6h

Replicons, DNA replication in Prokaryotes, Enzymes and proteins involved in DNA replication (Nucleases, Polymerases, Ligases, Helicases, Gyrases, SSBP, Replisome / Primosome).

UNIT III 6h

Transcription in Prokaryotes, RNA Polymerases, Protein factors involved in Initiation, Elongation and Termination of Transcription, structure of tRNA

UNIT IV 6h

Genetic Code, Characteristics of genetic Code, Wobble Hypothesis, Central Dogma of life and Reverse Central Dogma. Mechanism of Protein Synthesis in prokaryotes.

UNIT V 6h

Regulation of gene expression: operon concept, regulatory gene, operator and promoter regions, lac and trp operons as examples for inducible and repressible operons.

TEXT BOOKS

1. Freidfelder, D. Molecular Biology. Jones & Bartlett Pub, Second Edition. 1986.

2. Strickberger, MW., Genetics, 3rd edition, Macmillan Publishing Company, 1985

REFERENCE BOOKS

1. Basic Genetics by Daniel L. Hartl, David Freifelder, Leon A. Snyder Jones & Bartlett Pub. 1988.

2. Watson, J.D., Hopkins, N.H., Roberts, J.W., Steitz, J.A., and A.M. Weiner. Molecular Biology of the Gene, Volume I & II (4th Edition). Benjamin Cummings Publications, 1987.

PGD BIOT 304 IMMUNOBIOLOGY CREDIT-2

Unit I 6h

Introduction to the study of Immunology, Historic perspective, Cellular and Humoral mediated immune response. Innate and adaptive immunity, Cells, tissue and organs of immune system

Unit II 6h

Antigens and Immunogenicity. Antigens and Antibodies, B- cell generation and diversity, Immunoglobulins and subtypes of Ig's, Antigen - Antibody interactions, Cross reactivity, Precipitation and Agglutination reactions

Unit III 6h

Immunological assays - Agglutination tests, Complement fixation tests, Neutralization tests, Immunodiffusion, Immunoelectrophoresis, Radioimmunoassays, Immunoblotting and ELISA.

Unit IV 6h

Preparation and purification of Antigens and antiibodies, Hybridoma technology and Monoclonal antibodies. Productions of Mab's in ascites and cell culture. Antibody labeling.

Unit V 6h

Role of Complement in immune response. Hypersensitivity and Different Types of Hypersensitivity, Immunodeficiency, Immunosuppression and Autoimmunity

TEXT BOOKS

1. Goldsby RA, Kindt TJ, Osborne BA. Kuby Immunology, Sixth Ed, W.H. Freeman and company, New York, 2005.

2. Rose et al., Manual of Clinical laboratory Immunology, 6th Ed ASM Publications, 2002.

REFERENCE BOOK S

1. Kenneth M. Murphy, Paul Travers and Mark Walport. Janeway's Immunology. Taylor Publications, 2008.

2. Peter J. Delves, Ivan M. Roitt, Seamus J. Martin. Roitt's Essential Immunology. Blackwell publishers, 2006.

PGD BIOT 305 BIOTECHNOLOGY LABORATORY I CREDIT – 2 (40 h)

1. Absorption spectrum and dissociation constant determination
2. Isolation and estimation of protein by Lowry's method
3. Purification of enzyme from microbes
4. Antimicrobial susceptibility assays
5. Isolation and estimation of nucleic acids
6. UV-induced mutants and their effect on growth
7. Double diffusion method of immunoelectrophoresis
8. Blood group testing

PGD BIOT 306 RECOMBINANT DNA TECHNOLOGY CREDIT- 2

UNIT I 6h

Cloning Vectors: Plasmids, phages, cosmids,YACs. restriction enzymes, DNA polymerases, reverse transcriptase, ligases, polynucleotide kinase, alkaline phosphatase and nucleases.

UNIT II 6h

Transformation, transduction, electroporation, microinjection. *Agrobacterium* mediated gene transfer.

UNIT III 6h

Cloning strategies: Genomic libraries, cDNA Cloning, Subcloning, shot gun cloning. Cloning in *E. coli*, *Bacilli* and *yeast*. Yeast two hybrid system. cDNA phage display library. Recombinant clones: Detection of recombinant DNA and its Products.

UNIT IV 6h

Site-directed mutagenesis, DNA sequencing, design of PCR primers, RT-PCR, RACE, AP-PCR, PAF. Antisense and RNAi technology.

UNIT V 6h

Applications of genetic engineering in medicine, agriculture, veterinary and industry. Safety aspects, Intellectual property rights (IPR) and patents.

TEXT BOOKS

1. Primrose, S.B., Twyman, R.M., and R.W. Old. Principles of Gene Manipulation. Sixth Edition. Blackwell Science, 2001.

2. Lodish, H., Baltimore, D., and A. Berk. Molecular Cell Biology. W H Freeman & Co (Sd); 3rd edition, 1995.

REFERENCE BOOKS

1. Sambrook, J., Fritsch, E.F., and T. Maniatis. Molecular Cloning. A Laboratory Manual. 2nd Ed. Cold Spring Harbor Laboratory Press, New York,1989.

2. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., and P. Walter. Molecular Biology of the Cell, Fourth Edition. Garland & Co. 2002.

PGD BIOT 307 FERMENTATION TECHNOLOGY CREDIT-2

UNIT I 6h

Microbial biomass, microbial enzymes, microbial metabolites, recombinant products, transformation processes, Isolation, preservation and improvement of industrially important microbes.

UNIT II 6h

Microbial growth kinetics, Monod model, Batch culture, Contineous culture, multistage system, fed-batch culture, applications of fed-batch culture, sterlisation, medium formulation, rheology.

UNIT III 6h

Probes for monitoring and control of fermentation, aeration and agitation, k_La

UNIT IV 6h

Airlift fermentors, stirred fermentors, packed glass bead reactor, anaerobic fermentors. BOD, COD.

UNIT V 6h

Filteration, centrifugation, two phase aqueous separation, chromatography, ultrafilteration, reverse osmosis.

TEXT BOOKS

1. Principles of fermentation technology P F Stanbury, A Whitaker, S J Hall, Pergamon Press 2007.
2. Biochemical engineering fundamentals, J E Bailey, D F Ollis, McGraw-Hill (2006)

REFERENCE

1. Bioprocess Engineering by M Shuler and F Kargi (2002) Prentice Hall (I) Ltd, N Delhi.

PGD BIOT 308 ADVANCED ANIMAL BIOTECHNOLOGY CREDIT–2

UNIT I 6h

Animal Cell culture –primary and established cell line cultures, functions of different constituents of culture mediums, serum and protein free media and their applications, Application of animal cell culture. Stem cells and their applications.

UNIT II 6h

Reproductive Biotechnology- cryopreservation of gametes and embryos in mammals. In-vitro fertilization, embryo splicing and embryo transfer. Production of transgenics mammals. Application of transgenic technology.

UNIT III 6h

Integrated insect pest management using biocides, hormone analogues, pheromones and genetic manipulations. Biotechnology of silk worms-Life cycle, culture of silk worm, diseases of silk worm ,improvement of silk production and quality, Silk worm as a bioreactor.

UNIT IV 6h

RFLP and its applications in domestic animals. Biotechnological approaches to vaccine production. Ethical issues in animal biotechnology. Management aspects of biotechnology and genetic engineering

UNIT V 6h

Biotechnology in animal production-manipulation of growth using hormones and probiotics, manipulation of lactation, manipulation of wool growth in sheep and rabbits

TEXT BOOKS:

1. Animal Biotechnology (1989): Comprehensive Biotechnology Frist Supplement: (Ed.)L.A. Babink and J.P.Phillips. Pregamon press, Oxford,
2. Experimental approaches to Mammalian Embryonic Development. (1986) Rossant,J. and R.A.Pederson Cambridge University Press, Cambridge
3. Recombinant DNA. ,(1992): Watson,J.D., M.Gilman, J.Wikowski, and M.Zoller . Scientific American Books. W.H.Freeman & Co., NY, p.626.
4. Animals with novel genes (1994):Ed. Norman Maclean Cambridge University Press.
5. Animal cell culture – A practical approach. (1992) Ed. R.I.Freshney .IRL press.

REFERENCE BOOKS:

1. Future Developments in the Genetic Improvements of Animals. (1992): Ed. J.S.F.Barrer, K.Hammond and A.E.McClintock, Academic Press, NY.

2. Human Genetics : Concept and Applications .(2003) Ricki Lewis .McGraw Hill

PGD BIOT 309 PLANT GENETIC ENGINEERING CREDIT-2

UNIT-1 6h

Plant genome organization and gene structure and function and targeting of proteins to organelles

UNIT-2 6h

Tissue specific expression of storage protein genes, light-mediated genes and heat-shock protein genes.

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UNIT-3 6h

Mobile elements – Autonomous and non-autonomous elements, organization and function of maize transposons.

UNIT-4 6h

Structure and function of Ti plasmid of *Agrobacterium*, plant markers and promoters. Development of plant transformation cassettes.

UNIT-5 6h

Genetic engineering of plants. Tissue culture methods and gene transfer techniques. Transgenic resistance against pests and pathogens. Transgenic plants for delaying of fruit ripening and production of antibodies, antigens and peptides.

Text Books

1. Plant Biochemistry and Molecular Biology, Lea, PJ, Leegood, RC, eds. John Wiley and Sons, Chichester and New York (1993).
2. Plant Molecular Genetics - Monica A. Hughes. Harlow, England: Addison Wesley Longman (1996).

Reference Book

1. Principles of Plant Biotechnology: An Introduction to Genetic Engineering in Plants. S.H. Mantell, JA Mathews, and RA. McKee. Blackwell, Oxford (1993).

PGD BIOT 310 BIOTECHNOLOGY LABORATORY II CREDIT-2

1. Competent cell preparation and transformation of plasmid DNA
2. Restriction enzyme digestion and cloning of gene
3. Comparison of the product obtained by immobilization of *Lactobacillus subtilis* by using alginate and acrylamide
4. Determination of COD/BOD value of a given solution
5. Silk work rearing- Protein profile of silk gland and haemolymph of larval forms of Silk worm
6. Molecular detection of blue tongue disease in cattle
7. Heterologous expression of plant protein in *Escherichia coli* and analysis of protein by electrophoresis
8. Genetic engineering of plants by *Agrobacterium*-mediated gene transfer using antifungal protein