

CIRCULAR :

A reference is invited to the Ordinances, Regulations and syllabi relating to the B.Sc. degree course vide this office Circular No.UG/309 dated 29th July, 2004 and the Principals of the affiliated colleges in Science are hereby informed that the recommendation made by the Board of Studies in Microbiology at its meeting held on 20th January, 2007 has been accepted by the Academic Council at its meeting held on 9th February, 2007 vide item No.4.8 and that in accordance therewith the syllabus in the subject of Biotechnology for Applied Component at the T.Y.B.Sc. is revised as per Appendix and that the same has been brought into force with effect from the academic year 2007-2008.

Mumbai 400 032
2nd April, 2007

for REGISTRAR.

To, The Principals of the affiliated colleges in Science.

A.C.4.8/09.02.07

No.UG/ 119-A of 2007

2nd April, 2007

Copy forwarded with compliments for information to :-

- 1) the Dean, Faculty of Science,
- 2) the Chairman, Board of Studies in Microbiology.

for REGISTRAR.

Copy to :

The Director, Board of College and University Development, Deputy Registrar (Eligibility and Migration), the Director of students Welfare, the Personal Assistants to the Vice-Chancellor, the Pro-Vice-Chancellor, the Registrar and the Assistant Registrar Administrative sub-centre, Ratnagiri, for information.

The O.S.D. and Controller of Examinations (10 copies), the F. & A.O. (Accounts Section), Fort (2 copies), Record Section (5 copies), Publication Section (5 copies), D.R., Enrolment (3 copies), D.R. (Statistical Unit), D.R., Accounts Section, Vidyanagari, (2 copies), the Director, University Computer Centre (I.D.E. Bldg.), Vidyanagari, (2 copies), D.R. (Aif. Section) (2 copies), A.R., A.A. Unit (2 copies) and A.R. (Executive Authorities Unit) (2 copies), they are requested to treat this as action taken report on the concerned resolution adopted by the Academic Council/Management Council referred to in the above Circular and that no separate A.T.R. will be sent in this connection. A.R., CONCOL (1 copy), BUCTU (2 copies), In-charge, C.C.F. (1 copy), D.R., I.D.E. (10 copies), , D.R., P.R.O., (2 copies), D.R. (Special), Supdt., Thesis Section (2 copies), Supdt., P.G. Section (2 copies), Secretary, MUASA (1 copy), Dy. Acctt. (Unit V) (1 copy), Receptionist (1 copy), Telephone Operator (1 copy).

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UNIVERSITY OF MUMBAI

T.Y.B.Sc.

APPLIED COMPONENT
BIOTECHNOLOGY

REVISED SYLLABUS WITH EFFECT FROM 2007-2008



T.Y,B.Sc. APPLIED COMPONENT BIOTECHNOLOGY
REVISED SYLLABUS WITH EFFECT FROM 2007-2008

Paper I	Concepts and methodology in Biotechnology	No Of Lec 60	Paper II	Applied Biotechnology	No Of Lec 60
Unit I	Importance of Biotechnology and tools in genetic engineering	15	Unit I	Agricultural, Animal and Plant Biotechnology	15
Unit II	Techniques in genetic engineering	15	Unit II	Healthcare Biotechnology	15
Unit III	Methodology in animal and plant Biotechnology	15	Unit III	Environmental Biotechnology	15
Unit IV	Methodology in industrial Biotechnology And bioinformatics	15	Unit IV	Industrial Biotechnology	15

Examination Pattern

	THEORY	PRACTICAL	TOTAL
Paper I	60 marks	40 marks	100 marks
Paper II	60 marks	40 marks	100 marks

Each theory paper and practical is of 3 hour duration.

T. Y. B.Sc.
Applied Component : Biotechnology
Revised Proposed syllabus from academic Year 2007-08

Paper I

Concepts & Methodology of Biotechnology

UNIT I: Importance of Biotechnology and tools in genetic engineering **15 lectures**

- 1) History of biotechnology, Traditional & Modern biotechnology, Biotechnology as an interdisciplinary area, Global impact & current excitements of biotechnology (health care, agriculture, human genome project, environment) Biodiversity & its preservation. (4)
- 2) **Tools in genetic engineering** (11)
 - a) Basic requirements: Electrophoresis; agarose gel electrophoresis, Pulse field gel electrophoresis (PFGE), SDS- PAGE, 2D gel electrophoresis, (02)
 - b) Spectrophotometry; Matrix assisted laser desorption ionization (MALDI), Surface enhanced laser desorption ionization (SELDI), Electro spray ionization (ESI), U.V. & visible amplified polymerase DNA (RAPD Market) AP- PCR, DNA amplification finger printing (DAF), Applications of PCR. (05)
 - c) Blotting techniques: Southern, northern, western blotting, DNA sequencing, Probes, ELISA, RIA, Nick translation & in situ Hybridization. (04)

UNIT II: Techniques in genetic engineering

15 lectures

- a) Cutting & joining of DNA, Exonucleases, endonucleases, Restriction endonucleases (Type I, II, III) Examples of some enzymes- DNA ligases, alkaline phosphatases, DNA polymerases, use of linkers & adaptors (05)
- b) Cloning vectors: Properties of good vector, Cloning & expression vectors, E.coli vectors, Plasmid vectors, Bacteriophage vectors, Cosmid vectors, Phasmid vectors, Vectors for other bacteria, Shuttle vectors, Yeast vectors, Vectors for animals & plants. (05)
- c) Steps in gene cloning, Isolation of desired gene, cDNA library, Genomic library, Chemical synthesis of gene, Gene amplification by PCR, Introduction of vector in to suitable bacterial host, various transformation methods), Selection of recombinant clones; selection of clones containing recombinant vector, selection of clones containing specific DNA inserts, colony hybridization test.. (05)

UNIT III : Methodology in animal and plant Biotechnology

15 lectures

- a) Animal cell cultures, principles of mammalian cell culture, establishment of cell line, continuous cell lines, media & equipment for animal cell culture, hybridoma technology. In vitro fertilization & embryo transfer, animal cloning, genome maps; molecular markers,

- restriction fragment length polymorphism (RFLP), random amplified polymorphic DNA (RAPD), variable number of tandem repeats (VNTR), chromosome jumping, chromosome walking. (05)
- b) Transgenic animals; transfection methods, embryonic stem cell transfer, targeted gene transfer, detection of transgenic & trans gene transfer (04)
- c) Plant tissue cell & organ culture: Regeneration of plants, plant breeding – recombinant and nonrecombinant approaches, germ plasm bank. (03)
- d) Genetic engineering of plants; Agrobacterium mediated gene transfer, Agro infection and direct gene transfer methods, integration, inheritance analysis & confirmation of transgenic plants (03)

UNIT IV :Methodology in Industrial Biotechnology and Bioinformatics

15 lectures

- a) Bioreactors – major types, solid-state fermentation, immobilization techniques, downstream processing, Enzyme extraction & purification (amylases & proteases) (07)
- b) Legal, social & ethical aspects of biotechnology, Patent law, bioethics & bioterrorism (05)
- c) Genomics, proteomics, bioinformatics -
Genomic and protein data base, data similarity search BLAST and FASTA.) (03)

T. Y. B.Sc.

Applied Component : Biotechnology
Syllabus from academic Year 2007-08

Paper II

Applied Biotechnology

UNIT I Agricultural, plant & animal Biotechnology

15 lectures

- a) Biofertilizers, Biopesticides (04)
- b) Development of insect, pathogen and herbicide resistant plants, Development of stress & senescence tolerant plants, genetic manipulation of flower pigment, Modification of plant nutrient content, Modification of food plant taste and appearance, Plants as bioreactors. (06)
- c) Application of transgenic animals, animal bioreactors, molecular farming (pharming), Cloning live stock by nuclear transfer (05)

UNIT II Healthcare Biotechnology

15 lectures

- a) Disease prevention: - Vaccines; conventional vaccines, purified antigen vaccines, recombinant vaccines, DNA vaccines, synthetic vaccines (04)
- b) Disease diagnosis: - Probes, monoclonal antibodies & detection of genetic diseases (02)
- c) Disease treatment: - Products from nonrecombinant & recombinant organisms, interferons, growth factors, antisense nucleotides as therapeutic agents, monoclonal antibodies (04)
- Drug designing, pharmacogenomics, drug delivery & targeting, artificial tissue/organ, gene therapy, enzyme therapy & replacement, therapeutic proteins & blood products (02)
- d) Forensic medicine (03)

UNIT III Environmental Biotechnology

15 lectures

- a) Biological fuel generation, sources of biomass, ethanol and methane from biomass Hydrogen production, petroleum prospecting, enhanced oil recovery (05)
- b) Bioremediation: methods, bioremediation of hydrocarbons, dye, paper & pulp industry, heavy metals, xenobiotics (05)
- c) biofilters, bioaugmentation, vermicomposting, and bioleaching, biosensors and biochips (05)

UNIT IV Industrial Biotechnology

15 lectures

- a) Exploitation of microorganisms to produce primary and secondary metabolites; amino acids (Lysine) vitamin (B12) (02)
- b) Synthesis of novel antibiotics - engineering polyketide antibiotics, peptide antibiotics, (02)
- c) Biotransformation of steroids. (02)
- d) Alcoholic beverages (beer & wine), dairy products (cheese & yogurt), organic acids (vinegar, citric acid) (02)
- e) Production of SCP - Yeast, Spirulina, Mushroom (03)
- f) Production of Biopolymers - biogums, biopolysaccharides bioplastic (01)
- g) Synthesis of small biological molecules; synthesis of L- ascorbic acid & indigo (01)
- h) Application of enzymes in - detergent, leather, wool industry and food, dairy industry. Production of glucose & maltose syrup, aspartame synthesis (02)

Text books

- 1) A text book of Biotechnology: R. C. Dubey, 2006, S. Chand & company Ltd.
- 2) Molecular Biotechnology: Principles & applications of recombinant DNA, 3rd edn. Bernard R Glick, Jack J Pasternak.
- 3) Biotechnology: B. D. Singh, Kalyani Publishers.
- 4) Advances in biotechnology: S. N. Jogdand, 2005, 5th revised edn.

Reference books

- 1) Modern Biotechnology: S B Primrose, 1989. Blackwell scientific publication
- 2) Principles of gene manipulations: sandy Primrose & others: 6 th edn. 2004 Blackwell science.
- 3) Understanding Biotechnology: Aluizio Borem, & others, 2004, Pearson education.
- 4) Recombinant DNA: 2-nd edn. James Watson & others 2001, Scientific American books.

T. Y. B. Sc.
Applied Component : Biotechnology

PRACTICALS

- 1) Preparation of culture media. M9 and LB medium.
- 2) Study of growth curve of *E. coli* in synthetic and complex medium.
- 3) Preparation of buffers & measurement of pH
- 4) Isolation of plasmid DNA from *E. coli*
- 5) Transformation in bacterial cultures
- 6) Restriction digestion of DNA & study of restriction gene map
- 7) Gel electrophoresis of DNA
- 8) Isolation of genomic DNA (bacterial / yeast or onion)
- 9) Quantitation of DNA & protein using U. V. absorption.
- 10) PAGE for protein
- 11) Western blot technique
- 12) Estimation of protein by Folin – Lowry method
- 13) B galactosidase assay
- 14) Demonstration of cell fusion
- 15) Production of microbial polysaccharide & determination of yield
- 16) Isolation & cultivation of *Azotobacter*, *Rhizobium*, phosphate solubilizers & preparation of biofertilizer
- 17) Immobilization of *Saccharomyces cerevisiae* using calcium alginate & invertase assay
- 18) Production of Biopesticide (*Bacillus thuringiensis*)
- 19) Cultivation of edible mushroom
- 20) Plant tissue culture (callus formation)