

University of



No. UG/103 of 2019-20

CIRCULAR:-

Attention of the Principals of the Affiliated Colleges and Directors of the recognized Institutions in Science & Technology Faculty is invited to the syllabus uploaded Academic Authority Unit which was accepted by the Academic Council at its meeting held on 27th February, 2013 vide item No.4.10 relating to the revised syllabus as per the (CBSGS) for the T.Y.B.Sc. (Applied Component) B.Sc. Course – Biotechnology (USACBT).

They are hereby informed that the recommendations made by the Board of Studies in Microbiology at its meeting held on 22nd May, 2019 have been accepted by the Academic Council at its meeting held on 26th July, 2019 vide item No.4.10 and that in accordance therewith, the revised syllabus as per the (CBCS) for the T.Y.B.Sc. (Sem. -V & VI) Biotechnology (Applied Component) in the subject of Microbiology has been brought into force with effect from the academic year 2019-20, accordingly. (The same is available on the University's website www.mu.ac.in).

MUMBAI – 400 032

11th September, 2019


(Dr. Ajay Deshmukh)
REGISTRAR

To

The Principals of the affiliated Colleges and Directors of the recognized Institutions in Science & Technology Faculty. (Circular No. UG/334 of 2017-18 dated 9th January, 2018.)

A.C/4.10/26/07/2019

No. UG/103 -A of 2019-20

MUMBAI-400 032

11th September, 2019

Copy forwarded with Compliments for information to:-

- 1) The I/c Dean, Faculty of Science & Technology,
- 2) The Chairman, Board of Studies in Microbiology,
- 3) The Director, Board of Examinations and Evaluation,
- 4) The Professor-cum-Director, Institute of Distance and Open Learning (IDOL),
- 5) The Director, Board of Students Development,
- 6) The Co-ordinator, University Computerization Centre,


(Dr. Ajay Deshmukh)
REGISTRAR

Cover Page

AC 26/7/19
Item No. 4.10

UNIVERSITY OF MUMBAI



Syllabus for Approval

Sr. No.	Heading	Particulars
1	Title of the Course	TYBSc Applied Component for Microbiology : BIOTECHNOLOGY.
2	Eligibility for Admission	XII (Sc) Second Year BSc.
3	Passing Marks	40/100
4	Ordinances / Regulations (if any)	Ord : 0.2145 Gr No UG/394 of 2004 dt Sept 2004.
5	No. of Years / Semesters	2 Semesters
6	Level	P.G. / U.G./ Diploma / Certificate (Strike out which is not applicable)
7	Pattern	Yearly / Semester (Strike out which is not applicable)
8	Status	New / Revised (Strike out which is not applicable)
9	To be implemented from Academic Year	From Academic Year 2019-20

Date:

Signature: Bhathena

Name of BOS Chairperson / Dean : Prof (Dr) Z P. Bhathena

Rant

UNIVERSITY OF MUMBAI



**Revised Syllabus for T.Y.B.Sc.
SEM V and SEM VI**

**(APPLIED COMPONENT)
Program: B.Sc.(Microbiology)
Course: BIOTECHNOLOGY
(USACBT)**

Choice Based Credit System with effect from the
academic year **2019–2020**

T. Y. B. Sc.
Choice Based credit system
Biotechnology (Applied Component) Syllabus for B.Sc degree in
Microbiology
(To be implemented from the academic year 2019-2020)
Semester V

Introduction to Biotechnology				
Semester V				
Course code	Unit	Topic	Credits	Lectures/ Week
USACBT501	I	Basic Techniques in biotechnology	2	4
	II	Bioremediation in Biotechnology		
	III	Animal Biotechnology		
	IV	Industrial and Marine Biotechnology		
USACBT5P1		Practical Based on USACBT501	2	4

SEMESTER VI

Applied Biotechnology				
Semester VI				
Course code	Unit	Topic	Credits	Lectures/ Week
USACBT601	I	Role of Biotechnology in Society	2	4
	II	Bioenergy and Biofuels		
	III	Plant Biotechnology		
	IV	Healthcare Biotechnology		
USACBT6P1		Practical based on USACBT601	2	4

N.B.

I. Each theory period shall be of 48 minutes duration. Theory component shall have 60 instructional periods plus 60 notional periods per semester which is equal to 96 learning hours. For theory component the value of one credit is equal to 48 learning hours.

II. Each practical period shall be of 48 minutes duration. Practical component shall have 60 instructional periods plus 15 notional periods per semester which is equal to 60 learning hours. For Practical component the value of one credit is equal to 30 learning hours.

LEARNING OBJECTIVES:

Topics included in this semester aim:

- To revise and impart to the students, knowledge of the basic techniques of biotechnology with respect to gene cloning and cloning vectors.
- To give the students an overview of bioremediation of soil, water and the different methods of using genetically engineered microbes and plants.
- To provide a basic insight into the methods of generating transgenic animals and study their applications.
- To give an insight into the role of microorganisms in industrial and marine biotechnology.

Learning outcome:

- Students will become competent by gaining knowledge of bioremediation, industrial production and animal biotechnology which will enhance their chances for employment and for further education.
- The students will acquire knowledge to carry out techniques in biotechnology and will understand the applications of transgenic animals and the methods used for obtaining transgenic animals.

Introduction to Biotechnology Course code : USACBT501				
Semester V				
Unit	Topic	Lec/ topic	Lecture/ Sem	Credit
I	<p>Basic Techniques in Biotechnology</p> <p>1.1. Cutting and joining of DNA, Exonucleases, Endonucleases, Restriction Endonucleases (Nomenclature, examples and quality), DNA ligases, Alkaline Phosphatases, DNA polymerases, Use of Linkers and Adaptors</p> <p>1.2. Cloning Vectors : Properties of good vector, Expression vectors. E. coli vectors – Plasmid, Cosmid, Bacteriophage vectors, Shuttle vectors, Yeast vectors, Vectors for animals and plants.</p> <p>1.3. Gene cloning. Steps in Gene cloning, Introduction of vector in to suitable bacterial host (by transformation and selection), Screening by immunological assays</p>	07 06 02	15L	02
II	<p>Bioremediation in Biotechnology :</p> <p>2.1 Introduction and Types of reaction in Bioremediation. 2.2 Biodegradation of pesticides and herbicide 2.3 Bioremediation of contaminated soil and waste water. 2.4 Bioremediation using genetically engineered microbes (GEM) 2.5 Higher plants in Bioremediation : Phytoremediation 2.6 Transgenic plants for phytoremediation 2.7 Bioremediation market.</p>	02 03 02 02 02 02 02	15L	
III	<p>Animal Biotechnology :</p> <p>3.1 Transgenic Mice : Methodology: The retroviral Vector method, The DNA microinjection method, The engineering embryonic stem cell method, Genetic modification with the Cre-lox P recombination system , RNA interference, , Transgenesis with high capacity vectors.</p> <p>3.2 Transgenic mice applications: Transgenic disease models: Alzheimer disease, Using Transgenic mice as test systems, Conditional regulation of transgene expression, Conditional control of cell death.</p>	07 08	15L	

IV	<p>Industrial and Marine Biotechnology:</p> <p>4.1 Industrial Biotechnology: Synthesis of Novel Antibiotics – Engineering polykatid antibiotics, peptide antibiotics Production of SCP – Yeast, Spirulina, Mushroom Production of Biopolymers – Biogums, Biopolysaccharides, Bioplastic.</p> <p>4.2 Marine Biotechnology: Bio-prospecting, Marine Microbial Habitats and Their Biotechnologically relevant Microorganisms Methods for Microbial Bio-prospecting in Marine Environments. Biotechnological Potential of Marine Microbes Bioactive compounds from other Marine Organisms: fungi, Microalgae, Seaweeds, Actinomycetes, sponges Marine Bio-resources, Marine Secondary Metabolites, Marine Proteins, Marine Lipids, Cosmetics from Marine Sources, Marine Drugs, Marine Microbial Enzymes, Marine Drugs as Pharmaceuticals.</p>	07L 08L	15L	
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References:

- Elements of Biotechnology: 2009 PK Gupta, Rastogi Publications Edition 2nd ,
- Bernard R Glick and Jack J Pasternak. Molecular Biotechnology: Principles and Applications of recombinant DNA. 4th Edition.
- Primrose and others. Principles of Gene manipulations. 7th edition. 2004 Blackwell Science.
- Peter J. Russell 2006, “Genetics-A molecular approach”, 3rd edition.
- R. C. Bubey. A Taxy book of Biotechnology. 2006 S. Chand and Company Ltd.
- B. D. Singh. Biotechnology. Kalyani Publishers.
- Prescott and Dunn's ‘Industrial Microbiology’ 1982 4th Edition, McMillan Publishers
- Marine biotechnology in the twenty-first century-Problems, promise, and products, National academy press •

PRACTICALS BASED ON USACBT501

1. Restriction digestion of DNA and study of restriction gene map.
2. Gel electrophoresis of DNA
3. Isolation of genomic DNA (bacterial / yeast or onion)
4. Enrichment and isolation of Sulphate reducing bacteria
5. Isolation and identification of *Bacillus thuringensis*
6. Determination of COD and BOD of sewage sample /Industrial Effluent
7. Production of Biopesticide
8. Production of Microbial polysaccharide and determination of yield.
9. Cultivation of Edible mushroom
10. Isolation of marine microbial flora

SEMESTER VI

LEARNING OBJECTIVES:

- Aims at imparting knowledge on recent trends in plant and healthcare biotechnology.
- Aims at highlighting the significance of bioenergy and biofuel
- Create awareness of the importance of Biotechnology in society

LEARNING OUTCOME:

- Students will be trained to address issues of Bioenergy and Bio fuels
- They will be skilled to respond to issues related to genetic engineering in plant biotechnology.
- The learner will be able to comprehend details of the role of biotechnology in society

Applied Biotechnology Course code : USACBT601				
Semester VI				
Unit	Topic	Lec/ topic	Lecture /sem	Credit
I	Role of Biotechnology in Society 1.1 Benefits of Biotechnology. 1.2 ELSI of Biotechnology 1.3 Recombinant therapeutic product for human healthcare 1.4 Genetic modification and food consumption 1.5 Recombinant food and religious beliefs 1.6 Are Genetically Modified Food is safe? 1.7 Release of genetically engineered organisms 1.8 Application of Human genetic r-DNA research 1.9 Human embryonic stem cell research 1.10 Organ cloning 1.11 Biotechnology and the developing countries 1.12 Patenting Biotechnology Invention	15	15L	02
II	Bioenergy and Biofuel 2.1 Bioenergy Energy consumption world wide Energy consumption in India Solid biomass resources and dedicated energy crops Greenhouse gases and Kyoto protocol Bioenergy for Sustainable Development 2.2 Biofuel Liquid biofuels: Bio-diesel, Bio-ethanol, Bio-oils Gaseous Biofuels: Biogas, Bio hydrogen Fossil fuels: The nonrenewable sources of energy Renewable and C-Neutral bioenergy	07L 07L	15L	

	Biomass production and its utilization for bioenergy 2.3 Benefits and problems - in production and use of biofuels	01L	
III	Plant Biotechnology 3.1 Genetic engineering of Plants Plant transformation with Ti plasmids of <i>A.tumefaciens</i> , Ti plasmid derived vector systems, physical methods of transferring genes to plants. 3.2 Uses of genetically engineered plants: To overcome Biotic and abiotic stress: Insect resistance: Increasing expression of the <i>B.thuringiensis</i> protoxin, other strategies for protecting plants against insects, preventing the development of <i>Bacillus thuringiensis</i> resistant insects, Herbicide resistant plants Oxidative stress, Salt and drought stress, Modification of plant nutritional content: Vitamin A	06L 09L	15L
IV	Healthcare Biotechnology 4.1 Branches within healthcare biotechnology 4.2 Animal and human health care 4.3 Genetic Counseling 4.3 Forensic medicine	03 04 04 04	15L

References:

- Bernard R Glick and Jack J Pasternak. Molecular Biotechnology: Principles and Applications of recombinant DNA. 4th Edition.
- Bioenergy and biofuels: Ozcan Konur, CRC Press, Edition 1st 2018
- Elements of Biotechnology, 2009 P K Gupta, Second Revised Edition , Rastogi Publications .
- Vault Career guide to Biotechnology (E-Book)
- Biotechnology 2004 U .Satyanarayana ,Books and Allied (P) Ltd.

PRACTICALS BASED ON USACBT 601

1. Test for reducing sugars.
2. Bioethanol production from biomass.
3. Isolation of Cellulase producing microorganisms and determination of Cellulase activity
4. Plant tissue culture Callus formation.
5. Immobilization of *Sacchromyces cerevisiae* using alginate and invertase assay
6. Visit to PTC and ATC Facility
7. Case Studies

XX