UNIVERSITY OF MUMEAI
No.UG / 160 of 2008

CIRCULAR :-

A reference is invited to the Ordinances, Regulations and syllabi relating to the B.Sc. (Biotechnology) degree course **vide** Pamphlet No. 340 and the Principals of the affiliated Colleges in Science are hereby informed that the recommendation made by the Ad-hoc Committee appointed by the Academic Council to advise it on all matters relating to the courses of study and examination in the subject of Biotechnology at the B.Sc. and M.Sc. degree course at its meeting held no 5th February, 2008 has been accepted by the Academic Council at its meeting held on 27th February, 2008 **vide** item No. 4.20 and that, in accordance therewith, the syllabus in the subject of Biotechnology at the F.Y.B.Sc. examination is revised as per **Appendix** and that the same will be brought into force with effect from the academic year 2008-2009.

MUMBAI-400 032
16th April, 2008.

for I/c REGISTER

To,

The Principal of the affiliated colleges in Science.

A.C./4.20/27.02.2008

No.UG/160-A of 2008, MUMBAI-400 032 16th April, 2008

Copy forwarded with compliments for information to :-

1) The Dean, Faculty of Science.
2) The Convener, Ad-hoc Committee in Biotechnology.
3) The Controller of Examinations,
4) The Co-Ordinator, University Computerization Centre,

for I/c. REGISTRAR

opy to :-

he Director, Board of College and University Development, , the Deputy Registrar (Eligibility and Migration ection), the Director of Students Welfare, the Executive Secretary to the Vice-Chancellor, the Pro-Vice-Chancellor, e Registrar and the Assistant Registrar, Administrative sub-center, Ratnagiri for information .

The Controller of Examinations (10 copies), the Finance and Accounts Officer (2 copies), Record Section copies), Publications Section (5 copies), the Deputy Registrar, Enrolment, Eligibility and Migration Section copies), the Deputy Registrar, Statistical Unit (2 copies), the Deputy Registrar (Accounts Section), Vidyanagari copies), the Deputy Registrar, Affiliation Section (2 copies), the Director, Institute of Distance Education, 0 copies) the Director University Computer Center (IDE Building), Vidyanagari, (2 copies) the Deputy Registrar Special Cell), the Deputy Registrar,(PRO) . the Assistant Registrar, Academic Authorities Unit (2 copies)and the ssistant Registrar, Executive Authorities Unit (2 copies) . They are requested to treat this as action taken report on concerned resolution adopted by the Academic Council referred to in the above Circular and that, no separate tion Taken Report will be sent in this connection. the Assistant Registrar Constituent Colleges Unit (2 copies), CT(1 copy), the Deputy Account, Unit V(1 copy), the In-charge Director, Centralize Computing Facility (1 copy), Receptionist (1 copy), the Telephone Operator (1 copy), the Secretary MUASA (1 copy), the Superintendent, Post-duate Section (2 copies), the Superintendent, Thesis Section (2 copies)

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Enclosure to Item No. 4.20
27.2.08

UNIVERSITY OF MUMBAI

Revised Syllabus

in

Biotechnology

at the

F.Y. B.Sc.

(With effect from the academic year 2008-2009)

Revised Syllabus
(With effect from the Academic year 2008-2009)

UNIT STRUCTURE OF THE SYLLABUS

PAPER – I		PAPER-II	
UNIT	TOPIC	UNIT	TOPIC
I	MICROBIOLOGY	I	CELL BIOLOGY
II	GENETICS	II	BIOMOLECULES
III	MICROBIAL DIVERSITY AND FUNCTIONAL BIOLOGY	III	MEDICAL BIOTECHNOLOGICAL

PAPER – I

UNIT – I: Microbiology

TOPIC	SUB-TOPIC	NO. OF LECTURES
A) The Microscope	General principles of optics. Spectrum of light. Objectives, numerical aperture, resolving power. Immersion objectives. Depth of focus, equivalent focus, working distance, aberration, eye pieces, condensers. Ko'hler illumination. Damage to lenses. Dark field, phase constrast only ray diagram and explanation.	07
B)Sterilization and disinfection	i) Principle and application – methods of sterilization (physical, chemical, filtration, heat, radiation, gaseous, etc). ii) Disinfection – ideal disinfectant, list of disinfectant, and their application – evaluation of disinfection (Phenol coefficient)	08
C) Nutrition, isolation cultivation and preservation of microorganisms	Nutritional requirements. Nutritional classification of microorganisms. Design of culture media, types of culture media. Concept of isolation, methods of isolation- natural microbial populations (mixed culture). Cultivation of microorganisms Methods of enumeration. Preservation of microorganisms (Principles and method)	08
D)Stains and Staining solution	Definition of dye, chromogen. Structure of dye. Chromophore and auxochrome groups. Basic and acidic dyes, compound stain, Romanowsky's stain, natural dyes, Fluorescent stain. Nature of staining process and its mechanism. Agents used in staining: mordants, decolorizer. Types of staining: simple and differential. Monochrome staining, Gram's staining, blood staining, Acid – fast staining. Theories of staining.	07

UNIT – II: Genetics

TOPIC	SUBTOPIC	NO OF LECTURES
A) Mendelian principles	i)Segregation- Mendels experiments. terminology. testing phenotypes. examples of gene differences and segregation. ii) Independent assortment – genotypes of dihybrid crosses. testing dihybrid genotypes. crosses involving 3 -4 gene differences. correspondence between mendelian factors and chromosome. symbols. segregation and assortment in haploid organisms.	08
B) Mutations and mutagenic agents	Types of mutations. mutagen. types of mutagens. molecular basis of mutagenesis. reversion. induced and spontaneous mutation and silent mutation.	07
C) Gene transfer mechanisms in bacteria	Transformation- Griffith's exp. Conjugation-Davis experiment. Transduction-generalised (basic concept)	07
D) Extension of genetic analysis	Multiple alleles-blood group. modification of dominant relationships. gene interactions. essential and lethal genes. gene expression and environment-(temperature. light. hormones)	08

UNIT – III: Microbial diversity and Functional Biology

TOPIC	SUBTOPIC	NO OF LECTURES
A)Different groups of prokaryotes	i)Archaebacteria ii)Eubacteria iii)Blue green algae, Actinomycetes, Eumycota	08
B) Plants	Plant cell, types of plant tissues and their importance, organization on angiosperms and modifications of organs of commercial importance – Storage roots like sweet potato, carrot, beetroot, raddish. Storage stems – potato, ginger, turmeric, yams, onion, garlic, *Acorus* Fruits – Parthenocarpy Seeds – (lectin) red bean	07
C) Histology of mammalian tissues	Animal cell, tissues – epithelial tissues, connective tissues, muscular tissues, nervous tissues.	09
D) Experimental models	What organisms are suitable for genetic experimentation: eukaryotes and prokaryotes. Criteria for selection Maintenance of *Drosophila*, Albino mice, Guinea pigs, Hamsters, Monkey, *Saccharomyces cerevisiae, neurospora crassa, Zea mays, Pisum sativum, E.coli*	06

PAPER – II

UNIT – I: Cell Biology

TOPIC	SUBTOPIC	NO. OF LECTURES
A)Ultra structure of prokaryotes	Flagella, Pilli, capsule, cell wall, cell membrane, outer membrane, cytoplasm, endospores, reserve material, mesosome, nuclear material, plasmid-extrachromosomal material	10
B)Ultra structure of Eukaryotic cell	Structure of Fungal cell and Yeast, animal Cell – Cell wall, plasma membrane, introduction to cytoplasmic organelles- Mitochondria and chloroplast, golgi Complex.	10
C)Interface nucleus including (Cell cycle)	Nucleosome, biological significance of DNA, cell cycle- phases, regulation by cell growth and extra cellular signals, cell cycle check points, coupling of s phase to m phase, cell cycle progression.	10

UNIT – II: Biomolecules

TOPIC	SUBTOPIC	NO. OF LECTURES
A) Chemical bonds and Role of water	Covalent bonds, dipoles, ionic, hydrogen bonds. Hydrophobic interaction, Vander Waals forces, functional group. Structure and properties of water, pH – pH meter, Buffers.	06
B)Carbohydrates	D & L Glyceraldehydes, structure of monosaccharide, disaccharides, and polysaccharides. Isomers of monosaccharides, chemical/physical properties of carbohydrate, chemical reactions for detection of mono., di and polysaccharides	05
C)Lipids	Classification and properties, saturated, unsaturated, structure and function triacylglycerol, storage lipids, structural lipids, phospholipids, action of phospholipases, steroids.	06
D)Amino acids, proteins and Enzymes	Structure, properties, function, and chemical reaction of amino acids, classification and structure of proteins. Silk fibroin, keratin hemoglobin and myoglobin. Structure of peptides. Titration curve of amino acids. Concept of Isoelectric pH, zwitter ion. Introduction, classification, active site and enzyme specificity	08
E)Nucleic acids	Structure, function of NA, properties and types of DNA, RNA, structure of polynucleotides	05

UNIT – III: Medical Biotechnology

TOPIC	SUBTOPIC	NO. OF LECTURES
A) Introduction to Biotechnology and its areas of application	What is biotechnology? Biotechnology as an interdisciplinary pursuit. Scope of biotech in various areas. Public perception of biotechnology. Biotechnology and the developing world.	07
B) Host-Microbe interaction	Host parasite relations, infections: sources, methods of transmission, virulence factors, basic types of clinical infections,	08
C) Immunity	Introduction, mechanism of innate immunity, acquired immunity, local and herd immunity. Humoral and cellular immunity.	07
D) Antigens and antibody	Determinant of antigenicity, biological classes Structure, immunoglobulin classes.	08

Reference:

Sr. No	Title of Book	Author	Publisher
1	Fundamentals of Microbiology 5th Edition	I. Edward Alcamo	Addison Wesley Longman, Inc.
2	Genetics 3rd ed	Monroe W. Strickberger	Prentice-Hall of India Pvt. Ltd
3	Microbial Genetics	David Friefelder	Narosa Publishing House
4	Microbiology	M.J. Pelczar, E.C.S. Chan, Noel R. Krieg	Tata McGraw-Hill,Edition
5	Introduction to Microbiology	John L Ingraham and Catherine A Ingraham	Thomson™ Brooks/Cole
6	Fundamentals Principles of Bacteriology	A.J. Salle	Tata McGraw-Hill
7	Outlines of Biochemistry 5th Edition	Eric E. Conn and Stumpf	John Wiley and Sons
8	Lehninger Principles of Biochemistry 3rd Edition	David L Nelson and Michael M Cox.	MacMillan Worth Publishers.
9	Cell and molecular biology 8th Edition	E.D.P. De Robertis, E.M.F. De Robertis	Lippincott Williams and Wilkins
10	Biochemistry 3rd Edition	D. Voet and J.G. Voet	Wiley International edition.
11	Harper's Illustrated Biochemistry 26th Edition	R. Murray, D. Granner, P. Mayes, V.Rodwell,	McGraw-Hill.
12	College Botany Vol.I	H.C. Gangulee, K.S.Das, C. Datta	New Central Book Agency.
13	A textbook of Microbiology	R.C. Dubey, D. K. Maheshwari	S. Chand and Company Ltd
14	Genetics 5th Edition,	Peter J. Russell	Wesley Longman, Inc
15	College zoology	Dhammi & Dhammi	New Central Book Agency.
16	Textbook of microbiology 6th edition	R. Anantnarayan, C.K.J. Paniker	Orient Longman.
17	Advances in Biotechnology	S.N. Jogdand	Himalay Publication
18	Concepts in Biochemistry	Rodney Boyer, Brook/Cole	Publishing Company
19	Introductory Practical Biochemistry	S.K. Sawhney, Randhir Singh	Narosa Publishing House.

PRACTICALS

PAPER I

1. Study of Microscope, dark field microscope and all Lab equipments- autoclave, hot air oven, centrifuge, incubator, rotary shaker, filter assembly, LAF, pH meter
2. Study of minimum nutritional requirement.
3. Media preparation and sterilization –nutrient broth/agar, Sabourauds broth/agar, Mac conkeys broth/agar, Superimposed imposed blood agar-slant and plate
4. Aseptic transfer of NA/NB.
5. Isolation techniques of E.coli/ S. aureus
6. Serial dilution technique – Surface spread and pour plate.
7. Enumeration methods – haemocytometer, breeds count, opacity tube
8. Preservation of microorganisms – serial subculture method and paraffin oil tech.
9. Effects of environment on bacterial growth – effect of Ph, temp, osmotic pressure
10. Study of aerobic microflora and anaerobic microfiora from (cow dung) in Robertson's cooked meat medium
11. Study of plant tissues from suitable material- parenchyma, sclerenchyma, xylem and phloem.
12. Drosophila culture-corn meal medium.
13. Mounting of Squamous and stratified epithelium
14. Study of animal tissues from permanent slides:-blood, bone marrow, neuron, connective tissue-spongy, smooth, skeletol and heart muscles.
15. Enrichment (Allen and Chu) of algae and permanent slides of - *Nostoc, Anabaena, Spirullina, Chorella*
16. Slide culture technique for Actinomycetes.

PAPER II

1. Simple staining – Monochrome stain with basic fuchsin, crystal violet, malachite green, safranin.-yeast.
2. Differential staining – Grams staining of mixture (gram positive and gram negative)
3. Study of fungi (*Aspergillus niger*) and yeast.
4. Special staining – capsule, cell wall, lipid, spores, nucleus
5. Motility –hanging drop, stab culture.
6. Qualitative tests for biomolecules – carbohydrates, lipids, protein, nucleic acids, amino acids
7 Amylase, urease, invertase, catalase, dihydrogenase activity (qualitative)
8. Isolation of organism from stool/feces on selective medium (Mac conkey)
9. Gram staining of organism from saliva and skin.
10. Extraction of Casein from milk.
11. Stages of Mitosis
12. Extraction of Pectin from any suitable fruit.
13. Meat tenderization using papain
14. Staining of Starch grain from potato
15. Assignments in Biotechnology-areas of application, scope of biotech, research organization in biotech, biotech based industry- 5-6 pages hand written and pictures. (5 marks)
16. Industrial visit.

TERM I and II

PAPER	UNITS	TERM I	TERM II
PAPER I	I	A, B	C, D
	II	A, B,	C, D
	III	A, B	C, D
PAPER II	I	A, B	C
	II	A, B,C	D, E
	III	A, B	C , D

FYBSc BIOTECHNOLOGY

THEORY EXAMINATION PATTERN

PAPER-I

I Term			II Term		
Q. No.	Portion	Marks	Q. No.	Portion	Marks
Q 1	Units 1,2,3	15	Q 1	Units 4,5,6	15
Q 2	Unit 1	15	Q 2	Unit 4	15
Q 3	Unit 2	15	Q 3	Unit 5	15
Q 4	Unit 3	15	Q 4	Unit 6	15
Total Marks = 60			Total Marks = 60		

** Marks out of 60 to be converted out of 30 for both terms.*

PAPER-II

I Term			II Term		
Q. No.	Portion	Marks	Q. No.	Portion	Marks
Q 1	Units 1,2,3	15	Q 1	Units 4,5,6	15
Q 2	Unit 1	15	Q 2	Unit 4	15
Q 3	Unit 2	15	Q 3	Unit 5	15
Q 4	Unit 3	15	Q 4	Unit 6	15
Total Marks = 60			Total Marks = 60		

** Marks out of 60 to be converted out of 30 for both terms.*