DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.ACAD/SU/Sci./B.Sc. & M.Sc. Syll./5/2015

It is hereby notified for information to all the concerned that, on the recommendation of the Faculty of Science the Academic Council at its meeting held on 30-05-2015 has accepted the **revised semester-wise syllabi as mentioned against their names in the Faculty of Science as under** :-

Sr. No.	Name of the Subject	Semester
[1]	B.Sc. Computer Science Degree Course	III & IV
[2]	B.Sc. Information Technology Degree Course	III & IV
[3]	B.C.A. Science Degree Course	III & IV
[4]	B.Sc. Animation Degree Course	III & IV
[5]	B.Sc. Bioinformatics Degree Course	III & IV
[6]	B.Sc. Computer Science [Optional]	III & IV
[7]	B.Sc. Information Technology [Optional]	III & IV
[8]	B.Sc. Computer Applications [Optional]	III & IV
[9]	B.Sc. Computer Maintenance [Optional]	III & IV
[10]	B.Sc. Environmental Science [Optional]	V & VI
[11]	B.Sc. Bio-Chemistry [Optional]	V & VI
[12]	B.Sc. Forensic Science Degree Course	V & VI
[13]	B.Sc. Industrial Chemistry [Optional]	V & VI
[14]	B.Sc. Electronics [Optional]	V & VI
[15]	B.Sc. Zoology [Optional]	V & VI
[16]	B.Sc. Microbiology [Optional]	V & VI
[17]	B.Sc. Instrumentation Practice [Optional]	V & VI
[18]	B.Sc. Statistics [Optional]	V & VI
[19]	B.A. Statistics [Optional]	V & VI
[20]	B.A. / B.Sc. Mathematics [Optional]	V & VI
[21]	B.Sc. Home Science Degree Course	V & VI
[22]	B.Sc. Textile Interior Decoration Degree Course	V & VI
[23]	B.Sc. Fishery Science [Optional]	V & VI
[24]	B.Sc. Dairy Science & Technology [Optional]	V & VI
[25]	B.Sc. Botany [Optional]	V & VI
[26]	B.Sc. Physics [Optional]	V & VI
[27]	M.Sc. Computer Science	III & IV
[28]	M.Sc. I.T.	III & IV

This is effective from the Academic Year 2015-16 & onwards as appended herewith.

All concerned are requested to note the contents of the circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.ACAD/SU/SCI./
2015/3761-4160
Date:- 16-06-2015.

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Director,
Board of College and
University Development.

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Copy forwarded with compliments to:-

1] The Principals, affiliated concerned colleges,
Dr. Babasaheb Ambedkar Marathwada University

Copy to :-

1] The Controller of Examinations,
2] The Director, [E-Suvidha Kendra], in-front of Registrar's Quarter,
Dr. Babasaheb Ambedkar Marathwada University,
3] The Superintendent, [B.Sc. Unit],
4] The Superintendent, [M.Sc. Unit],
5] The Programmer [Computer Unit-1] Examinations,
6] The Programmer [Computer Unit-2] Examinations,
7] The Record Keeper.

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S*/-160615/-

Revised Syllabus ofB.Sc. Third Year
[Microbiology]
Semester- V & VI

(optional)

(Effective from June 2015 – 2016 onwards)

put before
A.C.
7/3/15

DR BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

Course Structure

Year	Semester	Paper number	Paper Title	Hours	Marks
B. Sc. Third	V	Paper-XV	Microbial Genetics	45	50
		Paper-XVI	Microbial Metabolism	45	50
		Paper-XVII	Practical	45	50
		Paper-XVIII	Practical	45	50
	VI	Paper-XIX	Recombinant DNA Technology	45	50
		Paper-XX	Industrial Microbiology	45	50
		Paper-XXI	Practical	45	50
		Paper-XXII	Practical	45	50
			Total	360	400

B.Sc. III rd Year, Microbiology

[Semester- V]

Paper XV- Microbial Genetics

Unit I : Properties of DNA and Gene expression (12)

- Molecular structure of DNA
- DNA as a genetic material: Experimental proof –
  i. Griffith and Avery, MacLeod and McCarty experiment
  ii. Hershey-Chase and experiments.
- Molecular properties of DNA – Melting. Breathing, Bending, flexibility, Novel structures, linking number, major and minor groove.

DNA Replication

- Semi conservative mode of DNA replication: Meselson and Stahl'sexperiment
- Mechanism, steps and process with enzymes involved in replication
- Post replication modification- Methylation (dam, dcm, hsd).

Unit II (11)

Gene expression

- Salient features of Genetic code.
- Biological expression of a gene: Protein synthesis : Transcription and Translations processes.
- Regulation of gene expression: Lac operon , Ara operon

Unit III: Genetic Mutations (11)

- Spontaneous mutation: Definition, causes, replica plating.
- Induced mutation: Types
  -Base pair substitution (transition and transversion)
  -Frameshift mutations (deletion and insertion)

- Missense mutation, nonsense mutations, silent mutation
- Genetic suppression- intragenic and extragenic
- Mutagenesis by physical and chemical agents

  Physical mutagenic agents: U.V. radiations, X rays

  Chemical mutations: Base modifiers: Nitrous oxide, Base analogue: 5 Bromo uracil, Agents producing distortion in DNA – Proflavin, Intercalating agents: ethidium bromide.

Unit IV: Bacterial Recombinations (11)

- **Transformation:** Definition, experimental proof, process of transformation, uptake of DNA, competence factor
- **Transduction:** Definition, Lederberg and Zinder 'U' tube experiment, Mechanism and process- generalized specialized and abortive transduction.
- **Conjugation :** Definition, Experimental proof Lederberg and Tatum experiment, Conjugation process,
- F, Hfr, F' factors.

[Semester- V]

Paper-XVI: Microbial Metabolism

Unit: 1 **(11)**

- Enzymes: Definition, properties, specificity, active site, activation of enzymes, Mechanism of action of enzymes (locks and key, induced fit, ping-pong)
- Nomenclature and classification of enzymes.
- Factors affecting catalytic activity of enzymes (pH, temperature ,enzyme concentration, substrate concentration ,metal ions, time)
- Michaelis-Menten equation : derivation and significance.
- Types of enzymes :extracellular, intracellular, constitutive and inducible.

Unit:II **(11)**

- Enzyme inhibition: Irreversible, reversible (competitive, uncompetitive, in competitive) and metabolic antagonism, feedback inhibition.
- Co-enzymes and respective enzymes. (NAD, FAD, Lipoic acid, Vitamin B12, Thiamine pyrophosphate)
- Elementary knowledge and uses of isoenzymes.
- Commercial uses of enzymes (any five) – (food, leather, textile, environment,
- pharmaceuticals and clinical)

Unit III **(11)**

- Definitions: Metabolism, anabolism, catabolism, free energy.
- Bioenergetics: chemical links between catabolism and biosynthesis, energy coupling through ATP and through pyridine nucleotides, Central role of ATP-ADP system.
- Modes of energy yielding metabolism : Definition and features of fermentation, Respiration and photosynthesis.
- Fermentation of carbohydrates:

- EMP, HMP, ED, Phospoketolase pathway (pentose , hexose) with structure.
- Alcoholic, homolactic, mixed acid, butanediol, butyric, acetone-butanol fermentations.

Unit IV **(12)**

- Aerobic respiration:
- RETC : location functions, components, redox carriers, oxidative phosphorylation artificial electron acceptors, bacterial cytochrome systems
- TCA cycle, glyoxylate cycle, anaplerotic sequences.
- Catabolism of saturated (16 carbon) and unsaturated fatty acids (16 carbon) by β Oxidation
- Degradation of proteins and amino acids: proteolysis, putrefaction.
- Transformation of amino acids: oxidation, reduction, decarboxylation, deamination (one example of each).
- Nucleic acid catabolism: DNA, RNA depolymerization, degradation of nitrogenous bases (mention end products without pathway)
- Biosynthesis of nucleotides: Purine and pyrimidine nucleotides, conversion of ribonucleotides to deoxyribonucleotides.

B.Sc. III rd year, Microbiology [Semester- V]

Practical paper – XVII

1. Isolation of total RNA from yeast.
    i) Purification of RNA by phenol extraction method.
    ii) Concentration of RNA by ethanol precipitation.
2. Hyperchromacity study of chromosomal DNA using UV -visible spectrophotometer
3. Isolation of spontaneous Lac mutant of *E coli* by Replica plating.
4. Effect of U.V. radiation (U.V. damage) on DNA and photo reactivation in *E coli.*
5. Study of Transformation in *E coli*
    a. Preparation of competent *E coli*
    b. Enumeration of transformed cells
    c. Determination of plasmid transfer efficiency
6. Isolation of coliphage from sewage.
7. Study of conjugation in *E coli* (Plate method)

Practical paper –XVIII

1. Preparation of buffers and reagents.
2. Study of enzymes: - α-amylase, caseinase, catalase, desulfurase, gelatinase, lecithinase, oxidase.
3. Effect of pH, temp, substrate concentration on α- amylase activity.
4. Demonstration of nitrate reduction
5. Demonstration of decarboxylation of amino acid.
6. Isolation of photosynthetic bacteria by column method
7. Primary screening for:
    i) Starch hydrolyzers.
    ii) Organic acid producers.
    iii) Antibiotic producers.

B.Sc. III Year [Semester-VI]

Paper- XIX: Recombinant DNA Technology

Unit:I **(11)**

- Recombinant DNA technology: definition, objectives of genetic engineering, tools used for cloning, steps in gene cloning.
- DNA manipulating enzymes: i) restriction endonucleases (types, nomenclature, recognition sequences, cleavage patterns with examples), ii) DNA ligase iii) alkaline phosphtase, iv) polynucleotide kinase v) reverse transcriptase.

Unit II: **(11)**

- Vectors: properties of good vector, cloning and expression vectors. (pBR322, pUC18), Bacteriophage vectors (improved λ vector), cosmids, YAC.
- Properties of good host (cloning organisms).
- Uptake of DNA (Calcium chloride treatment, electroporation, protoplast fusion, liposome).
- Selection of recombinant clones by blue script / white script screening.

Unit: III (11)

- Genomic library (construction and identification of desired clone).
- Probes (preparation &labeling) , its uses.
- PCR
- Nucleic acid and protein blotting techniques :
    - Southern blotting,
    - Western blotting,
    - Northern blotting.
- Colony hybridization
- DNA sequencing (Sanger method / dideoxy method)

Unit IV **(12)**

- Gene therapy (Somatic cell and germ line)
- Applications of genetic engineering
  - Agriculture-(Golden rice and Bt cotton)
  - Human and animal health (Interferon and HBV vaccine)
  - Industries (Strain improvement and recombinant proteins Insulin)
  - Environment(Super bug and Bioremediation using GEMS)
- Ethical issues of genetic engineering.

Semester VI Paper- XX Industrial Microbiology

Unit I : (11)

- Introduction to Industrial Microbiology, Historical events (any ten).
- Lay out of a fermentation Industry: Different units and departments and functions (stock, production and fermentation, Q.C and Q.A. and R & D, Packaging Importance of sterility maintenance and checking.
- I.P. and W.H.O. standards of sterility.
- Design of a fermentor, Types, (Single, multiple)
- Scale up of fermentation.

Unit II : (11)

- Primary and Secondary screening methods
- Preservation of industrially important Microbe (Serial subculture, overlaying mineral oil, soil stocks, lyophilisation, liquid nitrogen preservation)
- Strain improvement methods for increase in yield of product. (any one)
- Development of inoculum (Steps).
- Development of fermentation medium (Raw materials, nutrients, media formulation, pretreatment, sterilization, buffers, antifoam agents, cell lysates, precursors)
- Phage contamination and control

Unit III:

- Industrial fermentations (11)
    - Antibiotic – penicillin
    - Vitamin B12
    - L-Lysine (Direct method)

Unit: IV (12)

- Microbial production of
    - Ethyl Alcohol
    - Citric acid

Reference Books for B.Sc III rd Year Microbiology

1. Avinash & Kakoli Upadhay: MOLBIO , Himalaya Publications.
2. Barry J.M. & Barry F.M. Molecular Biology
3. Freifelder David : Microbial Genetics, Jones & Bartlett, Publications
4. Gardner Eldon , Simmon Michael & Sneustad Oeter: Principals of Genetics, John Wily & Sons, NEWYORK.
5. James D .Watson : Molecular Biology of the gene, W.A. Bejamin, inc.
6. Nilima Rajvaidya & D. Markendey: Genetical & biochemical applications of Microbiology, APH Publishing Co NEW DELHI.
7. A.H. Rose : Chemical microbiology-An introduction to microbial physiology, Butterworth World student, LONDON.
8. Campbell Peter N.& Smith Anthony D. : Biochemistry Illustrated, Churcill Livingstone, NEWYARK.
9. Deb A.C.: Fundamentals of Biochemistry, New central Book Agency, Calcutta.
10. Lehninger Alert L.: Principals of Biochemistry, CBS Publisher, DELHI.
11. Lehninger Alert L: Biochemistry , Kalyani Publisher NEW DELHI.
12. Moat Albert G. & Foster John W.: Microbial Physiology, John Wiley& Sons, Inc.
13. Moat A. G. Microbial Biochemistry.
14. Steinner R.F.: Life Chemistry- An Introduction to Biochemistry, D van Nostrand cc inc, LONDON.
15. Stryer Lubrt: Biochemistry, W.H. Freeman & Co. San Francisco.
16. T.Palmer: Understanding Enzymes .
17. Walker J.M. & Gingold A.D.: Molecular Biology & Biotechnology, Panima Publications NEW DELHI.
18. Sing B.D. : Biotechnology Kalyani Publisher, DELHI.
19. Joshi P. Genetic Engeneering and its applications Agro bios Jodhpur INDIA
20. Tikekar P.G. Practical Biochemistry for medical students, Purvi Pustak Kendra BOMBAY,
21. Jayaraman J. Laboratory manual in biochemistry: New age , International Publishers.
22. Plummer David : An Introduction To Practical Biochemistry,Tata Mac Grow Hill Books,Co -17
23. Chtwal Anand : Instrumental Methods –Chemical Analysis , Himalaya Publishing House .
24. Biss Swanger Hans : Practical Enzymology, Wiley –VCH VErlag Gmvh& co.
25. Prescott & Dumn: Industrial Microbiology, Mac Grow Hill Co Ltd.
26. Casida L.E. : Indusrtial Microbiology Willey Estern Ltd. NEW DELHI.
27. A.H. Patel : Industrial Microbiology , Mc Millan (India) Ltd. BOMBAY.
28. Strickberger M. : Genetics, Prentice Hall of India Pvt Ltd New Delhi.

- Amylase enzyme (fungal)

- Baker's yeast
- Biofertilizers (Azo-Rhizo. PSB) and Biopesticide production

Chairman
B. O. S.
Microbiology

B.Sc. III rd year, Microbiology [Semester- VI]

Practical papers XXI

1. Restriction digestion of lambda DNA
2. Isolation of *E. coli* chromosomal DNA.
3. Separation of *E coli* DNA by agarose gel electrophoresis.
4. Confirmation and estimation of DNA by diphenylamine
5. Ligation chain reaction
6. i) Study of DNA uptake in *E coli* using $Cacl_2$ treatment
   ii) Selection of recombinant clones on suitable medium.
7. Measurement of B-galactosidase activity of *E coli* / Yeast using ONPG
8. Demonstration of polymerase chain reaction (PCR)

Practical paper – XXII

1. Production, detection and estimation of ethanol using *S cerevisiae.*
2. Production and estimation citric acid by *Aspergillus spp*
3. Production of alpha-amylase by *Aspergillus / Bacillus spp.*
4. Identification of fermentation product by paper chromatography and thin layer chromatography – Lysine and Citric acid.
5. Separation of proteins by using agarose gel electrophoresis.
6. Microbiological Assay of penicillin.
7. Study tour and report submission

FACULTY OF SCIENCE

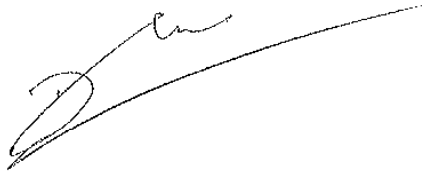
B.Sc. (Third Year)(Fifth Semester) Examination

MICROBIOLOGY

Paper XV- Microbial Genetics

Time-2 Hours *Maximum Marks-50*

Q1-	Question on unit-1 Or Question on unit-1	Marks-10
Q2-	Question on unit-2 Or Question on unit-2	Marks-10
Q3-	Question on unit-3 Or Question on unit-3	Marks-10
Q4-	Short notes on unit -4	Marks- 10
Q5-	Multiple choice 10 questions on all units	Marks -10



FACULTY OF SCIENCE

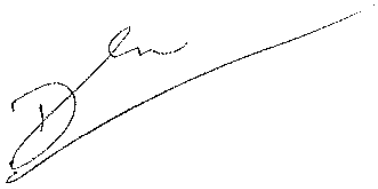
B.Sc. (Third Year) (Fifth Semester) Examination

MICROBIOLOGY

Paper-XVI: Microbial Metabolism

Time-2 Hours *Maximum Marks-50*

Q1-	Question on unit-1 Or Question on unit-1	Marks-10
Q2-	Question on unit-2 Or Question on unit-2	Marks-10
Q3-	Question on unit-3 Or Question on unit-3	Marks-10
Q4-	Short notes on unit -4	Marks- 10
Q5-	Multiple choice 10 questions on all units	Marks -10



FACULTY OF SCIENCE

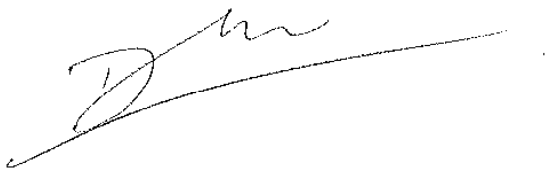
B.Sc. (Third Year) (Sixth Semester) Examination

MICROBIOLOGY

Paper- XIX: Recombinant DNA Technology

Time-2 Hours *Maximum Marks-50*

Q1-	Question on unit-1 Or Question on unit-1	Marks-10
Q2-	Question on unit-2 Or Question on unit-2	Marks-10
Q3-	Question on unit-3 Or Question on unit-3	Marks-10
Q4-	Short notes on unit -4	Marks- 10
Q5-	Multiple choice 10 questions on all units	Marks -10



FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) Examination

MICROBIOLOGY

Paper- XX Industrial Microbiology

Time-2 Hours *Maximum Marks-50*

Q1-	Question on unit-1 Or Question on unit-1	Marks-10
Q2-	Question on unit-2 Or Question on unit-2	Marks-10
Q3-	Question on unit-3 Or Question on unit-3	Marks-10
Q4-	Short notes on unit -4	Marks- 10
Q5-	Multiple choice 10 questions on all units	Marks -10