DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO. ACAD / NP /M.E./M.Tech./97/2012

It is hereby notified for the information of all concerned that, the Academic Council at its meeting held on 06-07-2012 has accepted the **following New Syllabi** under the Faculty of Engineering & Technology **as appended herewith** :-

Sr. No.	Syllabi.
[1]	M.E. Mechanical,
[2]	M.E. Mechanical [Design Engineering],
[3]	M.E. [Thermal],
[4]	M.E. [Biotechnology],
[5]	M. Tech. [Computer Science and Technology],
[6]	M.Tech. [Food Processing Tech.].

This is effective from the academic year 2012-2013 and onwards.

All concerned are requested to note the contents of this circular for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.ACAD/ NP/ M.TECH./
2012/20668-72

A.C.S.S. I.No.84

Date:- 03-08-2012.

★ ★ ★ ★ ★ ★ ★ ★

******

Director,
Board of College and
University Development.

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 Superintendent, [Engineering Unit],
3] The Superintendent, [Eligibility Unit],
4] The Record Keeper,
Dr. Babasaheb Ambedkar Marathwada University.

-=**=-

S/030812/-*

Dr BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

New Structure and Syllabus of

M.E.
BIOTECHNOLOGY

EFECTIVE FROM - 2012-13 & ONWARDS

DR BABASAHEB AMBEDKAR MARATHWADAUNIVERSITY, AURANGABAD

Teaching / practical / Examination scheme for 2012-2013 for M.E. (Biotechnology Engg.)

1st Year semester 1

Course Code	Subjects	Teaching scheme Hours per week			Examination scheme-Marks			Total Marks
		T	P	TOTAL	T	P/v	Total	
MEBT-111	Molecular Cell Biology (MCB)	4	2	6	100	25	125	125
MEBT-112	Biological Engineering	4	4	8	100	50	150	150
MEBT-113	Bioinformatics and Research Methodology	4	2	6	100	25	125	125
MEBT-114	Biomaterial Science	4	2	6	100	25	125	125
MEBT-115	Bioreactor design, operation and control	4	2	6	100	25	125	125
	Total	**20**	**12**	**32**	**500**	**150**		**650**

1st Year semester 2

Course Code	Subjects	Teaching scheme Hours per week			Examination scheme-Marks			Total Marks
		T	P	TOTAL	T	P/v	Total	
MEBT-121	Genetic Engineering and Bioinformatics	4	4	8	100	50	150	150
MEBT-122	Advances in biological engineering	4	2	6	100	25	150	150
MEBT-123	Protein, cell and tissue engineering	4	2	6	100	25	125	125
MEBT-124	Synthetic biology design and engineering—I	4	2	6	100	25	125	125
MEBT-125	Upstream and down stream processing	4	2	6	100	25	125	125
	Total	**20**	**12**	**32**	**500**	**150**		**650**

2nd Year Semester 1

Course Code	Subjects	Teaching scheme Hours per week			Examination scheme-Marks				Total Marks
		T	P	TOTAL	T	Term work	P/Viva	Total	
MEBT-231	Dissertation part-1 ****	48		48		100	100	200	200
	Total	**48**		**48**		**100**	**100**		**200**

****

Dissertation—It includes review of literature, project planning, synopsis submission, Pre-project presentation, every 15 days project progress report submission

Term work Include
Bioinformatics learning, research methodology iearning

Note: Project viva with two external examiners, pre-project report should submit to department head sign

2nd Year Semester 2

Course Code	Subjects	Teaching scheme Hours per week			Examination scheme-Marks				Total Marks
		T	P	TOTAL	T	P/viva	Term work	Total	
MEBT-241	Dissertation part-2 ****	48		48		150	50	200	200
	Total			**48**		**150**	**50**	**200**	**200**
Grand Total									**1700**

****

Dissertation

Execute proper experimental and project planning
Every 15 days project progress report should submit to HOD
After completion of project, there is viva on it with three external examiners

Course Code detail:

MEBT—M.E. Biotechnology
111------ 1-year 1—semester 1---subject code .

1st Year semester 1

Course Code	Subjects	Teaching scheme Hours per week			Examination scheme-Marks			Total Marks
		T	P	TOTAL	T	P/A	Total	
MEBT-111	Molecular Cell Biology (MCB)	4	2	6	100	25	125	125
MEBT-112	Biological Engineering	4	4	8	100	50	150	150
MEBT-113	Bioinformatics and Research Methodology	4	2	6	100	25	125	125
MEBT-114	Biomaterial Science	4	2	6	100	25	125	125
MEBT-115	Bioreactor design, operation and control	4	2	6	100	25	125	125
	Total	**20**	**12**	**32**	**500**	**150**		**650**

DR. BABASAHEB AMEBDKAR MARATHWADA UNIVERSITY, AURANGABAD
FACULTY OF ENGINEERING AND TECHNOLOGY
First Year Engineering
Semester-I

MEBT-111 Molecular Cell Biology

Teaching Scheme Hours / week			Examination Scheme	
Lectures	4		Theory	100
Practical	2		Practical /Viva	25
Theory Paper Duration	3 hrs.			

The Dynamic Cell, Evolution: At the Core of Molecular Change, The Molecules of Life, The Architecture of Cells, The Life Cycle of Cells, Cells into Tissues, Molecular Cell Biology: An Integrated View of Cells at Work

Chemical Foundations, Covalent Bonds, Noncovalent Bonds, Chemical Equilibrium, Biochemical Energetics, Activation Energy and Reaction Rate

Protein Structure and Function, Hierarchical Structure of Proteins, Folding, Modification, and Degradation of Proteins, Functional Design of Proteins, Membrane Proteins, Purifying, Detecting, and Characterizing Protein, PERSPECTIVES for the Future, PERSPECTIVES in the Literature

Nucleic Acids, the Genetic Code, and the Synthesis of Macromolecules, Structure of Nucleic Acids, Synthesis of Biopolymers: Rules of Macromolecular Carpentry, Nucleic Acid Synthesis, The Three Roles of RNA in Protein Synthesis, Stepwise Formation of Proteins on Ribosomes, PERSPECTIVES for the Future, PERSPECTIVES in the Literature

Biomembranes and the Subcellular Organization of Eukaryotic Cells, Microscopy and Cell Architecture, Purification of Cells and Their Parts, Biomembranes: Structural Organization and Basic Functions, Organelles of the Eukaryotic Cell, PERSPECTIVES for the Future, PERSPECTIVES in the Literature

Manipulating Cells and Viruses in Culture, Growth of Microorganisms in Culture, Growth of Animal Cells in Culture, Viruses: Structure, Function, and Uses, PERSPECTIVES for the Future, PERSPECTIVES in the Literature

Unit 2

Genetic Analysis in Cell Biology, Mutations: Types and Causes, Isolation and Analysis of Mutants, Genetic Mapping of Mutations, Molecular Cloning of Genes

S

Defined by Mutations, Gene Replacement and Transgenic Animals, PERSPECTIVES for the Future, PERSPECTIVES in the Literature

Molecular Structure of Genes and Chromosomes, Molecular Definition of a Gene, Chromosomal Organization of Genes and Noncoding DNA, Mobile DNA, Functional Rearrangements in Chromosomal DNA, Organizing Cellular DNA into Chromosomes, Morphology and Functional Elements of Eukaryotic Chromosomes, Organelle DNAs, PERSPECTIVES for the Future, PERSPECTIVES in the Literature

Regulation of Transcription Initiation, Bacterial Gene Control: The Jacob-Monod Model, Bacterial Transcription Initiation, Eukaryotic Gene Control: Purposes and General Principles, Regulatory Sequences in Eukaryotic Protein-Coding Genes, Eukaryotic Transcription Activators and Repressors, RNA Polymerase II Transcription-Initiation Complex, Molecular Mechanisms of Eukaryotic Transcriptional Control, Other Transcription Systems, PERSPECTIVES for the Future, PERSPECTIVES in the Literature

RNA Processing, Nuclear Transport, and Post-Transcriptional Control, Transcription Termination, Processing of Eukaryotic mRNA, Regulation of mRNA Processing, Signal-Mediated Transport through Nuclear Pore Complexes, Other Mechanisms of Post-Transcriptional Control, Processing of rRNA and tRNA, PERSPECTIVES for the Future, PERSPECTIVES in the Literature

DNA Replication, Repair, and Recombination, General Features of Chromosomal Replication, The DNA Replication Machinery, The Role of Topoisomerases in DNA Replication, DNA Damage and Repair and Their Role in Carcinogenesis, Recombination between Homologous DNA Sites, PERSPECTIVES for the Future, PERSPECTIVES in the Literature

Regulation of the Eukaryotic Cell Cycle, Overview of the Cell Cycle and Its Control, Biochemical Studies with Oocytes, Eggs, and Early Embryos, Genetic Studies with *S. pombe*, Molecular Mechanisms for Regulating Mitotic Events, Genetic Studies with *S. cerevisiae*, Cell-Cycle Control in Mammalian Cells, Checkpoints in Cell-Cycle Regulation, PERSPECTIVES for the Future, PERSPECTIVES in the Literature

Gene Control in Development, Cell-Type Specification and Mating-Type Conversion in Yeast, Cell-Type Specification in Animals, Anteroposterior Specification during Embryogenesis, Specification of Floral-Organ Identity in *Arabidopsis*, PERSPECTIVES for the Future, PERSPECTIVES in the Literature

Transport across Cell Membranes, Diffusion of Small Molecules across Phospholipid Bilayers, Overview of Membrane Transport Proteins, Uniporter-Catalyzed Transport, Intracellular Ion Environment and Membrane Electric

Potential, Active Transport by ATP-Powered Pumps, Cotransport by Symporters and Antiporters, Transport across Epithelia, Osmosis, Water Channels, and the Regulation of Cell Volume, PERSPECTIVES for the Future, PERSPECTIVES in the Literature

Cellular Energetics: Glycolysis, Aerobic Oxidation, and Photosynthesis, Oxidation of Glucose and Fatty Acids to CO_2, Electron Transport and Oxidative Phosphorylation, Photosynthetic Stages and Light-Absorbing Pigments, Molecular Analysis of Photosystems, CO_2 Metabolism during Photosynthesis, PERSPECTIVES for the Future, PERSPECTIVES in the Literature

Protein Sorting: Organelle Biogenesis and Protein Secretion, Synthesis and Targeting of Mitochondrial and Chloroplast Proteins, Synthesis and Targeting of Peroxisomal Proteins, Overview of the Secretory Pathway, Translocation of Secretory Proteins across the ER Membrane, Insertion of Membrane Proteins into the ER Membrane, Post-Translational Modifications and Quality Control in the Rough ER, Protein Glycosylation in the ER and Golgi Complex, Golgi and Post-Golgi Protein Sorting and Proteolytic Processing, Receptor-Mediated Endocytosis and the Sorting of Internalized Proteins, Molecular Mechanisms of Vesicular Traffic, PERSPECTIVES for the Future, PERSPECTIVES in the Literature

Cell Motility and Shape I: Microfilaments, The Actin Cytoskeleton, The Dynamics of Actin Assembly, Myosin: The Actin Motor Protein, Muscle: A Specialized Contractile Machine, Actin and Myosin in Nonmuscle Cells, Cell Locomotion, PERSPECTIVES for the Future, PERSPECTIVES in the Literature

Cell Motility and Shape II: Microtubules and Intermediate Filaments, Microtubule Structures, Microtubule Dynamics and Associated Proteins, Kinesin, Dynein, and Intracellular Transport, Cilia and Flagella: Structure and Movement, Microtubule Dynamics and Motor Proteins during Mitosis, Intermediate Filaments, PERSPECTIVES for the Future, PERSPECTIVES in the Literature

Cell-to-Cell Signaling: Hormones and Receptors, Overview of Extracellular Signaling, Identification and Purification of Cell-Surface Receptors, G Protein – Coupled Receptors and Their Effectors, Receptor Tyrosine Kinases and Ras, MAP Kinase Pathways, Second Messengers, Interaction and Regulation of Signaling Pathways, From Plasma Membrane to Nucleus, PERSPECTIVES for the Future, PERSPECTIVES in the Literature

Nerve Cells, Overview of Neuron Structure and Function, The Action Potential and Conduction of Electric Impulses, Molecular Properties of Voltage-Gated Ion Channels, Neurotransmitters, Synapses, and Impulse Transmission, Neurotransmitter Receptors, Sensory Transduction, Learning and Memory, PERSPECTIVES for the Future, PERSPECTIVES in the Literature

Integrating Cells into Tissues, Cell-Cell Adhesion and Communication, Cell-Matrix Adhesion, Collagen: The Fibrous Proteins of the Matrix, Noncollagen Components of the Extracellular Matrix, The Dynamic Plant Cell Wall, PERSPECTIVES for the Future, PERSPECTIVES in the Literature

Cell Interactions in Development, Dorsoventral Patterning by TGFβ-Superfamily Proteins, Tissue Patterning by Hedgehog and Wingless, Molecular Mechanisms of Responses to Morphogens, Reciprocal and Lateral Inductive Interactions, Overview of Neuronal Outgrowth, Directional Control of Neuronal Outgrowth, Formation of Topographic Maps and Synapses, Cell Death and Its Regulation, PERSPECTIVES for the Future, PERSPECTIVES in the Literature

Cancer, Tumor Cells and the Onset of Cancer, Proto-Oncogenes and Tumor-Suppressor Genes, Oncogenic Mutations Affecting Cell Proliferation, Mutations Causing Loss of Cell-Cycle Control, Mutations Affecting Genome Stability, PERSPECTIVES for the Future

Reference

1. "Essential Cell Biology" (2ndor 3rd edition) by Alberts et al. Garland Publishing.
2. "The Molecular Biology of the Cell", Alberts et al.
3. Molecular Biology: Principles and Practice, 1st edition, by Cox et al.
4. Karp, Gerald. 2008. Cell and Molecular Biology: Concepts and Experiments., John Wiley and Sons, Inc. 5th Ed.
5. Molecular and Cell Biology For Dummies by René Fester Kratz
6. Molecular Cell Biology (Lodish, Molecular Cell Biology) by Harvey Lodish, Arnold Berk, Chris A. Kaiser and Monty Kriege
7. Molecular Cell Biology by Harvey Lodish, Arnold Berk, Chris A. Kaiser and Monty Krieger
8. Cell and Molecular Biology: Concepts and Experiments (Karp, Cell and Molecular Biology) by Gerald Karp
9. Molecular Cell Biology Solutions Manual by Harvey Lodish
10. The Cell: A Molecular Approach, Fifth Edition by Geoffrey M. Cooper and Robert E.
11. Molecular Biology of the Gene (6th Edition) by James D. Watson, Tania A. Baker, Stephen P. Bell and Alexander Gann
12. Working with Molecular Cell Biology, Fifth Edition: A Study Companion and Solutions Manual by Brian Storrie, Eric Wong, Rich Walker and Glenda Gillaspy
13. Cell Biology: A Short Course by Stephen R. Bolsover, Elizabeth A. Shephard, Hugh A. White and Jeremy S. Hyams

Practicals: with reference to theory syllabus

Theory Examination

Theory Examination is like other ME courses

Practical Examination

Lab Experiment with viva on it

DR. BABASAHEB AMEBDKAR MARATHWADA UNIVERSITY, AURANGABAD
FACULTY OF ENGINEERING AND TECHNOLOGY
First Year Engineering
Semester-I

MEBT-112 Biological Engineering

Teaching Scheme Hours / week			Examination Scheme	
Lectures	4		Theory	100
Practical	4		Practical /Viva	25
Theory Paper Duration	3 hrs.			

What Is Bioengineering? Engineering versus Science, Bioengineering, Career Opportunities, Further Consideration of the Ethical Dimensionsof Bioengineering

Cellular, Elemental, and Molecular Building Blocks

of Living Systems--Origins and Divergence of Basic Cell Types, Elemental and Molecular Composition of a Cell, Molecules That Contain Information, Unique versus Interchangeable Parts Leads to Molecular-Based Classification, Cellular Anatomy, Cellular Physiological Lifestyles, Viruses, Prions

Mass Conservation, Cycling, and Kinetics-Open versus Closed Systems, Steady State versus Unsteady State, Approaches to Performing Mass Balances, Recycle, Bypass, and Purge, Kinetics, Unsteady-State Mass Balances, Review of Moles, Molecular Formulas, and Gas Compositions

Requirements and Features of a Functional and Coordinated System--Chemical Reaction Rate Acceleration, Energy Investment to Provide Driving Forcesfor Nonspontaneous Processes, Control and Communication Systems

Bioenergetics--Bioenergetic Units, Sensible versus Latent Heat , The First Law of Thermodynamics Works on All Scales, Using the First Law in Energy Balancing, Bioenergetics at the Human Scale, How Energy Is Produced, Stored, and Transduced at the Cellular Level, Representative Energetic Values at the Cellular Level, More Sophisticated Chemical Energy Accounting, Electrochemical Potential Calculation Examples

and Applications, Why Coupling between Energy Evolving Reactions and ATP Formation Is Imperfect, Biological and Medical Applications of Membrane Energetization

Molecular Basis of Catalysis and Regulation, Binding in the Biological Context, Binding Is Dynamic, Different Venues in Which Binding Operates

Analysis of Molecular Binding Phenomena--General Strategy for Problem Formulation and Solution, Analysis of a Single Ligand-Single Binding Site System, How to Decide What the Free Ligand Concentration Is, Examples of Binding Calculations, Analysis of Binding When Enzyme Catalysis Occurs, A Protein with Multiple Binding Sites, Further Thoughts on How Living Systems Are Designed and Function

Applications and Design in BiomolecularTechnology

Binding Applications, Enzyme Catalysis Application, Using Enzymes in Food Processing, Bioresource Engineering, Immobilized Enzymes in Chemical Weapon Defense and Toxic Chemical Destruction 139

Cellular Technologies and Bioinformatics Basics-Microbial Metabolic Engineering, Tissue Engineering, Gene Therapy and DNA Vaccines, An Experimental Facet of

References

1. Introduction to Biomedical Engineering, Third Edition by John Enderle and Joseph Bronzino
2. Bioengineering Fundamentals by Ann Saterbak, Ka-Yiu San and Larry V McIntire
3. An Introductory Text to Bioengineering (Advanced Series in Biomechanics) by Shu Chien, Peter C Y. Chen and Y C. Fung
4. Introduction to Bioengineering by S. A. Berger, W. Goldsmith and E. R. Lewis
5. Numerical and Statistical Methods for Bioengineering: Applications in MATLAB (Cambridge Texts in Biomedical Engineering) by Michael R. King and Nipa A. Mody
6. Bioengineering: Principles, Methodologies and Applications (Biotechnology in Agriculture, Industry and Medicine) by Audric Garcia and Ciel Durand
7. Statistics for Bioengineering Sciences: With MATLAB and WinBUGS Support (Springer Texts in Statistics) by Brani Vidakovic
8. Handbook of Bioengineering by Richard Skalak and Shu Chien
9. Bioengineering of the Skin by Klaus-Peter Wilhelm, Peter Elsner, Enzo Berardesca and Howard I. Maibach
10. Methods in Bioengineering: Stem Cell Bioengineering (The Artech House Methods in Bioengineering Series) (Methods in Bioengineering (Artech House)) by Biju Parekkadan and Martin L. Yarmush
11. Bioengineering of the Skin by Klaus-Peter Wilhelm, Peter Elsner, Enzo Berardesca and Howard I. Maibach

Practicals: with reference to theory syllabus

Theory Examination

Theory Examination is like other ME courses

Practical Examination
Lab Experiment with viva on it

DR. BABASAHEB AMEBDKAR MARATHWADA UNIVERSITY, AURANGABAD
FACULTY OF ENGINEERING AND TECHNOLOGY
First Year Engineering
Semester-I

MEBT-113 Bioinformatics and Research Methodology

Teaching Scheme Hours / week			Examination Scheme	
Lectures	**4**		**Theory**	**100**
Practical	**2**		**Practical /Viva**	**25**
Theory Paper Duration	**3 hrs.**			

Bioinformatics and Research methodology

Sequence-alignment methodologies.--Sequence databases; Similarity matrices; Pairwise alignment: Features of dynamic Programming, alignment by Bayesian Statistical Methods, multiple sequence alignment: local multiple sequence alignment: MEME, PSSM, HMM(algorithms and applications) Progressive methods for global multiple sequence alignment: CLUSTALW, PILEUP, T COFFEE; Statistical significance of alignment results.

Pattern analysis in sequences--- Motif representation: consensus, regular expressions; PSSMs; Markov models; Regulatory sequence identification using Meme; Gene finding: composition based finding, sequence motif-based finding.

Pattern analysis in sequences and Phylogenetic tree construction methods

Motif representation, Markov models; .Distance Based methods: clustering based methods, optimality based methods: Fitsch -Margoliash and Minimum evolution methods, Neighbor joining and related neighbor methods Character Based methods: Maximum parsimony methods, Maximum likely hood method, , genetic algorithm, Phylogenetic tree evaluation: Boot strap analysis; dendrogram and applications.

Structure-Prediction of Biomolecules with applications in Bioinformatics----

Structure classification of proteins (SCOP, CATH); Secondary structure prediction of various protein categories (e.g transmembrane proteins and helical proteins), RNA secondary structure prediction methods. Patterns, motifs and Profiles in sequences: Derivation and search methods;Derived Databases of patterns, motifs and profiles e.g Prosite, Blocks, Prints- S, Pfam. Overview of tertiary structure prediction methods; algorithms for modeling protein folding; algorithms for 3D structure prediction with representative examples. Protein structure prediction by comparative modelling approaches (homology modeling and foldrecognition); ab initio structure prediction methods.Bioinformati

Molecular Modelling and drug design

Force fields and their evaluation (e.g MM2, AMBER) Monte Carlo and molecular dynamics simulations (e.g. GROMACS); simulation approaches towards protein and nucleic acid conformation determination; Energy minimization techniques; Structure comparison using database formalisms(DALI, VAST etc.); CASP for dry-wet structure comparisons. Classification of drug targets, Target discovery and validation methodologies Types of drug targets and characterization of drugs, Structure based drug design methods including computer-aided drug design (pharmacophore development) and recent technology developments; Target selection, Ligand(lead compound) design ,optimization and analysis; Protein-ligand docking; QSAR; physico-chemical molecular descriptors; ADME parameters and their optimization; drug deliverability, metabolism, toxicity and pharmacokinetics; molecular diversity and Combichem;, discussion of drug design to drug discovery to drug development with pharmaceutical/biotech drug case studies.

Introduction to Research methodology: Development of hypothesis. Logical reasoning and analytical thinking. Planning and scientific strategy. Designing research methods. Setting up of scientific goals. Introduction to scientific statements Dimensions and properties Comparison and Models of research.

Critical reading of scientific paper Outline of scientific paper – planning of parts. Title, Introduction and Summary/abstract Materials and methods – importance of measurements, reproducibility, statistics, confidence. Results: Text, data presentation, methodology: Tables, graphs, histograms, photographic plates, legends. Discussion: Logical presentation and critical analysis of ideas and data, conclusions Citations: How to find references from journals, books etc

Testing of Hypothesis and Experimental design Specific search for similar hypothesis. Designing methods in order of simple to complex methodologies. Reverse testing of data by alternative methods. Double blind and randomization of protocol. Unbiased analysis. Data interpretation at multiple levels and integrating the broad idea. Reproducibility of data. Significance and correlation analysis.

Practicals: with reference to theory syllabus

Theory Examination

Theory Examination is like other ME courses

Practical Examination
Lab Experiment with viva on it

Texts/References:

1. David W. Mount. Bioinformatics: Sequence and Genome Analysis ,2nd Edition, CSHL Press, 2004.

2. A. Baxevanis and F. B. F. Ouellette, Bioinformatics: a

practical guide to the analysis of genes and proteins, 2nd Edition, John Wiley, 2001.

3. Jonathan Pevsner, Bioinformatics and Functional Genomics, 1st Edition, Wiley-Liss, 2003.

4. P. E. Bourne and H. Weissig. Structural Bioinformatics. Wiley. 2003.

5. C. Branden and J. Tooze, Introduction to Protein Structure, 2nd, Edition, Garland □Publishing, 1999.

6. W.B. Pratt and P. Taylor, Principles of Drug Action, Churchill Livingston by W.O. Foye, T.J. Lemke and D.A. Williams, Principles of Medicinal Chemistry, □Williams and Williams

7. Andrew Leach, Molecular Modelling: Principles and Applications, Pearson Education

8. Scolnick.J.; Drug Discovery and Design, Academic Press, London,2001

9. N. R. Cohen, Editor, Guidebook on Molecular Modeling in Drug Design. Academic □Press,□San Diego, 1996

DR. BABASAHEB AMEBDKAR MARATHWADA UNIVERSITY, AURANGABAD
FACULTY OF ENGINEERING AND TECHNOLOGY
First Year Engineering
Semester-I

MEBT-114 Biomaterial Science

Teaching Scheme Hours / week			Examination Scheme	
Lectures	4		Theory	100
Practical	2		Practical /Viva	25
Theory Paper Duration	3 hrs.			

Materials for Biomedical Applications,Chemical Structure of Biomaterials, Physical Properties of Biomaterials. Mechanical Properties of Biomaterials. Biomaterial Processing .Surface Properties of Biomaterials, classes of materials used in Medicine.

The role of adsorbed proteins in tissue response to biomaterials. cells and cell injury, Tissues- the extracellular Matrix and cell- Biomaterial interactions, mechanical forces on cells, Protein Interactions with Biomaterials. Cell Interactions with Biomaterials, Biomaterial Implantation and Acute Inflammation,Wound Healing and the Presence of Biomaterials, Immune Response to Biomaterials, Biomaterials and Thrombosis, Infection. Tumorigenesis and Calcification of Biomaterials. the complement system, systemic toxicity and hypersensitivity. blood coagulation and blood- materials interaction

Testing Biomaterials-introduction. in vitro assessment of tissue compatibility, in vivo assessment of tissue compatibility, testing of blood- materials interaction, large animal models in cardiac and vascular biomaterials research and testing, microscopy for biomaterials science

Degradation of materials in the biological environment—introduction, degradation of materials in the biological environment, degradation effects of the biological environment on metals and ceramics, pathological calcification of biomaterials

The world wide burden of diseases, global population aging and the burden of disease, the global economic impact of disease, the role of novel biomaterials in alleviating disease, practical consideration for modern biomaterials, coronary artery disease—historical perspective on coronary artery disease, pathology of coronary artery disease, biomaterials as bioactive stents, biomaterials as degradable stents, biomaterials for cardiac regeneration, stroke—pathology of stroke, biomaterials for brain imaging, biomaterials for nerve regeneration, pneumonia- historical perspective on pneumonia, pathology of pneumonia, biomaterials as novel antibiotic carriers

COPD-historical perspective on COPD, pathology of COPD, Biomaterials for lung regeneration, diarrheal disease—pathology of diarrhea, complexity and cost of current diagnostic methods, biomaterials as low- cost diagnostic devices, HIV/AIDS-pathologenesis of HIV/AIDS, biomaterials as vaccine adjuvants, tuberculosis—pathology of tuberculosis, biomaterials for sustained drug release, lung cancer—pathology of lung cancer, biomaterials for passive target drug delivery, biomaterials for active target drug delivery

Traumatic injuries—clinical necessity for wound closure technologies, fibrin based biomaterials for wound closure, cyanoacrylate-based biomaterials as tissue glues, crosslinked protein- based biomaterials as tissue glues, polyethylene glycol (PEG)-

based biomaterialsfor wound closure, emerging biomaterials for wound closure, permaturity lung surfactant and respiratory distress in infants, biomaterials as synthetic surfactants for the lung

Artificial red blood cell substitute, extracorporeal artificial organs, clinical aspects of orthopedic biomaterial performance, dental implantation, adhesives and sealants, ophthalmological applications, intraocular lens implant—a scientific perspective, burn dressings and skin substitutes, sutures, drug delivery systems, bioelectrodes , cohlear implants, biomedical sensors and biosensors, diagnostics and biomaterials and medical applications of silicones

Practicals: with reference to theory syllabus

Theory Examination

Theory Examination is like other ME courses

Practical Examination
Lab Experiment with viva on it

References

1. Biomaterials: The Intersection of Biology and Materials Science by Johnna S. Temenoff and Antonios G. Mikos
2. Biomaterials Science: An Introduction to Materials in Medicine, Second Edition by Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen and Jack E. Lemons
3. Biomaterials: An Introduction by Joon Park and R. S. Lakes
4. Biomaterials by Joyce Y. Wong and Joseph D. Bronzino
5. Advanced Biomaterials: Fundamentals, Processing, and Applications by Bikramjit Basu, Dhirendra S. Katti and Ashok Kumar
6. Biomaterials Science, Third Edition: An Introduction to Materials in Medicine by Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen and Jack E. Lemons
7. Mechanics of Biomaterials: Fundamental Principles for Implant Design (Cambridge Texts in Biomedical Engineering) by Lisa A. Pruitt and Ayyana M. Chakravartula
8. Biomaterials: A Nano Approach by Seeram Ramakrishna, Murugan Ramalingam, T .S. Sampath Kumar and Winston O. Soboyejo
9. Biomaterials Science:: An Introduction to Materials in Medicine by Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen and Jack E. Lemons
10. A Laboratory Course in Biomaterials by Wujing Xian

11. An Introduction to Tissue-Biomaterial Interactions by Kay C. Dee, David A. Puleo and Rena Bizios
12. An Introduction to Biomaterials, Second Edition (Biomedical Engineering) by Jeffrey O. Hollinger
13. Biomaterials for Clinical Applications by [illegible]
14. Integrated Biomaterials in Tissue Engineering (Biomaterials Science, Engineering and Technology) by Murugan Ramalingam, Ziyad Haidar, Seeram Ramakrishna and Hisatoshi Kobayashi