Panjab University

Scheme and Syllabus of
B.E.MBA Integrated (Biotechnology)
3rd to 10th Semester

2014-2015

University Institute of Engineering and Technology,
Panjab University, Chandigarh
## SCHEME OF EXAMINATION OF B.E. MBA INTEGRATED IN BIOTECHNOLOGY

### Second Year - Third Semester

<table>
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* Cumulative marks for mid semester and end semester evaluation.
SCHEME OF EXAMINATION OF B.E. MBA INTEGRATED IN BIOENGINEERING

Second Year - Fourth Semester

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* Cumulative marks for mid semester and end semester evaluation.
## SCHEME OF EXAMINATION OF B.E. MBA INTEGRATED IN BIOTECHNOLOGY

### Second Year – Fifth Semester

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* Cumulative marks for mid semester and end semester evaluation.
# SCHEME OF EXAMINATION OF B.E. MBA INTEGRATED IN BIOTECHNOLOGY

## Second Year - Sixth Semester

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<td>Operation Research (Prac.)</td>
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<td>Managerial Economics</td>
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* Cumulative marks for mid semester and end semester evaluation.
SCHEME OF EXAMINATION FOR B.E.M.B.A. INTEGRATED COURSE
IN BIOTECHNOLOGY

FOURTH YEAR- SEVENTH SEMESTER

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* Cumulative marks for mid semester and end semester evaluation.
## SCHEME OF EXAMINATION FOR B.E.M.B.A. INTEGRATED COURSE IN BIOTECHNOLOGY

### FOURTH YEAR- EIGHTH SEMESTER

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**Total** 18 0 10 28 24 400 250 650

* Cumulative marks for mid semester and end semester evaluation.

Options in Elective - I*
1. Nanobiotechnology
2. Microbial Biodiversity
### SCHEME OF EXAMINATION OF B.E. MBA INTEGRATED IN BIOTECHNOLOGY

**IX Semester**  
**STUDENT HAVE TO SELECT 3 SUBJECT FROM MAJOR SUBJECT AND 2 FROM MINOR**

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<th>Sr. No</th>
<th>Course No</th>
<th>Course Type</th>
<th>Course Title</th>
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**X Semester**

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<td>Elective (HR) Strategic Human Resource Management</td>
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<td>Elective (HR) Manpower Planning and Performance Appraisal</td>
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STUDENTS HAVE TO SELECT 2 SUBJECTS FROM THE MAJOR SUBJECT AND 2 FROM MINOR
SYLLABUS
B.E. MBA INTEGRATED IN BIOTECHNOLOGY
THIRD SEMESTER

Paper Title: Process Calculations
Paper Code: BIO 311  Max. Marks 50  L T P 4 0 0  Credits: 4

Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Course objectives: To introduce students to types of calculations involving material and energy balance for reaction and separation processes. The course aims at introducing students to the use of data sources for physical and chemical properties and the estimation of such data.

SECTION-A

Introduction to Engineering Calculations: Units and dimensions, mole concept, conventions in methods of analysis and measurement, basis, temperature, pressure, the chemical equations and stoichiometry. Composition of mixtures and solutions: mass fractions, mole fraction. (10)

Material Balance: Material balance with and without chemical reactions; Material balance involving multiple subsystems; recycle, bypass and purge. Concept of limiting and excess reactant, conversion and yield. Metabolic stoichiometry of growth and product formation. (15)

SECTION-B

P-V-T relations for gas and gas mixtures, calculations using ideal gas law, vander waal’s equation of state. Liquid and liquid mixtures, vapor pressure, saturation, partial saturation and humidity. (10)

Enthalpy changes, energy balance for simple flow process, calculation of heat capacity, mean heat capacity, application of the energy balance to systems with and without reactions. Use of Hess’s law for calculation of heats of formation, heats of combustion, heats of reaction. Kirchoff’s equation for calculating heats of reaction at different temperatures. (10)

Books Recommended:

**Paper Title: Microbiology (Theory)**

**Paper Code: BIO 312**  
**Max. Marks: 50**  
**L T P: 4 0 3**  
**Credits: 4**

**Course Duration:** 45 Lectures of one hour each.

**Note for the Paper setter:** The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

**Objective of the course:** To teach students about the role and significance of microorganisms and the various aspects and importance of Microbiology

**SECTION- A**

1. Brief history of microbiology. Scope and application of microbiology to biotechnology (in agriculture, food, health, environment, industry) (3)
2. Microbial diversity- Fine structure of bacteria, fungi, algae, virus (8)
3. Methods in microbiology- cultural characteristics and cultivation of microorganisms, pure culture technique, enumeration and preservation of microorganisms, principles of microbial nutrition, construction of culture media, theory and practice of sterilization, control of microorganisms by physical, chemical and biological agents, methods of bacterial staining (simple, differential and special stains). (9)
4. Microbial growth - definition, expression, measurement, Growth curve, synchronous and asynchronous growth. Transport of nutrients across the cell membrane (4)

**SECTION- B**

5. Microbial metabolism- Energy generation and biosynthesis in prokaryotes (6)
6. Microbial genetics- Mutations, recombination in bacteria, conjugation, transduction, transformation (5)
8. Microbes as geochemical agents- nitrogen, phosphorous, carbon and sulphur cycles; microbial interactions (4)

**Books Recommended:**


**Paper Title: Microbiology (Practical)**

**Paper Code: BIO 362**

Max. Marks: 50  
Credits: 2

1. To prepare different culture media-broth and agar  
2. To learn the culturing of microorganisms by simple streaking and pure culture technique  
3. To learn the preservation of microorganisms on agar slants  
4. To isolate microorganisms from soil/milk/food sample by dilution plate method.  
5. To study the working of a compound microscope  
6. To perform Gram staining of a given microbial sample  
7. To perform endospore staining of endospore forming microorganisms  
8. To perform motility test on the given bacterial sample  
9. To calibrate cell number vs O.D. to measure the growth of the given sample  
10. Case study of the first artificial micro-organism

**Paper Title: Biochemistry (Theory)**

**Paper Code: BIO 313**

Max. Marks: 50  
L T P : 4 0 3  
Credits: 4

**Course Duration: 45 Lectures of one hour each.**

**Note for the Paper setter:** The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

**Objectives of the course:** The course provides introduction to the basic concepts of biochemistry necessary for biotechnology studies and applications. It introduces the students to structures of various biomolecules, their functional relationship, as well as how ensemble of biomolecules builds a complex multicellular organism, undergoing diverse anabolic and catabolic pathways integrated with intermediary metabolism. It includes studies on mechanisms of how the cell is able to harness energy through various enzymes and pathways in mammals, plants and microorganisms.

**SECTION-A**

1. **Classification, Chemistry, molecular structures and properties of following Biomolecules:**
   
   a) Amino acids  
   b) Peptides and proteins  
   c) Carbohydrates
d) Fatty acids and Lipids

- Nucleic acids,
- Water soluble vitamins. (16)

2. **Chemical Bonds**: Covalent bonds, co-ordinate bonds, hydrogen bonds, Vander waal's forces, hydrophobic interactions, ionic bonds, dipole interactions. (2)

3. **Proteins**: Primary, secondary, tertiary and quaternary structures, forces responsible for the respective structures, methods for isolation and purification of proteins, protein analysis and amino acid sequence determination. (5)

4. **Carbohydrate metabolism and energy calculations**: Glycolysis, end product formation under aerobic and anaerobic conditions, glycogenolysis, glycogenesis and their regulation, citric acid cycle, anaplerotic reactions. (4)

**SECTION-B**

5. **Fat metabolism and energy calculations**: β-Oxidation of fatty acids, α and ω oxidation, synthesis of fatty acids (fatty acid synthase complex), ketone bodies and their implications. (3)

6. **Amino acid metabolism**: General pathways of amino acid metabolism, transamination, decarboxylation, deamination, Urea cycle. (4)

7. **Nucleic acid metabolism**: Biosynthesis of purines and pyrimidine nucleotides, biosynthesis of deoxyribonucleotides, their regulation, catabolism. (5)

8. **Mitochondria**: Structure of mitochondria, organization of respiratory chain, oxidative phosphorylation, ATP synthase complex (3)

9. **Plant and microbial biochemistry**: Photosynthesis and Nitrogen fixation (3)

**Books Recommended:**


**Paper Title: Biochemistry (Practical)**

**Paper Code: BIO363  Max. Marks 50  Credits: 2**
Practicals:
Qualitative tests of carbohydrates (monosaccharides, disaccharides, polysaccharides, reducing and non-reducing sugars etc.), proteins and amino acids, paper chromatography of amino acids or sugars. Estimation of proteins (by Biuret method and Lowry method) carbohydrates, DNA, RNA, Cholesterol, lipids, Serum urea, glucose by spectrophotometry.

Paper Title: Cell Biology and Genetics (Theory)

Paper Code: BIO 314 Max. Marks: 50 LTP: 4 0 2 Credits: 4

Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Objectives
The topics in this subject would help students in understanding various characteristics of cell that are important in cell behavior. The emphasis has been laid to provide students with cells architectural as well as structure assortment that are important to its normal functions. The information regarding how cells transfers its characters to next generation have been comprehensively discussed and elaborated in topics covering cell genetics. It is hoped that students understanding about various intricacies of cell, structure and function would be sorted out.

SECTION-A

Biological membranes- models, structure and function, membrane proteins (6)

Cytoskeletal elements- microtubules, intermediate filaments and microfilaments, their structure and functions (3)

Extracellular matrix interactions- Types of ECM, interaction of cell with the ECM, malfunctions in ECM signaling (3)

Chromosomes structure and organization- Chemical composition of DNA, structural organization of nucleosomes, chromosomal organization, polytene and lampbrush chromosomes, human chromosomes, centrosome, telomere (4)

Types of DNA sequence- unique and repetitive DNA, hetero chromatin (1)

Cell cycle- Phases in cell cycle, regulation and control of cell cycle (2)

Cell division – Detail of different stages in Mitosis and meiosis, their importance (3)

SECTION-B

Molecular genetics: C value paradox, cot curve, transposons (bacterial, eukaryotic, retrotransposons, viral), gene families, homologous gene, pseudogene (4)

Extensions of Mendelian principles: Codominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting, penetrance and expressivity, phenocopy (5)

Chromosome Theory of Inheritance The chromosome theory of heredity, Sex Chromosomes and sex determination, Genetic linkage and Genetic mapping, sex linkage, sex limited and sex influenced characters (7)
**Extra chromosomal inheritance:** Inheritance of Mitochondrial and chloroplast genes, maternal inheritance

**Cyto genetics:** Human Karyotype, chromosome banding, ploidy, chromosome aberrations

**Reference Books:**


**Paper Title: Cell Biology and Genetics (Practical)**

**Paper Code: BIO 364**

**Max. Marks:** 50  
**Credits:** 1

**Practicals:**

1. Observation of cell cycle and cell division related permanent slides
2. Determination of bacterial cell density by counting of bacterial cells using hemocytometer
3. Determination of cell no. (viable/nonviable) in bacterial cell population
4. To study structure of cell from onion leaf peels
5. Extraction of collagen ECM using glacial acetic acid
6. Chromosomal preparation of mitotic cell division using onion root tip and observation under simple microscope
7. Staining of DNA and RNA using methyl green and pyronin stains
8. Identification of Barr Body in human Buccal smear

**ORGANIZATION BEHAVIOR**

**Paper – Compulsory**

**Paper Code:** IBM- 301  
**Credits:** 3

**Time:** 3 Hours

Course Duration: 45 Lectures of one hour each.
Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50

External Assessment: 50

Part-A


Perception: Factors Influencing perception- perceptual selectivity Linkage between perception and Individual decision making- ethics in decision making.

Personality and Emotional Quotient (EQ): The meaning of personality, its determinants- personality Traits; The big five model, Emotional quotient.

Motivation & Morale: Concepts to Applications.


Part-B


Conflict & Inter Group Behaviour & Collaboration: Sources of Conflict, Intra-individual Conflict, Interpersonal Conflict, Inter-group behavior and Conflict, Organizational Conflict, Negotiations-Approaches to Conflict Management-Collaboration.


References

1. Behavior in Organizations ,Greenberg, Baron , PHI
Paper Title: Engineering Mathematics – III
Paper Code: AS -306  Maximum Marks: 50  Credits: 4

Course Duration: 45 lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section

SECTION- A


Linear Algebra: Concept of linear independence and dependence, Rank of a matrix: Row – Echelon form, System of linear equations: Condition for consistency of system of linear equations, Solution by Gauss elimination method. Inverse of a matrix: Gauss – Jordan elimination method (Scope as in Chapter 6, Sections 6.3 – 6.5, 6.7 of Reference 1). (7 Lectures)

Eigen values, eigen vectors, Cayley – Hamilton theorem (statement only). Similarity of matrices, Basis of eigenvectors, diagonalization (Scope as in Chapter 7, Sections 7.1, 7.5 of Reference 1). (7 Lectures)

SECTION- B

Complex Functions: Definition of a Complex Function, Concept of continuity and differentiability of a complex function, Cauchy – Riemann equations, necessary and sufficient conditions for differentiability (Statement only). Study of complex functions: Exponential function, Trigonometric functions, Hyperbolic functions, real and imaginary part of trigonometric and hyperbolic functions, Logarithmic functions of a complex variable, complex exponents (Scope as in Chapter 12, Sections 12.3 – 12.4, 12.6 – 12.8 of Reference 1). (8 Lectures)

Laurent Series of function of complex variable, Singularities and Zeros, Residues at simple poles and Residue at a pole of any order, Residue Theorem (Statement only) and its simple applications (Scope as in Chapter 15, Sections 15.1 – 15.3 of Reference 1) (7 Lectures)

Conformal Mappings, Linear Fractional Transformations (Scope as in Chapter 12, Sections 12.5, 12.9 of Reference 1). (8 Lectures)

References:

SYLLABUS

B.E. MBA INTEGRATED IN BIOTECHNOLOGY
FOURTH SEMESTER

Paper Title: Molecular Biology (Theory)

Paper code: BIO 411 Max. Marks: 50 L T P: 4 0 2 Credits: 4

Course Duration: 45 lectures of one hour each

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Course Objective- To make student understand DNA, RNA, protein metabolism, their regulation, cell signalling pathways and application of molecular biology in molecular medicine

SECTION-A

Introduction-Chromosome, chromatin, gene for understanding molecular processes (1)
DNA replication-Unit of replication, enzymes involved, replication process (initiation, elongation and termination) in Prokaryotes and Eukaryotes, fidelity of replication, extrachromosomal replicons (6)
DNA repair and recombination mechanism-Importance of DNA repair and recombination, various types of DNA damages and repair mechanisms in Prokaryotes and Eukaryotes, homologous and site-specific recombination, DNA transposition (6)
RNA metabolism in eukaryotes and prokaryotes – structure, function and types of RNA, Transcription factors and machinery, formation of transcriptional initiation complex, elongation and termination. (6)
Post transcriptional modifications- splicing, capping and polyadenylation, RNA editing (3)

Geneic Code Characteristics of genetic code, degeneracy of codon & Wobble Hypothesis (2)

SECTION-B

Protein metabolism in eukaryotes and prokaryotes-small and large Ribosomal subunits in eukaryotes and prokaryotes, various translational factors, translation initiation, (aminoacylation
of tRNA, tRNA-identity, aminoacyl tRNA synthetase, and translational proof-reading),
elongation and termination, translational inhibitors, Post-translational modifications. (7)

**Regulation of gene expression** - Operons in prokaryotes (lac and galactose operons), Regulatory elements in eukaryotes (enhancers, activators, mediators), Control of gene expression at translation level (such as si-RNA), regulation through epigenetic mechanism. (6)

**Signal Transduction** - Cell surface receptor, second messenger molecules, signaling through G-protein coupled receptors, signal transduction pathways, bacterial chemotaxis and quorum sensing (4)

**Basic Molecular biology Techniques and their applications** - Principle, general and specialized electrophoretic techniques, gel electrophoresis (types of gels, modes of gel electrophoresis) Distcontinuous gel electrophoresis, isoelectric focusing, 2D gel electrophoresis, pulse field gel electrophoresis, PCR, molecular hybridization and their applications (3)

Role of molecular biology in molecular medicine (1)

**Recommended Books**

Harvey Lodish and others: Molecular Cell Biology, (macmillan) 7th edition (2013)

**Paper Title: Molecular Biology (Practical)**

**Paper Code : BIO 461**

Max. Marks : 50 Credits: 1

1. Genomic DNA extraction from yeast cells using mechanical disruption and resolution of DNA on agarose gel
2. Total RNA extraction from yeast cells using CTAB method
3. Resolution of isolated RNA on formaldehyde agarose gel
4. To study cell cycle arrest in onion root tip cells by treatment with colchicines
5. Study of bacterial lac operon regulation in bacterial cells using IPTG as an inducer
6. Generation of auxotrophic markers in yeast by UV induced mutagenesis
7. Extraction and separation of total proteins from bacterial cells/animal cell using one-dimensional SDS gel electrophoresis method
IT FOR MANAGERS
Paper – Compulsory

Paper Code: IBM-401
Credits: 3

Time: 3 Hours
Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50
External Assessment: 50

Part A
Information Technology (IT): IT and society, IT infrastructure in India vis-à-vis developed nations (Telecommunication, Internet reach, PC, Broadband, Mobile Phones), IT applications in Healthcare & Education
System Investigation & Analysis, Networking: System Analysis & Design, Symbols used in modeling a business process, modeling different business processes, Networking concepts: Ethernet, IP addressing, Functioning of Routers, Bridges, hubs and switches in a network, Telecommunication (GSM, CDMA, Wireless and other new technologies)
Internet & Intranet: Functioning of Internet, Encryption & Digital signatures, Firewalls, Fraud on the Internet, Virus, Hacking & Denial of Service attacks, Intellectual Property Protection on the Internet, Intranet & security

Part B
E-Commerce & E-Governance: E-Commerce models, Intermediaries in E-Commerce, study of successful models like E-Choupal, E-Payments (E-Cash, E-Wallets) and major players in the area, Online Shopping, Revenue models for Online Shopping Portals, Web Auctions: study of portals like EBay, dealing with E-Waste, E-Governance in India, study of implementation of E-Governance in different states in India, scope for further improvement
New Technologies shaping the IT field: Study of new technologies like RFID, WiMAX, Bluetooth, GPS, smart cards etc and their implementation case studies
Online Banking: infrastructure and implementation of Online Banking in India, intermediaries in online banking
Cloud Computing: The business model of cloud computing, advantages and drawbacks of adopting the cloud computing framework.

References:
1. Business Data Communications & Networking, Jerry FitzGerald, Alan Dennis, John Wiley
2. Information Technology for Management: Improving Performance in the Digital Economy, Efraim Turban, Linda Volonino, John Wiley
Paper Title: Thermodynamics

Paper Code: BIO 412       Max. Marks: 50       L T P: 4 0 0       Credits: 4

Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Course objectives: To enable students solve typical problems involving the application of the first and second laws of thermodynamics, this includes understanding and using the property tables.

SECTION-A

Review: state functions, types of systems, internal energy, heat and work, reversible and irreversible processes, first laws of thermodynamics and its application, Heat capacities, Heat effects during phase change, reaction, formation, combustion and mixing. (7)

Throttling process, Joule Thompson coefficient, liquefication of gases. (3)

Second law of thermodynamics, concept of entropy, Refrigeration cycle, refrigerants, vapor compression cycle, Absorption refrigeration, Third Law of thermodynamics. (7)

SECTION-B

Vapor liquid equilibrium: Duhem’s theorem, Raoult’s law, Henry’s law. Estimation of vapor liquid equilibrium data. Solution thermodynamics: chemical potential, phase equilibria, partial properties, Gibbs/Duhem equation. Concept of fugacity and fugacity coefficient, activity and activity coefficient. (14)

Chemical Equilibrium: chemical reaction equilibrium; standard free energy change and equilibrium constant, effects of temperature on free energy change; equilibrium constant; equilibrium conversion. (10)

Applications of thermodynamics on bio-systems. (4)

Books Recommended:

2. Rao, Y.V.C., Chemical Engineering Thermodynamics, University Press.

Paper Title: Chemical Reaction Engineering (Theory)
Paper Code: BIO413 Max. Marks: 50 L T P: 4 0 2 Credits: 4
Course Duration: 45 Lectures of one hour each

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section

Objective: This course applies the concepts of reaction rate, stoichiometry and equilibrium to the analysis of chemical and biological reacting systems. Derivation of rate expressions from reaction mechanisms and equilibrium or steady state assumptions. Design of chemical and biochemical reactors via synthesis of chemical kinetics and mass and energy balances.

SECTION-A
1) Kinetics: Types of reactions, Rate Equation, Analysis of Mechanism and Rate equations for archetypal models of reactions, Intermediates, Data Analysis. (8)
2) Ideal Reactors: Batch, Plug Flow Reactor, CSTR (Constant Volume & Variable Volume) (5)
3) Multiple Reactor system for Single Reactions. (6)
4) Biochemical reaction systems: Michaelis-Menten kinetics, Kinetic of competitive and Non-competitive inhibition, evaluation of M-M equation parameters, enzyme fermentation in batch, plug-flow and mixed flow fermenters. (4)

SECTION-B
5) Thermal Characteristic of Reactors: Optimum temperature progression, Adiabatic Operations. (6)
6) Design for Multiple Reactions: Qualitative and Quantitative Product distribution for Parallel and Series reaction. Qualitative product distribution of Series-Parallel reactions. (10)
7) Biochemical kinetics: Microbial Fermentation, Monod Growth Model, qualitative treatment in Batch and Mixed-flow fermenter, Kinetics of availability of food and harmful wastes. (6)
Books Recommended:

Paper Title: Chemical Reaction Engineering (Practical)
Paper Code: BIO 463 Max. Marks: 50 Credits: 1
1) Kinetics studies for a non-catalytic reaction in a shake-flask.
2) Kinetic studies in a batch reactor at constant temperature.
3) Kinetic studies in a batch reactor at different temperatures.
4) Kinetic studies in a plug flow reactor.
5) Kinetic studies in a CSTR at constant temperature.
6) Kinetic studies in a CSTR at different temperatures.
7) Kinetic studies in a semi-batch reactor.
8) RTD studies in CSTR.
9) Dispersion number for packed bed reactor.
10) Adiabatic batch reactor.

Paper Title: Industrial Biotechnology (Theory)
Paper Code: BIO 414 Max. Marks: 50 L T P: 4 0 2 Credits: 4
Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Objectives of the course: The course objective is to impart the knowledge of biotechnology processes for industrial purposes using various types of cells, to make the students understand the requirements of biotech processes in terms of medias, design of fermenters, strains and their development etc. The objective is also to acquaint the students to biotechnological approaches that will yield green industrial processes using cells or components of cells like enzymes.

SECTION-A
1) Industrially important microbes: (E. coli, Bacillus, Actinomyces, Saccharomyces) (3)
2) Classifications of microbial products. (2)
3) Screening strategies and isolation of microbes for new metabolites such as antibiotics, organic acids, enzymes and other substances. (3)
4) Fermentation media: components of fermentation media, synthetic media and crude
media, their advantages and disadvantages, sources of raw materials for biotechnology industry. Prerequisites and preparation of an ideal growth medium for production of biomass and a microbial product.  

5) Microbial fermentations: Upstream processing (USP) and downstream processing (DSP), inoculum preparation, scale up, Introduction to design of fermenters, solid state fermentations and its advantages.

6) Strain improvement: methods, strain improvement by genetic means, random mutagenesis, protoplast fusion, regulatory pathways and directed mutagenesis

7) Stock cultures and Culture preservation: general methods, methods based on the organism and culture type.

SECTION-B

8) Microbial production processes, strain development, biochemical pathways and applications of the following industrially important classes of products
   a) Organic acids and solvents: citric acid, lactic acid, acetone and butanol
   b) Antibiotics: Classification and production of penicillin, streptomycin
   c) Enzymes: Amylases, proteases,
   d) Flavoring agents : nucleosides and nucleotides
   e) Other important and upcoming productions such as dextran, biofertilizers and carotene.

9) Microbial enzymes, their stability and enzyme immobilization methods.

10) Microbial biotransformations and role of enzymes in bio-conversions of industrially important compounds.

Books Recommended:

Paper Title: Industrial Biotechnology (Practical)
Paper Code: BIO 464  Max. Marks: 50  Credits: 1
Practicals:
Cell growth kinetics of bacteria (E.coli/Bacillus) and S. cerevisiae, counting of cells by Neaubaur chamber, cfu determination, identification of industrially important bacteria and fungi, cryopreservation of cultures, studies on utilization of glucose, production of solvents/ethanol, isolation of organisms for production of amylase/protease, assay of enzymatic activity and immobilization of enzymes.

Paper Title: Immunology and Immunotechnology (Theory)
Paper code: BIO 415  Max. Marks: 50  L T P: 4 0 2  Credits: 4
Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Course Objective- To understand the immune system, various cells involved in immune system and their applications in disease diagnostics

SECTION-A
1. Introduction- Introduction and historical perspectives of immune system. (2)
2. Cell and Tissues of immune system: Lymphoid cell, mononuclear cell, granulocytes, mast cells, dendritic cells, primary lymphoid organs, lymphatic system, secondary lymphoid organs (4)
3. Antigens and Haptens: Immunogenecity, chemical composition, susceptibility to antigen processing, immunogen dosage and route of administration, haptens, adjuvants. (4)
4. Antibody Structure, Function and Diversity: Basic structure, Immunoglobulin domains, classes. (6)
5. Major Histocompatibility Complex: MHC molecules, cellular distribution, general importance. (3)
6. Antigen processing and Presentation to T cell: Antigen presenting cells and their role, pathway. (4)

SECTION-B
7. B and T cell activation: Antigen recognition and activation of immune response. (4)
8. Autoimmunity: Organ specific and systematic autoimmune diseases. (3)
9. Hypersensitive Reactions: Types, mechanisms of hypersensitivity. (3)
10. Complement System: Components, Complement activation, consequences. (4)
11. **Antigen-antibody reactions**: interaction, cross reactions, precipitation and agglutination. (1)
12. **Vaccines**: Active and Passive immunization, various types of vaccines (3)
13. **Applications of antibodies**: Polyclonal and monoclonal antibodies, Immunoassays, radioimmunoassay, Enzyme linked immunosorbent assay, Western blotting, Immunocytochemistry, supershift assays (4)

**Books Recommended:**

**Paper Title: Immunology and Immunotechnology (Practical)**
**Paper Code: BIO 465**
**Max. Marks: 50**
**Credits: 1**

1. TLC and DLC for blood samples.
2. Determination of cell number (viable/non-viable).
3. Separation of lymphocytes cells from blood
4. Determination of blood group antigens by hemeagglutination assay
5. Radial immunodiffusion Assay.
7. Characterization of immunobiologics by ELISA.
SYLLABUS
B.E. MBA INTEGRATED IN BIOTECHNOLOGY
FIFTH SEMESTER

Paper Title: Enzyme Engineering & Technology (Theory)

Paper Code: BIO501  M. Marks: 50  Credits: 4

Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Section - A
Introduction & Scope; General distinctive features and industrial applications; enzyme kinetics; single, substrate steady state kinetics; King-Altman’s method; inhibitors and activators; effect of pH and temperature; multi-substrate systems allosteric enzymes.

Section - B
Immobilization of enzymes; advantages; carriers; adsorption; covalent coupling; cross linking and entrapment methods; micro-environmental effect; enzyme reactors; reactors for batch/continuous enzymatic processing, choice of reactor type; idealized enzyme reactor systems; mass transfer in enzyme reactors; steady state analysis of mass transfer and biochemical reaction in enzyme reactors bio-process design; physical parameters, reactor operational stability; operational strategies; a few case studies.

Paper Title: Enzyme Engineering & Technology (Practical)

Paper Code: BIO551  M. Marks: 50  Credits: 1

Assay of enzymes; substrate specificity and efficiency of enzymatic catalysis; Kinetics of enzyme catalyzed reactions, Immobilization of enzymes, Microenvironmental effects in immobilized enzymes.

Books Recommended
Paper Title: Bio-Process Engineering (Theory)

Paper Code: BIO 502  Max. Marks: 50  Credits: 4

Course Duration: 45 lectures of one hour each.

**Note for the Paper setter:** The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

**Section - A**
Kinetics of Microbial growth, substrate utilization and product formation in Batch, Fed-batch and continuous processes. (10)
Rheology of fermentation fluids and Scale-up concepts. (05)
Introduction to modeling of growth kinetics: General structure for kinetic models, overview of structure and unstructured models. (08)

**Section - B**
Sterilization of media: design of heat sterilization processes; kinetics; Sterilization in place and Cleaning in place concepts. (06)
Sterilization of air : Filter sterilization and kinetics. (04)
Design of fermentation media and optimization. (06)
Aeration and agitation : various correlations and mass-transfer aspects, \( k_L \alpha \) determination. (06)

Paper Title: Bio-Process Engineering (Practical)

Paper Code: BIO 552  Max. Marks: 50  Credits: 1

Study of different phases of microbial growth; Estimation of cell mass; Growth rate; mass and energy balance in a typical bioconversion process; Concept of limiting nutrient and effect of its concentration on cell growth; Study of growth inhibition kinetics; Comparison between aerobic and anaerobic bioconversion processes; Power consumption in a fermentation process and its correlation with rheology of the fermentation fluid; effect of speed on the mixing time in a bioreactor; Estimation of \( k_L \alpha \) in a fermentation process.

**Books Recommended:**


Paper Title: Animal Cell Culture & Bio-Technology (Theory)

Paper Code: BIO503 M. Marks : 50 Credits: 4

Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Section-A

Animal Cell metabolism, regulation and nutritional requirement; Animal cell growth characteristics and kinetics; nutrients, substrate and product transport through mammalian cell; primary & secondary culture; cell culture in continuous, perfusion and hollow-fiber reactor; mass transfer in mammalian cell culture; scale-up of cell culture processes; case studies.

Section-B

Gene transfer in animal cells and its applications; contamination & cyno presentation; Transgenese and transgenic animals including live stock; Transgenics as bioreactors ; Biotechnology or aquaculture, silkmoth, past control; Biodiversity, characterization, conservation; In vitro fertilization, embryotransfer technology; Stem cell Biology & Cloning.

Paper Title: Animal Cell Culture & Bio-Technology (Practical)

Paper Code: BIO553 M. Marks: 50 Credits: 1

i. Preparation of cell culture medium.
ii. Establishment of Primary Culture;
iii. Establishment of culture of adherent cell line.
iv. Subculturing of non-adherent cell line
v. Cryopreservation of cultured cells.
vi. Revival of cryopreserved cell lines into culture.

Books Recommended:
Paper Title: Transport Phenomena (Theory)

Paper Code BIO 504  Max marks 50  Credits: 4
Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

SECTION-A


Transport properties-Viscosity, Thermal Conductivity and mass diffusivity.

Development of mathematical models of transfer processes through shell momentum balance for solving specific problems of transport of momentum in laminar flow or in solids in one dimension.

Development of general differential equations of fluid flow and their applications in solving one-dimensional steady state and unsteady state problems of momentum transfer.

Emphasis on the analogy between momentum heat and mass transfer with respect to transport mechanism and governing equations.

SECTION-B

Development of mathematical models of transfer processes through shell energy balance and shell mass balance for solving specific problems of transport of heat and mass in one dimension.

Development of general differential equations for heat transfer and mass transfer and their applications in solving one-dimensional steady state and unsteady state problems of heat and mass transfer.

Dimensional Analysis.

Books recommended:

Paper Title: Transport Phenomena (Practical)

Paper Code: BIO 554  Max Marks 50  Credits: 1
1. Thermal Conductivity of solids
2. Measurement of viscosity of liquids
3. Measurement of diffusivity of a binary system
5. Heat transfer in natural convection.
7. Wetted wall column: to find the mass transfer coefficient as a function of gas mass velocity in a wetted wall column.

Paper Title: MARKETING MANAGEMENT (Theory)

Paper – Compulsory

Paper Code: IBM- 501 Credits: 3
Time: 3 Hours

Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50 External Assessment: 50

Part A
Introduction to Marketing: Definition; Scope and Importance of Marketing; Key Customer Markets; Concepts/Philosophies of Marketing; Holistic Marketing Concept; Marketing Tasks; Marketing Mix

Marketing Environment: Marketing Environment; New Marketing Realities; New Consumer Capabilities; Demographic Environment; Social-Cultural Environment; Natural Environment; Technological Environment and Political-Legal Environment; SWOT analysis.

Analyzing Markets: Marketing Research Process; Sources of data collection; factors influencing consumer behavior; buying decision process; post-purchase behavior; Organizational Buying; Stages in the Buying Process.

Market Segmentation: Levels of market segmentation; segmenting consumer markets; Niche Marketing; segmenting business markets; Michael Porter’s five forces model; Analyzing competitors; strategies for market leaders; Targeting and Positioning.

Part B
Product Decisions: Product characteristics; classifications; differentiation; packaging and labeling; Product Life Cycle.

Pricing Strategies: Understanding Pricing; Setting the Price; Initiating and Responding to Price Changes; Reactions to Competitor’s Price Changes.

Marketing Channels: Marketing Channels; Role of Marketing Channels; Identifying Major Channel Alternatives; Types of Intermediaries; Channel-Management Decisions, Retailing, Wholesaling.

Marketing Communication: The Role of Marketing Communications; Communications Mix-Advertising, Sales Promotion, Public Relations and Publicity, Events and Experiences, Direct and Interactive Marketing, Personal Selling.

References:
1. Principles of Marketing, Philip Kotler, Pearson
2. Marketing Management, R.Saxena, TMH

Paper Title: HUMAN RESOURCE MANAGEMENT (Theory)

Paper – Compulsory

Paper Code: IBM- 502
Time: 3 Hours

Credits: 3

Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50
External Assessment: 50

Part-A


Job analysis : Methods - IT and computerized skill inventory - Writing job specification - HR and the responsive organization.

32
Recruitment and selection process: Employment planning and forecasting – Building employee commitment: Promotion from within - Sources, Developing and Using application forms - IT and recruiting on the internet.

Employee Testing & selection: Selection process, basic testing concepts, types of test, work samples & simulation, selection techniques, interview, common interviewing mistakes, Designing & conducting the effective interview, small business applications, computer aided interview.

**Part-B**

Training & Development: Orientation & Training: Orienting the employees, the training process, need analysis, Training techniques, special purpose training, Training via the internet Performance appraisal: Methods - Problem and solutions - MBO approach – The appraisal interviews - Performance appraisal in practice.

Managing careers: Career planning and development - Managing promotions and transfers.


References:

**Paper Title: Bioinstrumentation (Theory)**

Paper Code: BIO506 M. Marks: 50 Credits: 4 Course Duration: 45 Lectures of one hour each.

**Note for the Paper setter:** The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

**Section - A**

Introduction: Problems unique to bioinstrumentation; Lab View: A graphical programming language for virtual instrumentation;
Basic Principles: Review of system concepts input/output characteristics, the black box signals linear, time-invariant systems static characteristics dynamic characteristics time versus frequency domain analysis Fourier Analysis; Fourier transforms of common and important signals windowing Discrete Fourier Transforms The Fast Fourier Transform Spectrum Analyzers windows Frequency Analysis transfer functions, frequency response magnitude and phase functions signals through systems 'ideal' and 'best' systems time vs frequency domain filters how to measure frequency response in the laboratory; Sample systems in the time and frequency domains; 0th, 1st, and 2nd order systems; Non-ideal systems noise and signal-to-noise ratio; nonlinearities and distortion products.

wave-analyzer synchronous [lock-in] detection modulator, demodulator digital techniques analog to digital conversion signal averaging V. Transducers and associated electronics displacement transducers resistive strain gages bridge circuits capacitive displacement transducers piezoelectric transducers optical transducers temperature transducers;

**Hemodynamic Measurements**

Blood pressure, pressure transducers (manometers) extra-vascular techniques blood sounds stethoscopes intra-vascular techniques catheter-manometers

Blood Volume and Flow indicator-dilution methods electromagnetic flow meters ultrasonic methods.

**Section - B**

**Bioelectric Potentials-Electrophysiology**

Origins of biopotentials dipoles remote versus local potentials muscle and nerve cells, intracellular potentials resting potential action potential stimulators discriminators histograms remote potentials evoked potentials; example: evoked potential audiometry

Electrodes electrode interfaces fluid-fluid salt-fluid metal-fluid surface (skin) electrodes metal micro-electrodes glass micro-electrodes microelectrode preamplifiers

Recording and Stimulating Systems, Putting it all together interference minimization and rejection stimulus isolation shielding grounding ground-loops; Sample recording system: electrocardiogram; ECG instrumentation

Other cardiac devices ; Pacemakers power and pulse sources electrodes; Defibrillators, Introduction to medical imaging

**Books Recommended:**

5. J.R. Cameron : Homodynamic Measurements, Medical Physics.


BIO507 Training of 4-6 weeks after 4th semester exams: 50 Marks  Credits: 1
SYLLABUS
B.E. MBA INTEGRATED IN BIOTECHNOLOGY
SIXTH SEMESTER

Paper Title: Recombinant DNA Technology (Theory)

*Paper code:* BIO601  *Max. Marks: 50*  *Credits: 4*

*Course Duration: 45 Lectures.*

*Note for the Paper setter:* The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

**SECTION-A**

1. Gene cloning and need to clone a gene; Isolation and purification of plasmid, chromosomal and genomic DNA from bacterial, plant and animal cells.  

2. Different cloning vectors like plasmids, cosmids, phagemids, shuttle vectors, and other vectors for plant and animals; enzymes used in recombinant DNA technology like restriction endonucleases, ligases, polymerases, kinases and phosphatases.  

**SECTION-B**

3. Cloning of a specific gene; studying gene location and structure; studying gene expression; expression of foreign genes in research and biotechnology; maximization of recombinant proteins; brief introduction to sequencing and site directed mutagenesis, different types of PCR and applications; safety measures and regulations for recombinant DNA work  

4. A brief introduction to the followings: phage display system, Yeast two hybrid system, and RNAi technology.  

5. Applications of recombinant DNA technology in the fields of Medicine, Agriculture, Forensic and Environment.  

**Paper Title: Recombinant DNA Technology (Practical)**

*Paper code:* BIO651  *Max. Marks: 50*  *Credits: 1*

Digestion of plasmid DNA by restriction endonuclease; Ligation assay; Amplification of DNA using PCR; RAPD PCR; Induction and expression of a gene cloned in an expression vector in *E.coli*.
Books Recommended:


Paper Title: Operations Research (Theory)

Paper Code: B10602 Maximum Marks: 50 Credits: 4

Course Duration: 45 lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

PART A

Optimization Problems. Linear Programming: Graphical Method (Scope as in Chapter 1 of Reference 1).
Solution of simultaneous linear equations: An overview (Scope as in Chapter 2, Sections 2.15 – 2.16 of Reference 1).
Basic solutions, lines and hyperplanes, convex sets, extreme points, convex sets and hyperplanes (Scope as in Chapter 2, Sections 2.19 – 2.21 of Reference 1).
Reduction of any feasible solution to a system of equations to a basic feasible solution. Simplex Method: The simplex algorithm (Scope as in Chapter 3, 4 of Reference 1).
Tableau format for simplex computations, Charne’s M-method, Two phase method (Scope as in Chapter 5 of Reference 1).
The revised simplex method (Scope as in Chapter 7 of Reference 1). (12 Lectures)

Duality theory: Formulation of the dual problem, Theorems on duality: Weak Duality Theorem, Strong Duality Theorem, Complementary Slackness Theorem, Dual Simplex Algorithm (Scope as in Chapter 8, Sections 8.1 – 8.12 of Reference 1). (6 Lectures)

Integer Linear Programming: Branch and Bound Algorithm, Cutting Plane Algorithm (Scope as in Chapter 9, Section 9.1 – 9.2 of Reference 2). (4 Lectures)
**PART B**

**Transportation Problem:** Initial solution by North-West corner rule, Row minima method, Column minima method, Matrix minima method, Vogel’s method. Tableau of transportation problem, u-v algorithm for solving transportation problem. Degeneracy in transportation problem. (Scope as in Chapter 9 of Reference 1). (6 Lectures)

**The Assignment Problem:** Hungarian Method (Scope as in Chapter 5, Section 5.4 of Reference 2). (2 Lectures)

**Traveling Salesman Problem** (Scope as in Chapter 9, Section 9.3 of Reference 2).

**Dynamic Programming:** Shortest route problem, Knapsack Model, Workforce size model, Equipment replacement model, Investment model, Game of chance (Scope as in Chapter 10, Sections 10.1 – 10.3, Chapter 15, Section 15.1 – 15.2 of Reference 2). (6 Lectures)

**CPM and PERT:** Network representation, Critical path computations, Construction of time schedule, Linear programming formulation of CPM, PERT networks (Scope as in Chapter 6, Section 6.6 of Reference 2). (2 Lectures)

**Basic Queuing Systems:** Elements of a queuing model, Pure birth and pure death model, Generalized Poisson queuing model (Scope as in Chapter 17, Section 17.1 to 17.5 of Reference 2). (5 Lectures)

**References:**


**Paper Title:** Operation Research (Practical)

**Paper Code:** BIO652  
**Max. Marks:** 50  
**Credits:** 1

Practicals based on theory paper code BIO602
**Paper Title:** Introduction to Bioinformatics (Theory)

**Paper Code:** BIO 603  
**M. Marks:** 50  
**Credits:** 4

**Course Duration:** 45 Lectures of one hour each.

*Note for the Paper setter:* The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

**SECTION –A**

**Introduction to Bioinformatics:**
History of Bioinformatics; Objectives and areas of Bioinformatics; Genome sequencing projects; Human Genome Project - history, techniques and insights.

**Introduction to databases:**
Basic concept of database, Type of databases;  
Literature Databases-PUBMED, MEDLINE;  
Nucleic acid and protein databases- GenBank, EMBL, DDBJ, SWISS PROT, UNIPROT;  
Human, animal and plant databases- Ensembl, Genome project TIGR database, Maize GDB etc. Structural databases- PDB, PDBsum, NDB etc; Motifs and Pattern Databases- PROSITE, Pfam, BLOCKS, PRINTS etc; Database Retrieval and deposition systems- SRS, Entrez, Bankit, Seqin, Webin, AutoDep.

**Basic Sequence Analysis:**
Protein Sequence Analysis- composition, hydropathy, flexibility, pattern, motif etc;  
Nucleic acid Sequence Analysis- Composition, motif, restriction site, primer design etc.

**Sequence Homology:**
Scoring matrices, Local and global alignment concepts, Dot matrix sequence comparison, Dynamic programming; Statistics of alignment score;  
Database searches for homologous sequences- FASTA, BLAST, PSI-BLAST and PHI-BLAST;  
Multiple sequence alignment: CLUSTALW, PILEUP;  
Evolutionary analysis- Concept of phylogeny and trees, Relationship of phylogenetic analysis to sequence alignment.

**Gene prediction:**
Gene prediction in prokaryotic and eukaryotes genomes; evaluation of gene prediction methods.
Section - B

Protein structure prediction:
Prediction of protein secondary structure from the amino acid sequence- Chou-Fasman/GOR method, JPRED, PSIPRED, PHD;
Prediction of three-dimensional protein structure-Homology-based structure prediction, Fold recognition and ab initio methods for structure prediction;
Evaluating the success of structure predictions-CASP and CAFASP.

Introduction to the concepts of molecular modeling:
Molecular structure and internal energy; Molecular Mechanics; Energy Minimization and related methods for exploring the energy surface; Molecular Dynamics, Conformational analysis;
Use of molecular graphics packages- Rasmol, MOLMOL, Chimera, Pymol, spdbviewer.

Computer Aided drug design:
Drug discovery process; Role of molecular recognition in drug design; Concepts in Quantitative structure activity relationships (QSAR); Docking problem, Concepts of docking; Structure based Drug design.

Applications of Bioinformatics:
Comparative Genomics; Proteomics; Gene expression informatics; Metabolomics; Computer aided vaccine design.

Text / Reference Books:

7. Jiawei Han, Micheline Kamber, Data Mining Concepts and Techniques- Morgan Kaufmann publisher, 2001.
13. P.Clate & R.Backofen (1998), Computational Molecular Biology, Willy Publication,
Paper Title: Introduction to Bioinformatics (Practical)

Paper Code: BIO 653 Max Marks 50 Credits: 1

a) To study & analyse various biological databases at NCBI, EBI, Expasy, NBRF-PIR Nucleic acid sequence databases like Gene Bank, EMBL etc.
Protein sequence databases SWISSPROT, UNIPROT etc.
Structural databases- PDB, NBD
b) To retrieve sequences from NCBI/EBI/ExPasy using ENTRZ, SRS
c) Similarity searches using various tools like BLAST/FASTA, BLAST N, BLAST P, BLAST X
d) CLUSTALW / Phylogenetic analysis tools
e) To predict gene/ORF for genomic DNA sequences of prokaryotic and eukaryotic origin.
f) To analyze protein sequence using Secondary Structure prediction Methods:
Chou-Fasman/GOR method, JPRED, PSIPRED, PHD etc.
g) Energy minimization using SPDBV.
h) To down-load structures of proteins in software like RASMOL, SPDBV and analysis of structures in these software
i) Fold recognition
j) Homology modeling using SPDBV.

Paper Title: MANAGERIAL ECONOMICS (Theory)
Paper – Compulsory

Paper Code: IBM-601 Credits: 3
Time: 3 Hours

Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50
External Assessment: 50

Part-A

Introduction to Managerial Economics and Demand Concepts: Nature Scope and Importance of Managerial Economics, opportunity costs, incremental principle, time perspective, Equi marginal principles, Individual Demand, Market Demand, Kinds of Demand, Determinants of Demand, Demand Functions and Law of Demand, Income and Price elasticity of demand, substitution effect

Production Function: Concept and types, Returns to Factor and Returns to Scale, Law of Variable Proportions, law of diminishing marginal returns

Cost concepts and Analysis: Concept of Cost, Short run and Long-run Cost Curves, Relationships among various costs

Revenue Curves: Concept and Types.

Part B

Perfect Competition: Characteristics, Equilibrium Price, Profit Maximizing output in Short Run and Long Run, Price Discrimination; Imperfect Competition, Monopolistic Competition, Oligopoly and Barriers to Entry.

Economic Environment of Business- Meaning of GDP, Monetary and Fiscal Policy, Deficit Financing, Inflation, Subsidies, Devaluation of Rupee, Liberalization, Privatization and Disinvestment

References:

1. Managerial Economics, Mote, Paul Gupta, Vikas Publisher, New Delhi
3. Microeconomics, Robert. Pindyck, Daniel Rubinfield, Pearson

Paper title: CORPORATE LEGAL ENVIRONMENT (Theory)

Paper – Compulsory

Paper Code: IBM- 602 Credits: 3

Time: 3 Hours

Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50

External Assessment: 50

Part A

The Contract Act 1872: Introduction: Meaning of contract; Types of contract; Essential elements of a valid contract. Offer: Meaning and Definition of offer; Types; Rules regarding offer; Revocation of offer; Lapse of offer. Acceptance: Meaning and Definition of acceptance; Rules regarding acceptance; Revocation of acceptance.
Consideration: Definition; Types; Rules; Exceptions
Capacity of Parties: Position of Minor, Person of unsound mind, Persons disqualified by law.
Free consent; Discharge of contract, Remedies for Breach of contract, Contract of Indemnity, Contract of Guarantee

Sales of Goods Act 1930 : Meaning; Difference between Sale of Goods and Agreement to Sale, Essentials of Contract of Sale; Difference between Contract of Sale and Hire-Purchase Agreements; Conditions and Warranties; Transfer of property or ownership; Performance of Contract of Sale; Rights of Unpaid Seller; Auction Sale.

The Companies Act, 1956 : Definition; Meaning; Features; Types of companies; Incorporation of a company; Memorandum of Association; Articles of Association and Prospectus; Doctrine of Indoor Management; Lifting of Corporate Veil; Registration and Incorporation of a company; Doctrine of Ultravires Transactions; Winding up of company.

Part B

Information Technology Act-2000 : Objective of the act, documents excluded from the scope of the act, digital signatures, types of digital signatures in India, certifying authorities in India, regulation of certifying authorities, duties of subscribers, offences, appellate tribunal, penalties and adjudication

References:
2. An Introduction to Mercantile Laws- N.D. Kapoor, Sultan Chand & Sons

Paper Title : Downstream Processing (Theory)

Paper Code: BIO605 M. Marks 50 Credits: 4

Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.
Section – A

Introduction; An overview of Bioseparation, Separation of cells and other insolubles from fermented broth; Filtration and microfiltration; Centrifugation (batch, continuous). Designing of centrifuges for desired product of desired capacity; Cell disruption: Physical methods – osmotic shock, grinding with abrasives solid shear, liquid shear, Chemical methods- alkali reagents, enzymatic methods; Product isolation: Extraction and adsorption method, solid-liquid separation, liquid-liquid separation, distillation, precipitation method using ammonium sulfate, organic solvents, high molecular weight polymers, reverse osmosis.

Section – B

Electrophoresis and chromatography principles for product purification. Different electrophoresis techniques viz. isoelectric focusing, chromatographic techniques viz. paper, gel filtration, column, ion exchange, affinity, GLC, HPLC. Dialysis, ultrafiltration; Product polishing: crystallization and drying.

Books Recommended:

1. Bailly & Ollis Biochemical Engg. – Academic Press, 2\(^{nd}\) ed., TMH.

Paper Title: Down Stream Processing (Practical)

Paper Code: BIO655 Max. Marks 50 Credits: 1

Cell lysis and release of cell contents; Use of centrifugation, ultra centrifugation Ultra filtration, lyophilization, crystallization, HPLC for bioseparation.

Paper Title: Biomaterials (Thoery)

Paper Code: BIO606 M. Marks 50 Credits: 4

Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of
conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Section – A

Introduction to biomaterials, Characterization of materials; mechanical properties; thermal properties; surface properties and adhesion; Various classes and forms of biomaterials;

**Metals** : Stainless steel, Cobalt- Chromium Alloys, Titanium based alloys other metals, metallic corrosion and luological tolerance.

**Cermics** : Carbons alumina, recoverable ceramics, composites, ceramic surface analysis

**Synthetic polymers** : Polymers in luomedical use, polyethylene, polypropylene, perfluorinated polymers. Acrylic polymers, hydrogels, polyurethanes, polyamide, silicone rubbers, polymer sterilization.

**Biopolymers** : Collagen, Elastin, Mucopolysarrharides, Proteoglycans Cellulose and derivatives and other.

**Tissue grafts** : Blood, Tissue grafts and rejection processes, shim and grafts

**Soft tissue speciation** : Space filters maxillofacial and fluid transfer implants, biomaterials in urological practice.

Section – B


**Biomaterials in ophthalmology** : Anatomy of eye, Viscoelastic Solution Contact Lens and Optical implants, Skeletal looking material for retinal detachment Vitreous implants artificial tears.

**Orthopedic implants** : Bone composition and materials, fixation devices, Fracline healing by clinical and dedromagnetic stimulation hip joint replacement, Knee joint repair, bone regeneration with restorable materials.

**Dental Materials** : Tooth composition and mechanical properties impression materials, filling and restorative materials, metal in dentist, oral implants use of collagen in dentist

**Books Recommended** :
2. Finman : Biomaterials
SYLLABUS FOR
B.E. MBA INTEGRATED COURSE IN BIOTECHNOLOGY

SEVENTH SEMESTER

Paper Title: Environmental Biotechnology (Theory)
Paper Code: BIO701 Max marks 50 Credits: 4
Course Duration: 45 lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

SECTION-A

Introduction: Environmental Pollution: Sources and effects. Biodegradation and Bioremediation-definitions and examples. (5)

SECTION-B

Microbial Leaching and Mining: Recovery of metals from solutions, microbes in petroleum extraction, microbial desulphurization of coal. (7)
Environmental Genetics: Degradative plasmids, release of genetically engineered microbes in environment. (5)

Books Recommended
1. To determine BOD & COD levels of the sample.
2. Application of microbial approaches in the remediation of contaminated soils.
3. Analysis of contaminated and bioremediated samples.

**Paper Title: Food Biotechnology (Theory)**

**Paper Code: BIO702**

Max. Marks 50

Credits: 4

Course Duration: 45 lectures of one hour each.

*Note for the Paper setter:* The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

**SECTION-A**

History of Microorganisms in food, Primary sources of Microorganisms in foods, Synopsis of common food borne bacteria, fungi and yeasts. (11)

Incidence & Behavior of Microorganisms in foods, Extrinsic & Intrinsic parameters of foods, Role and Significance of Microorganisms as Single cell proteins, Food value of Mushrooms, Yeasts, Production of Fermented foods. (10)

**SECTION-B**

Food types and their physical & chemical properties, Food Spoilage, Food Borne diseases. (13)

Food Preservation, Diagnosis of microbial contents of food: Classical & Molecular approach, Food Biosensors (11)

**Books Recommended**


**Paper Title: Food Biotechnology (Practical)**
**Paper Code: BIO752**
**Max. Marks 50**
**Credits: 1**

Microbiological Examination of food/s. Enumeration and detection of food borne organisms. Estimation of quality of milk-by dye reduction, direct microscopic count, Determination of diacetyl, titrable acidity in the milk sample.

**Paper Title: Plant Tissue Culture (Theory)**
**Paper Code: BIO703**
**Max. Marks 50**
**Credits: 4**

**Course Duration:** 45 lectures of one hour each.

**Note for the Paper setter:** The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

**SECTION-A**

- Introduction, requirements and Techniques. (4)
- Tissue Culture Media and Cell Culturing. (5)
- Cellular Totipotency, Somatic Embryogenesis, Synthetic seeds. (6)
- Haploid Production: Zygotic Embryo Culture: Morphogenesis in the culture of seeds with partially differentiated embryos. (5)

**SECTION-B**

- Microsurgical experiments, Morphogenic potential of the embryo callus, practical applications. (5)
- In-Vitro Pollination and Fertilization: Introduction, Terminology, In-Vitro Pollination, Applications. (5)
- Genetic engineering and production of pathogen free plants: Gene expression, genetic stability, and field performance. (5)
- Introduction, Strategies used to optimize product yield, commercial aspects, Germplasm storage: Introduction, long term Storage, Short or Medium term storage. (10)
Books Recommended

Paper Title: Bio-analytical Techniques (Theory)
Paper Code: BIO704 Max. Marks 50 Credits: 4
Course Duration: 45 lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

SECTION-A
Spectrophotometry (UV and Visible): Principle, single beam and double beam spectrophotometer, factors influencing the absorption spectra, overview of empirical rules, solvent perturbation method and difference spectroscopy; various applications of absorption spectroscopy with respect to biotechnology. (05)
Spectrofluorimetry: Principle, significance and various details related to instrumentation. (03)
Atomic absorption Spectrophotometry: Principle, instrumentation details, various interferences in atomic absorption spectroscopy and applications. (04)
Infrared and Raman Spectroscopy: Principle, factors deciding the spectra, instrumentation, overview of different class of compounds and their IR spectra. Introduction to Raman scattering. (04)
Nuclear Magnetic resonance: Phenomena of resonance, instrumentation, diamagnetic shielding, anisotropy, chemical shift, free induction decay (FID), population distribution of nuclei, and prediction of NMR spectra on the basis of (n+ 1) rule for basic class of compounds. Overview of electron spin resonance spectroscopy (ESR) and magnetic resonance imaging (MRI). (08)

SECTION-B
Electron Microscopy: Transmission and scanning electron microscopy, significance of vacuum, basic instrumentation for TEM and SEM, sample preparation for electron microscopy. Overview of Atomic force microscopy and tunneling microscopy with respect to their working principle and comparison with other scanning techniques. (05)
Crystallography and X-ray diffraction: Introduction to x-ray and general theory and instrumentation, Bragg’s law, various techniques to determine crystal structure. (05)

Radioisotope techniques: Radiotracers, units of radioactivity measurement, proportional and scintillation counters, introduction to autoradiography and nuclear medicine. (06)

Mass Spectroscopic Techniques: Introduction to mass-spectroscopy, significance, instrumentation details of a mass-spectrometer, ionization techniques, single and double focusing, alternate mass separation techniques- time of flight and quadruple. Interface of mass-spectra with liquid and gas chromatography (LC-MS and GC-MS). (05)

Books Recommended

Paper Title: Bio-analytical Techniques (Practical)
Paper Code: BIO754 Max. Marks 50 Credits: 1

Different experiments to confirm spectroscopic laws, practical demonstration of the above mentioned techniques.

Paper Title: Accounting for Managers
Paper Code: IBM701 Max. Marks 50 Credits: 3

Course Duration: 45 lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Part – A

Accounting and its functions; Basic Accounting Concepts and Accounting Conventions; Accounting Principles; Generally Accepted Accounting Policies (GAAP); Accounting Standards; Branches of Accounting: Financial Accounting; Cost Accounting; Management Accounting; Accounting Equation; Accounting Structure; Types of Accounts.
Rules regarding Journal Entries; Recording of Journal Entries; Ledger Posting; Trial Balance; Preparation of Final Accounts; Trading Account; Profit & Loss Account; Balance Sheet; Treatment of Adjustments into trial balance.
Meaning of Management Accounting; Nature; Scope; Objectives; Functions of Management Accounting; Relationship between Financial and Management Accounting; Tools and Techniques of Management Accounting; Limitations; Meaning of Financial Statement; Importance and Limitations of Financial Statement; Meaning and Objectives of Financial Statement Analysis; Limitation of Financial Analysis.
Ratio Analysis: Meaning of Ratio; Interpretation of Ratios; Significance of Ratio Analysis; Limitations of Ratio Analysis; Classification of Ratio; Analysis of Short-term financial position; Analysis of Long term financial position; Analysis of profitability.

Part – B

Fund Flow Analysis: Meaning and Concept of Funds; Meaning of Fund Flow; Meaning of Fund Flow Statement; Significance; Limitations; Procedure of Preparing Fund Flow Statement; Schedule Showing Change in working capital; Adjusted Profit & Loss Account; Statement of Sources and Applications of Funds. Treatment of Adjustment;
Cash Flow Analysis: Meaning; Classification of Cash Flow; Comparison between Fund Flow Statement and Cash Flow Statement; Difference between Cash Flow Statement and Cash Budget Limitations; Preparation of Cash Flow Statement (as per AS-3); Treatment of Adjustments.

References:


Paper Title: Statistics & Business Research Methodology (Theory)
Paper Code: IBM702 Max. Marks 50 Credits: 3
Course Duration: 45 lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Part A
Introduction to Descriptive Statistics: Types of Data , Measures of Central Tendency; Measures of Dispersion- Range, Quartile Deviation, Mean Deviation, and Standard Deviation, Skewness & Kurtosis.
Probability : Basic probability concepts , Joint probability, Conditional probability, Bayes Theorem, Random Variables and Discrete Probability distributions : Poisson, Binomial and Normal , Normally distributed variables , areas under the standard normal curve

Research Design: Meaning, Characteristics and various concepts relating to research design and classification of research design, Importance.

Measurement and Scaling: Data Types Nominal, Ordinal and Ratio scale; scaling techniques.

Part B

Formulation of Hypothesis: Confidence Intervals , Meaning, Characteristics and concepts relating to testing of Hypothesis (Parameter and statistic, Standard error, Level of significance, type-I and Type-II errors, Critical region, one tail and two tail tests); Procedure of testing Hypothesis. Numerical problems based on chi-square test , Hypothesis tests for one population mean : Z test, t-test, Wilcoxon Signed- Rank test , Inferences for two population means, Mann-Whitney Test , F-test

Data Analysis & Interpretation: Introduction to Multivariate analysis - Multiple and partial correlation, Analysis of Variance (ANOVA)-One way and Two way ANOVA. Introduction to discriminant analysis and Factor Analysis

References:
1. Business Research Methods, William G. Zikmund, Cengage Learning India
2. Business Research Methods , Cooper,D.R.& Schindler , TataMcGraw-Hill

BIO706: TRAINING OF 6 WEEKS AFTER 6th SEMESTER EXAMINATIONS.

Max. Marks 50

Credits: 1
SYLLABUS FOR  
B.E. MBA INTEGRATED COURSE IN BIOTECHNOLOGY  

EIGHTH SEMESTER  

Paper Title: Major Project (Practical)  
Paper Code: BIO801  
Max. Marks 50  
Credits: 2  

Paper Title: Enzyme Catalyzed Organic Synthesis (Theory)  
Paper Code: BIO802  
Max. Marks 50  
Credits: 4  

Course Duration: 45 lectures of one hour each.  

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.  

SECTION-A  

Biocatalysis: Definition of Biocatalysis, advantages and disadvantages of Biocatalysis over chemical catalysis. Different types of Biocatalysis; microbial, enzymatic and enzymatic and immobilized system of Biocatalysis; current industrial biocatalysis with different enzymes. Immobilized enzymes for Biocatalysts. (15)  
Industrial processes: Comparing different approaches. (8)  

SECTION-B  

Stereo selective biocatalysts for the synthesis of chiral pharmaceutical intermediate such as synthesis of ACE inhibitors, definition, mode of action of inhibitors, recent developments synthesis of anticholesterol drug by biocatalysis routs, calcium channel blocking drugs, potassium channel openers, antiviral. (22)  

Books Recommended  


**Paper Title: Enzyme Catalyzed Organic Synthesis (Practical)**
**Paper Code: BIO852**
**Max. Marks 50**
**Credits: 2**

Optimization of enzymatic catalysis reaction conditions.
Enzymatic catalysis reaction with activators and inhibitors.
Product identification using different analytical technique.

**Paper Title: Business Research**
**Paper Code: IBM 801**
**Max. Marks 50**
**Credits: 3**

Course Duration: 45 lectures of one hour each.

*Note for the Paper setter:* The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

**PART-A**

Research Design formulation, Exploratory, Descriptive and Casual Research , Exploratory Research Design- Secondary Data ,Primary Data , Qualitative Research-Focus Group Interviews, Depth Interviews, Analysis of Qualitative Data, Survey and observation- Survey methods, Observation method, Casual Research Design- Experimentation, Validity in Experimentation, Extraneous variables, Statistical Designs-Randomized-Block Design, Latin Square Design, Factorial Design

Measurement and Scaling- Primary Scales of measurement, Comparative Scaling Techniques, Non comparative Scaling techniques-Likert ,Semantic Differential Scale, Stapel Scale, Questionnaire Design- question content, structure and order

**PART-B**

Sampling Design: Meaning and need of Sampling, Probability and non-probability sampling design, simple random sampling, systematic sampling, stratified sampling, cluster sampling and convenience,sampling , judgement and quota sampling (non-probability), determination of sample size, Hypothesis Testing, Parametric and Non-Parametric Tests
Discriminant and Logit Analysis- Formulating the problem for Discriminant analysis, Multiple Discriminant Analysis, Logit model

Factor analysis, Cluster analysis and Multidimensional Scaling - Conducting Factor analysis, Cluster analysis and Multidimensional Scaling- Conjoint Analysis

Reference Books:
2. Marketing Research- Text and Cases, Rajendra Nangundkar, TMH
3. Marketing Research –GC Beri, TMH
4. Marketing Research- Parshuram, Dhruv Grewal, R.Krishnan – Biztantra

Paper Title: Financial Management (Theory)
Paper Code: IBM 802 Max. Marks 50 Credits: 3
Course Duration: 45 lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

PART-A

Introduction to Financial Management: Meaning; Scope; Finance Function; Financial Goals; Agency Problem; Relationship of Finance with Accounts and Economics.

Sources of Finance: Features; Advantages and Limitations of Equity Shares; Preference Shares; Debentures; Term-Loans; Right Issue.

Cost of Capital: Meaning; Calculation of Cost of Debt Capital; Equity Capital; Preference Capital; Retained Earnings; Weighted Average Cost of Capital.

Capital Structure: Meaning; Determinants; Assumptions; Net Income and Operating Income Approach; Traditional Position; M-M Position; EBIT and EPS Analysis; Capital Structure and Taxation.
Leverage Analysis: Meaning; Types; Estimation of Financial; Operating and Combined Leverage; Relation of Financial Leverage with Risk and Return.
Management of Working Capital: Meaning of WC; Need of WC Management; Determinants of WC; Operating Cycle; Estimation of WC.

PART-B

Inventory Management: Meaning; Need to hold Inventory; Objective of Inventory Management; Inventory Investment Analysis; Inventory Control System.

Capital Budgeting: Meaning; Basic Principles of Costs and Benefits; Investment Criteria; Payback Method; Accounting Rate of Return Method; Net Present Value Method; Benefit-Cost Ratio; Internal Rate of Return; Capital Rationing; Introduction to Basic Techniques of Risk Analysis in Capital Budgeting.

Dividend Decisions: Meaning and Types of Dividend; Issues in Dividend Policy; Traditional Model; Walter Model; Gordon Model; Miller and Modigliani Model; Bonus Shares and Stock Splits.

References:
1. Financial Management, Van Horne, PHI

Paper Title: Modeling and Simulation of Bioprocesses (Theory)

Paper Code: BIO804  Max. Marks 50  Credits: 4

Course Duration: 45 lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

SECTION-A

Types of kinetic models. Data smoothing and analysis. (8)
Mathematical representation of bioprocess; parameter estimation; numerical integration techniques; parameter sensitivity analysis; statistical validity. (10)
Discrimination between two models. Physiological state markers and its use in the formulation of a structured model. (5)

SECTION-B
Development of compartment and metabolic pathway models for intracellular state estimation. 

Dynamic simulation of batch, fed-batch steady and transient culture metabolism; Numerical optimization of Bioprocesses using Mathematical models.

Books Recommended

Paper Title: Modeling and Simulation of Bioprocesses (Practical)
Paper Code: BIO854       Max. Marks 50       Credits: 2

To design and solve mathematical models from the provided data.

Paper Title: Nanobiotechnology (Elective-I) (Theory)
Paper Code: BIO805       Max. Marks 50       Credits: 4

Course Duration: 45 lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

SECTION A

Cell nanostructure interactions: Surface patterning to control the adhesion of cells using nanoscale topography and chemical modifications.
Tissue engineering: Significance, Methodology, Tissue engineering scaffolds- composition, properties, fabrication, cell seeding and proliferation.
Nanomembranes: Freely suspended nanomembranes.

SECTION B

Books Recommended

Paper Title: Microbial Diversity (Elective-I) (Theory)
Paper Code: BIO805 Max. Marks 50 Credits: 4
Course Duration: 45 lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

SECTION A
Microbial biodiversity: definition and introduction, evolution and diversity of microorganisms. (7) Physiological and metabolic diversity of microorganisms. (7) Microbial diversity of major ecosystems. (8)

SECTION B
Biodiversity & role of microorganisms in plants and animal symbiosis. (8) Microbial diversity in extreme environments. (9) Microbial biodiversity, biotechnology and future biodiversity. (6)

Books Recommended
SYLLABUS FOR B.E. MBA (BIO- TECHNOLOGY)
NINTH SEMESTER

QUANTITATIVE TECHNIQUES FOR MANAGEMENT

Course : BE-MBA IX th Semester

Paper – Compulsory

Paper Code: IBM-901

Time: 3 Hours

Course Duration: 45 Lectures of one hour each.

Credits: 3

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50
External Assessment: 100

Part-A

Linear Programming- Equation formulation , Graphical solution of two-variable linear programming problems, Simplex algorithm, Transportation and Assignment problems

Game theory- Game models, zero sum games, dominance rule, 2 x n and m x 2 games, solution of m x n games

Queuing: Single channel single-phase queuing system, multichannel single-phase queuing system, single channel multiphase queuing system

Part-B

Markov Chains – Markov processes , Markov analysis , input transition probabilities, input conditions, output- specific state probabilities, steady state probabilities, absorbing chains

Simple linear regression and multiple regression analysis (with two independent variables), specification of regression models and estimation of parameters, interpretation of results

Forecasting models- Moving- average forecast methods, Simple Exponential Smoothing, Holt’s method- Exponential Smoothing with trend, Winter’s Method- Exponential Smoothing with Seasonality

1. Business Forecasting : John.E.Hanke , Dean.W.Wichern , PHI
2. Statistics for Managers using Microsoft Excel : Levine, Stephan, Krehbiel, Brenson , PHI

BUSINESS RESEARCH
Course: BE-MBA IXth Semester

Paper – Compulsory

Paper Code: IBM-902 Time: 3 Hours

Course Duration: 45 Lectures of one hour each. Credits: 3

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50 External Assessment: 100

Part-A


Measurement and Scaling– Primary Scales of measurement, Comparative Scaling Techniques, Non comparative Scaling techniques-Likert, Semantic Differential Scale, Stapel Scale, Questionnaire Design– question content, structure and order

Part-B

Sampling Design: Meaning and need of Sampling, Probability and non-probability sampling design, simple random sampling, systematic sampling, stratified sampling, cluster sampling and convenience, sampling, judgement and quota sampling (non-probability), determination of sample size, Hypothesis Testing, Parametric and Non-Parametric Tests

Discriminant and Logit Analysis– Formulating the problem for Discriminant analysis, Multiple Discriminant Analysis, Logit model

Factor analysis, Cluster analysis and Multidimensional Scaling – Conducting Factor analysis, Cluster analysis and Multidimensional Scaling– Conjoint Analysis


6. Marketing Research– Text and Cases, Rajendra Nangundkar, TMH

7. Marketing Research– GC Beri, TMH

8. Marketing Research– Parshuram, Dhruv Grewal, R.Krishnan – Biztrantra
SUPPLY CHAIN MANAGEMENT

Course: BE-MBA IX th Semester

Paper: Elective-Marketing

Paper Code: IBM-903

Time: 3 Hours

Course Duration: 45 Lectures of one hour each.

Credits: 3

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50

External Assessment: 100

Part –A

Definition of Supply Chain Management and Logistics - Scope of Transportation, Relationship between transportation and other business functions, Transport Economics: Distance – volume-density, Freight Cost – Handling – Liability - market factors; Third party logistics (3 PL) & fourth party logistics service provider (4 PL), Logistics equipment; Reverse Logistics, Govt. rule & regulations related to Logistics; Documentation related to Transportation :- Bill of Lading, Freight Bill, Claims and F.O.B Terms of Sale, Legal Classification of carriers- Private, Contract carrier etc.

Inventory Control, Planning & Managing Inventories: Strategic role of stock, costs of holding stock, Economic Order Quantity (EOQ), uncertainty in demand and costs, models for known demand: price discount from suppliers, planned shortages and back-orders, models for uncertain lead time demand

Material Handling & Wastage Control; Packing & Packaging; Order Management; Competitive advantage through logistics and supply chain management; Responsive Supply Chain, RFID applications in Supply Chain.

Part –B

Network Design and Facility Location – Facility location analysis, Optimization models, Heuristic Modeling – Grid Technique. Information systems for Supply Chain Management-Contemporary Logistics Information Technologies, e-enabled logistics management and tracking systems.

Planning & Sourcing in Supply Chain; Planning demand and supply: Demand forecasting – Type and Time horizon of forecast and category of forecasting, aggregate planning; Strategic sourcing; Sourcing decision in Supply Chain- selection of source, technical up-gradation of vendor, vendor performance evaluation, vendor rationalization.
SERVICES MARKETING

Course: BE-MBA IX th Semester

Paper: Elective-Marketing

Paper Code: IBM- 904

Time: 3 Hours

Course Duration: 45 Lectures of one hour each.

 Credits: 3

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50

External Assessment: 100

Part-A

Marketing of services - Introduction - Growth of the Service Sector - The Concept of Service - Characteristics of Services - Classification of Services - Designing the Service - Blueprinting, Using Technology, Developing Human Resources, Building Service Aspirations.


Strategic Marketing Management for Services - Matching Demand and Supply through Capacity Planning and Segmentation - Internal Marketing of a Service - External versus Internal Orientation of Service Strategy.

Part-B


Marketing of Services with special reference to (a) Financial Services (b) Health Services (c) Hospitality Services including Travel, Hotels and Tourism. (d) Professional Services (e) Public Utility Services (f) Communication Services (g) Educational Services

ADVERTISING AND SALES MANAGEMENT

Course: BE-MBA IXth Semester
Paper: Elective-Marketing

Paper Code: IBM-905  Time: 3 Hours

Course Duration: 45 Lectures of one hour each.  Credits: 3

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50  External Assessment: 100

Part-A

Advertising: As an element in Marketing Mix, its role and importance; Advertising as a means of communication, Setting advertising objectives, DAGMAR approach to setting objectives. Preparing advertising plan, Developing message, writing copy, advertising appeals and pre-testing and post-teaching copy

Media decisions, media strategy and scheduling decisions; Planning and managing advertising campaigns; Different types of advertising, public relations; Industrial advertising; advertising budget and relevant decisions; Advertising agencies; their role and importance; management problems of agencies; client-agency relations; advertising in India, problems and prospects.

Part-B

Sales Management: Size of the sales force, sales organization based on customer, geography, product and combinations and current trends – sales training programs and motivating the sales force – sales force compensation, sales incentives and sales force evaluation – controlling the sales effort – sales quotas, sales territories, sales audit, selecting channel members, setting distribution objectives and tasks – Target markets and channel design strategies.

Product, Pricing and Promotion issues in Channel Management and Physical Distribution - Motivating channel members – Evaluating channel member performance – Vertical marketing systems – Retail co-operatives, Franchise systems and corporate marketing systems.

E-commerce and e-retailing as a channel of distribution, Electronic intermediaries, Disintermediation and Re-intermediation
INDIAN FINANCIAL SYSTEM

Course: BE-MBA IX th Semester  
Paper: Elective-Finance  

Paper Code: IBM-906  
Time: 3 Hours  

Course Duration: 45 Lectures of one hour each.  
Credits: 3

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50  
External Assessment: 100

Part-A

Commercial Banking-Evolution, Financial Services, Fiduciary Services, Off-balance Sheet Activities, Analysis of Assets and Liabilities of Scheduled Commercial Banks; Reserve Bank of India-Central Banking-Introduction to Central Banking, Instruments of Monetary Control, Public Debt, Secondary Debt Market, REPO's, Reserve Requirements, Selective Credit Controls, Advances to Priority Sector, Supervision System; Regional Rural Banks-Objectives, RBI Assistance, Evaluation of RRB's.

Cooperative Credit-Introduction, Role of RBI, Organizational Structure, National Bank for Agriculture and Rural Development (NABARD), Reforms in Cooperative Credit.

Non-banking Finance Companies - Introduction, Definition of Non-banking Finance Company, Financial Sector Reform, Liberalization Measures for NBFC's, Regulations for NBFC's Accepting Public Deposits, Limits on Acceptance of Deposits, Size of Non-banking Companies, Deposits, Distribution of Deposits, Comparison of NOF and Deposits, Capital Issues by Finance Companies, FCNR Deposits for NBFC's, Assets of NBFC's, Investment Norms for NBFC's, Deployment of Funds, Funds Mismatch of HP/Leasing Companies.

Part-B


MANAGEMENT OF FINANCIAL SERVICES
Course: BE-MBA IX th Semester
Paper: Elective-Finance

Paper Code: IBM- 907

Time: 3 Hours

Course Duration: 45 Lectures of one hour each.

Credits: 3

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50

External Assessment: 100

Part-A

Financial Services - Meaning, types and their importance, Securities Trading - Online Vs Offline Trading, Demat and Remat, Depository - Introduction, Concept, depository participants, functioning of depository systems, process of switching over to depository systems, benefits, depository systems in India, SEBI regulation.

Insurance Services- Introduction, Principles of insurance, Types of Insurance, Life Insurance Products- Traditional and ULIPs, Credit rating - the concept and objective of credit rating, various credit rating agencies in India and International credit rating agencies, factors affecting credit rating & procedural aspects.

Part-B

Leasing - concept and development of leasing, business, difference between leasing & hire purchase, types of leasing business, advantages to lessor and lessee.

Venture capital - concepts and characteristics of venture capital, venture capital in India, guidelines for venture capital.

Call money market, Treasury bill market, Commercial Bill market, Market for CPs and CDs, Discount market and market for financial guarantees, Factoring - Development of factoring types & importance, procedural aspects in factoring, financial aspects, prospects of factoring in India.
Plastic Money - Concept and different forms of plastic money - credit and debit cards, pros and cons. Credit process followed by credit card organizations. Factors affecting utilization of plastic money in India.

References

2. Nalini P T Financial Instruments and services PHI

CORPORATE TAX PLANNING

Course : BE-MBA IX th Semester
Paper: Elective-Finance

Paper Code: IBM- 908

Time: 3 Hours

Course Duration: 45 Lectures of one hour each.

Credits: 3

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50
External Assessment: 100

Part –A

Basic framework of direct and indirect taxes in India, Concept of Tax Planning, Meaning, importance and scope, Tax planning versus Tax avoidance and Tax evasion, Methods of Tax Planning, Areas of Tax Planning, Scale of business / Nature of business and its relation to Tax Planning.
Taxation of companies in India, Assessment of Business and other incomes of Joint Stock Companies , Tax planning and managerial considerations with reference to newly established Industrial Undertakings in certain specified areas like E.P.Z and E.O.U’s. Tax Planning with reference to amalgamations, Foreign collaborations and joint venture agreements
Tax Planning and Financial management – Tax planning with reference to capital structure, capital budgeting and management of working capital, Tax considerations in issue of bonus, shares and dividend policy.

Part-B

Tax Planning with regard to specific management decisions like Make of Buy , own on Lease repair , renewal, replace , closure or continuance , Maintenance of proper records of complying with requirement of tax laws, deductions of Tax at source, advance payment of tax, time for
payment and filing of income tax returns, types of assessments and procedure, defaults and penalties.

Tax planning in respect of excise duty, custom duty and sales tax, maintenance of proper records for complying with the requirements of indirect tax laws, filing of returns under different indirect tax laws, details and penalties under indirect tax laws.

References:

1. Singhania, V.K., Direct Taxes: Planning and Maintenance (Tax Man publications)
2. Lakhotia, R.N., Corporate Tax Planning

E-COMMERCE

Course: BE-MBA IX th Semester
Paper: Elective-IT

Paper Code: IBM-909 Time: 3 Hours

Course Duration: 45 Lectures of one hour each. Credits: 3

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50 External Assessment: 100

Part-A

Ecommerce terminology: Blogs, Message boards, Newsgroups, Banner Advertising, Spiders / crawlers/ robots, hacking, SSL / SET protocols, Escrow, Podcast, webcast, web beacons, spyware, Adware, RSS feed, Spam, Web agents, cookies, search engine, worms

Planning for a Ecommerce: Value chain analysis, SWOT analysis, studying trends and current technology, government incentives, hardware and software assessment for building a web store, intermediaries in Ecommerce

Characteristics of E-Business markets: Various business models, Business model design, pricing and distribution of digital products, bundling, building customer traffic, subscription vs paid model, bricks and clicks business model, call centre integration in ecommerce, affiliate marketing, viral marketing

Part-B

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Security in ecommerce transactions: Public key infrastructure, process of getting a digital signature in India, types of digital signatures, role of intermediaries like Verisign

Internet audience: study of internet audience, online consumer behavior, Online research: Click stream analysis, Search log analysis, emails, pop-ups, online focus group

Online payment systems: On-Line Electronic Cash, Electronic Payment Schemes, Credit card secure electronic transaction, e-cheque, accumulating balance payment system, stored value payment system, digital wallets

References

1. E-commerce Management, Text and cases, Sandeep Krishna Murthy, Cengage
3. Ecommerce, Strategy, Technology and Implementation, Gary.P.Schneider, Cengage
4. Web commerce Technology Handbook, Daniel Minoli, Emma Minoli, TMH

IT PROJECT MANAGEMENT

Course: BE-MBA IX th Semester
Paper: Elective-IT

Paper Code: IBM-910 Time: 3 Hours

Course Duration: 45 Lectures of one hour each. Credits: 3

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50 External Assessment: 100

Part-A

Software development process: waterfall model, prototyping, spiral model, software configuration management process, process management-cyberability maturity model

Software requirement analysis and specification: problem analysis, data flow diagram, entity-relationship modeling, decision tables, creating a requirement document

Planning a software project: cost estimation-COCOMO model, schedule and milestones, personnel plan, software quality assurance plans, configuration management plans, project monitoring plans, risk management
Part-B

Function-Oriented design: Modularity, Top-down and bottom-up strategies, structure charts, first-level factoring, design heuristics, Metrics- network metrics, stability metrics, information flow metrics

Object oriented design (OO): classes and objects, encapsulation, inheritance and polymorphism, OO design notation and specification, dynamic modeling, metrics- Weighted Methods per Class (WMC), Depth of Inheritance (DIT), Number of Children (NOC), Coupling between Classes (CBC)

Software testing: error, fault and failure, top-down and bottom-up approaches, test cases and test criteria, functional testing- equivalence class partitioning, cause-effect graphing, structural testing-control based criteria, data flow based criteria

Software delivery: models, managing IT project teams

References:
1. Software Engineering, Ian Sommerville, Addison-Wesley
2. Software Engineering Project Management, R. Thayer, Wiley

DECISION SUPPORT SYSTEMS

Course: BE-MBA IX th Semester
Paper: Elective-IT

Paper Code: IBM - 911

Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50  External Assessment: 100

Credits: 3

Part-A

Distinction between Transaction Processing System (TPS), Management Information System (MIS), Expert System (ES) and Decision Support System (DSS)
Architectures of DSS system: components, classifications, backend and front end components of DSS, Web based DSS, Group Decision Support System (GDSS), technologies and infrastructure for group decision making, distributed computing

Modeling for DSS: the decision making modeling process, Intelligence, design and choice phases, design under certainty, risk and uncertainty, sensitivity analysis, what-if, goal-seek and scenario analysis with spreadsheets

DSS design to support operational, tactical and strategic decision making

DSS design methodology for Healthcare, Insurance, Manufacturing and Education sectors.

Part-B

Enterprise Decision Support System (EDSS): Characteristics and capabilities of EDSS, integrating DSS and EDSS, Computerized systems like CRM, ERP, MRP and their design basics, EDSS and supply chain, Corporate Enterprise portals and their design, Electronic Document Management (EDM) systems

Importance of Knowledge Management Systems (KMS) and its integration with DSS, Design of Knowledge Management System for different sectors, Artificial Intelligence based DSS systems.

Reference


TRAINING AND DEVELOPMENT

Course: BE-MBA IX th Semester
Paper: Elective-HR

Paper Code: IBM-912

Time: 3 Hours

Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50 External Assessment: 100

Part-A
National Training Interventions: Training as an economic instrument, achievements and challenges, National initiatives: 1964 to the present day, the European scene, which way forward.

Attitudes Towards Education and training: Education, training and work, changes in attitudes to training and development, Philosophies of training. Learning and Training: What do we understand by learning, Reinforcement theories, cybernetic and information theories, cognitive theories and problem solving, experimental learning, Learning to learn and self-development, Mental process, other horizons.

The Learner and the Organization: The learner, the organization as a learning environment, the learning organization. Approaches to Training Interventions: Organization learning systems, Generalized approaches, Planned training interventions, the costs and benefits of training interventions.

**Part-B**

The Training Function in Organizations: The training function, Management's responsibility for training, Creating and appropriate structure, The training of training staff, Ethical standards.

Assessing Organizational Training Needs: The levels of organizational needs, types of organizational reviews, before starting the review, reasons for an organizational review, carrying out an organization-wide review.

Training Policy, Plans and Resources: Training policy, policy development, annual training plan, training resources, from policy to training plan and budget, Assessing Training Needs-the job and the individual: Job training analysis, Analytical techniques, Carrying out an individual training needs analysis, assessing performance.

Determining and evaluating training interventions: Training interventions, determination of training objectives, determination of the appropriate training strategy, planning and implementation of the training, evaluation of the programme.

**ORGANIZATIONAL CHANGE AND DEVELOPMENT STRATEGIES**

Course: BE-MBA IX th Semester
Paper: Elective-HR

*Paper Code: IBM- 913 Time: 3 Hours*

Course Duration: 45 Lectures of one hour each.

*Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of*
conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50  
External Assessment: 100

**Part-A**


Values, Assumption, And Beliefs in OD- Chronology of Events in Management and organization Thought, early Statement of OD values and assumptions, A Values Study.


OD Interventions :Thinking about OD Interventions, Classifying OD Interventions.

**Part-B**


Intergroup and Third-Party Peacemaking Interventions :Intergroup Team-Building Interventions, Third party Peacemaking Interventions ,organization Mirror Interventions, Partnering.


**INDUSTRIAL PSYCHOLOGY**

Course : BE-MBA IX th Semester
Paper:Elective-HR
Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50          External Assessment: 100

**Part-A**

Nature and scope of Industrial Psychology: Psychology and management, contributions of Freud and post Freudian development of Psychology

Factory organization: industrial bureaucracy, formal and informal groups, status system, balancing of social power, union and employer’s organizations

Psychology of leadership, understanding and motivating employees, industrial morale and job satisfaction, counseling, Psychology of industrial conflict, stress management

**Part-B**

Personality: Idiographic approach, Nomothetic approach, psychoanalytical perspectives, levels of awareness, defence mechanism, projective tests, Rorschach test, Thematic Appreciation Test (TAT), Role playing or visualization, stereotyping, brand personality.

Trait perspective: Allport’s trait categories, Catell’s 16 PF test, personality tests, personality questionnaire, Type perspective- four humours, Sheldon’s typology, Eysenck’s typology, Factor theory, Jung’s typology, Allport’s typology

Intelligence: models, Stanford-Binet intelligence scale, Wechsler scale, Emotional intelligence

References:

1. Psychology in Organizations, S.Alexander Haslam, Sage publications

IBM 915 Training of 6-8 weeks after 9th semester exams:          200 Marks
STRATEGIC MANAGEMENT

Course: BE-MBA X th Semester
Paper – Compulsory

Paper Code: IBM-1001 Time: 3 Hours

Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50 External Assessment: 100

Part –A

Definition, nature, scope, and importance of strategy; and strategic management (Business policy), Strategic decision-making. Process of strategic management and levels at which strategy operates, Role of strategists, Defining strategic intent: Vision, Mission, Business definition, Goals and Objectives.

Environmental Appraisal—Concept of environment, components of environment (Economic, legal, social, political and technological).

Environmental scanning techniques- ETOP, QUEST and SWOT (TOWS) PEST.

Internal Appraisal – The internal environment, organisational capabilities in various functional areas and Strategic Advantage Profile. Methods and techniques used for organisational appraisal (Value chain analysis, Financial and non financial analysis, historical analysis, Industry standards and benchmarking, Balanced scorecard and key factor rating). Identification of Critical Success Factors (CSF).

Part –B


Strategic Management of Technology and Innovation- Licensing new technology, imbibing new technology, searching for strategic partners in new business areas, Internal and external sources
of technology, linking new technology and novel customer needs, building competence through new product development, technological innovation and strategy.

**Recommended Text Books**


**GLOBAL MARKETING**

Course: BE-MBA Xth Semester  
**Paper: Elective-Marketing**

**Paper Code:** IBM- 1002  
**Time:** 3 Hours  
**Credits:** 3

**Course Duration:** 45 Lectures of one hour each.

**Note for the Paper setter:** The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50  
External Assessment: 100

**Part-A**

Global Marketing: Development of Global Marketing, market characteristics, Industry conditions, marketing infrastructure, regulatory framework, basis for trade- absolute vs comparative advantage, protectionism and trade restrictions, tariffs, quotas, GATT

Selecting markets: list of selection criteria, market index for country selection, grouping global markets, consumer market, business market and government market, categorizing global marketing mindsets, global market entry strategies- exporting, local production, ownership

Pricing for global markets: transportation cost, tariffs, taxes, local production costs, channel costs, market and environmental factors affecting price, determining transfer prices, dealing with parallel imports or gray markets, sources of finance- commercial banks, government sponsored financing

**Part-B**

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Developing new products for global markets: three strategic choices – extension, adaptation, invention, role of foreign subsidiaries in R&D, acquisitions as a route to new products, joint venture route to new products, concept test, test marketing.

Developing a global distribution strategy: distribution density, channel length, channel alignment, distribution logistics, locating and selecting channel partners.

Planning and controlling global marketing: selecting control metrics, resolving conflicts between headquarters and subsidiaries.

References:
2. Global Marketing., Johny K. Johansson, TMH

CONSUMER BEHAVIOR
Course: BE-MBA Xth Semester
Paper: Elective-Marketing

Paper Code: IBM-1003 Time: 3 Hours

Course Duration: 45 Lectures of one hour each. Credits: 3

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50 External Assessment: 100

Part-A
Current trends in Consumer Behavior (CB), Consumer empowerment through the web, Information bank for understanding CB, consumer need arousal, need recognition, consumer Psychological set, consumer information search and processing, Brand evaluation, Purchase and post purchase behavior.
Consumer learning, Habit and Brand Loyalty, unplanned purchase behavior, strategic implications of low-involvement decision making, situational influences, use of situational variables in marketing strategy, consumer perception, perception interpretation, price perception, Attitude development for change, lifestyle and personality.

Part-B
Group and culture influences, culture values, cross-culture values, subculture influences, reference group influences, House-hold decision making, group communication – word of mouth as diffusion process, Market segmentation and Micromarketing. Marketing communication process – source effects in marketing communication, message effects, media effects, consumer decoding of marketing communication, Alternatives evaluation and selection- how consumers make choices, evaluation criteria , decision rules for Attribute based choices. Consumer Rights and Social responsibility.

**References**

1. Consumer Behavior – Insights from Indian Market, Majumdar, PHI
2. Consumer Behavior – A Strategic Approach , Henry Assael , Biztantra (Dreamtech)

**INVESTMENT ANALYSIS AND PORTFOLIO MANAGEMENT**

Course : BE-MBA X th Semester  
**Paper: Elective-Finance**

*Paper Code: IBM- 1004* 

Time: 3 Hours

Course Duration: 45 Lectures of one hour each.

**Note for the Paper setter:** The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50  
External Assessment: 100

**Part-A**


Risk and Return: Concept of Risk, Components of Investment Risk, Measurement of Risk through Standard Deviation, Regression Equation, Covariance, Concept of Return, Expected Yield, Actual Yield, Holding Period Yield, Relationship between Risk and Return


Part-B


2. Investment Management - Lofthouse, Stephen, John Wiley & Sons Publications

INTERNATIONAL FINANCIAL MANAGEMENT

Course: BE-MBA X th Semester
Paper: Elective-Finance
Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50

External Assessment: 100

Part-A
Global Financial markets and interest rates: domestic and offshore markets, Euromarkets, Interest rates in the global money markets, money market instruments
Foreign exchange market: types of transactions and settlement dates, exchange rate quotations and Arbitrage, exchange rate determination and forecasting
Forwards, Swaps and Interest parity: Swaps and deposit markets, interbank forward dealing, option forwards, Exchange Rate Agreements and Foreign Exchange Agreements (FXA), Forward currency markets in India

Part-B
Currency and Interest rate futures: futures contracts, markets and trading process, future prices expected spot prices and forward prices, option pricing models, Over the Counter (OTC) market prices
Hedging , Speculation and Management of Transaction exposure: Hedging with money market, currency options, currency futures, internal hedging strategies
Management of Interest Rate Exposure: Forward Rate Agreements (FRAs), Interest

STRATEGIC FINANCIAL MANAGEMENT

Course : BE-MBA  X th Semester
Paper: Elective-Finance
Options, Futures and Corporate finance: call options, put options, valuing options, option – pricing formula, stocks and bonds as options, capital structure policy and options
Warrants and convertibles: difference between warrants and call options, warrant pricing and Black-Scholes model, value of convertible bonds
Derivatives and Hedging risk: forward contracts and futures contracts, interest-rate futures contracts, duration hedging

Part-B

International Corporate Finance: Foreign exchange markets and exchange rates, law of one price and purchasing-power parity, interest rates and exchange rates, interest rate parity, international bond marketing

References:
1. Mergers, Restructuring and Corporate Control, Weston, Chung, Hoag, PHI
2. Corporate Finance, Ross, Westerfield, Jaffe, TMH

Enterprise Resource Planning

Course: BE-MBA X th Semester
Paper: Elective-IT

Paper Code: IBM-1007 Time: 3 Hours
Course Duration: 45 Lectures of one hour each. Credits: 3

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50 External Assessment: 100

Part-A

ERP Package selection: Need assessment, Justifying ERP implementation, cost benefit analysis, ERP package evaluation and selection, make or buy decision
ERP systems development process: ERP implementation life cycle, planning, requirement analysis, reengineering vs customizing, transition strategies- big bang, phased, parallel, hybrid, implementation-hidden costs
ERP systems: Sales and Marketing- sales and distribution, sales forecasting, product pricing systems, billing systems ERP and Customer Relationship Management (CRM), Accounting and Finance- cash management process, capital budgeting process, financial accounting and management accounting Production and Materials management- MRP system, capacity planning process, manufacturing execution systems ,Human Resources-compensation and benefits administration

Part-B

Managing an ERP project: Risks in ERP implementation, managing large scale ERP projects, project team selection ,user training , technological challenges, operation and up gradation issues Role of consultants and vendors: maintenance of ERP system, future trends and directions in ERP, open source ERP systems

References

1. Enterprise Resource Planning, Mary Sumner, Pearson
2. Enterprise Resource Planning, Alexis Leon, TMH
DATA WAREHOUSING & DATA MINING

Course: BE-MBA  X th Semester
Paper: Elective-IT

Paper Code: IBM-1008  Time: 3 Hours
Course Duration: 45 Lectures of one hour each.

Credits: 3

Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50  External Assessment: 100

Part-A

Data Warehousing (DW): components of DW, DW and data marts, planning for DW, specifying business requirements, DW and Meta Data, dimensional modeling, slowly changing dimensions type1, 2 and 3, factless fact tables, aggregate fact tables, data extraction, transformation and loading (ETL), ETL tools, indexing the DW, DW and OLAP

Data mining: preprocessing data for data mining, descriptive data summarization, data cleaning, prediction modeling with simple linear regression and multiple regression, logistic regression

Classification data mining modeling: classification by decision tree induction, tree pruning, Bayesian classification, classification by back propagation in Neural networks

Part-B

Mining frequent patterns and associations: market basket analysis, Apriori Algorithm, web mining, web log analysis, text mining

Cluster analysis: interval scaled variables and binary variables, cluster analysis by partitioning, hierarchical methods, density based methods, clustering based on distance

Open source data mining software and proprietary software

References:

1. Data Mining –Concepts and Techniques, J.Han, Micheline Kamber, Elsevier
2. Data Mining –Methods and Models, Daniel T.Larose, Wiley
3. Data Mining- Galit Shimuli, Wiley
STRATEGIC HUMAN RESOURCE MANAGEMENT

Course: BE-MBA Xth Semester
Paper: Elective-HR

Paper Code: **IBM- 1009**
Time: 3 Hours

Course Duration: 45 Lectures of one hour each.

**Note for the Paper setter:** The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

Internal Assessment: 50
External Assessment: 100

**Part-A**

Introduction to Strategic Human Resource Issues, Challenges of Career development, Diverse work force development, self development, Pay-for-performance systems, Types of Pay-for-performance plans- individual based, team based, plant wide and corporate level

Hofstede’s cultural orientation model, FIRO-B questionnaire, Johari Window questionnaire, HR metrics and importance, Factor analysis in HR Research, competency mapping models and framework

**Part-B**

Determining the mix of Host-country and expatriate employees, the challenges of expatriate assignments, selective training, career development and compensation of expatriate employees, developing a global HR system and pay system, international staffing managing diversity, off shoring, equal employment opportunities, repatriation—problems and solutions, HR strategies and orientation for Mergers

Managing employee separation, Downsizing and outplacement, cost and benefits of employee separation, types of early separation (voluntary and Involuntary), features of early retirement policies, managing layoffs, alternatives to layoffs, the goals of outplacement.

3. Human Resource Research methods, Dipak Kumar Bhattacharyya, Oxford
MANPOWER PLANNING & PERFORMANCE APPRAISAL

Course : BE-MBA X th Semester
Paper: Elective-HR

**Paper Code: IBM-1010**

**Time: 3 Hours**

Course Duration: 45 Lectures of one hour each.

*Note for the Paper setter: The Semester question paper of a subject be of 50 Marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.*

Internal Assessment: 50

External Assessment: 100

**Part-A**

Manpower planning: setting up objectives, aligning manpower planning with strategic business goals, Role analysis, job analysis, job specification, job description

Recruitment and selection: recruitment and legislation, fair employment practices, recruitment, hiring procedure, forecasting human resource requirements, managing growth and replacement of top executives

**Part-B**

Performance appraisal: need for performance appraisal, parameters of performance appraisal, computerized performance appraisal systems, self appraisal questionnaire, 360 degree performance appraisal systems