



**UNIVERSITY OF JAMMU**  
**NOTIFICATION**  
**(11/Nov/ADP/40)**

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the competent authority, has been pleased to authorize :-

a) adoption of the revised Syllabi and Courses of Study in the following course Nos. of the subjects of Biotechnology, Microbiology and Biochemistry for Master's Degree Programme, given in annexure, for the examinations to be held in the years as indicated below against each alongwith %age of change :-

i) M.Sc. Bio-technology

S. No.	Course No. & Course Title	Semester	Examinations to be held in the years	%age of change
1.	BMB-410 (Biomolecules-II)	Ist	Dec. 2011, 2012 & 2013	More than 25%
2.	BMB-450 (Molecular Biology)	IIInd	May 2012,2013,2014	Less than 25%
3.	BMB-510(Genetic Engineering-II)	III	Dec. 2011	More than 25%
4.	BMB-556(Animal Bio-Technology)	IV	May 2012	Less than 25%

ii) M.Sc. Bio-Chemistry

S. No.	Course No. & Course Title	Semester	Examinations to be held in the years	%age of change
1.	BMB-409 (Biophysical and Bio-Organic Chemistry-II)	Ist	Dec. 2011, 2012 & 2013	More than 25%
2.	BMB-510(Genetic Engineering-II)	III	Dec. 2011	More than 25%
3.	BMB-555(Mammalian Hormones)	IV	May 2012	Less than 25%

iii) M.Sc. Microbiology

S.No.	Course No. & Course Title	Semester	Examinations to be held in the years	%age of change
1.	BMB-510(Genetic Engineering-II)	III	Dec. 2011	More than 25%

- b. continuation of the existing syllabi and courses of study in all the course nos in the subject of Biotechnology, Microbiology and Biochemistry for I & II semesters of Master's Degree Programme except course nos. mentioned in (a) for the examinations to be held in Dec. 2011, 2012 & 2013 (for 1st semester) and May 2012, 2013 & 2014 (for IInd semester).
- c. cancellation of the syllabi and courses of study of course no. **BMB-510 of the subject of Biotechnology, Microbiology and Biochemistry** for III semester of MDP already notified vide no.08/Dec./ADP/41 bearing endorsement No.F.Acd./87/08/9420-49 dated 22.12.2008 for the examination to be held in the year Dec. 2011.
- d. cancellation of the syllabi and courses of study in course no. **BMB-556(Animal Bio-Technology)** in the subject of Bio-Technology and **BMB-555(Mammalian Hormones)** of Bio-Chemistry for IV semester of MDP already notified vide no. Notified vide no.08/Dec./ADP/41 and endorsement No.F.Acd./87/08/9420-49 dated 22.12.2008 for the examination to be held in May 2012.

The alternative question papers are required to be set as per the regulations given below:-

- i). If the change in the syllabi and courses of study is less than 25%, no alternative question papers be set.
- ii). if the change is 25% and above but below 50%, alternative question papers be set for one year.
- iii). If the change is 50% and above or whole scheme is changed, alternative question papers be set for two years.

Sd/-  
REGISTRAR

F.Acd/XIX/11/7514-38  
Dated: 30/11/2011

Copy for information and necessary action to:

1. Special Secretary to Vice-Chancellor;
2. P.S. to Dean Academic Affairs
3. P.A. to Registrar
4. Sr. P.A. to Controller of Examinations;
5. Dean, Faculty of Life Sciences;
6. Convener, Board of Studies in Biotechnology;
7. All Members of the Board of Studies concerned;
8. Director, School of Biotechnology.
9. I/C D.R. (Publications/Eval. NP)
10. Asstt. Registrar (Exams. P.G / Conf./PRI) Conf. - M/Eval. NP)
11. C.A. to Controller of Examinations
12. S.O (Confidential);
13. Content Manager, University Website.

*Masht*  
Assistant Registrar (Acad)

22/11

UNIVERSITY OF JAMMU

SCHEME OF COURSES

M.Sc BIOTECHNOLOGY

(Effective Academic session 2011-12 and examination of December 2011 onwards)

**Semester-I:**

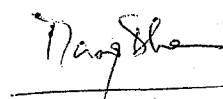
		Credits
BMB-400	Cell Biology	4
BMB-401	Biochemistry and Metabolism	4
BMB-402	Biomolecules	4
BMB-403	General and Applied Microbiology	4
BMB-410	Biomolecules – II	4
BMB-425	Laboratory Course-1 based on theory Course Nos. 400 & 403	4
BMB-426	Laboratory Course-2 based on theory Course Nos. 401 & 402	4
BMB-427	Laboratory Course-3 based on theory Course No.401 & 410	4

**Semester-II:**

BMB-450	Molecular Biology	4
BMB-451	Enzymology	4
BMB-452	Genetics	4
BMB-453	Immunology	4
BMB-475	Laboratory Course-1 based on theory Course Nos. 450 & 452	4
BMB-476	Laboratory Course-2 based on theory Course No.451	2
BMB-477	Laboratory Course-3 based on theory Course No.453	2

**Semester-III:**

BMB-500	Genetic Engineering	4
BMB-501	Plant Biotechnology	4
BMB-502	Bioprocess Engineering	4
BMB-503	Animal Biotechnology	4
BMB-509	Bioinformatics	4
BMB-510	Genetic Engineering – II	4



BMB-525	Laboratory Course-1 based on theory Course No.500	4
BMB-526	Laboratory Course-2 based on theory Course No.501	2
BMB-527	Laboratory Course-3 based on theory Course No.502	2
BMB-528	Laboratory Course-4 based on theory Course No.510	4
<b>Semester-IV:</b>		
BMB-550	Research Project	14
	i. Journal Club	2
	ii. Project Presentation and Viva-voce	4
	iii. Dissertation	8
BMB-551	Bioinformatics	4
BMB-552	Environmental Biotechnology	4
BMB-556	Animal Biotechnology	4
BMB-575	Laboratory Course-1 based on theory Course No.552	2

# UNIVERSITY OF JAMMU

## SCHEME OF COURSES

### M.Sc MICROBIOLOGY

(Effective Academic session 2011-12 and examination of December 2011 onwards)

#### Semester-I:

		Credits
BMB-400	Cell Biology	4
BMB-401	Biochemistry and Metabolism	4
BMB-404	Mycology and Phycology	4
BMB-405	Bacteriology and Virology	4
BMB-430	Laboratory Course-1 based on theory Course Nos. 400 & 401	4
BMB-431	Laboratory Course-2 based on theory Course Nos. 404 & 405	4

#### Semester-II:

BMB-450	Molecular Biology	4
BMB-451	Enzymology	4
BMB-452	Genetics	4
BMB-453	Immunology	4
BMB-475	Laboratory Course-1 based on theory Course Nos. 450 & 452	4
BMB-476	Laboratory Course-2 based on theory Course No.451	2
BMB-477	Laboratory Course-3 based on theory Course No.453	2

#### Semester-III:

BMB-500	Genetic Engineering	4
BMB-502	Bioprocess Engineering	4
BMB-504	Environmental Microbiology	4
BMB-505	Food Microbiology	4
BMB-509	Bioinformatics	4
BMB-510	Genetic Engineering - II	4

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BMB-530	Laboratory Course-1 based on theory Course No.500	4
BMB-531	Laboratory Course-2 based on theory Course No.502	2
BMB-532	Laboratory Course-3 based on theory Course No. 504	2
BMB-533	Laboratory Course-4 based on theory Course No.510	4

**Semester-IV:**

BMB-550	Research Project	14
	i. Journal Club	2
	ii. Project Presentation and Viva-voce	4
	iii. Dissertation	8
BMB-551	Bioinformatics	4
BMB-553	Medical Microbiology	4
BMB-557	Food Microbiology	4
BMB-576	Laboratory Course-I based on theory Course No.553	2

UNIVERSITY OF JAMMU

SCHEME OF COURSES

M.Sc BIOCHEMISTRY

(Effective Academic session 2011-12 and examination of December 2011 onwards)

**Semester-I:**

		Credits
BMB-400	Cell Biology	4
BMB-406	Vitamins and Minerals	4
BMB-407	Chemistry of Biomolecules	4
BMB-408	Bio-physical and Bio-organic Chemistry	4
BMB-409	Bio-physical and Bio-organic Chemistry-- II	4
BMB-427	Laboratory Course-1 based on theory Course Nos. 407 & 408	4
BMB-428	Laboratory Course-2 based on theory Course Nos. 400	2
BMB-429	Laboratory Course-3 based on theory Course No. 406	2
BMB-430	Laboratory Course-4 based on theory 407 & 409	4

**Semester-II:**

BMB-450	Molecular Biology	4
BMB-451	Enzymology	4
BMB-452	Genetics	4
BMB-453	Immunology	4
BMB-475	Laboratory Course-1 based on theory Course Nos. 450 & 452	4
BMB-476	Laboratory Course-2 based on theory Course No.451	2
BMB-477	Laboratory Course-3 based on theory Course No.453	2

**Semester-III:**

BMB-500	Genetic Engineering	4
BMB-506	Plant Biochemistry	4
BMB-507	Intermediary Metabolism	4
BMB-508	Nutritional Biochemistry	4

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BMB-509	Bioinformatics	4
BMB-510	Genetic Engineering- II	4
BMB-528	Laboratory Course-1 based on theory Course No.500	4
BMB-529	Laboratory Course-2 based on theory Course Nos.506 & 507	4
BMB-530	Laboratory Course-3 based on theory Course No.510	4
<b>Semester-IV:</b>		
BMB-550	Research Project	14
	i. Journal Club	2
	ii. Project Presentation and Viva-voce	4
	iii. Dissertation	8
BMB-551	Bioinformatics	4
BMB-554	Clinical Biochemistry	3
BMB-555	Mammalian Hormones	3
BMB-558	Nutritional Biochemistry	4



**M.Sc. BIOTECHNOLOGY  
SEMESTER-I**

**COURSE TITLE: BIO-MOLECULES--II**

**Course No: BMB-410**

Duration of Examination : 3 Hours

Contact hours	: 48
Credits	: 4
Max Marks	: 100
Semester Exam	: 80
Internal Assessment:	20
Total	: 100

**Syllabi for the examinations to be held in the years Dec.2011, Dec.2012 & Dec.2013**

**Objectives:** This course is intended to educate the students about rapid identification of and familiarization with the structural features of natural products commonly encountered in Biological materials. Studies on metabolic pathways are necessary to understand how bio molecules interact with each other in a living system. Also in this course students will get familiarised with the basic techniques used by the biologist in the routine experimentation. Since biotechnology is emerging as the most potent technology for commercial synthesis of pharmaceuticals and allied products, basic knowledge of Bio-molecules and the methodologies involved in their structural analysis will stand in good stead.

**UNIT-I: CHEMICAL FOUNDATIONS OF BIOLOGY AND STEREOCHEMISTRY**

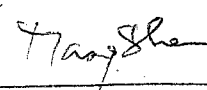
Chemical bonding including de-localization, and Hydrogen bonding. pH, pKa, pKb, Handderson-Haselbach equations. Muta-rotation, Z&E Nomenclature, Chirality in biphenyls, alkenes & spiranes, chirality with reference to monosaccharide, amino acids. Functional group detection by micro techniques. General principles and application of UV spectroscopy, Chromophore, auxochrome, UV spectra of  $\alpha$ ,  $\beta$ - Unsaturated ketones with special reference to steroids, CD, ORD. General principles of UV, IR spectroscopy, stretching and bending vibrations. IR absorption bands of common functional groups (hydroxyl, carbonyl, amides, amines).

**UNIT-II: MASS SPECTROSCOPY & NMR**

Principles of Mass spectrometry, RDA fragmentation Mc Lafferty rearrangement with special reference to steroids. Nuclear Magnetic Spectroscopy- $H^1$  NMR: Basic principles, chemical shift parameters; multiplicity factors controlling J values (coupling constant).  $C^{13}$ -NMR: Basic principle, Comparison of  $C^{13}$  and  $H^1$  nuclei for NMR studies. Structural elucidation of simple molecules like ethyl alcohol, ethyl acetate, benzene, phenols and their methyl ethers, glucose & its acetate.

**UNIT-III: ANALYTICAL TECHNIQUES**

Chromatography Techniques; TLC, Paper Chromatography, Chromatographic methods for macromolecule separation- Gel permeation, Ion exchange, Hydrophobic, Reverse- Phase and Affinity Chromatography, HPLC & FPLC. Electrophoretic Techniques; Theory and



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application of Polyacrylamide and Agrose gel electrophoresis, Capillary electrophoresis, 2D electrophoresis, Disc gel electrophoresis, gradient electrophoresis, Pulse Field gel electrophoresis Centrifugation; Basic principle, and theory (RCF, sedimentation coefficient), Types of Centrifuges- Microcentrifuge, High speed and Ultra centrifuge, preparative centrifugation, differential & density gradient\sedimentation equilibrium methods.

#### **UNIT-IV: STEROIDS, VITAMINS AND ANTIBIOTICS**

Biosynthesis of Cholesterol, structure of Cholesterol, Ergosterol (without synthesis), Steroidal Sex Hormones: Classification, structure of Estrone, Progesterone, Testosterone, Physiological importance of steroidal hormones. Non-Steroidal hormones, Structure of Vitamin A,B<sub>1</sub>,B<sub>2</sub>,B<sub>6</sub>,B<sub>12</sub>, Vitamin K, Vitamin P. Functions of Vitamins, Vitamin deficiency related diseases. Natural products as drugs; Antibiotics, Broad spectrum antibiotics, Penicillin and other modified forms. General structure of Cephalosporin along with modified forms and streptomycin.

#### **NOTE FOR PAPER SETTING**

The question paper will have 9 questions in all. Question 1 based on material from all 4 units will be compulsory and will have minimum of 4 parts. Besides, there will be 8 questions, two from each unit. The students will be required to attempt the compulsory question and four others, one from each unit.

#### **BOOKS RECOMMENDED:**

1. Segel, I.H. (1976) Biochemical Calculations. John Wiley and Sons.
2. Burger, A. (Latest Edition) Medicinal Chemistry, Part I, II and III.
3. Silverstein, R.M (2004). Spectrometric identification of organic compounds. John Wiley and sons, USA.
4. Finar, I.L (2007). Organic Chemistry, Vol.II.Pearson Education, Singapore.
5. Voet, D. And Voet, J.G.(2007). Biochemistry. John Wiley and Sons.
6. Freifelder, D. Physical Biochemistry. W.H. Freeman and Company, New York.

**M. Sc. BIOTECHNOLOGY  
SEMESTER - II**

**COURSE TITLE: MOLECULAR BIOLOGY**

**Course No. BMB - 450**

Duration of Examination: 3 hrs

Contact hours	:	48
Credits	:	4
Max Marks	:	100
Semester Exam	:	80
Internal Assessment	:	20
Total	:	100

**Syllabi for the examinations to be held in the years May 2012, May 2013 & May. 2014**

**Objectives:** In today's scientific world no biological study is complete till it is studied at the molecular level. This course will guide students about the basic background (physical and chemical) of molecular biology. The primary objective is to make students achieve a simple, comprehensive and interested view of basic composition of nucleic acids, their structure and their mode of replication. The study deals with conversion of genetic information coded in DNA to cellular macromolecules. The contents cover important aspects like, synthesis, modification and regulation of important cellular macromolecules, namely RNA and Protein.

**UNIT-I: DNA STRUCTURE, FUNCTION AND REPLICATION**

DNA as a genetic material, DNA Structure and function: Physical and chemical structure of DNA, Alternate forms of DNA A, B, Z; Alternate DNA structure H-, G- DNA loops; D-loop, R-loop cruciforms, hairpin loops; DNA structures; Primary, secondary, tertiary and quaternary DNA structure; Function of alternate forms and structure of DNA. Role of nucleotide sequence in determination of structure of DNA; Satellite and repetitive DNA. Denaturation analysis of DNA; denaturation curve and assesment of GC % and Tm, Hyper- and hypochromic effect of DNA. Linear and circular DNA, DNA supercoiling and topology. Single stranded as well as double stranded genomes. Replication of DNA, Replication of core genome and replication of extrachromosomal DNA, Elements and factors required for replication of core genome in eukaryotes, prokaryotes and viruses taking E.coli, yeast and phi X174 as models.

**UNIT-II: RNA STRUCTURE FUNCTION AND REPLICATION**

RNA Structure ( Physical and chemical structure) and Function. RNA as genetic material; RNA genomes; Single stranded as well as double stranded genomes. Replication of RNA genomes + sense, -ve sense, ambi-sense and ds RNA genomes. RNA as a structural molecule transfer and ribosomal RNA, RNA as a information molecule messenger RNA, RNA as an biocatalyst, Ribozymes, RNA as a regulatory molecule; RNAi and Antisense RNA; Introduction to various types of small nuclear, small nucleolar , small cytoplamic Mi and Si RNA molecules and their role in cell. Denaturation analysis of RNA.

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### **UNIT-III: GENE EXPRESSION - TRANSCRIPTION**

Mechanism of transcription in prokaryotes: Elements and factors involved in prokaryotes; Promoter sequences and regulatory factors, Operon concept; lac and ara operons. Mechanism of transcription in Eukaryotes: Gene activation in eukaryotes, Basal transcription apparatus, Eukaryotic promoter sequences, enhancers and silencers and general and specific factors. Initiation, elongation and termination of transcription. Regulation of transcription; Post transcriptional regulation: mRNA processing capping and polyadenylation, splicing and editing, nucleo-cytoplasmic transport, mRNA stability and degradation,

### **UNIT-IV: GENE EXPRESSION - TRANSLATION**

Genetic Code; Universality and degeneracy of code and exceptions to code, Wobble hypothesis, Codon bias. Mechanism of translation in prokaryotes: Elements and factors required for translation, Co-transcriptional translation, Initiation, elongation and termination of translation. Ribosome free translation, peptide synthesis. Mechanism of translation in Eukaryotes: Elements and factors required for translation, Initiation, elongation and termination of translation. Regulation of translation, co- and post translational modification of peptides, role of molecular chaperons.

### **NOTE FOR PAPER SETTING**

The question paper will have 9 questions in all. Question 1, based on material from all 4 units will be compulsory and will have minimum of 4 parts. Besides, there will be 8 other questions, 2 from each unit. The students will be required to attempt the compulsory question and 4 others, one from each unit.

### **BOOKS RECOMMENDED**

1. Watson G.D (2008). Molecular biology of the gene. Cold spring harbor Ltd Press.
2. Burton E (2008). Molecular Biology: gene to protein. Jones & Bartlett.
3. Clark & Pazdernik (2009). Biotechnology: applying the genetic revolution. Academic Press.
4. Hartwell(2004). Genetics from genes to genomes. Macgrawhill.
5. Russell (2006). Genetic: molecular Approaches. Pearson Press.
6. Lewin (2011). GenesX. Jones & Bartlett.

**M.Sc. BIOCHEMISTRY  
SEMESTER-I**

**COURSE TITLE: BIOPHYSICAL AND BIO-ORGANIC CHEMISTRY**

**Course No: BMB-408**

Duration of Examination: 3 Hours

Contact hours	: 48
Credits	: 4
Max Marks	: 100
Semester Exam	: 80
Internal Assessment:	20
Total	: 100

**Syllabi for the examinations to be held in the years Dec. 2011, Dec.2012 & Dec. 2013**

**Objectives:** This course is intended to educate the students about rapid identification of and familiarization with the structural features of natural products commonly encountered in Biological materials. Studies on metabolic pathways are necessary to understand how bio-molecules interact with each other in a living system. Also in this course students will get familiarised with the basic techniques used by the biologist in the routine experimentation. Since biochemistry is related to the commercial synthesis of pharmaceuticals and allied products, basic knowledge of Bio-molecules and the methodologies involved in their structural analysis will stand in good stead.

**UNIT-I: CHEMICAL FOUNDATIONS OF BIOLOGY AND STEREOCHEMISTRY**

Chemical bonding including de-localization, and Hydrogen bonding. pH, pKa, pKb, Handderson-Haselbach equations. Muta-rotation, Z&E Nomenclature, Chirality in biphenyls, alkenes & spiranes, chirality with refrence to monosaccharides, amino acids. Functional group detection by microtechniques. General principles and application of UV spectroscopy, Chromophore, auxochrome, UV spectra of  $\alpha,\beta$ - Unsaturated ketones with special refrence to steroids, CD, ORD. General principles of UV, IR spectroscopy, stretching and bending vibrations. IR absorption bands of common functional groups (hydroxyl, carbonyl, amides, amines).

**UNIT-II: MASS SPECTROSCOPY & NMR**

Principles of Mass spectrometry, RDA fragmentation Mc Lafferty rearrangement with special reference to steroids. Nuclear Magnetic Spectroscopy- $H^1$  NMR: Basic principles, chemical shift parameters; multiplicity factors controlling J values (coupling constant).  $C^{13}$ -NMR: Basic principle, Comparison of  $C^{13}$  and  $H^1$  nuclei for NMR studies. Structural elucidation of simple molecules like ethyl alcohol, ethyl acetate, benzene, phenols and their methyl ethers, glucose & its acetate.

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### UNIT-III: ANALYTICAL TECHNIQUES

Chromatography Techniques; TLC, Paper Chromatography, Chromatographic methods for macromolecule separation- Gel permeation, Ion exchange, Hydrophobic, Reverse- Phase and Affinity Chromatography, HPLC & FPLC. Electrophoretic Techniques; Theory and application of Polyacrylamide and Agrose gel electrophoresis, Capillary electrophoresis, 2D electrophoresis, Disc gel electrophoresis, gradient electrophoresis, Pulse Field gel electrophoresis. Centrifugation; Basic principle; and theory (RCF, sedimentation coefficient), Types of Centrifuges- Microcentrifuge, High speed and Ultra centrifuge, preparative centrifugation, differential & density gradient centrifugation, Applications (Isolation of cell components), Analytical centrifugation, Determination of molecular weight by sedimentation velocity and sedimentation equilibrium methods.

### UNIT-IV: STEROIDS, VITAMINS AND ANTIBIOTICS

Biosynthesis of Cholesterol, structure of Cholesterol, Ergosterol (without synthesis), Steroidal Sex Hormones: Classification, structure of Estrone, Progesterone, Testosterone, Physiological importance of steroidal hormones. Non-Steroidal hormones, Structural elucidation of Vitamin A, B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub>, B<sub>12</sub>, Vitamin K, Vitamin P. Functions of Vitamins, Vitamin deficiency related diseases. Natural products as drugs; Antibiotics, Broad spectrum antibiotics, Pencillin and other modified forms. General structure of Cephalosporins along with modified forms and streptomycin.

### NOTE FOR PAPER SETTING

The question paper will have 9 questions in all. Question 1 based on material from all 4 units will be compulsory and will have minimum of 4 parts. Besides, there will be 8 questions, two from each unit. The students will be required to attempt the compulsory question and four others, one from each unit.

### BOOKS RECOMMENDED:

1. Segel, I.H. (1976) Biochemical Calculations. John Wiley and Sons.
2. Burger, A. (Latest Edition) Medicinal Chemistry, Part I, II and III.
3. Silverstein, R.M (2004). Spectrometric identification of organic compounds. John Wiley and sons, USA.
4. Finar, I.L (2007). Organic Chemistry, Vol.II. Pearson Education, Singapore.
5. Voet, D. And Voet, J.G.(2007). Biochemistry. John Wiley and Sons.
6. Freifelder, D. Physical Biochemistry. W.H. Freeman and Company, New York.

## M. Sc BIOCHEMISTRY SEMESTER-III

### COURSE : GENETIC ENGINEERING – II

Course No. BMB-510

Duration of examination : 3 hours

Contact hours : 48

Credits : 4

Semester exam : 80

Internal assessment: 20

Total : 100

Syllabi for the examinations to be held in the years Dec. 2011, Dec. 2012 & Dec. 2013

**Objectives** : This course is the continuation of Molecular Biology course taught in Second semester of M. Sc programme. The aim of the course is to extend the student's understanding of new concepts and expertise in Molecular Biology and fundamentals of recombinant DNA technology.

#### UNIT-I: BASIC CONCEPT

Genetic Engineering guidelines and patenting of life forms. Isolation and purification of DNA from various organisms. Cloning vectors; plasmids, bacteriophages, cosmids and artificial chromosomes. Concept of cloning; gene centric cloning and genome centric cloning. Molecular tools used in cloning; restriction endonucleases, DNA, RNA ligases, kinases, terminal transferases, DNases, DNA phosphates, polynucleotide kinases. Gene tagging and transposon tagging as alternative strategies for gene cloning. Chromatin Immunoprecipitation, DNA-protein Interaction – electromobility shift assay. DNase-I footprinting; methyl interference assay.

#### UNIT-II: EXPRESSION CLONING

Types of expression cloning: PCR based cloning and cDNA based cloning. Comparing transcriptomes; differential screening, subtractive hybridization, differential display, array based methods and expressed sequence tags (EST) cloning. Construction of cDNA library; screening and analysis of genomic and cDNA library by function based and sequence based screening. DNA/RNA probes-radioactive and non-radioactive labeling, Southern, Northern and Western blotting, Strategies for heterologous gene expression; expression vectors, vector engineering and codon optimization, host engineering, *in vitro* transcription and translation.

#### UNIT-III: PCR AND ITS APPLICATION

Polymerase chain reaction and nucleic acid amplification. Primer design, fidelity of thermostable enzymes; DNA polymerases Types of PCR-multiplex, nested, reverse transcriptase, real time PCR, touchdown PCR, hot start PCR, colony PCR, cloning of

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PCR products; T-vectors; proof reading enzymes PCR in gene recombination; deletion addition Overlap extension and SOEing; Site specific mutagenesis PCR in molecular, diagnostics; Viral and bacterial detection; PCR based mutagenesis, Mutation detection: SSCP, DGGF, RFLP, Oligo Ligation Assay (OLA), MCC (Mismatch Chemical Cleavage, ASA (Allele-Specific Amplification), PTT (Protein Truncation Test).

#### **UNIT-IV: METHODOLOGIES**

DNA sequencing; Chemical degradation and chain termination methods, automated sequencing methods, pyrosequencing; their applications. Site directed mutagenesis and protein engineering; methods strategies and applications. Method to study promoters; reporter genes, gel retardation assay. Methods to study protein-protein interaction or cloning interacting genes and three hybrid system, cloning differentially active genes. Scope of genetic engineering; in health, medicine and agriculture. Molecular diagnostics and genetically engineered drugs and vaccines.

#### **BOOKS RECOMMENDED :**

1. Nicole (2002) Introduction to Genetic Engineering, Cambridge University Press
2. Primose S. B and Twyman (2006) Principles of gene manipulation and genomics. Wiley-Blackwell
3. Brown T.A. (2010) The basic principles of gene cloning and DNA analysis. Wiley-Blackwell
4. Richard J (2004) Analysis of gene & genomes. John Wiley and Sons Ltd.
5. Debnath M (2009) Principles of Genetic Engineering. Pointer Publishers Jaipur
6. Greene and Rao (1998) Recombinant DNA principles and methodologies. Marcel DeKker, New York.



# M. Sc. BIOTECHNOLOGY SEMESTER - IV

## COURSE TITLE: ANIMAL BIOTECHNOLOGY

Course No. BMB - 556  
Duration of Examination: 3 hrs

Contact hours	:	48
Credits	:	4
Max Marks	:	100
Semester Exam	:	80
Internal Assessment	:	20
Total	:	100

Syllabi for the examinations to be held in the years May 2012, May 2013 & May. 2014

**Objectives:** Animal biotechnology is the application of scientific and engineering principles to the processing or production of materials by animals for the benefit of humans. Examples include generation of transgenic animals or transgenic fish, using gene knockout technology to generate animals in which a specific gene has been inactivated, production of nearly identical animals by somatic cell nuclear transfer. The present course will familiarize the students about these aspects of modern biology.

### UNIT-I: FUNDAMENTALS OF CELL CULTURE

Introduction to animal cell and tissue culture, advantages and limitations. Cell culture: laboratory design and equipment, Cell culture media, serum and serum free media; Different tissue culture techniques including primary and secondary cultures; continuous cell lines; suspension culture. Mammalian cell cultures, cell separation, scaling up of suspension and monolayer cultures.

### UNIT-II: ANIMAL CELL CULTURE AND TYPES

Development, characterization of maintenance of cell lines, common cell culture contaminants. Cell synchronization, measurement of cell viability and cytotoxicity, cryopreservation; Cell transformation (phenotypic properties of transformation); Organ, Organotypic and Histotypic culture; three dimension culture; concept and importance of Tissue engineering, Stem cell culture and its applications.

### UNIT-III: APPLICATIONS OF ANIMAL CELL CULTURE

Conventional methods of animal vaccine production, recombinant approaches to vaccine production; Hybridoma technology, applications of animal cell culture for *in vitro* testing of drugs, production of human and animal viral vaccine and pharmaceutical proteins, Antigen-antibody based diagnostic assay, Somatic cell cloning and hybridization, micro-organism and protein used as probiotics, lactic acid bacteria as live vaccine, application of probiotics for humans, farm animals and poultry.

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## UNIT-IV: ANIMAL CLONING

Animal cloning; basic concept, cloning from embryonic cells and adult cells; cloning of different animals, ethical, social and moral issue related to cloning. Human cloning benefits and risk of cloning. In vitro fertilization, culture of embryo and embryo transfer in livestock. Gene-knock out technology and animal models for human genetic disorders. Transgenic animal production, animals as bioreactor.

### NOTE FOR PAPER SETTING

The question paper will have 9 questions in all. Question 1, based on material from all 4 units will be compulsory and will have minimum of 4 parts. Besides, there will be 8 other questions, 2 from each unit. The students will be required to attempt the compulsory question and 4 others, one from each unit.

### BOOKS RECOMMENDED

1. Freshney, R.I. (2000) Culture of animal cells: a manual of basic technique. John Wiley and Sons Inc., USA.
2. Morgan, S.I. (2004) Animal Cell Culture, Bio Scientific Publishers Ltd., Oxford.
3. Butler, M. (1991) Mammalian Cell Biotechnology: A practical approach. IRL Press Oxford.
4. Kuchler, R.J. (1997) Biochemical methods in Cell culture and Virology, Dowden, Hutchinson and Ross, Inc., USA.
5. Mather, J. P. and Brans D. Animal cell culture methods, Methods in Cell Biology, Vol. 57, Academic Press.
6. Satyanarayana, U. (2005) Biotechnology. Books and Allied (p. Ltd.,)
7. Das, H. K. (2005) Textbook of Biotechnology. Wiley Dreamtech, India Pvt. Ltd.
8. Ranga, M.M. (2007). Animal Biotechnology. Agrobios Pub. India. 2<sup>nd</sup> edition.
9. Portner R.2007. Animal Cell Biotechnology, Humana Press.
10. Springer TA. 1985. Hybridoma Technology in Biosciences and Medicine, Plenum Press.
11. Barry R Bloom, Paul- Henri Lambert 2002: the vaccine book, Academic Press.
12. Huffnagle GB 7 Wernick S.2007. The probiotics Revolution: The Definitive guide to safe natural health, Banatm Books.

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**M. Sc BIOCHEMISTRY  
SEMESTER-IV**

**COURSE TITLE: MAMMALIAN HORMONES**

**Course No. : BMB-555**

Duration of examination : 2.5 hours

Contact hours :	36
Credits :	3
Max. Marks :	75
Semester exam:	60
Internal assessment:	15
Total :	75

**Syllabi for the examinations to be held in the years May, 2012, May 2013 & May, 2014**

**Objectives:** This course deals with the mammalian hormones, both endocrine and exocrine in nature and covers the hormones that are either derived from amino acids or are short peptides and polypeptides and their regulation and mechanism of action, including that through signal transduction processes. Steroidal hormones or those derived from fatty acids, including those that act locally, are also to be covered.

**UNIT-I : GENERAL CONCEPTS AND THE HORMONES OF THE PITUITARY AND HYPOTHALAMUS**

Definition and classification of hormones, receptors of hormones on cell surfaces, transport of hormones, mechanism of action of hormones. **Hormones of hypothalamus;** growth hormone releasing hormones (GHRH & GHIRH), Gonadotropin release hormones (GnRH viz; FSH-RH & LH-RH), Thyroid stimulating release hormones (TSH-RH), Somatostatin, Corticotropin release hormones (CRH), Melanocyte stimulating release hormone (MSH-RIH), Dopamine. **Hormones of pituitary glands :** Adenohypophysial hormones: Growth Hormone (GH), Prolactin, Thyroid stimulating hormones (TSH), Adrenocorticotropic hormones (ACTH), Gonadotropic Hormones (FSH & LH), Melanocyte stimulating hormone (MSH) Neurohypophysial hormones : Oxytocin, Vasopressin.

**UNIT-II: HORMONES OF PANCREAS, THYROID PARATHYROID AND GASTROINTESTINAL TRACT – STRUCTURE, SYNTHESIS AND FUNCTIONS**

Insulin, Glucagon, T3 and T4, Thyrocalcitonin, Parathormone, Erythropoietin, Angiotensin, Kallikrein, Somastostatin, Somatomedin, GABA, 5-OH Tryptamine, Epigastrin, Gastrin, Cholecystokinin, Leptin, Placental Hormones.

**UNIT-III: STEROID HORMONES OF ADRENALS AND GONADS – STRUCTURE; SYNTHESIS AND FUNCTION**

Epinephrine, Nor-epinephrine, Glucocorticoids; cortisol, cortisone: Mineralo-corticoids: aldosterone; Estrogens, progesterone and androgens (testosterone), Eicosanoids: Prostaglandins, Thromboxines and leukotrienes.

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## NOTE FOR PAPER SETTING

The question paper will have 7 questions in all. Question 1, based on material from all 3 units will be compulsory and will have minimum of 3 parts. Besides, there will be 6 other questions, two from each unit. The students will be required to attempt the compulsory question and three others, one from each unit.

## BOOKS RECOMMENDED :

1. Guyton and Hall (2007), Textbook of medical Physiology, Gopsons Paper Ltd. 10<sup>th</sup> edition.
2. Smith, Rae, Backett (2005), Clinical Biochemistry. Blackwell Science 6<sup>th</sup> edition.
3. Burtis Carl, A. Ashwood, R. Edward (2008). Fundamentals of Clinical Chemistry, 5<sup>th</sup> edition.
4. Marschall, Clinical Biochemistry
5. Montgemery: Biochemistry
6. Ganong, F. William, Review of Medical Physiology, 20<sup>th</sup> edition.
7. Das, Debajyoti, Biochemistry, Academic Publishers.