NEP-2020 BASED CURRICULA AND EXAMINATION SCHEME,
UNIVERSITY OF KOTA, KOTA

B. Sc. Microbiology

programme

CBCS pattern

DEPARTMENT OF MICROBIOLOGY

UNIVERSITY OF KOTA
MBS Marg, KOTA (Rajasthan)-324 005
INDIA

COURSE CODE:5700

Type of the Course: Professional

Title of the Course: B. Sc. Microbiology

Level of the Course: UG level

Credit of the Course: 120

Delivery subtype of the Course: Practical

DURATION: Six Semesters (Three Years)

COURSE STRUCTURE

1. The learning outcome-based curriculum framework for B.Sc. Microbiology is intended to provide a comprehensive foundation for the subject and to develop the abilities of the students with required skills for continuing with their further studies and research. The present syllabus focuses on students' needs, skills development, interdisciplinary approach to learning, and enhancing employability.
2. For admission, students from Science Biology stream with 10+2 (HS exam) or equivalent, ISC, CBSE exam will be eligible.

OBJECTIVE OF PROGRAM

To convey scientific and technological knowledge and information with modern age orientation. To help young learners and realize that science and technology, both hand in hand can enrich and develop a personality, thus promising a life of success and achievement.

Hyperlinks of suggested e resources on University website and on web

NPTEL and UGC epathsala, SWAYAM, MH Education, GeoGebra and MS Excel toolbox
https://link.springer.com/
https://www.tandfonline.com/
https://onlinelibrary.wiley.com/
https://ghr.nlm.nih.gov/resources#inheritance
https://opentextbc.ca/biology/chapter/10-1-cloning-and-geneticengineering/
http://www.hoajonline.com/molbiolgeneteng
https://www.yourgenome.org/facts/what-is-genetic-engineering
https://www.immunology.org/
https://onlinelearning.hms.harvard.edu/hmx/courses/hmximmunology
https://www.rcsb.org/
http://jgi.doe.gov/our-science/
https://www.genengnews.com/
http://biosafety.icgeb.org/in
https://iop.vast.ac.vn/theor/conferences/smp/1st/kaminuma/SWISSPROT/ index.html

http://www.ipindia.nic.in/
http://www.nbaindia.org
http://www.envfor.nic.in/ divisions/csurv/geac/annex-5.pdf
https://www.hhs.gov/vaccines/about/resources/smart-vaccinetool/index.html
https://www.cdc.gov/vaccines/pubs/pinkbook/index.html
https://www.embl.org/
https://www.cathdb.info/
Science Daily, Nature News, Science News
Nature Microbiology,
Visual Media
1. The Inner Life of the Cell 2. Mitosis World Movies 3. Davidson College Biology Videos 4. Borisy Lab Movie Page 5. The Biology Project Meiosis I and II Movies

Assessment Pattern:

The assessment of the students shall be divided into two parts in which first part is continuous assessment or internal assessment or mid-term assessment (30% weightage of the maximum marks) and second part is semester assessment or external assessment or end-term assessment (70% weightage of the maximum marks). Assessment pattern and distribution of maximum marks is summarized as given below:

(i) Continuous or Internal or Mid Term Assessment:

(a) The continuous or internal or mid-term assessment (30% weightage of the maximum marks) for each theory paper shall be taken by the faculty members of the respective Departments during each semester. There will be three internal assessment tests (*i.e.*first internal assessment test or first mid-term test and second internal assessment test or second mid-term test and third internal assessment test) each of 10% weightage of maximum marks of each theory paper. Each internal assessment shall be of one hour duration for theory paper and shall be taken according to academic calendar which will be notified by the Department / University.

(b) For practical papers, there will be no continuous or internal or mid-term assessment. There will be only one external or semester or end-term assessment (100% weightage of maximum marks).

(ii) Semester or External or End Term Assessment:

(a) The semester or external or end-term assessment (70% weightage of the maximum marks) shall be three hours duration to each theory paper and twelve hours duration (spread over two days with 6 hours per day) for each practical paper and shall be taken by the University at the end of each semester.

(b) The syllabus for each theory paper is divided into five independent units and question paper for each theory will be divided into three sections as mentioned below:

Section-A *will carry 20 marks with one compulsory question comprising ten short answer type questions taking two questions from each unit. Each question shall be of two marks.*
Section-B *will carry 50 marks with equally divided into five long answer type questions . Paper setter shall be advised to set two questions from each unit and students are instructed to attempt five questions by selecting one question from each unit.*

(c) The syllabus of practical paper is divided according to main streams of Biotechnology. Marks shall be awarded on the basis of major & minor experiments, spotting, viva-voce, practical record, regularity factor, lab skills, maintain cleanness of workplace, *etc*.

Question Paper Pattern:

(A) Continuous or Internal or Mid Term Assessment:

30% weightage of Maximum Marks (30 Marks out of 100 Maximum Marks).

(i) Continuous or Internal or Mid Term Assessment:

Format

Department of .....
College / University .....
Address.....

First Internal Assessment Test 20… - 20….

Class	**:**	**Max. Marks**	**: 10 Marks**
Semester	**:**	**Duration of Exam.**	**:**
Subject	**:**	**Date of Examination**	**:**
Paper	**:**	**Name of Teacher**	**:**

Note: All questions are compulsory and marks are given at the end of the each question. Two or three sub-divisions may be given in the question.

Q. No. 1. ……..
or……4 Marks
Q. No. 2. ……..
or……3 Marks
Q. No. 3. ……..
or……3 Marks

(B) Semester or External or End Term Assessment:

70% weightage of Max Marks (*i.e.*70 Marks out of 100 Max Marks).

Duration of Examination: 3 Hours **Max. Marks: 70**

Note*: The syllabus is divided into five independent units and question paper will be divided into three sections.*

- ***Section-A*** *will carry 20 marks with one compulsory question comprising ten short answer type questions taking two questions from each unit. Each question shall be of one mark.*
- ***Section-B*** *will carry 50 marks with equally divided into five long answer type questions . Paper setter shall be advised to set two questions from each unit and students are instructed to attempt five questions by selecting one question from each unit.*

SECTION-A

Q. 1.

Unit-I

(i) …… **2 Mark**
(ii) …… **2 Mark**

Unit-II

(iii) …… **2 Mark**
(iv) …… **2 Mark**

Unit-II

(v) …… **2 Mark**
(vi) …… **2 Mark**

Unit-IV

(vii) …… **2 Mark**
(viii) ..…… **2 Mark**

Unit-V

(ix) …… **2 Mark**

(x) …… **2 Mark**

SECTION-B

Unit-I

Q. 2. ……..…… **10 Marks**
or ……...…… **10Marks**

Unit-II

Q. 3. ……...……**10 Marks**
or ……..…..…… **10 Marks**

Unit-III

Q. 4. ……..…… **10 Marks**
or ……..…… **10 Marks**

Unit-IV

Q. 5. . ……..…… **10 Marks**
or ……..…….. **10Marks**

Unit-V

Q. 6. ……....…… **10 Marks**
or ……..… **10 Marks**

Practical Examinations:

Continuous or Internal or Mid Term Assessment: *Not applicable in practical.*
External or Semester or End Term Assessment:
Duration of Exam : 6 Hours
Maximum Marks : 150 Marks*
Distribution of Maximum Marks:

S. No.	Name of Exercise	Marks
1.	Exercise No. 1 : Major Experiment	12
2.	Exercise No. 2 : Major Experiment	12
3.	Exercise No. 3 : Major Experiment	12
4.	Exercise No. 4 : Minor Experiment	10
5.	Exercise No. 5 : Minor Experiment	10
6.	Exercise No. 6 : Minor Experiment	10
7.	Exercise No. 7: Preparation	8
8.	Exercise No. 8: Preparation	8
9.	Exercise No. 9: Preparation	8
10.	Exercise No. 10 : Spotting Experiment(5 x 3 = 15spots)	30
11.	Record (5x3)	15
12.	Viva-voce	15
Total Marks		**150**

Semester-wise Details

First Year

Year / Semester	Serial Number, Code & Nomenclature of Paper				Duration of Exam	Teaching Hrs/Week & Credit			Distribution of Marks			Min. Pass Marks	
	Number	Code		Nomenclature		L	P	C	Inter-nal Assess.	Sem. Assess.	Total Marks	Internal Assess.	Sem. Assess.
I Year **I Semester**	1.1	BMB01	DCC	Principles of Microbiology	3 Hrs	4	--	4	30	70	100	12	28
	1.2	BMB02	DCC	Cell Biology and Microbial Genetics	3 Hrs	4	--	4	30	70	100	12	28
	1.3	BMB03	DCC	Diversity of Microbes	3 Hrs	4	--	4	30	70	100	12	28
	1.4	BMB04	DCC	Practical-I	6 Hrs	--	12	6	--	150	150	--	75
	1.9 & 1.10	AEC	AEC	Hindi/English	1.5 Hrs	2	---	2	---	50	50	--	20
	Semester Total					**14**	**12**	**20**	**90**	**410**	**500**	**--**	
I Year **II Semester**	2.1	BMB05	DCC	Fundamentals of Biochemistry	3 Hrs	4	--	4	30	70	100	12	28
	2.2	BMB06	DCC	Fundamentals of Molecular Biology	3 Hrs	4	--	4	30	70	100	12	28
	2.3	BMB07	DCC	Basic Immunology	3 Hrs	4	--	4	30	70	100	12	28
	2.4	BMB08	DCC	Practical-II	6 Hrs	--	12	6	--	150	150	--	75
	1.9 & 1.10	AEC	AEC	English/Hindi	1.5 Hrs	2	---	2	---	50	50	--	20
	Semester Total					**14**	**12**	**20**	**90**	**410**	**500**	**--**	
	First Year TOTAL					**28**	**24**	**40**	**180**	**820**	**1000**	**--**	
Option for exit with Certificate in Microbiology (40 credits score)													

Semester I

Paper 1.1. BMB – 01 PRINCIPLES OF MICROBIOLOGY

Course Type : Core **Credits:4**

Duration :3 hrs Continuous/Internal/Assessment : 30 Marks
Semester Assessment : 70 Marks

Note*: The syllabus is divided into five independent units and question paper will be divided into two sections.*

- ***Section-A*** *will carry 20 marks with one compulsory question comprising ten short answer type questions taking two questions from each unit. Each question shall be of two marks.*
- ***Section-B*** *will carry 50 marks with equally divided into five long answer type questions (answer about in 400 words). Paper setter shall be advised to set two questions from each unit and students are instructed to attempt five questions by selecting one question from each unit.*

UNIT- I

Overview of history of Microbiology - Biogenesis and abiogenesis Contributions of Redi, Spallanzani, Needham, Pasteur, Tyndal, Joseph Lister, Koch, Edward Jenner and Flemming, Scope of Microbiology.

UNIT- II

Classification of Microbes - Systems of classification, Numerical taxonomy, Identifying characters for classification, General properties and principles of classification of microorganisms Systematics of bacteria, Nutritional types [Definition and examples]. Classification on the basis of oxygen requirement.

UNIT-III

Stains and staining techniques – Definition of auxochrome, chromophores, dyes, Classification of stains, Theories of staining, Mechanism of gram staining, acid fast staining, negative staining, capsule staining, flagella staining, endospore staining
Sterilization: – disinfectant's, antiseptics, Sanitizers, microbiocides, microbiostatic, Principle and methods: Physical Methods and Chemical methods.

UNIT- IV

Kinetics of Bacterial growth: Different types of bacterial culture, Growth Phases, Growth Kinetics, Calculation of duration of Phases and generation time, Growth yields, Methods of growth determination, Environmental factors affecting growth.

UNIT- V

Basic concepts of Microbes: General characteristics and functions of Microbes, Structures of Microbes, Importance of Cell shape cell size in rods and cocci, septum formation, cell elongation, brief outline of Microbial cell wall synthesis and cell separation, Bacterial Sporulation.

Reference Books:

1. Microbiology, Authors- Pelczar, Chan and Kreig.
2. Microbiology- an Introduction- (8th Edn), Authors- Tortora, G.J., Funke, B.R., Case, C.L.

3. General Microbiology, Authors- Stainer, Ingharam, Wheelis and Painter.
4. Microbial Physiology, Authors- Moat and Foster.
5. A Text book of Microbiology, Authors- P. Chakraborty.
6. Textbook of Microbiology, Authors- Dubey and Maheshwari.
7. Microbiology, A Practical Approach. Authors- Patel and Phanse
8. General Microbiology, Authors- Powar and Daginawala.
9. Microbiology, Author- S.S. Purohit.
10. Microbiology, Authors- Presscott, Herley and Klein.
11. Bacteriology, Authors- Topley and Wilson.

Semester I

Paper 1.2. BMB 02- CELL BIOLOGY AND MICROBIAL GENETICS

Course Type : Core **Credits:4**

Duration :3 hrs
Continuous/Internal/Assessment : 30 Marks
Semester Assessment : 70 Marks

Note*: The syllabus is divided into five independent units and question paper will be divided into two sections.*

- ***Section-A*** *will carry 20 marks with one compulsory question comprising ten short answer type questions taking two questions from each unit. Each question shall be of two marks.*
- ***Section-B*** *will carry 50 marks with equally divided into five long answer type questions (answer about in 400 words). Paper setter shall be advised to set two questions from each unit and students are instructed to attempt five questions by selecting one question from each unit.*

UNIT- I

Ultra Structure of Prokaryotic and Eukaryotic Cell.
Structure and Function of Cell components: Cell Wall, Plasma Membrane, Endoplasmic Reticulum, Golgi apparatus, Lysosome, Peroxisome, Ribosome,Chloroplast, Mitochondria, cytoskeleton (Microfilament, Microtubule and Intermediate Filaments).

UNIT- II

Nucleus: Nuclear envelope, nuclear pore complex. Chromatin – Molecular organization.Nucleolus. Structure of chromosome. Nucleosome model, euchromatin and heterochromatin, karyotype. Special types of Chromosomes (Polytene and Lampbrush Chromosome.)

UNIT- III

Cell cycle: Amitosis, mitosis and meiosis. Components of cell cycle control system, Programmed cell death (Apoptosis). Cell Signalling. Function of cell surface receptors.

UNIT- IV

Methods of genetic recombination: Conjugation, transformation, transduction (Generalized transduction, specialized transduction) and sexduction.
Plasmid- Structure, properties and types. Genetic recombination and site-specific recombination.

UNIT -V

Mutation: spontaneous and induced mutation. Mutagens –Physical and chemical mutagens. DNA damage and repair: Photoreactivation & SOS repair. Transposable elements of prokaryotes–Types and significance.

Reference Books:

1. Molecular Biology of Cell- Bruce Alberts et al, Grand publications.
2. Cell Biology- Ambrose & DorouthyMasty, ELBS Publications.
3. Fundamentals of Cytology- Sharp, McGraw Hill Company.
4. Cytology- Wilson &Marrison, Reinform Publications.
5. Cell Biology and Molecular Biology- EDP Robertis and EMF robertis, Sauder College.
6. Cell Biology, Genetics and Evolution & Ecology P.S. Verma and Agarwal.
7. Cell Biology: A lab manual. Shanmucan. Mc Millan India Ltd.
8. Genetics- Strickberger, 2nd.
9. Microbial Genetics – D. Frifielder.
10. Baltimore- Molecular Biology of the Cell

Semester I

Paper 1.3. BMB 03- DIVERSITY OF MICROBES

Course Type : Core **Credits:4**

Duration :3 hrs Continuous/Internal/Assessment : 30 Marks
Semester Assessment : 70 Marks

Note*: The syllabus is divided into five independent units and question paper will be divided into two sections.*

- ***Section-A*** *will carry 20 marks with one compulsory question comprising ten short answer type questions taking two questions from each unit. Each question shall be of two marks.*
- ***Section-B*** *will carry 50 marks with equally divided into five long answer type questions (answer about in 400 words). Paper setter shall be advised to set two questions from each unit and students are instructed to attempt five questions by selecting one question from each unit.*

UNIT – I

Whittaker's classification system. Hackel's three kingdom, Carl Woes classification. Important archaeal and eubacterial groups according to Bergey's Manual of Systematic Bacteriology. Study of ultra structure of typical prokaryotic cell and eukaryotic cell, comparative account.

UNIT – II

Classification and General characteristics of algae - Occurrence, thallus organization, algae cell ultra-structure, pigments, flagella, eyespot food reserves and vegetative, asexual and sexual reproduction. Different types of life cycles in algae. Applications of algae in agriculture, industry and environment.

UNIT – III

Classification and General characteristics of fungi - habitat, nutritional requirements, ultra-structure, thallus organization, asexual reproduction, sexual reproduction, heterokaryosis, heterothallism and parasexual mechanism. Economic Importance. Protozoa: General characteristics, vegetative & reproductive structure.

UNIT – IV

Definition, history of virology, General characteristics of viruses – size, shape and chemical composition, classification of viruses. Structure and General Characteristics of viroids, virusoids, satellite viruses and Prions. Multiplication of bacterial viruses (lytic and lysogenic cycles).

UNIT – V

Eubacteria: Cell morphology, function, reproduction of Photosynthetic eubacteria, Gram positive eubacteria (Actinomycetes), Spore forming bacteria (spore formation and germination), Sulfur bacteria, Nitrogen fixing bacteria and mycoplasma.
Archaea: General characteristics, structure, metabolic character, function, reproduction and application.
Cyanobacteria: General characteristics and economic importance.

Reference Books:

1. Microbiology: An Introduction by Tortora GJ, Funke BR and Case CL., 9th Ed., Person Education, 2008.
2. Microbiology by Pelczar Jr MJ, Chan ECS and Krieg NR. 5th Ed. Tata McGraw Hill, 2011 (Reprint),
3. Black JG (2008) Microbiology: Principles and Explorations. 7th edition. Prentice Hall.
4. Madigan MT and Martinko JM (2006) Brock Biology of Micro-organisms. 8th edition. Parker J. Prentice Hall International, Inc.
5. Stanier RY, Ingraham JL, Wheelis ML and Painter PR. (2005) General Microbiology. 5thedition. McMillan 4.
6. Srivastava S and Srivastava PS (2003). Understanding Bacteria. Kluwer Academic Publishers, Dordrecht.

Semester I

Paper 1.4. PRACTICALS

1. Microbiology Good Laboratory Practices
2. Principles, working knowledge of Instruments like Autoclave, pH meter, Incubator, Hot air oven, Centrifuge, Microscope, Refrigerator, Colony counter,
3. Laminar Air Flow. BOD incubator used in the microbiology laboratory.
4. Cleaning and sterilization of glassware's.
5. Measurement of microorganisms.
6. Preparation of culture media: PDA, BG-11, Nutrient Agar.
7. Preparation of stains.
8. Motility of bacteria by Hanging drop method.
9. Staining procedures I- Simple staining –Negative staining.
10. Staining procedures II- Differential staining - Gram Staining and Acid-Fast Staining.
11. Staining procedures III- Special / Structural staining -Capsule staining, Endospore staining.
12. Sterilization of medium using Autoclave and assessment for sterility.
13. Sterilization of glassware using Hot Air Oven and assessment for sterility.
14. Demonstration of the presence of microflora in the environment by exposing nutrient agar plates to air.
15. Mitosis in onion root tip
16. Identification of giant chromosome in Chironomus larvae
17. Cell Counting and viability
18. Blood Smear Preparation.
19. Separation of cell organelles by sucrose gradient.
20. Preparation and study of various stages of mitosis and meiosis.
21. Isolation of plasmid DNA from bacteria.
22. Preparation of competent.

23. Restriction enzyme digestions and its analysis by gel electrophoresis.
24. U.V. Induced Mutagenesis.
25. Bacterial transformation by $CaCl_2$ method)
26. Transduction in *E. coli.*
27. Conjugation in *E. coli.*
28. Study of *Rhizopus*, *Penicillium*, *Aspergillus, Saccharomyces* using temporary mounts.
29. Study of *Spirogyra* and *Chlamydomonas, Volvox* using temporary mounts .
30. Study of the following protozoans using permanent mounts/photographs:*Amoeba*, *Entamoeba*, *Paramecium* and *Plasmodium*

Semester II

Paper 2.1. BMB-04 FUNDAMENTALS OF BIOCHEMISTRY

Course Type : Core **Credits:4**

Duration :3 hrs
Continuous/Internal/Assessment : 30 Marks
Semester Assessment : 70 Marks

Note*: The syllabus is divided into five independent units and question paper will be divided into two sections.*

- ***Section-A*** *will carry 20 marks with one compulsory question comprising ten short answer type questions taking two questions from each unit. Each question shall be of two marks.*
- ***Section-B*** *will carry 50 marks with equally divided into five long answer type questions (answer about in 400 words). Paper setter shall be advised to set two questions from each unit and students are instructed to attempt five questions by selecting one question from each unit.*

UNIT – I

Bioenergetics: Principles of bioenergetics. First and second laws of Thermodynamics. Definition of Gibb's Free Energy, Enthalpy and Entropy.
Energy rich compounds: Phosphoenolpyruvate, 1, 3- Bisphosphoglycerate.

UNIT – II

Carbohydrates: Structural aspects – Introduction & Occurrence, Classification of Mono-, Di- and Polysaccharides, Reducing & Non-reducing Sugars, Constitution of Glucose & Fructose, Osazone formation, Pyranose & Furanose forms, Determination of ring size, Inter-conversion of monosaccharides

UNIT – III

Lipids: Structural aspects – General introduction, Classification & Structure of Simple & Compound lipids, Properties of Lipid aggregates (elementary idea), Biological membrane, Membrane protein – structural aspects, Lipoproteins.

UNIT – IV

Proteins: Structural aspects – General introduction, Classification & General characteristics, Structure of Primary, Secondary, Tertiary & Quaternary proteins, Classification of Amino acids.

UNIT – V

Nucleic acid: Structural aspects – Components of DNA and RNA, Nucleosides & Nucleotides (introduction, structure & bonding), Double helical structure of DNA (Watson-Crick model), various forms of DNA.
Enzymes An introduction to enzyme; Reaction rate; Thermodynamic definitions; Principles of catalytic power and specificity of enzymes; Enzyme kinetics – Approach to mechanism.

References:

1. Lenhinger. Principles of Biochemistry, Nelson & Cox, 4th Edition.
2. Voet &Voet Donald. 3rd Edition. Fundamentals of Biochemistry, J/W.
3. U Satyanarayan, Biochemistry, 3rd Edn, Books and Allied Pvt. Ltd.
4. Stryer – Biochemistry. W.H.Freeman & Co.
5. Price & Steven, Fundamentals of Enzymology,3rd Edition
6. Geoffrey Cooper. The cell with CD- Rom. Sinauer Asso. Incorp.
7. Elliott & Elliot.3rd Edition Biochemistry and molecular biology.
8. Boyer, Concepts in biochemistry. Thomson
9. Plumner. An introduction to practical Biochemistry,3rd Edition
10. J.Jayraman. Lab Manual in Biochemistry.

Semester II

Paper 2.2. BMB-05 FUNDAMENTALS OF MOLECULAR BIOLOGY

Course Type : Core **Credits:4**

Duration :3 hrs

Continuous/Internal/Assessment : 30 Marks
Semester Assessment : 70 Marks

Note*: The syllabus is divided into five independent units and question paper will be divided into two sections.*

- ***Section-A*** *will carry 20 marks with one compulsory question comprising ten short answer type questions taking two questions from each unit. Each question shall be of two marks.*
- ***Section-B*** *will carry 50 marks with equally divided into five long answer type questions (answer about in 400 words). Paper setter shall be advised to set two questions from each unit and students are instructed to attempt five questions by selecting one question from each unit.*

UNIT-I

DNA Structure: Miescher to Watson and Crick- historic perspective, DNA structure, Types of DNA, Types of genetic material, denaturation and renaturation kinetics, cot curves. DNA topology: linking number, topoisomerases, Organization of genetic material in prokaryotes and eukaryotes. Concept of gene. Evidence for the role of DNA and RNA as the genetic material.

UNIT-II

DNA replication in prokaryotes and eukaryotes: Mechanism of DNA replication and Regulation of DNA replication Various models of DNA replication, DNA damage and Repair mechanism, Fidelity of DNA replication and proof reading.

UNIT-III.

Structural features of RNA and types, Transcription in Prokaryotes and Eukaryotes: Definition, difference from replication, promoter - concept and strength of promoter RNA Polymerase and the transcription unit. Transcription in Eukaryotes: RNA polymerases, general Transcription factors. Post transcriptional processing: capping, tailing and splicing.

UNIT-IV

Genetic code, anticodon, Wobble hypothesis. Translation in Prokaryotes and Eukaryotes: Mechanisms of initiation, elongation and termination of polypeptides in both prokaryotes and eukaryotes, Fidelity of translation, Inhibitors of protein synthesis in prokaryotes and eukaryote.

UNIT-V

Regulation of gene expression in prokaryotes: Operon concept, positive and negative regulation. Examples of lac and trp- operon. Regulation of gene expression in eukaryotes (In brief).

References:

1. Genes V by Benjamin Lewin, Oxford University Press, New York.
2. Principles of Genetics, Snustad and Simmons, Fourth Edition, John Wiley and Sons, Inc.
3. Molecular Cell Biology, Lodishet.al., W. H. Freeman and Company.
4. Genomes by T.A. Brown, John Wiley and sons (Asia)PTE LTD, New York.
5. Principles of Gene Manipulation and Genomics by S.B. Primrose and R. M. Twyman, Seventh edition, Blackwell Publishing, U.K.
6. Cell and Molecular Biology concepts and experiments By Gerald Karp, Third edition, John Wiley and sons, Inc., U.S.A.
7. Molecular Biology by Friefelder, David.

Semester II

Paper 2.3. BMB 06- BASIC IMMUNOLOGY

Course Type : Core **Credits:4**

Duration :3 hrs

Continuous/Internal/Assessment : 30 Marks
Semester Assessment : 70 Marks

Note*: The syllabus is divided into five independent units and question paper will be divided into two sections.*

- ***Section-A*** *will carry 20 marks with one compulsory question comprising ten short answer type questions taking two questions from each unit. Each question shall be of two marks.*
- ***Section-B*** *will carry 50 marks with equally divided into five long answer type questions (answer about in 400 words). Paper setter shall be advised to set two questions from each unit and students are instructed to attempt five questions by selecting one question from each unit.*

UNIT I

Concept of Innate and Adaptive immunity.
Structure, Functions and Properties of Immune Cells: Stem cell, T cell, B cell, NK cell, Macrophage, Neutrophil, Eosinophil, Basophil, Mast cell, Dendritic cell
Immune Organs – Bone Marrow, Thymus, Lymph Node, Spleen, GALT, MALT, CALT.

UNIT II

Characteristics of an antigen; Haptens, Epitopes (T & B cell epitopes), T-dependent and independent antigens, Adjuvants.
Structure, Types, Functions of antibodies.

UNIT III

Antigen–Antibody Interaction: Principles of Precipitation, Agglutination, Immunodiffusion (ODD, RID), Immunoelectrophoresis, ELISA, Western blotting.
Organization of MHC locus; Structure and Functions of MHC I & II molecules.

UNIT IV

Complement- Components and biological activities. Primary and Secondary Immune Response; Generation of Humoral Immune Response (Plasma and Memory cells); Generation of Cell Mediated Immune Response (Self MHC restriction, T cell activation, Co- stimulatory signals).

UNIT V

Hypersensitivity – (immediate and delayed types).
Autoimmune diseases: Good pastures syndrome, Rheumatoid arthritis (RA), Multiple sclerosis, Systemic lupus erythematosus (SLE), Type 1 diabetes, Hashimoto's thyroiditis.

Reference Books:

1. Essentials of Immunology, Author- Roitt, I.M., ELBS. Blackwell Scientific Publishers, London.
2. Immunology II Edition, Author- Kuby, J. WH., Freeman and Company, New York.
3. Immunology. Author- Klaus D. Elgert ,Wiley-Liss. NY.
4. Text Book on Principles of Bacteriology, Virology and Immunology, IX Edition (5 volumes). Authors- Topley and Wilson's, Edward Arnold, London.
5. The Experimental Foundations of Modern Immunology. Authors- Clark, V.R., John Willeyand Sons, Incl.
6. Fundamental Immunology. Author – W.E. Paul, Raven Press, New York.
7. Fundamentals of Immunology. Authors – R.M. Coleman, M.F. Lombord and R.E. Sicard. 2nd ed. C.Brown publishers.

Semester II

Paper 2.4. PRACTICALS II

1. Analysis of Sugars
    a) Monosaccharide-Glucose, Fructose, Galactose, Mannose, Pentose.
    b) Disaccharides-Sucrose, Maltose and Lactose.
    c) Polysaccharides-Starch and Dextrin.
2. Analysis of Amino Acids
3. Lipid Analysis [Group Experiments]
    a) Determination of Saponification number.
    b) Determination of Acid number.
    c) Determination of Iodine number
    4. Demonstration Experiments

1. Separation of amino acids by TLC.
2. Preparation of genomic DNA from bacteria.
3. Isolation of genomic DNA from Blood.
4. Quantitation of DNA by spectrophotometry.

5. Isolation of plasmid DNA from bacteria.
6. Restriction enzyme digestions and its analysis by gel electrophoresis.

7. Identification of human blood groups.
8. Perform Total Leukocyte Count of the given blood sample.
9. Perform Differential Leukocyte Count of the given blood sample.
10. Separate serum from the blood sample (demonstration).
11. Perform immunodiffusion by Ouchterlony method.
12. Perform DOT ELISA.
13. Perform immunoelectrophoresis.