FACULTY OF SCIENCES

SYLLABUS FOR THE BATCH

FROM THE YEAR 2024 TO YEAR 2028

Programme Code: BSMD

Programme Name: B.Sc. Medical

(Semester I-II)

DEPARTMENT OF BOTANY
KHALSA COLLEGE, AMRITSAR

(An Autonomous College)

S.No.	PROGRAMME OBJECTIVES
1.	To understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.
2.	To understand the conduction path of water and mineral nutrients, translocation of assimilates into different plant parts.
3.	To study general characters, origin and evolution of cyptogams- Algae, Bryophytes and Pteridophytes.
4.	To analyze morphological description, brief idea of cultivation and economic uses of medicinal plants and pulses.
5.	To study general characters, origin and evolution of gymnosperms, geological time scale and evolution of seed habit.

S.No.	PROGRAMME SPECIFIC OUTCOMES (PSOS)
PSO-1	Understand the range of plant diversity in terms of structure, function and plant classification of Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.
PSO-2	Understand the nature and basic concepts of cell biology, biochemistry, taxonomy and ecology.
PSO-3	Understand contribution of botany in medicines, food, fibers and other plant products.
PSO-4	Understand knowledge of botany in recognizing the position of plant in the broad classification and phylogenetic level.
PSO-5	Students learn to interpret the plant morphology, anatomy, plant identification, vegetation analysis techniques, physiochemical analyses of plant materials in the plant physiology and biochemistry.

B.Sc. Medical
Programme: BSMD
Scheme of Courses
Session 2024-25

COURSE SCHEME											
SEMESTER - I											
Course Code	**Course Name**	**Hours/Week**	**Credits**			**Total Credits**	**Max Marks**				**Page No.**
			L	**T**	**P**		**Th**	**P**	**IA**	**Total**	
Discipline Specific Course (DSC)											
BOT111A	Diversity of Microbes	2	2	0	0	2	37	-	38	150	3-4
BOT111B	Diversity of Cryptogams	2	2	0	0	2	37	-			5-6
BOT111P	Botany Lab – I (Based on BOT111A & BOT111B)	4	0	0	2	2	-	38			7

*For practical one credit means two hours of practical/per week; IA = Internal assessment

SEMESTER - II											
Course Code	**Course Name**	**Hours/Week**	**Credits**			**Total Credits**	**Max Marks**				**Page No.**
			L	**T**	**P**		**Th**	**P**	**IA**	**Total**	
Discipline Specific Course (DSC)											
BOT121A	Cell Biology	2	2	0	0	2	37	-	38	150	8-9
BOT121B	Genetics	2	2	0	0	2	37	-			10-11
BOT121P	Botany Lab - II (Based on BOT121A & BOT121B)	4	0	0	2	2	-	38			12-13

*For practical one credit means two hours of practical/per week; IA = Internal assessment

B.Sc (MEDICAL) SEMESTER–I
Programme: BSMD
Course Code: BOT111A
Course Type: Major (Theory)
Course Title: Diversity of Microbes

Credit L-T-P: 2-0-0

BOT111A: 37 marks
BOT111B: 37 marks
BOT111P: 38 marks
Internal Assessment: 38 marks
Total Marks : 150 marks

BOT111A

Instructions for the Paper Setters:

The question paper will be divided into 5 sections (Section A-E). Section A: (Total weightage 9 marks). This section will have 8 very short answer type questions (maximum limit 50 words) and students have to attempt any 6 questions. Each question will carry 1.5 marks, questions to be covered from the whole syllabus. Section B, C, D and E: (Total weightage 28 marks). Each section will have two questions from one unit. The student will have to attempt one question from each section and will carry 7 marks. The answers should not exceed 5 pages. The questions should not have more than two subparts.

Course Objectives:

CO-1	To acquaint students with basic concepts of diversity of Algae, Fungi, Bacteria, Viruses, Lichens etc.
CO-2	To study systematic position, structure, and function of these microbes.

UNIT-I

General Characters and Classification of Algae-Taxonomic parameters including those pertaining to photosynthetic pigments, cell wall, food reserves, flagellation. Life cycles in algae, Economic importance of algae: Uses of algae as food and feed; in agriculture and industry.

UNIT-II

Important features and life history of:

Chlorophyceae–***Volvox, Oedogonium***

Xanthophyceae–***Vaucheria***

Phaeophyceae–***Ectocarpus***

Rhodophyceae–***Polysiphonia***

UNIT-III

General characters, classification and economic importance of fungi.

Important features and life history of:

Mastigomycotina**–** ***Phytophthora***

Zygomycotina**–*Mucor***

Ascomycotina**–*Saccharomyce, Peziza***

Basidiomycotina**–*Puccinia, Agaricus***

Deuteromycotina**–*Colletotrichum***

UNIT-IV

General account of cyanobacteria, distribution, thallus structure, cell structure, reproduction

General account of Lichens**,** Organisation of thallus: crustose, foliose and fruticose

General account of viruses and bacteria: structure, nutrition and reproduction.

Suggested Readings:

1. Dubey, R. and Maheshwari, D. (2016). A textbook of Microbiology. S. Chand and company, New Delhi.
2. Alexopoulous, C.J., Mims, C.W. and Blackwell, M. (2002). Introductory Mycology (4th Edition), Wiley - Blackwell, USA.
3. Dube, H.C. (2007). A Textbook of Fungi, Bacteria and Viruses (3rd edition), Scientific Publishers, India
4. Dube, H.C. (2012). An Introduction to Fungi (4th edition), Scientific Publishers., India.
5. James W. Brown. (2014). Principles of Microbial Diversity. ASM press, USA.
6. Ogunseitan, O. (2004). Microbial Diversity: Form and function in Prokaryotes. Wiley Publishers, USA.
7. Sharma, O.P. (2004). Text Book of Thallophytes. McGraw Hill Publishing Co., India.
8. Sharma, P.D. (2004). The Fungi, (2nd Edition) Rastogi Publication, India

Course Outcomes:

CO-1	This course makes student aware about the diversity in various life forms of plant kingdom.
CO-2	It enables students to identify algae and fungi.
CO-3	It enables students to structurally differentiate among different microbes.
CO-4	Increase the awareness of human friendly viruses, bacteria, algae and their economic importance.

B.Sc (MEDICAL) SEMESTER–I

Programme: BSMD
Course Code: BOT111B
Course Type: Major (Theory)
Course Title: Diversity of Cryptogams

Credit L-T-P: 2-0-0 **BOT111B: 37 marks**

Instructions for the Paper Setters:

The question paper will be divided into 5 sections (Section A-E). Section A: (Total weightage 9 marks). This section will have 8 very short answer type questions (maximum limit 50 words) and students have to attempt any 6 questions. Each question will carry 1.5 marks, questions to be covered from the whole syllabus. Section B, C, D and E: (Total weightage 28 marks). Each section will have two questions from one unit. The student will have to attempt one question from each section and will carry 7 marks. The answers should not exceed 5 pages. The questions should not have more than two subparts.

Course Objectives:

CO-1	The main objective of this course is to introduce the students with the basic knowledge of cyptograms.
CO-2	To study the detailed structure, functions and reproductive system in cyptograms.

UNIT-I

General characters and classification of bryophytes, Bryophytes as amphibians of plants kingdom, life cylce displaying alternation of generations, Affinities of bryophytes with algae and pteridophytes.

UNIT-II

Morphology, anatomy and reproduction of:

Marchantia,

Anthoceros,

Funaria,

(Developmental stages are excluded). Ecological and Economic importance of bryophytes.

UNIT-III

General characters and classification of Pteridophyta**,** Stelar System, Life cycle showing alternation of generations.

UNIT-IV

Morphology, anatomy and reproduction of ***Rhynia, Lycopodium, Selaginella, Equisetum, Pteris, Marsilea.*** (Developmental stages are excluded). Economic importance of Pteridophytes.

Suggested Readings:

1. Goffinet B. (2008). Bryophyte Biology. Cambridge University Press, UK.

2. Sambamurty, S.S. (2005)**.** A Textbook of Bryophytes, Pteridophytes, Gymnosperms andPaleobotany. I K International Publishing House Pvt Ltd., India

3. Sharma, O.P. (2014). Bryophyta. Mc Graw Hill Education Pvt Ltd., India.

4. Rashid, A. (1998). An Introduction to Bryophyta. Vikas Publishing House Pvt. Ltd. NewDelhi.

5. Vashistha, P.C., Sinha, A.K. and Kumar, A. (2010) Pteridophyta. S. Chand. Delhi, Indi

Course Outcomes:

CO-1	This course makes student aware about the diversity in various life forms of plant kingdom.
CO-2	Students able to differentiate bryophytes and pteridophytes.
CO-3	Students develop critical understanding on morphology, anatomy and reproduction of Bryophytes & Pteridophytes.
CO-4	Students learn about evolution of first land plants.

B.Sc (MEDICAL) SEMESTER–I
Programme: BSMD
Course Code: BOT111P
Course Type: Major (Practical)
Course Title: Botany Lab-I
(Based on BOT111A & BOT111B)

Credit L-T-P: 0-0-2 **Maximum Marks: 38**
Hours per week: 4

Course Objective

CO-1	The course will give hands on training to students to work in laboratories.
CO-2	Understand the diversity among bacteria, algae, fungi, brytophytes and pteridophytes.

Suggested Laboratory Exercises

Teachers may select plants/material available in their locality/institution.

1. Gram staining of bacteria.
2. Observation of disease symptoms in hosts infected by fungi, viruses and mycoplasma Section cutting of diseased material and identification of the pathogens as per the theory syllabus.
3. Study of the genera included in theory under algae and fungi.
4. Study of morphology, reproductive structures and anatomy Bryophytes (***Marchantia, Anthoceros*** and ***Funaria***) and Pteridophytes (***Lycopodium, Selaginella, Equisetum, Pteris*** and ***Marsilea***).

Suggested Readings:

1. Lee, R.E. (2008).Phycology, Fourth Edition, Cambridge University Press, USA.
2. Agrios, G.N. (1997). Plant Pathology, 4th edition, Academic Press, U.K.

Course Outcomes:

CO-1	Prepare and view specimens for examination using microscope.
CO-2	Differentiate algae, fungi, bryophytes and pteridophytes on the basis of morphology, reproductive structures and anatomy.
CO-3	Understand and identify plant diseases with special reference to the causative agents, symptoms and etiology.

B.Sc (MEDICAL) SEMESTER–II
Programme: BSMD
Course code: BOT121A
Course Type: Major Course (Theory &Practical)
Course Title: Cell Biology

Credit L-T-P: 2-0-0

BOT121A: 37 marks
BOT121B: 37 marks
BOT121P: 38 marks
Internal Assessment: 38 marks
Total Marks : 150 marks

BOT121A

Instructions for the Paper Setters:

The question paper will be divided into 5 sections (Section A-E). Section A: (Total weightage 9 marks). This section will have 8 very short answer type questions (maximum limit 50 words) and students have to attempt any 6 questions. Each question will carry 1.5 marks, questions to be covered from the whole syllabus. Section B, C, D and E: (Total weightage 28 marks). Each section will have two questions from one unit. The student will have to attempt one question from each section and will carry 7 marks. The answers should not exceed 5 pages. The questions should not have more than two subparts.

Course Objectives:

CO-1	The main objective of this course is to provide fundamental knowledge of structural and functional aspects of cell and cell organelles.
CO-2	To study detailed structure of chromosome and different types of alterations in chromosomes.

UNIT-I

Ultrastructure and function of plant cell with refernce to: Plastids, Mitochondria, Golgi apparatus, Endoplasmic reticulum, Vacuoles.

Structure and Function of Nucleus: Ultrastructure; nuclear membrane; nuclear pore models; nucleoplasm; Nuclear matrix; chromatin; nucleolus.

UNIT-II

Extranuclear Genome: Presence and function of mitochondrial and plastid DNA; plasmids and their types.

Cell Division: Cell cycle, Mitosis, Meiosis and their significance.

UNIT-III

Chromosome Organization: Morphology, centromere and telomere; nucleosome, giant chromosomes, chromosome alterations; deletions, duplications, translocations, inversions, variations in chromosome number, aneuploidy, polyploidy, sex chromosomes and their function.

UNIT-IV

The Cell Envelopes: Cell wall - structure and function;
Plasma membrane – Chemical composition, Membrane models and functions; membrane transport: diffusion, active, passive and bulk transport.

Suggested Readings:

1. Gupta, P.K. (2013). A Text–book of Cell and Molecular Biology (3rd edition). Rastogi Publications, Meerut, India
2. Johnson, A., Raff, L. and Walter, R. (2008). Molecular Biology of the Cell (5th Edition). Taylor and Francis Group, USA.
3. Karp, G. (2013). Cell and Molecular Biology: Concepts and Experiments (7th Edition). Wiley Publishers, USA.
4. Kleinsmith, L.J. and Kish, V.M. (1995). Principles of Cell and Molecular Biology (2nd edition). Harper Collins College Publishers, New York, USA.
5. Lodish, H., Berk, A., Kaiser, C. A., Krieger, M., Bretscher, A. and Ploegh, H. (2016). Molecular Cell Biology, W.H. Freeman & Co., New York, USA.
6. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics (5th Edition). John Wiley and Sons Inc., U.S.A.
7. Cooper, G.M. and Hausman, R.E. (2013). The Cell: A Molecular Approach (6th Edition). Sinauer Associates Inc.

Course Outcomes:

CO-1	Students learn about basic unit of life i.e. Cell.
CO-2	Students learn about differences between prokaryotic and eukaryotic organism on the basis of cellular details.
CO-3	It enables students to know about chromosomes, genes etc.
CO-4	Students learn about the functional role of cell organelles.

B.Sc (MEDICAL) SEMESTER–II

Programme: BSMD
Course Code: BOT121B
Course Type: Major Course (Theory & Practical)
Course Title: Genetics

Credit L-T-P. 2-0-0 **BOT121B: 37 marks**

Instructions for the Paper Setters:

The question paper will be divided into 5 sections (Section A-E). Section A: (Total weightage 9 marks). This section will have 8 very short answer type questions (maximum limit 50 words) and students have to attempt any 6 questions. Each question will carry 1.5 marks, questions to be covered from the whole syllabus. Section B, C, D and E: (Total weightage 28 marks). Each section will have two questions from one unit. The student will have to attempt one question from each section and will carry 7 marks. The answers should not exceed 5 pages. The questions should not have more than two subparts.

Course Objectives:

CO-1	To introduce the students with history of genetics and heredity.
CO-2	To study the basics of genetics (genetic material, variation, cell division, expression and regulation of genes etc.).

UNIT-I

DNA-the Genetic Material: DNA structure; replication; DNA–protein interaction; the nucleosome model, Mutations: Types of mutations; Molecular basis of Mutations; Mutagens: physical and chemical (Base analogs, deaminating, alkylating and intercalating agents); transposable genetic elements

UNIT-II

Genetic Inheritance: Mendelism: laws of segregation and independent assortment, linkage analysis; allelic and non–allelic interactions. (Incomplete dominance and co-dominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Recessive and Dominant traits).

UNIT-III

Gene expression: Structure of gene, transfer of genetic information; transcription, translation, genetic code, Gene regulation, Operon model.

UNIT-IV

Population and Evolutionary Genetics: Allele frequencies, Hardy-Weinberg Law, role of natural selection, genetic drift. Genetic variation and speciation.

Suggested Readings:

1. Brown, T.A. (2011). Genetics: A Molecular Approach (3rd Edition). BIOS Scientific Publishers, UK.
2. Fletcher, H., Hickey, I. and Winter, P. (2010). Instant Notes on Genetics (3rd edition) Taylor and Francis Group, USA.
3. Gardner, E.J., Simmons, M.J. and Snustad, D.P. (2012). Principles of Genetics (8th Edition). Wiley Sons, USA.
4. Gupta, P.K. (2016). Cell and Molecular Biology, Rastogi Publications, Meerut, India.
5. Kleinsmith, L.J. and Kish, V.M. (1995). Principles of Cell and Molecular Biology (2nd Edition). Harper Collins College Publishers, New York, USA.
6. Krebs, B. E., Goldstein, E.S. and Kilpatrick, S.T. (2011). Lewins Genes X. Jones and Bartlett Publishers, LLC, UK.
7. Lodish, H., Berk, A., Kaiser, C. A., Krieger, M., Bretscher, A. and ploegh, H. (2016). Molecular Cell Biology, W.H. Freeman & Co., New York, USA.
8. Singh, B.D. (2007). Molecular Genetics. Kalyani Publishers, India.
9. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics (5th Edition). John Wiley and Sons Inc., U.S.A.

Course Outcomes:

CO-1	It makes students aware about heredity and variation.
CO-2	Students come to know how children are different from parents.
CO-3	Develop concept wise understanding of laws of inheritance, genetic basis of loci and alleles and their linkage.
CO-4	Students able to differentiate between alleles and non-alleles and allelic and non-allelic interactions.
CO-5	Students learn about genetic material and various factors responsible for variations in plants.

B.Sc (MEDICAL) SEMESTER–II

Programme: BSMD
Course Code: BOT121P
Course Type: Major Course (Theory & Practical)
Course Title: Botany Lab-II
(Based on BOT121A & BOT121B)

Credit L-T-P: 0-0-2 **Maximum Marks: 38**
Hours per week: 4

Course Objective

CO-1	Train students for microprepration of slides to understand the fundamentals of cell biology and related processes.
CO-2	Students will learn the laws of inheritance and mode of inheritance of linked genes.

Suggested Laboratory Exercises

Teachers may select plants/material available in their locality/institutions.

1. To study generalized plant cell structure from onion leaf peels; demonstration of staining and mounting methods.
2. Comparative study of cell structure in onion cells, ***Hydrilla*** and ***Spirogyra.***
3. Study of cyclosis in ***Tradescantia*** Staminal Cells.
4. Examination of electron micrographs of eukaryotic cells with special reference to organelles: chloroplast, mitochondria, endoplasmic reticulum, golgi appratus, nucleus).
5. Study of plastids to examine pigment distribution in plants.
6. Examination of various stages of mitosis using onion root tips.
7. Examination of various stages of meiosis using onion flower buds.
8. Preparation of karyotypes from dividing root tip cells.
9. Cytological examination of special types of chromosomes: bar body, polytene chromosomes.
10. Working out the laws of inheritance using seed mixtures.
11. Working out the mode of inheritance of linked genes from test cross and/or F2 data.

Suggested Readings:-

1. Fukui, K. and Nakayama, S. 1996. Plant Chromosomes; Laboratory Methods, CRC Press, Boca Raton, Florida.
2. Gunning, B.E.S. and Steer, M.W. 1996. Plant Cell Biology; Structure and Function, Jones and Barllett Publishers, Boston, Massachusetts.
3. Harns, N. and Oparka, K.J. 1994. Plant Cell Biology, A Practical Approach. IRL Press, at Oxford University Press, Oxford, UK.
4. Sharma, A.K. and Sharma, A. 1999. Plant Chromosomes; Analysis. Manipulation and Engineering, Harwood Academic Publishers, Australia.
5. Plopper, G. (2016). Principles of Cell Biology. Jones and Barnett Learning, Boston, Massachusetts.

Course Outcomes:

CO-1	Students will gain knowledge on staining and fixation of specimens on slides.
CO-2	Students will be able to critically examine the cell structure, its components and pigments.
CO-3	Understand the basic cellular processes including mitosis and meiosis with the help of plant material.
CO-4	Prepare karyotypes and gain knowledge on special chromosomes.
CO-5	Understand the concept of inheritence and linked genes.