FACULTY OF LIFE SCIENCES

SYLLABUS

Of

Botany For

Master of Science (Botany)

Semester (I – II)

(Under Credit Based Continuous Evaluation Grading System)

Session: 2023-24

The Heritage Institution

KANYA MAHA VIDYALAYA JALANDHAR (Autonomous)

Session: 2023-24
Master of Science (Botany)
Program Specific Outcomes

PSO1. Understand the nature and basic concepts of cell biology, biochemistry, taxonomy and ecology.

PSO2. Analyze the relationships among animals, plants and microbes.

PSO3. Perform procedures as per laboratory standards in the areas of biochemistry, bioinformatics, taxonomy, economic botany and ecology.

PSO4. Apply the knowledge of basic science, life Science and fundamental process of plants to study and analyze any plant form.

PSO5. Identify the taxonomic position of plants, formulate the research literature, and analyze non reported plants with substantiated conclusions using first principles and methods of nomenclature and classification in Botany.

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATIONS OF TWO-YEAR DEGREE PROGRAMME

Master of Science (Botany) Semester-I

Session: 2023-24

Course Code	Course Title	Course Type	Hours /Week	Credits L-T-P	Total Credits	Marks				Examination time (in Hours)
						Total	Th	P	CA	
MBTL-1071	Fungi and Plant Pathology	C	3	3-0-0	3	75	60	-	15	3
MBTL-1072	Phycology	C	3	3-0-0	3	75	60	-	15	3
MBTL-1073	Bryology	C	3	3-0-0	3	75	60	-	15	3
MBTL-1074	Plant Physiology	C	3	3-0-0	3	75	60	-	15	3
MBTL-1075	Genetics and Evolution	C	3	3-0-0	3	75	60	-	15	3
MBTL-1046	Computer Applications and Bioinformatics	IC	3	3-0-0	3	75	60	-	15	3
MBTP-1077	Botany Practicals I	C	6	0-0-3	3	75	-	60	15	6
MBTP-1078	Botany Practicals II	C	6	0-0-3	3	75	-	60	15	6
Student can opt any one of the following Interdisciplinary optional courses		IDE			4	100	80		20	3
Total					**24**	**600**				
IDEC-1101 IDEM-1362 IDEH-1313 IDEI-1124 IDEW-1275				Effective Communication Skills Basics of Music (Vocal) Human Rights and Constitutional Duties Basics of Computer Applications Indian Heritage: Contribution to the world (Credits of these courses will not be added to SGPA)						

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATIONS OF TWO-YEAR DEGREE PROGRAMME

Master of Science (Botany) Semester-II

Session: 2023-24

Course Code	Course Title	Course Type	Hours/ week	Credits L-T-P	Total Credits	Marks				Examination time (in Hours)
						Total	L	P	CA	
MBTL-2071	Pteridology	C	3	3-0-0	3	75	60	-	15	3
MBTL-2072	Diversity and Biology of Gymnosperms	C	3	3-0-0	3	75	60	-	15	3
MBTL-2073	General Microbiology	C	3	3-0-0	3	75	60	-	15	3
MBTL-2074	Cell Biology	C	3	3-0-0	3	75	60	-	15	3
MBTL-2075	Ecological Modelling and Forest Ecology	C	3	3-0-0	3	75	60	-	15	3
MBTL-2336	Theoretical Biology	IC	3	3-0-0	3	75	60	-	15	3
MBTP-2077	Botany Practicals I	C	6	0-0-3	3	75	-	60	15	6
MBTP-2078	Botany Practicals II	C	6	0-0-3	3	75	-	60	15	6
MBTI-2079	Summer Training	C		0-0-0	0	Satisfactory/Not satisfactory				
Total					**24**	**600**				

Kanya Maha Vidyalaya, Jalandhar

SCHEME AND CURRICULUM OF EXAMINATIONS OF TWO-YEAR DEGREE PROGRAMME

Session: 2023-24

List of Interdisciplinary (ID) Courses (Optional)

Name of ID Course	Course Code	Semester
Effective Communication Skills	IDEC-1101	I
	IDEC-3101	III
Basic Fundamentals of Music (Vocal)	IDEM-1362	I
	IDEM-3362	III
Human Rights and Constitutional Duties	IDEH-1313	I
	IDEH-3313	III
Basics of Computer and IT	IDEI-1124	I
	IDEI-3124	III
Indian Heritage: Contribution to the world	IDEW-1275	I
	IDEW-3275	II

Semester - I

Session: 2023-24
Master of Science (Botany) Semester-I
Course Title: Fungi and Plant Pathology
Course Code: MBTL-1071

Course outcomes

After passing this course the student will be able to

CO: 1 Explain diversity in the fungal kingdom

CO: 2 Understand life cycle of major genera of fungi

CO: 3 Understand the major virulence mechanisms that phytopathogens employ to colonize plants.

CO: 4 Develop an appreciation for the strategies that can be employed to incorporate disease resistance in crop plants.

Session: 2023-24
Master of Science (Botany) Semester-I
Course Title: Fungi and Plant Pathology
Course Code: MBTL-1071

LTP: 3-0-0

Max. Marks- 75

Theory - 60

CA – 15

Examination Time: 3 hrs

Instructions for the Paper Setters:

Eight questions of equal marks (i.e. twelve marks each) are to be set, two in each of the four sections (A-D). Questions of section (A-D) should be set from Unit (I-IV) of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT-I

History, classification, study of structure, development, reproduction, life history of the following

- **GYMNOMYCOTA**
  (i) Acrasiomycetes - a general account
  (ii) Protosteliomycetes - a general account
  (iii)Myxomycetes: *Stemonitis*
- **MASTIGOMYCOTA** 1. Haplomastigomycotina
  (i) Chytridiomycetes: *Chytriomyces*, *Allomyces;* (ii) Hyphochytridiomycetes: *Rhizidiomyces*
  (iii) Plasmodiophromycetes: *Plasmodiophora*

2. Diplomastigomycotina(i) Oomycetes: *Pythium*, *Saprolegnia*, and *Achlya*

- **AMASTIGOMYCOTA** Zygomycotina (i) Zygomycetes: *Entomophthora* and *Pilobolus*
  (ii) Trichomycetes – a general account.

UNIT-II

History, classification, study of structure, development, reproduction, life history of the following:

AMASTIGOMYCOTA Ascomycotina (Ascomycetes)
(i) Hemiascomycetidae: *Protomyces*
(ii) Piectomycetidae: *Talaromyces*
(iii) Pyrenomycetidae: *Melanospora* and *Nectria*.
(iv) Discomycetidae:*Morchella*
(v) Laboulbeniomycetidae: *Laboulbenia*
vi) Loculoascomycetidae: *Mycospharella*

Basidiomycotina (Basidiomycetes)
(i) Teliomycetidae: *Ustilago* and *Puccinia*
(ii) Holobasidiomycetidae-I (Hymenomycetes): *Polyporus* and *Exobasidium*.
(iii) Holobasidiomycetidae-II (Gasteromycetes): *Lycoperdon*.

(Deuteromycetes) (i) Hyphomycetidae: *Alternaria, Cercospora and Rhizoctonia*
(ii) Blastomycetidae: *Sporobolomyces* and *Cryptococcus*.

Session: 2023-24
Master of Science (Botany) Semester-I

UNIT-III

Symptomatology: Identification, etiology and control measures of the following plant disease:
Fungal Diseases: Potato wart, damping-off diseases, Blight of colocasia, peach leaf curl, apple scab. Wilt of cotton and arhar, Anthracnose disease of chillies, Late blight of potato, Early blight of potato, Stem rust of wheat, Loose smut of wheat, Karnal bunt of wheat, powdery mildew of bajra, White rust of crucifers, Tikka disease of groundnut.
Bacterial Diseases: Bacterial leaf blight of rice, ring rot of potato, citrus canker, brown rot of potato, tundu disease of wheat.
Viral Diseases: Papaya leaf curl, leaf curl of tomato and bunchy top of banana

UNIT-IV

Principles and methods for the prevention and control for plant diseases, toxins and enzymes in plant diseases, defence mechanisms of plants against pathogens, Genetics of plant pathogen interaction. Sex hormones in fungi, Heterothallism, heterokaryosis, parasexual cycle. Mycorrhizae in agriculture and plant growth, Biological control and concept of mycoherbicides.
Important contributions of the following mycologists/microbiologists: E. J. Butler, K.C. Mehta, B. B. Mundkur, Robert Koch, Alexander Flemming, S.A. Waksman, W.M. Stanley and Christian Gram. Important mycological and plant pathological journals and institutes.

Reference Books:

1. Agrios, G.N. (2005). Plant Pathology. 5th edition, Academic Press, New York.
2. Ainsworth, G. C. (2008). Ainsworth & Bisby's dictionary of the fungi. 10th edition, Cabi.
3. Alexopoulos, C.J., Mims, C.W. and Blackwell, M. (2007). Introductory Mycology. 4th edition, John Wiley and sons, INC, New York.
4. Aneja, K.R. and Mehrotra, R.S. (2015). An Introduction to Mycology. 2nd edition, New Age International Private limited, New Delhi.
5. Watkinson, S. C., Boddy, L., & Money, N. (2015). *The fungi*. Academic Press.
6. Dube, H. C. (2013). An Introduction to Fungi, 4th Edition, Scientific Publisher, India
7. Mehrotra, R.S. (2017). Plant Pathology. 3rd edition, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
8. Vashista, B.R., Sinha, A.K. and Kumar, A. (2016) Botany for degree students - Fungi. S. Chand and Company Ltd, New Delhi-pp 1-752.
9. Webster, J. and Weber, R. W. S. (2007). Introduction to Fungi. Cambridge University Press, Cambridge, London.

Session: 2023-24
Master of Science (Botany) Semester-I
Course Title: Phycology
Course Code: MBTL-1072

Course Outcomes

After passing this course the student will be able to:

CO: 1 Identify and classify different species of algae.

CO: 2 Understand comparative life history of Green and Yellow Green Algae

CO: 3 Provide a comparative account on Brown and Red Algae.

CO: 4 Understand the role of algae from an ecological and economic point of view.

Session: 2023-24
Master of Science (Botany) Semester-I
Course Title: Phycology
Course Code: MBTL-1072

LTP: 3-0-0

Max. Marks- 75

Theory - 60

CA – 15

Examination Time: 3 hrs

Instructions for the Paper Setters:

Eight questions of equal marks (i.e. twelve marks each) are to be set, two in each of the four sections (A-D). Questions of section (A-D) should be set from Unit (I-IV) of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT-I

Habitat and habit, Comparative account of important system of classification (Fritsch F.E.1937 and Lee R.E.2008). Organization of thallus, structure of algal cell, algal pigments and photosynthetic apparatus. Algal flagella food reserves,

UNIT-II

Comparative account of, reproductive diversity, life history patterns, nutrition, origin & evolution of sex in algae Chlorophyta (*Volvox*, *Hydrodictyon*, *Cladophora*, *Fritschiella*, *Oedogonium*, *Zygnema, Chara*). Xanthophyta (*Vaucheria).*

UNIT-III

Phaeophyta (*Ectocarpus*, *Laminaria*, *Dictyota*, *Fucus*), Rhodophyta (*Porphyra*, *Batrochospermum*, *Polysiphonia*).

UNIT-IV

Cyanophyta (*Nostoc*, *Oscillitoria*, *Rivularia*, *Stigonema*). Rhythms and bioluminescence in Dinoflagellates, economic importance of algae, bacterial and fungal pathogens of algae, algae as indicators of water pollution and algal blooms.

Reference Books:

1. Ahluwalia, A.S. (Ed.) (2003). Phycology. Daya Publishing House, New Delhi-15035
2. Anderson, R.A. (2005). Algal Culturing techniques. Physiological society of America. Elsevier Academic Press, USA.
3. Barsanti, L. and Gualtieri, P. (2014) Algae: Anatomy, Biochemistry, and Biotechnology 2nd Edition, CRC press
4. Fritsch, F.E. (1979) The structure and reproduction of algae (Vol. I and II). Vikas Publishers House Pvt. Ltd., New Delhi.
5. Kumar. H. D. (2017) Introductory Phycology, 2nd edition, East – West Press Pvt. Ltd. New Delhi.
6. Lee, R. E. (2018). Phycology. 5th edition, Cambridge University Press.
7. Vashishta, B. R., Singh, V. P. and Sinha, A. K. (2012) Botany for Degree Students – Algae S. Chand Publishing, New Delhi, India

Session: 2023-24
Master of Science (Botany) Semester-I
Course Title: Bryology
Course Code: MBTL-1073

Course outcomes

After passing this course the student will be able to:

CO1: Understand the main characteristics of bryophyte.

CO2: Describe the distinguishing traits of liverworts, hornworts, and mosses.

CO3: Understand evolution in gametophyte and sporogonium in bryophytes.

CO4: Understand means of spore dispersal, peristome teeth and various methods to conserve bryophytes.

Session: 2023-24
Master of Science (Botany) Semester-I
Course Title: Bryology
Course Code: MBTL-1073

LTP: 3-0-0

Max. Marks- 75

Theory - 60

CA – 15

Examination Time: 3 hrs

Instructions for the Paper Setters:

Eight questions of equal marks (i.e. twelve marks each) are to be set, two in each of the four sections (A-D). Questions of section (A-D) should be set from Unit (I-IV) of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT-I

Habitat and habit and distribution of Bryophytes, origin of bryophytes (including fossil records), primitive vs advanced/derived characters, economic importance

UNIT-II

Comparative morphological account of gametophytes and sporophytes and life cycle of Marchantiales (*Riccia*, *Marchantia*, *Targionia*, *Cyathodium*, *Lunularia*); Sphaerocarpales (*Sphaerocarpus*); Calobryales, Jungermanniales (*Porella*); Metzgeriales (*Pellia*); Anthocerotales (*Anthoceros*); Sphagnales (*Sphagnum*); Andreaealas (*Andrea*); Bryales (*Funaria*)

UNIT-III

Origin of land habit, Evolution of gametophyte and sporogonium in liverworts and mosses (taking examples of above-mentioned orders).

UNIT-IV

Means of spore dispersal, peristomal teeth in mosses, palynology of Bryophytes, method to conserve Bryophytes at national level. Morphogenetic changes in moss protonema, characteristic endohydric, ectohydric, myxohydric bryophytes

Reference Books:

1. Campbell, D.R. (1985). The Evolution of Land Plants (Embryophyta) Reprinted Central Book Depot, Allahabad
2. Goffinet, B. and Shaw, A.J. (2008) Bryophyte Biology, 2nd edition, Cambridge University Press, Cambridge, pp. 476
3. Willis, K. and McElwain, J. (2014). The evolution of plants. Oxford University Press.
4. Stewart, W.N. (1983). Palaeobotany and Evolution of Plants. Cambridge University Press, London.
5. Taylor, T.N. (1981). Palaeobotany. An Introduction to Fossil Plant Biology, McGraw Hill Book Company, New York.
6. Vanderpoorten, A. and Goffinet, B. (2009). Introduction to Bryophytes. Cambridge University Press.

Session: 2023-24
Master of Science (Botany) Semester-I
Course Title: Plant Physiology
Course Code: MBTL-1074

Course outcomes

After passing this course the student will be able to:

CO: 1 Understand the water relationship with plants and energy metabolism.

CO: 2 Understand the interaction between the cell and signalling mechanism

CO: 3 Gain an appreciation of the nitrogen metabolism

CO: 4 understands the sulphur chemistry and sulphur metabolism in plants

Session: 2023-24
Master of Science (Botany) Semester-I
Course Title: Plant Physiology
Course Code: MBTL-1074

LTP: 3-0-0 **Max. Marks- 75**

Theory - 60

CA – 15

Examination Time: 3 hrs

Instructions for the Paper Setters:

Eight questions of equal marks (i.e. twelve marks each) are to be set, two in each of the four sections (A-D). Questions of section (A-D) should be set from Unit (I-IV) of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT-I

Properties of water, soil-plant, water relations kinetic theory, chemical and potential gradients, Raolt's Laws, rate of diffusion free energy of water, atmospheric H2O, measurement of water potential components.

Energy metabolism (concept of the energy), thermodynamic principles in biology, energy rich bonds, weak interactions, coupled reactions and oxidative phosphorylations, group transfers, biological energy transducers, bioenergetics.

UNIT-II

Signal transduction: Overview, receptors and G-proteins, phospholipid signaling, role of cyclic nucleotides, calcium-calmodulin cascade, diversity in protein kinases and phosphatases, specific signaling mechanisms e.g. two-component sensor-regulator system in bacteria and plants, sucrose-sensing mechanism.

UNIT-III

Nitrogen Metabolism: Introduction, Overview of nitrogen in the biosphere and in plants, Overview of nitrogen fixation, Enzymology of nitrogen fixation, symbiotic nitrogen fixation, Ammonia uptake and transport, Overview of nitrate uptake and reduction, Nitrate reduction, Interaction between nitrate assimilation and carbon metabolism.

UNIT-IV

Sulphur Metabolism: Overview of sulphate assimilation, Sulphur chemistry and function, Sulphur uptake and transport, the reductive sulphate assimilation pathway, Synthesis and function of glutathione and its derivatives.

Reference Books:

1. Buchann, B.B., Gruissen, W., and Jones, R.L(2010). Biochemistry and molecular biology of plants. American society of plant physiologists, Maryland. USA
2. Nobel, P.S. (2009). Physiochemical and Environmental Plant Physiology. Academic press, San Diego.U.S. A
3. Pandey, S. N. and Sinha,B. K. (2005). Plant Physiology, 4th edition, Vikas Publication House Pvt Ltd
4. Scott, P. (2008). Physiology and Behaviour of Plants. John Wiley and Sons Ltd. England.
5. Stewart, S.and Globig, S. (2011). Plant Physiology. Apple Academic Press Inc., Canada.
6. Taiz, L., and Zeiger, E. (2010). Plant Physiology. Sinauer Associates, Inc., Publishers, Massachusetts.
7. William, G., Hopkins and Norman P.A. Huner (2008). Plant Physiology. John Wiley& Sons. Inc. USA
8. Salisbury, B., Frank and Ross, W., Cleon (2004). Plants Physiology. Wadsworth, U.S.A

Session: 2023-24
Master of Science (Botany) Semester-I
Course Title: Genetics and Evolution
Course Code: MBTL-1075

Course Outcomes

After passing this course the student will be able to

CO:1 Understand the concept of genes, genetic material and Mendelian Principles.

CO:2 Understand the biochemistry and molecular biology of cancer and mutations.

CO:3 Understand transposable genetic elements and regulation of Gene expression in prokaryotes

CO:4 Understand the role of genetic mechanisms in evolution.

Session: 2023-24
Master of Science (Botany) Semester-I
Course Title: Genetics and Evolution
Course Code: MBTL-1075

LTP: 3-0-0 **Max. Marks- 75**

Theory - 60

CA – 15

Examination Time: 3 hrs

Instructions for the Paper Setters:

Eight questions of equal marks (i.e. twelve marks each) are to be set, two in each of the four sections (A-D). Questions of section (A-D) should be set from Unit (I-IV) of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT-I

Fine structure of gene, classical versus molecular concept of gene, the cis-trans complementation for functional allelism; Mendelian Principles: Codominance, incomplete dominance, gene interactions, pleiotropy, penetrance, expressivity, fine structures of gene and "Complex loci" in eukaryotes, over-lapping genes; concept of split gene; pseudogenes, nucleotide sequences.
Genetic Material: - Properties and replication, proof that the genetic information is stored in DNA, the Watson - Crick Model, the double helix, alternate forms of double helix, DNA replication, initiation and primer problem, complex replication apparatus, rolling circle replication of phage ϕ X174.

UNIT-II

Homologous chromosomes, polytene and Lampbrush chromosomes; Oncogenes, biochemistry and molecular biology of cancer, genetic disorders, Correlation between mutagenicity and carcinogenicity.
Mutations: Definition, types, detection in bacteria, *Neurospora*, maize and *Drosophila*; molecular basis of mutations; induced mutations (radiation and chemical mutagenesis), DNA repair mechanisms, DNA recombination mechanism.

UNIT-III

Transposable Genetic Elements: introduction, transposable elements in bacteria (Is elements, Tn 3 family), transposable elements in eukaryotes "Yeast Ty elements", maize transposons, Drosophila transposons, significance of transposable elements. Somatic Crossing Over: Molecular mechanism of crossing over, gene conversion, ordered and unordered tetrad analysis, somatic cell hybridization.
Regulation of Gene Expression in Prokaryotes: The Operon model, lac, an inducible operon, trp, a repressible operon, positive control of the lac operon by CAP and CAMP, attenuation.

Session: 2023-24
Master of Science (Botany) Semester-I

UNIT-IV

Polyploids: Inheritance pattern in autopolyploids (chromosome and chromatid segregation), diplodization, role of polyploidy in evolution.
Paleontology and Evolutionary History: The evolutionary time scale; eras, periods and epoch; major events in the evolutionary time scale; origins of unicellular and multicellular organisms; major groups of plants and animals; stages in primate evolution including Homo.
Organic evolution: Review of theories of evolution. Hardy-Weinberg law, speciation, modes of speciation (gradual and abrupt).

Reference Books:

1. Brown, T.A. (2017). Genomes 4, 4th edition, Garland Science, United States.
2. Griffiths, A. J., Wessler, S. R., Lewontin, R. C., Gelbart, W. M., Suzuki, D. T., & Miller, J. H. (2005). An introduction to genetic analysis. Macmillan. Freeman and Company, USA.
3. Hawley R.S. and Walker, M. Y. (2003) Advanced Genetic Analysis-Finding meaning in Genome. Blackwell Publishing, USA.
4. Klug W. S., Cummings, M. R., Spencer, C. A. and Palladino M. A. (2015). Concepts of Genetics. 11th edition, Pearson Education, London, England.
5. Krebs, J. E., Goldstein, E. S., & Kilpatrick, S. T. (2018). Lewin's GENES XII. Jones & Bartlett Learning. Burlington, Massachusetts.
6. Simmons, M. J., & Snustad, D. P. (2006). Principles of genetics. John Wiley & Sons.
7. Smith, J.M. (1998). Evolutionary Genetics. 2nd edition, Oxford University Press.
8. Watson, J. D. (2004). Molecular biology of the gene. Pearson Education India.

Session: 2023-24
Master of Science (Botany) Semester-I
Course Title: Computer Applications and Bioinformatics
Course Code: MBTL-1046

Course outcomes:

A student completing this paper shall be able to apply:

CO: 1 Understand the concept, applications, basic and advanced skills of Document.

CO: 2 Learn problem-solving skills, including the ability to develop new algorithms and analysis methods in Spread Sheet.

CO: 3 Understand working with Presentation and basic concepts of Bioinformatics.

CO: 4 An understanding of the intersection of life and information sciences, the core of shared concepts, language and skills the ability to speak the language of structure-function relationships, information theory, gene expression, and database queries.

Session: 2023-24
Master of Science (Botany) Semester-I
Course Title: Computer Applications and Bioinformatics
Course Code: MBTL-1046

LTP: 3-0-0 **Max. Marks- 75**

Theory - 60

CA – 15

Examination Time: 3 hrs

Instructions for the Paper Setters:

Eight questions of equal marks (twelve marks each) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION-A

Overview of document processing software, creating, saving and opening a new file in document, various formatting tools, paragraphs and sections, indents and outdents, creating lists and numbering, types of lists, Headings, styles, fonts and font size. Editing, positioning and viewing texts, Finding and replacing text, inserting page breaks, page numbers, book marks, symbols and dates, Inserting header, footer

SECTION-B

Spread sheet: Introduction to Spread sheet, Spread sheet basics, building a Spread sheet, moving within spread sheet, entering data into Spread sheet, saving & quitting Spread sheet, opening and moving around in an existing Spread sheet,

Working with Formulae: cell referencing, use of formulae, auto sum, copying formulae, absolute & relative addressing, working with ranges- creating, editing and selecting ranges,

Previewing & Printing Spreadsheet: page setting, print titles, adjusting margins, page break, headers and footers. Graphs and Charts: using wizards, various charts type, formatting grid lines & legends, previewing & printing charts.

SECTION-C

Introduction to Presentation, presentation overview, presentation elements, exploring presentation Menu, entering information, presentation creation. Opening and saving presentation, slide view, slide sorter view, Notes view, outline view, Printing Slides, formatting and enhancing text formatting.

Introduction to Bioinformatics, History of Bioinformatics, milestones, objectives and applications of Bioinformatics. Introduction to Biological Databases, Types of Databases, Literature Databases: PUBMED, PUBMED Central, European PUBMED Central,NCBI datamodel : why specialized data model is required for biological sequences.

SECTION-D

Nucleic acid and protein databases: GenBank, EMBL, DDBJ, SWISSPROT, UNIPROT. Database Retrieval and Deposition Systems: SRS, Entrez, Bankit, Seqin, Webin. Biotechnological Databases: EST, SNP. Databases for species identification and classification:

GBIF, taxonomy browser at NCBI. Plant Genome Databases: TAIR, Rice Genome Annotation Project, Maize GDB. Structural Databases: PDB, NDB. Carbohydrates and lipid databases: GlycoSuiteDB, LIPIDAT.

Reference Books:

1.) Baxevais B.F. and Quellette F. (2004). Bioinformatics A Practical Guide to the Analysis of Genes and Proteins. Wiley-Interscience.

2.) Bourhe P. E. and Weissig H. (2003). Structural Bioinformatics (Methods of Structural Analysis). Wiley-Liss.

3.) Eidhammer I., Jonassen I. and Taylor W. R. (2004). Protein Bioinformatics: An Algorithmic Approach to Sequence and Structure Analysis. Mathematics.

4) Mount D. W. (2004). Bioinformatics & Genome Analysis. Cold Spring Harbor Laboratory Press.

5) Orengo C.A., Jones D.T. and Thornton J.M. (2003). Bioinformatics: Genes Proteins and Computers. Bios Scientific Pub.

6) Peter Norton's (1998). Introduction to computers, Tata McGraw-Hill Publishing Company Limited, New Delhi

7) Sinha, P.K. (1998). Computer Fundamentals. BPB Publications, New Delhi.

Session: 2023-24
Master of Science (Botany) Semester-I
Course Title: Botany Practicals I
Course Code: MBTP-1077

(Based on MBTL-1071, MBTL-1072, MBTL-1073)

Course Outcomes:

After passing this course the student will be able to:

CO1: Characterize different disease symptoms of crop plants.
CO2: Identify pathogenic organisms responsible for plant diseases.
CO3: Know about the history and time-scale of land plant evolution, and evaluation of the principal types of evidence underlying.
CO4: Understand algal diversity (incl. morphology, cell structure and level of organization) to phylum level, and their association as lichens.
CO5: Understand diversity and morphology of bryophytes
CO6: Identify prominent members of bryophytes

Session: 2023-24
Master of Science (Botany) Semester-I
Course Title: Botany Practicals I
Course Code: MBTP-1077

(Based on MBTL-1071, MBTL-1072, MBTL-1073)

LTP: 0-0-3

Max. Marks- 75

Practical - 60

CA – 15

Examination Time: 6 hrs

Instructions for the paper setter: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

Suggested Practicals

Based on MBTL-1071:

1. Principles & working of instruments in the Mycology & Plant Pathology laboratory.
2. Characterization of disease symptoms and identification of pathogenic organisms (stem rust of wheat, damping off disease, white rust of crucifers, early and late blight of potato, loose smut of wheat, wilt of cotton, tikka disease of groundnut, citrus canker, leaf curl of papaya, yellow vein mosaic ofbhindi, red rot of sugarcane, anthrocnose of chillies.)
3. To study type genus *Eurotium*, *Mucor*, *Peziza*, *Geastrum*, *Nidularia*, *Lycoperdon*, *Morchella*, *Agaricus*.
4. Comparative biochemical and physiological observations of healthy and infected leaves.
5. Ocular micrometry of spores of pathogenic fungi.
6. Obsevations on rhizosphere of infected plants.
7. Modelling for disease forecasting.
8. Studies on different defense mechanism adopted by plants against pathogenic attack.
9. Measurement of radial growth of fungi in petriplates.

Based on MBTL-1072:

10. Sectioning and permanent mounting of thalli of various species of Cyanophyta, Chlorophyta, Charophyta, Phaeophyta, Rhodophyta.
11. Study of diversity of freshwater and sewage water algae.
12. Preparation of synthetic media and cultivation of algae
13. Interpretation of electron micrograph of some algae.
14. Biochemical analysis of pigments present in available algal species
15. Studies on habit and habitat of various algae
16. Estimation of total carbohydrates from fresh water algae.

Based on MBTL-1073:

1. Morphological, reproductive and anatomical study of representative members of the bryophytes studied in theory using cleared whole mount preparation and sectioning (*Riccia, Marchantia, Porella, Pellia, Funaria, Sphagnum, Polytrichum*).
2. Studies on habit and natural habitat of bryophytes.
3. Study of Peristomal teeth (WM).
4. Study of Scales, rhizoids (WM).
5. Study of dehiscence pattern of sporogonium.

Session: 2023-24
Master of Science in Botany Semester-I
Course Title: Botany Practicals II
Course Code: MBTP-1078

(Based on MBTL-1074, MBTL-1075, MBTL-1046)

Course outcomes:

After passing this course the student will be able to:

CO1: Prepare various biological reagents used in experiments

CO2: Estimate various biological activities in plants.

CO3: Understand the lab structure of cytogenetics and perform the molecular level of practicals like DNA isolation.

CO4: Perform the different types of cell division in various plants.

CO5: Understand basics of computer.

CO6: Interpret data in document and presentation files.

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Session: 2023-24
Master of Science in Botany Semester-I
Course Title: Botany Practicals II
Course Code: MBTP-1078

(Based on MBTL-1074, MBTL-1075, MBTL-1046)

LTP: 0-0-3

Max. Marks- 75

Practical - 60

CA – 15

Examination Time: 6 hrs

Instructions for the paper setter: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

Suggested Practicals

Based on MBTL-1074

1. Study on principles of pH meter, spectroscopy.
2. Studies on preparation of various concentrations of solutions.
3. Permeability observations on plasma membrane using different concentrations of organic solvents.
4. Effect of temperature on permeability of plasma membrane.
5. Preparation of standard curve of protein (e.g. BSA) and determine the protein content in unknown samples.
6. Estimation of activity of enzyme catalase.
7. Estimation the activity of enzyme glutathione reductase.
8. Determination of osmotic potential of vacuolar sap by plasmolytic method.
9. Determination of the water potential of any tuber by constant weight method.
10. Determination of the water potential of any tuber by Chardakov's dye method.
11. Separation of amino acids in a mixture by paper chromatography and their identification by comparison with standards.

Based on MBTL-1075:

12. Learning the cytogenetics laboratory-methods of microscopy, fixation, staining and dehydration
13. Meiotic and mitotic studies in *Allium cepa*
14. Polyploidy induction methods in laboratory organisms-treatment with colchicine
15. Studies on chromosomal aberrations in *Allium cepa*-using DDT and other pesticides
16. DNA isolation, purity and quantitative estimations.
17. Gel Scoring and data analysis
18. Demonstration of principles of Genetics in *Pisum sativum*
19. Numerical exercises on pedigree analysis, gene interactions, population genetics, chi-square & probability

20. Morphological observations in chromosomes- study on polytenic chromosomes of *Drosophila*.
21. Karyotypic analysis of laboratory Organisms-*Allium cepa*, *Vicia faba*, *Drosophila*
22. Studies of human karyotyes and genetic diseases associated.
23. Demonstration of Hardy-Weinberg Law using pea seeds.

Based on MBTL-1046

1. Introduction to Document
2. Creating Table in Document
3. Introduction to Page Formatting
4. Printing in Document
5. Page Layout
6. Creating Slide Presentation
7. Viewing the Slideshow
8. Adding Images in Presentation
9. Inserting Sound and Videos in Presentation
10. Introduction to Spread sheet
11. Creating different Spreadsheets in Spread Sheet
12. Inserting Charts in Spread Sheet
13. Introduction to various functions in Spread Sheet
14. Literature Searching Using Pubmed
15. Downloading the nucleic and Protein Sequence using Biological sequence.

Semester - II

Session: 2023-24
Master of Science (Botany) Semester-II
Course Title: Pteridology
Course Code: MBTL-2071

Course outcomes

After passing this course the student will be able to:

CO1: Understand taxonomic and biological features of Pteridophyta.

CO2: Understand systematics and life cycles of various Pteridophytes.

CO3: Comprehend the evolutionary trends among different genera of Pteridophytes

CO4: Understand land adaptations and importance of Pteridophytes.

Session: 2023-24
Master of Science (Botany) Semester-II
Course Title: Pteridology
Course Code: MBTL-2071

LTP: 3-0-0 **Max. Marks- 75**

Theory - 60

CA – 15

Examination Time: 3 hrs

Instructions for the Paper Setters:

Eight questions of equal marks (i.e. twelve marks each) are to be set, two in each of the four sections (A-D). Questions of section (A-D) should be set from Unit (I-IV) of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT-I

Origin of land floras, differentiation of organs in vascular plants – telome and enation theories, significance and short comings. Monophyletic vs polyphyletic origin of pteridophytes, pteridophytic life cycle with reference to alternation of generations, homologous and the antithetic theories of the origin of the sporophyte.

UNIT-II

General characters and classification of pteridophytes, occurrence, comparative organography, systematics, reproduction and types of life cycle in: Psilophytales (*Psilophytum*), Rhyniales(*Rhynia*), Psilotales (*Psilotum*), Lycopodiales (*Lycopodium*), Selaginallales (*Selaginella*).

UNIT-III

Equisetales (*Equisetum*); Ophioglossales (*Ophioglossum*); Marattiales (*Marattia*); Filicales (*Pteris*, *Dryopteris*); Marsileales (*Marsilea*); Salviniales (*Salvinia*, *Azolla*). Evolutionary trends in pteridophytes, prothallial evolution, organization and evolution of sorus in ferns.

UNIT-IV

Apomictic life cycle, apogamy, apospory, heterospory and seed habit. Spore structure, pattern of spore germination in ferns, Role of polyploidy and hybridization in speciation in ferns, Utility of ferns for phytoremediation.

Reference Books:

1. Parihar, N.S. (1992). The Biology and Morphology of Pteridophytes, Central Book
2. Rashid, A. (1999). An Introduction to Pteridophyta. 2nd edition, South Asia Books
3. Sporne, K.R. (1962). Morphology of Pteridophytes, BI Publications, New Delhi.
4. Stewart, W.N. (1983). Palaeobotany and Evolution of Plants. Cambridge University Press, London.
5. Vashishta, P.C. (2010). Botany: For Degree Students: Pteridophyta. 2nd edition, S Chand & Company, New Delhi, India.

Session: 2023-24
Master of Science (Botany) Semester-II
Course Title: Diversity and Biology of Gymnosperms
Course Code: MBTL-2072

Course outcomes

After passing this course the student will be able to:

CO1: Describe general characteristics of gymnosperms.

CO2: Understand the history of gymnosperms.

CO3: Identify and classify different gymnosperm genera and their distribution on the earth's surface.

CO4: Understand origin and evolution of gymnosperms.

Session: 2023-24
Master of Science (Botany) Semester-II
Course Title: Diversity and Biology of Gymnosperms
Course Code: MBTL-2072

LTP: 3-0-0 **Max. Marks- 75**

Theory - 60

CA – 15

Examination Time: 3 hrs

Instructions for the Paper Setters:

Eight questions of equal marks (i.e. twelve marks each) are to be set, two in each of the four sections (A-D). Questions of section (A-D) should be set from Unit (I-IV) of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT-I

Gymnosperms, the first seed plants, diversity of structure and complexity. Classification of gymnosperms and their distribution in India and in the globe in time and space. Geological time scale and important geological formations in India

UNIT-II

Morphology, general account, structure and reproduction of Progymnosperms (Aneurophytales, Archeopteridales etc.): Cycadofilicales, Glossopteridales, Pentoxylales, Cordaitales,

UNIT-III

Morphology, general account, structure and reproduction of Cycadeoidales, Cycadales, Ginkgoales, Coniferales, Taxales, Ephedrales, Welwitschiales and Gnetales.

UNIT-IV

Evolutionary tendencies in gymnosperm organography and life cycle with particular reference to male and female sporophylls, cones, ovules, pollination mechanisms, seeds and archegonia. Cytology of Gymnosperms, general survey of the cytology of gymnosperms.

Reference Books:

1. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New age International, Private Limited.
2. Biswas, C. and Johri, B.M. (1997). Gymnosperms. Narosa Publishing House, New Delhi.
3. Rothwell, G.W. (1985). The Role of Comparative Morphology and Anatomy in Interpreting the Systematics of Fossil Gymnosperms, Bot. Rev., 51: 318-327.
4. Sharma, O.P. (2017). Gymnosperms. XIV edition, Pragati Prakashan, Meerut, India.
5. Sporne, K.R. The Morphology of Gymnosperms, B. I. Publications, Delhi, 1974.
6. Vashishta, P.C., Sinha, A.K. and Kumar, A. (2013). Botany for Degree Students-Gymnosperms, S. Chand & Company Ltd., New Delhi, India.

Session: 2023-24
Master of Science (Botany) Semester-II
Course Title: General Microbiology
Course Code: MBTL-2073

Course outcomes

After passing this course the student will be able to:

CO1: Learn about classification, characteristics, ultrastructure of Prokaryotic and Eukaryotic microbes

CO2: Know about viruses and diseases related to viruses.

CO3: understand the water treatment, bioremediation and aeromicrobiology

CO4: Gain knowledge on industrial products related to microbes and control of microbes

Session: 2023-24
Master of Science (Botany) Semester-II
Course Title: General Microbiology
Course Code: MBTL-2073

LTP: 3-0-0 **Max. Marks- 75**

Theory - 60

CA – 15

Examination Time: 3 hrs

Instructions for the Paper Setters:

Eight questions of equal marks (i.e. twelve marks each) are to be set, two in each of the four sections (A-D). Questions of section (A-D) should be set from Unit (I-IV) of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT-I

Methods in Microbiology: Basic principles of microscopy, micrometry, staining, sterilization methods; culture media, pure culture methods. 2. Classification of bacteria (Bergey's system) characteristics of each group, Nutrition of bacteria, nature of virulence, toxins and extracellular enzymes of pathogenic bacteria, conjugation, transformation and transduction.

UNIT-II

Nomenclature and classification of plant viruses, transmission of plant viruses with control measures, Viroids and origin of viruses, morphology and nature of virus particles, infection and replication with reference to TMV and bacteriophage, viral disease with special reference to encephalitis, hepatitis, AIDS, rabies, foot and mouth disease.

UNIT-III

Environmental Microbiology: Sewage (waste water) treatment: Ecological impact of raw sewage on receiving water, public health impact of raw sewage discharge. Primary, Secondary and tertiary waste water treatments. Total coliform bacteria analysis, Fecal coliform bacteria analysis in drinking water. Landfills, composting. Bioremediation: Biodegradative organisms, advantages of bioremediations, problem associated with bioremediation, methodology of bioremediation. Aeromicrobiology.

UNIT-IV

Industrial Microbiology: The Microbe: Primary and secondary metabolites, major industrial products: foods, flavoring agents and food supplement, vitamins and beverages; organic acids; enzymes and microbial transformation; inhibitors; genetically engineered microorganisms – Human insulin and human growth hormones and vaccines.

Reference Books:

1. Cowan, M. K. (2018). Microbiology: a systems approach. McGraw-Hill.
2. Pelczar M. J., Chan E. C. S. and Krieg N. R. (2001). Microbiology. 5th edition. McGraw Hill Book Company.
3. Stanier, R. Y., Ingraham, J. L., Wheelis, M. L., and Painter, P. R. (2005). General Microbiology. 5th edition. McMillan.
4. Tortora, G. J., Funke, B. R. and Case, C. L. (2019). Microbiology: An Introduction. 13th edition. Pearson Education.
5. Willey J. M., Sherwood, L. M., and Woolverton, C. J. (2017). Prescott, Harley and Klein's Microbiology. 10th edition. McGraw Hill Higher Education.

Session: 2023-24
Master of Science (Botany) Semester-II
Course Title: Cell Biology
Course Code: MBTL-2074

Course outcomes

After passing this course the student will be able to:

CO1: Learn about levels of structural organization, cellular membranes and intracellular transport.

CO2: Gain knowledge on the structural organization and function of intracellular organelles, genes and chromosomes.

CO3: Study about the cell cycle and cell division.

CO4: Gain knowledge on cellular communication & cell signaling.

Session: 2023-24
Master of Science (Botany) Semester-II
Course Title: Cell Biology
Course Code: MBTL-2074

LTP: 3-0-0

Max. Marks- 75

Theory - 60

CA – 15

Examination Time: 3 hrs

Instructions for the Paper Setters:

Eight questions of equal marks (i.e. twelve marks each) are to be set, two in each of the four sections (A-D). Questions of section (A-D) should be set from Unit (I-IV) of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT-I

Levels of Structural Organization: Unicellular, colonial and multicellular forms; levels of organization of tissues, organs and systems; comparative anatomy. Membrane Structure and Function: Structure of model membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, ion pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes.

UNIT-II

Structural Organization and Function of Cell wall and Intracellular Organelles: nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, chloroplast, structure & function of cytoskeleton and its role in motility. Organization of Genes and Chromosomes: Operon, interrupted genes, gene families, structure of chromatin and chromosomes, unique and repetitive DNA, heterochromatin, euchromatin, transposons.

UNIT-III

Cell division and Cell Cycle: Mitosis and meiosis, their regulation, steps in cell cycle, and control of cell cycle. Microbial Physiology: Growth, yield and characteristics, strategies of cell division, stress response Cell Signaling: Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways.

UNIT-IV

Bacterial and plant two-component signaling systems, bacterial chemotaxis and quorum sensing. Cellular communication: Regulation of hematopoiesis, general principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, neurotransmission and its regulation.

Reference Books:

1. Alberts, B., Bray, D., Hopkin, K., Johnson, A. D., Lewis, J., Raff, M. and Walter, P. (2013). Essential cell biology. Garland Science.
2. Becker, W.M., Kleinsmith, L.J. and Hardin, J. (2000). The World of the Cell. The Benjamin/Cummings Publishing Company.
3. Clark, D. P. (2009). Molecular Biology: Academic Cell Update Edition. Academic Press.
4. Cooper, G.M. (2000). The Cell – A Molecular Approach. ASM Press, Washington, D.C.
5. Karp, G., Iwasa, J. and Marshall, W. (2015). Cell and Molecular Biology: Concepts and Experiments. 8th edition. John Wiley & Sons Inc., New York.
6. Karp, G., Iwasa, J. and Marshall, W. (2018). Karp's Cell Biology Global Edition. John Wiley & Sons Inc., New York.
7. Lodish, H., Darnell, J. E., Berk, A., Kaiser, C. A., Krieger, M., Scott, M. P. and Matsudaira, P. (2008). Molecular cell biology. Macmillan.
8. Pollard, T.D. and Ernshaw, W.C. (2002). Cell Biology. Elsevier Science (USA)

Session: 2023-24
Master of Science (Botany) Semester-II
Course Title: Ecological Modelling and Forest Ecology
Course Code: MBTL-2075

Course outcomes:

After passing this course the student will be able to:

CO1: Understand the importance of Ecological models in simulating and analyzing the long-term dynamics and stability properties of complex ecological systems.

CO2: Integrate information from species association and diversity.

CO3: Understand the distribution of vegetation with respect to the environment.

CO4: Understand different Environmental Law & Policy.

Session: 2023-24
Master of Science (Botany) Semester-II
Course Title: Ecological Modelling and Forest Ecology
Course Code: MBTL-2075

LTP: 3-0-0 **Max. Marks- 75**

Theory - 60

CA – 15

Examination Time: 3 hrs

Instructions for the Paper Setters:

Eight questions of equal marks (i.e. twelve marks each) are to be set, two in each of the four sections (A-D). Questions of section (A-D) should be set from Unit (I-IV) of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT-I

Exponential Population Growth: Differential equations, finite rate of increase, intrinsic rate of natural increase, stable age distribution, matrix model for population growth. Logistic Population Growth: Differential model for population growth in limited environment. Interaction Between Two Species: Competition – Differential equations, Leslie-Gower Model, Lotka-Volterra model for predator – prey interaction, Leslie model, simple epidemics.

UNIT-II

Association Analysis and Community Classification: Chisquare, Cole's measures and point correlation coefficient for association, continuum concept. Species Diversity: Species area relationships, species abundance relationships – information measures of diversity. Brillouin's measure, Shannon-Weaver measure, Simpson's measure. Extinction and formation of single populations, McArthur – Wilson theory of biogeography.

UNIT-III

Production and Energy Flow: Production in animal populations, efficiency, measurement of ingestion. measurement of production in plants, litter decomposition. Forest types, climatic region of India, Central, characters and distribution of different forest type of India, Salient features of Indian forest act 1972, different methods employed for conservation of forest, Social and urban forest.

UNIT-IV

Environmental Law & Policy: Constitutional provisions, Water (prevention and control of pollution) Act, 1974; Air (prevention and control of pollution) Act, 1981; Environment Protection Act, 1986; Forest (Conservation) Act, 1980; Wildlife (Protection) Act, 1972; the concept of biosphere reserves, International environmental perspectives.

Reference Books:

1. Barbour, M.G., Burk, J.H. and Pitts, W.D. (1998). Terrestrial Plan Ecology, 3rd edition, Benjamin/Cummings Publication Company, California.
2. Begon, M., Townsend, C. R., & Harper, J. L. (2006). Ecology: from individuals to ecosystems (No. Sirsi) i9781405111171).
3. Chapman, J.L. and Reiss, M.J. (1998). Ecology: Principles and Applications, 2nd edition, Cambridge University Press, Cambridge.
4. De, A.K. (1990). Environmental Chemistry. Wiley Eastern Pvt. Ltd., New Delhi.
5. Hapke, A. (2017). Forest Ecology. Callisto Reference
6. Hill, M.K. (1997). Understanding Environmental Pollution. Cambridge University Press, Cambridge.
7. Kimmins, J. P. (2004). Forest Ecology: A foundation for sustainable forest management and environmental ethics in forestry. Prentice Hall.
8. Kormondy, E.J. (1996). Concepts of Ecology. 4th edition, Prentice Hall of India Pvt. Ltd., New Delhi.
9. Schulze, E-D., Beck, E. and Müller-Hohenstein, K. (2005). Plant Ecology. Springer-Verlag Berlin Heidelberg.

Session: 2023-24
Master of Science (Botany) Semester–II
Course Title: Theoretical Biology
Course Code: MBTL-2336

Course outcomes

After the successful completion of this subject, the students should be able to:

CO 1: Understand linear function, power function and periodic function.
CO 2: Recognize algebraic, exponential, logarithmic function and will come to know how to calculate their differentiation and apply derivatives of sum, difference, product and quotient of two functions.

CO 3: Recognize Integration as an inverse of differentiation and to calculate area under curve and understand integrals as limit of sum and its geometrical interpretation.

CO 4: Understand the concept of mathematical expectation and use it to find out the mean, variance, standard deviation, kurtosis etc. of normal probability distribution.

CO 5: Use Correlation to identify the strength and direction of a linear relationship between two variables and using Regression to predict how much a dependent variable change based on adjustments to an independent variable and also apply Karl Pearson Correlation coefficient and Spearman's Rank Correlation and Least Square technique for Regression lines.

CO 6: Manage to solve problems using t and Chi-Square test.

Session: 2023-24
Master of Science (Botany) Semester–II
Course Title: Theoretical Biology
Course Code: MBTL-2336

LTP: 3-0-0 **Max. Marks- 75**

Theory - 60

CA – 15

Examination Time: 3 hrs

Instructions for the Paper Setters:

Eight questions of equal marks (twelve marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. The question paper must contain 15% of the article/theory from the syllabus.

The students can use only Non-Programmable & Non-Storage Type Calculator and statistical tables.

UNIT-I

1. Linear Function: y=ax and y=ax+b
2. Power Function: $y=ax^n$.
3. Sine and cosine, trigonometric relations.
4. Exponential and Logarithmic Functions: Exponential function $y=aq^x$, logarithmic function.

UNIT-II

5. Differentiation and Integration: differentiation of some important functions (Linear function, Power function, Logarithmic, Exponential, Trigonometric functions), product rule and quotient rule of differentiation, chain rule of differentiation.
6. Integration: Rules of integration (Linear function, Power function, Logarithmic, Exponential, Trigonometric Functions), integration by substitution, integration of product of two functions.

UNIT-III

7. Probability: Random experiment, sample space events, mathematical definition of probability, addition and multiplication law of probability.

UNIT-IV

8. Statistics: Mean, standard deviation, Normal Distribution, Simple linear regression and correlation.

9. Hypothesis testing: Sample Statistics and parameters, standard error, Z-test, t-test as a test of single mean, chi square test as a goodness of fit and association of attributes (For uniformity, ratio and proportion)

Text Books:

1. Hussain I. et. al. Mathematics, A textbook for class XI, NCERT.
2. Joshi, D.D. et. al. Mathematics, A textbook for class XII, NCERT.
3. S.C Gupta, V.K Kapoor, Fundamentals of Mathematical Statistics

Reference Books:

1. Batschelet, E. (1971). Introduction to Mathematics for Life Scientists. Springer-Verlag, Berlin. 2nd edition
2. Ludwig, J and Reynolds, J.F. (1988). Statistical Ecology. John Wiley & Sons, New York.

Session: 2023-24
Master of Science (Botany) Semester-II
Course Title: Botany Practicals I
Course Code: MBTP-2077
(Based on MBTL-2071, MBTL-2072 and MBTL-2073)

Course Outcomes:

After passing this course the student will be able to:

CO1: Understand Morphological, reproductive and anatomical structures of plants.

CO2: Understand wood anatomy of gymnosperms.

CO3: Perform different experiments based on microorganisms.

CO4: Culture microorganisms on different media and their future potential.

Session: 2023-24
Master of Science (Botany) Semester-II
Course Title: Botany Practicals I
Course Code: MBTP-2077
(Based on MBTL-2071, MBTL-2072 and MBTL-2073)

LTP: 0-0-3

Max. Marks- 75

Practical - 60

CA – 15

Examination Time: 6 hrs

Instructions for the paper setter: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

Suggested Practicals

Based on MBTL-2071:

1. Morphological, reproductive and anatomical study of representative members of the pteridophytes studied in theory using cleared whole mount preparation and sectioning (*Selaginella, Lycopodium, Equisetum, Pteris, Dryopteris, Marselia, Salvinia*).
2. Studies on habit and natural habitat of pteridophytes.
3. Study of spore morphology.
4. Study of spore germination on Knop's medium.

Based on MBTL-2072:

1. Study of morphology, structure and reproduction in *Cycas, Pinus, Cedrus, Ginkgo, Ephedra, Taxus, Podocarpus, Gnetum.*
2. Study of fossils: *Williamsonia.*
3. Understanding wood anatomy using T.S, T.L.S and R.L.S in *Pinus* and *Cedrus.*
4. Study of secondary growth in stem and root.

Based on MBTL-2073:

1. Acquaintance with working, principle, parts and precautions of most commonly used instruments in a microbiology lab.
2. Calibration of microscope: determination of dimensions of microorganisms.
3. Acclimatization with aseptic techniques-sterilization, preparation and cultivation media for bacteria.
4. To prepare temporary and permanent cotton plugs.
5. To prepare solid and liquid culture media.
6. To culture or cultivate bacteria.
7. To stain and study bacteria.
8. To measure bacterial cells through ocular micrometry.

9. Microscopic examination of milk and curd.
10. To isolate micro-organisms from mixed culture and grow a pure culture.
11. Isolation of microbes from soil sample by streaking method.
12. Isolation of microorganisms from given water sample by serial dilution.
13. Methylene blue reduction test for examining the microbial activity of milk.
14. To study radial growth of fungi on nutrient media.
15. To determine antibiotic staining of bacterial strain.
16. Demonstration of Lambert Beer's law by colorimeter.

Session: 2023-24
Master of Science (Botany) Semester-II
Course Title: Botany Practicals II
Course Code: MBTP-2078
(Based on MBTL-2074, MBTL-2075 and MBTL-2336)

Course Outcomes:

After passing this course the student will be able to:

CO1: Understand structures of various cell organelles.

CO2: Examine cell divisions in plant cells.

CO3: Perform different experiments based on plant ecology.

CO4: Analyze nutrients and pigment contents in plants using various techniques.

CO5: Learn application of Statistics in Life Science.

CO6: Analyze and interpret the observations Statistically

Session: 2023-24
Master of Science (Botany) Semester-II
Course Title: Botany Practicals II
Course Code: MBTP-2078
(Based on MBTL-2074, MBTL-2075 and MBTL-2336)

LTP: 0-0-3

Max. Marks- 75

Practical - 60

CA – 15

Examination Time: 6 hrs

Instructions for the paper setter: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

Suggested Practicals

Based on MBTL-2074:

1. Understanding the cytology laboratory- components of compound/electron microscope.
2. Examination of electron micrographs of eukaryotic cells with special reference to organelles.
3. Examination of various stages of mitosis and meiosis using appropriate plants material (e.g. onion root tips, onion flower buds).
4. Calculation of Mitotic and meiotic index from dividing root tip cells and pollen grains.
5. Study on cyclosis in *Tradescantia* and *Hydrilla* leaves.
6. Observations on Barr bodies in Squamous epithelium.
7. Preparation of Feulgen stained chromosomes in root tip cells.
8. Effect of colchicine on chromosome movements during mitosis.
9. Use of fluorescent dye to visualize cell components.

Based on MBTL-2075:

1. To determine minimum size and number of quadrats required for reliable estimate of biomass in grassland.
2. To find out association between grassland species using chi square test.
3. To analyse plant communities using Bray-Curtis ordination method.
4. To determine soil moisture content, porosity, bulk density of different soil samples collected from different locations.
5. To study chlorophyll content of SO_2 fumigated and unfumigated plant leaves.
6. To determine Na, K concentration of water sample using flame photometer.
7. To determine water holding capacity of different soil samples.
8. To determine percent organic Carbon and organic matter in different soil samples.
9. To estimate chlorophyll content in SO_2 fumigated and unfumigated plant leaves.

10. To estimate rate of CO_2 evolution from different soil using soda lime or alkali absorption method.
11. To determine sulphate content of water samples.
12. To determine O_2 content of water samples.

Based on MBTL-2336:

1. To Study the Exponential Growth of Microbes with the help of Graph.
2. To Find the rate of change of Bacterial Growth w.r.t time, nutrient etc.
3. To Study the Application of Probability in Life Sciences / Genetics.
4. To Analyse the Biostatistical data using mean and Standard deviation.
5. To Find Correlation and Regression between two Variables of Biostatistical data.
6. Application of t-test as a Single mean in Life Sciences.
7. Application of χ^2-test as a Goodness of fit in Life Sciences.
8. Application of χ^2- test in association of attributes in Life Sciences.
9. Application of Z- test as test of single Mean in Life Sciences in Botany.