MANGALORE UNIVERSITY
BSc. DEGREE COURSE

OPTIONAL BOTANY SYLLABUS

Three year [Six semester] course
SCHEME FOR CREDIT BASED SEMESTER

I AND II SEMESTER

Semester	Paper	Teaching / practical hours per week	Total No. of teaching /practical hours per semester	Duration of exam [hours]	Max.marks for exam	Internal Assessment max.marks	Total marks	CREDITS
I Semester	Theory BO-101	4	48	3	80	20	100	2
	Practical BO-102	3	30	3	40	10	50	1
II Semester	Theory BO-151	4	48	3	80	20	100	2
	Practical BO-152	3	30	3	40	10	50	1

BO-101:Theory ------- Protophyta and Phycology

BO-102:Practical ------- Protophyta and Phycology

BO-151 Theory ------- Mycology,Pathology and Bryophyta

BO-152:Practical -------Mycology,Pathology and Bryophhyta

MANGALORE UNIVERSITY
BSc. DEGREE COURSE

OPTIONAL BOTANY SYLLABUS

Three year [Six semester] course
SCHEME FOR CREDIT BASED SEMESTER

III AND IV SEMESTER

Semester	Paper	Teaching / practical hours per week	Total No. of teaching /practical hours per semester	Duration of exam [hours]	Max.marks for exam	Internal Assessment [max.marks	Total marks	CREDITS
III Semester	Theory BO-201	4	48	3	80	20	100	2
	Practical BO-202	3	30	3	40	10	50	1
IV Semester	Theory BO-251	4	48	3	80	20	100	2
	Practical BO-252	3	30	3	40	10	50	1

BO-201: Theory ------- Pteridophyta,Gymnosperms,Histology and Anatomy

BO-202: Practical ------- Pteridophyta,Gymnosperms,Histology and Anatomy

BO-251: Theory ------- Cell Biology,Molecular Biology and Genetics

BO-252: Practical ------- Cell Biology,Molecular Biology and Genetics

MANGALORE UNIVERSITY
BSc. DEGREE COURSE

OPTIONAL BOTANY SYLLABUS

Three year [Six semester] course
SCHEME FOR CREDIT BASED SEMESTER

V AND VI SEMESTER

Semester	Paper	Teaching / practical hours per week	Total No. of teaching /practical hours per semester	Duration of exam [hours]	Max.marks for exam	Internal Assessment [max.marks	Total marks	CREDITS
V Semester	Theory	3	36	3	80	20	100	2
	Practical	2	20	2	40	10	50	1
	Theory	3	36	3	80	20	100	2
	Practical	2	20	2	40	10	50	1
VI Semester	Theory	3	36	3	80	20	100	2
	Practical	2	20	2	40	10	50	1
	Theory	3	36	3	80	20	100	2
	Practical	2	20	2	40	10	50	1

BO -301:Theory ------- Physiology- I and Ecology- I

BO -302 Theory ------ Angiosperm Morphology,Biotechnology and Microbiology

BO -303:Practical ------ Physiology -I and Ecology -I

BO -304:Practical ------ Angiosperm Morphology,Biotechnology and Microbiology

BO -351:Theory ------- Physiology-II and Ecology- II

BO -352:Theory ------ Taxonomy and Economic Botany

BO-353:Practical -------Physiology- II and Ecology-II

BO-354:Practical ------- Taxonomy and Economic Botany

MANGALORE UNIVERSITY
B.Sc. Degree – Botany
I SEMESTER
BO - 101: PROTOPHYTA AND PHYCOLOGY

Total – 48 hours

UNIT – I

12hours

VIRUSES: Discovery, occurrence, nomenclature, morphology, chemical nature, replication,. Structure of TMV and Bacteriophage T4, Life cycle of Bactriophage [virulent], infectivity and symptoms of plant viral diseases with examples, Prions and viroids.
MYCOPLASMA: Nature, structure and reproduction, sandal spike disease – symptoms and management,culturing of mycoplasma
BACTERIA: Discovery, distribution, morphology, ultra structure,Gram's staining, nutrition, and reproduction - budding, fission, spore formation ,conjugation, transformation and transduction. Economic importance.
CYANOBACTERIA: General characteristics, Thallus construction and reproduction in *Gloeocapsa*, *Oscillatoria*, *Scytonema* and *Rivularia*. Economic importance.Cyanobacteria as an indicator of eutrophication.

UNIT – II

12 hours

Algae : Salient features of Algae and classification upto major classes -Fritsh system
Chlorophyceae: Salient features of chlorophyceae, Structure, reproduction and life cycle of *Chlorella, Volvox, Cladophora, Oedogonium, Caulerpa and Chara.*

UNIT – III

12hours

Xanthophyceae: Salient features of Xanthophyceae, Structure, reproduction and life cycle of *Vaucheria.*
Bacillariophyceae: Salient features of Bacillariophyceae, Structure of Centric and Pennate diatoms, reproduction - cell division and auxospore formation in diatoms. Diatomaceous earth.
Phaeophyceae: Salient features of Phaeophyceae, Structure, reproduction and life cycle of *Sargassum*.

UNIT – IV

12hours

Rhodophyceae: Salient features of Rhodophyceae, Structure, reproduction and life cycle of *Polysiphonia.*
Economic Importance ; Algae as food, fodder, medicine, industrial uses and biofertiliser. Algae as pollution indicator, Algae and water supply, Algae as phyto-planktons, algal toxins and paracitic algae, Note on algal culture.

B.Sc. Degree – Botany
I SEMESTER -PRACTICAL
BO – 102: PROTOPHYTA AND PHYCOLOGY
[10 practicals of 3 hours duration, one practical per week)

1. Study of parts of compound microscope, method of using, care, cleaning and precautions
2. Study of Morphological types of Bacteria, Simple staining and negative staining
3. Demonstration of Gram's staining technique.
4. Study of Bacterial motility by hanging drop technique.
5. Structure of *Gloeocapsa,Oscillatoria ,Rivularia* and *Scytonema*
6. Structure of *Chlorella and Volvox*, Reproductive stages in *Volvox.*
7. Structure and reproductive stages of *Cladophora* and *Oedogonium*,.
8. Structure of *Caulerpa* and *Chara*. Sex organs of *Chara*.
9. Structure and reproduction in *Vaucheria*, Structure of Centric/ Pennate diatoms
10. Structure and reproductive organs of *Sargassum* and *Polysiphonia.*

Note:

1. The students shall be taken for field work to some nearby places for specimen collection .
2 Submission of **THREE** specimens [**one** from virus/bacteria/cyanobacteria and **two** from algae] with field notes for the practical examination.

REFERENCES FOR I SEMESTER

1. Bhatia K.N. 1994. Algae, R. Chand
2. Fritsch F. E. 1952. The Structure & Reproduction of the Algae Vol. I & II Cambridge at the Univ. Press.
3. Kumar H.D. & H.N. Singh. 1996. A Text Book of Algae, East West Press, New Delhi
4. Kumar H.D. 1990. Introductory Phycology, Affiliated East-West Press.
5. Lee R.E. 1980 Phycology, Cambridge Univ. Press
6 Ganguli and Kar. Kar.College Botany Vol I & II
7 Pandey S.N. & P.S. Trivedi 1977. A text Book of Botany vol I. Vikas
8 Prescott G.W. 1969. The Algae: A review Thomas Nelson & Sons Ltd.
9 Smith G.M. 1955. Cryptogamic Botany Vol 1. Algae & Fungi, McGraw Hill Book Co.Inc. 2 edition
10 Smith K.M. 1990. Plant viruses 6 edition Universal Book stall New Delhi
11 Srivastava H.N. 2004. Algae, Pradeep
12 Vasishta B.R., A.K. Sinha & V.P. Singh. 2010. Botany for degree students - Algae, S. Chand
13 Venkataraman G.S. 1972. Algal biofertilisers & rice cultivation. Today & Tomorrows Printers & Publishers, New Delhi
14 Adigan M.T., J.M. Martinko, J. Parker, 2003. Biology of Microorganism 10 edition
15 Ananthanarayanan R. & C. K. Jayaram Paniker. 1996. Text Book of Microbiology, Orient Longman
16 Atherly A.G. J.R.Girton, J.F.McDonald. 1999.The Science of Genetics.Saunders College . Publ
17 Desikachary T.V. 1959. Cyanophyta, ICAR, New Delhi
18 Luria S.E. et at 1978. General ViroLogy 3 edition John Wiley & Sons.
19 Mandahar C.L 1987. Introduction to Plant viruses, S. Chand.
20 Nester W.E. et al 1983. Microbiology 3 edition John Wiley & Sons.
21 Pelczar M.J., E.C.S. Chan a N.R. Krieg. 1988. Microbiology 5 edition, Mc Grow Hill
22 Purohit S.S. 1989. Viruses, Bacteria E Mycoplasmas, Agrobotenical Publ.
23 Carter N.1926 Freshwater Algae from India. Bishen Singh Mahendra Pal Singh, Dehradun
24 Vashishta B.R. 2008. Algae 9 edition S. Chand Co
25 B.P.Pandey A text book of Algae S. Chand Co

B.Sc. Degree – Botany

II SEMESTER

BO-151: MYCOLOGY, PLANT PATHOLOGY AND BRYOPHYTA

Total – 48 hours

UNIT –I **12 hours**

MYCOLOGY

Fungi: Salient features of Fungi and classification upto major classes (Alexopoulos).

Class – Oomycetes: Structure, reproduction and economic importance of *Phytophthora.*

Class – Zygomycetes: Structure, reproduction and economic importance of *Rhizopus.*

Class – Ascomycetes: Structure, reproduction and economic importance of *Penicillium.* Reproductive structures in *Peziza* and *Xylaria*

UNIT – II **12 Hours**

Class - Basidiomycetes: Structure, reproduction and Life cycle of *Puccinia*
Economic importance of fungi, General account of mushroom cultivation.

Lichens: General account, structure, nutrition and reproduction
Economic importance of lichens.

UNIT-III **12 Hours**

PLANT PATHOLOGY

Etiology, symptoms, transmission and disease management of the following**:**

a. Katte disease of Cardamom
b. Bunchy top of Banana
c. Citrus canker
d. Bud rot of coconut
e. Koleroga of arecanut
f. Stem bleeding disease of coconut
g. Leaf rust of coffee
h. Blast disease of rice
i. Root knot disease of brinjal

Brief account of seed borne diseases.
Biological control of plant diseases (Trichoderma), biopesticides (Neem]

UNIT— IV **l2 Hours**

BRYOPHYTA– Salient features and classification.

Class- HEPATICOPSIDA-*Riccia* and *Porella*

Class- ANTHOCEROTOPSIDA – *Anthoceros*
[developmental stages in the above types are not needed]
Significance of *Anthoceros* in the evolution of land plants

Class- BRYOPSIDA- Characteristics of gametophyte and sporophyte of *Funaria*.
[developmental stages are not needed]
Evolution of gametophytes and sporophytes in Bryophytes-progressive & retrogressive theories.
Importance of Bryophytes in soil conservation.

B.Sc. Degree – Botany
II SEMESTER -PRACTCAL
BO- 152 : MICOLOGY, PLANT PATHOLOGY, HISTOLOGY AND ANATOMY.
(10 practical's of 3 hrs duration each, one practical per week)

1. Asexual stages of *Phytophthora*, Asexual and sexual stages of *Rhizopus*. Demonstrating the growth of *Rhizopus* on bread and jack inflorescence.
2. Asexual stages of Penicillium and fructification of *Peziza* and *Xylaria.*
3. Stages in the life cycle of *Puccinia.*
4. Katte disease of cardamom, Bunchy top disease of banana and Citrus canker
5. Bud rot of coconut , Nut rot of arecanut and Stem bleeding of coconut
6. Leaf rust of coffee, Blast disease of rice and Root knot disease of brinjal
7. Lichens – Types, Thallus T.S., asexual stages and apothecial study
8 Study of thallus and reproduction of *Riccia* and *Porella*
9 Study of thallus and reproduction of *Anthoceros*
10 Study of thallus and reproduction of *Moss*. (locally available)

Note:

1 The students shall be taken for field work to some nearby places for specimen collection
2 Submission of **THREE** specimens (**two** from fungi/lichens and **one** from pathology/ bryophyta) with field notes for the practical examination

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REFERENCES FOR II SEMESTER

1. Alexopoulos C.J. 1962. Introductory Mycology Wiley Eastern Ltd.
   Alexopoulos C.J. 1996. Introductory Mycology Wiley Eastern Ltd
2. Barnett H.L. (1972) & B.B. Hunter 3/e Illusrated genera of Imperfect Fungi. Burgess Pubi. Co. Minnesota
3. Mishra S.R. 2005. Morphology of fungi, D Ph Publisher
4. Dube H.C. 1983. An Introduction to Fungi Vikas Publications
   Webster J. 1980. Introduction to Fungi 2 edition
5. Agrios G.M. 1969. Plant Pathology 4 edition Harcourt. Asia Pte Ltd. Academic Press
6. Aneja K.R. 1996. Experiments in Microbiology, Plant Pathology, tissue culture & Mushroom cultivation 2 edition Wishwa Prakashan, New Delhi.
7. Vashishta B.R. 2008. Fungi 9 edition S. Chand Co.
8. Misra A. & R. P. Agarwal 1978. Lichens - A Preliminary Text Oxford & IBH

10 Jha D.K. (1995), Laboratory Manual of Seed Pathology. Vikas
11 Kamat M.N. 1967. Introductory Plant Pathology 3 edition. Prakash Publ. House, 360, Budhwar Pet, Poona – 2
12 Pandey B.P. 2008. Plant Pathology S. Chand & Co.
13 Rangaswami G. 1972. Diseases of Crop Plants in India. Prentice Hall of India Pvt. Ltd. New Delhi
14 Sharma P.D. 2000 Plant Pathology Rastogi.
15 Singh R.S. 1963. Plant diseases 2 edition. Oxford & IBH
16 Pandey B.P. 2009 Text book of Bryophyta.S. Chand Co
17 Parihar N.S. 1987. An Introduction to Embryophyta Vol. 1. Bryophyta Central Book Depot Allahabad
18 Smith G.M. 1955. Cryptogamic Botany Vol II. Bryophytes & Pteridophytes Mc Graw Hill .
19 Campbell D.H. 1918. The structure & Development of mosses & Ferns 3 edition
20 Pandey S.N. S.P. Misra & P.S. Trivedi 1972. A Text Book of Botany Vol II 2 edition Vikas Pubil.
21 Snvastava H.N. 2004. Bryophyta. Pradeep Publications
22 Vasishta B.R. 2008. Bryophyta S. Chand Co

B.Sc. Degree – Botany
III SEMESTER
BO- 201: PTERIDOPHYTA, GYMNOSPERMS ,HISTOLOGY AND ANATOMY.

Total- 48 hrs

UNIT—II **l2hrs**

PTERIDOPHYTA: Salient features and classification
PSILOTALES- *Psilotum* - External morphology,stem anatomy & Reproduction only.

LYCOPODIALES: *Lycopodium* and *Selaginella*
External morphology,sporophyte and gametophyte,stem anatomy only.

UNIT—III **l2hrs**

SPHENOPHYLLALES: *Equisetum*
External morphology, sporophyte and gametophyte stem anatomy only.
FILICALES : *Ophioglossum* - external morphology and spike only.
Osmunda- external morphology and tassel only.
Pteris - Morphology ,anatomy of rachis, sporophyll and prothallus only.
MARSILEALES *Marsilea* -external morphology, anatomy of rhizome,HLS of sporocarp only.

UNIT—IV **l2hrs**

GYMNOSPERMS : Salient features and classification
Cycadales; *Cycas*-Morphology,anatomy of coralloid root, primary and secondary structure of stem,anatomy of leaflet,structure of male cone,microsporophyll,megasporophyll and structure of ovule.
Coniferales; *Pinus* -Morphology, anatomy of needle, structure of male cone, structure of female cone and structure of ovule
Gnetales; Gnetum- Morphology,primary and secondary structure of stem, structure of male cone, structure of female cone and structure of ovule
Affinities of *Gnetum* with angiosperms

UNIT –IV

HISTOLOGY AND ANATOMY **12 hours**
Meristems, types of meristems, organization of shoot apex - Tunica Corpus theory,
structure of root apex - Histogen theory.
Simple tissues- Parenchyma, Collenchyma, Sclerenchyma - distribution,.structure and function
Complex tissues-Xylem-and Phloem - distribution,.structure and function
Secretory tissues - glandular and laticifer tissue
Secondary growth in dicot stem and root .
Annual rings, heart and sap wood, medullary rays, phellogen, periderm, cork, bark and lenticels.

B.Sc. Degree- Botany
III Semester -PRACTCAL
BO- 202: PTERIDOPHYTA, GYMNOSPERMS, HISTOLOGY AND ANATOMY
(10 Practicals of 3 hrs duration each, one practical per week)

1. Study of *Psilotum* (Morphology and Synangium only, anatomy is not needed.), *Lycopodium* (Morphology of at least 3 species, stem anatomy, strobilus only)
2. Study of *Selaginella* (Morphology, stem anatomy, rhizophore anatomy, strobilus). *Equisetum* (Morphology, stem anatomy, strobilus or cone, spores).
3. Study of *Ophioglossum* [external morphology and spike], Osmunda(external morphology and tassel] *Pteris /Pteridium*.(Morphology, rachis anatomy, sporophyll and prothallus only
4. Study of *Marsilea* (Morphology, stem anatomy, sporocarp HLS)
5. Study of *Cycas* (Morphology, anatomy of corolloid root and leaflet, male cone, female sporophyll, ovule).
6. Study of *Pinus* (Morphology, anatomy of needle, male and female cones and ovule). Study of *Gnetum* (Morphology , male and female cones and ovule
7. A study of the structure of following tissues from locally available plant materials- meristems, parenchyma, collenchyma, sclerenchyma, xylem and phloem tissues.
8. Study of the structure of T.S of primary structures of dicot stem and root.
9. Study of T.S of monocot stem and root
10. Study of dorsiventral leaf and isobilateral leaf

Note :- A study tour should be conducted to study Pteridophytes and Gymnosperms in their natural habitat

REFERENCES FOR III SEMESTER

1. Pandey B.P.. 2008 Text book of Pteridophyta. S. Chand Co.
2. Pandey B.P. 2009 Text book of Gymnosperms.S. Chand Co
3. .
4. Parihar N.S. 1996. Biology and Morphology of Pteridophytes. Central Book Depot Allahabad.
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22 Srivastava H.N. 1998. Anatomy of Angiosperms. Pradeep.
23 Tayal M.S. 1984. Plant Anatomy. Rastogi publishers
24 Esau K. 1977. Anatomy of Seed Plants 2 edition Wiley Eastern.
25 Fahn A. 1990. Plant Anatomy 4 edition Aditya Books (P) Ltd. New Delhi
26 26Ganguli & Kar.College Botany Vol I & II
27 Gemmell A.R. 1969. Developmental Plant Anatomy. Edward Arnold Indian reprint. (60 pages)
28 28Vasishta P.C. 2004. Plant Anatomy. S. Chand Eames A.J. & L.H. Mac Daniels 1947.
29 An Introduction to Plant anatomy. Mc Graw Hill Book Co.
30 Cutter E.G. 1978. Plant Anatomy. Part 1 & 2. ELBS.

B.Sc. Degree – Botany

IV Semester

BO- 251: CELL BIOLOGY, MOLECULAR BIOLOGY & GENETICS

Total 48 hrs

UNIT-I 12hrs

CYTOLOGY - Structure of plant cell, Structure & functions of cell-wall, plasma -membrane, endoplasmic reticulum, lysosomes, plastids, ribosomes, golgi complex, mitochondria and peroxisome. Non Living inclusions, nucleus in general, nuclear membrane, pore complex and nucleolus.

CHROMOSOMES - Chromosome morphology - size, structure, number, Ideogram – Karyotype, chromosome banding, centromere, telomere, numerical changes in number and kinds of chromosomes (autosomes and allosomes). Structure of the chromosome - nucleosome – solenoid model

CELL DIVISION - Cell cycle, mitosis and meiosis, Significance of mitosis and meiosis.

UNIT- 2 12hrs

STRUCTURE AND CHEMISTRY OF THE GENE: DNA as genetic material, evidences from bacterial transformation - experiments of Griffith and Avery - MacLeod experiments; evidence from experiments with Bacteriophage – Hershey - Chase experiments, Molecular structure of DNA, Watson and Crick model of DNA, DNA replication, types of RNA, Genetic code and protein synthesis.

GENE CONCEPT -Cistron, recon and muton, Gene expression in prokaryotes - Lac operon. Gene expression in Eukaryotes at the level of genome- transcription and translation , split genes, exons, introns and gene splicing, transposons – characteristics, parent site and target site types with example.

UNIT-3 12hrs

MENDELISM: Mendel's work - mono and dihybrid crosses. Mendel's Law of segregation and law of independent assortment. Back cross and test cross. Incomplete dominance

CROSSING OVER Mechanisim of crossing over **,**Bateson and Punnett coupling and repulsion, types of crossing over and theories of crossing over[break and exchange theory,copy choice theory],significance of crossing over.

LINKAGE: Linkage in Maize , Morgan's chromosome theory of Linkage.

SEX DETERMINATION IN PLANTS.

Chromosomal homo & heterogametic sexes with plant examples. Single genic and multigenic sex determination, sex determination in Melandrium,Coccinia,Viscus,Papaya and Maize.

INTERACTION OF GENES:, supplementary genes [9:3:4]; complementary genes [9:7], dominant epistasis, (12:3:1) recessive epistasis[15:1], and duplicate genes (15:1)with plant examples

MULTIPLE FACTORS: Polygenic inheritance with example[kernel color in wheat].

UNIT-4 12hrs.

PLOIDY: Aneuploidy, euploidy, Autopolyploids [natural and artificial] and allopolyploids [natural and artificial], amphidiploidy. Role of polyploidy in plant breeding and evolution.

CHROMOSOMALABERRATIONS : deficiencies, duplications, inversions and translocations

GENE MUTATIONS: Gene mutations - mutagenesis by tautomer shifts:mutagens - physical mutagens and chemical mutagens. Role of mutations in plant breeding and evolution

B.Sc. Degree - Botany

IV SEMESTER -PRACTCAL

BO-252: CELL BIOLOGY, MOLECULAR BIOLOGY & GENETICS

(10 practicals of 3 hours duration each, one practical per week)

1. Study of cell organelles under Light microscope
2. Study of ergastic - starch (potato, rice grain), aleurone (wheat grain), calcium oxalate (Pistia), calcium carbonate (Ficus leaf)and oil globules (castor seed).
3. Squash preparation of onion root.
4. Study of stages of mitosis
5. Squash preparation of flower buds of onion
6. Study of stages of meiosis
7. Solving genetic problems in monohybrid and dihybrid crosses
8. Solving genetic problems in incomplete dominance (in mono & dihybrid crosses)
9. Solving genetic problems in interaction of gens
10. Preparation of double stained free hand sections of stem, root or leaf material

Note:-

1. **Three** double stained permanent slides prepared by the student must be submitted at the time of practical examination along with the certified class record

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REFERENCES FOR IV SEMESTER

1. Atberts Bruce et at 2002. Molecular Biology of the Cell 4 edition. Garland Sciences, Taylor & Francis Group.
2. Atherly A.G., J.R. Girton, J.F. McDonald. 1999. The Science of Genetics. Saunders College Publ.

3. Burns G.W. 1983. The Science of Genetics - An Introduction to Heredity. 5 edition Mac Millan Publ.
4. Cooper G.M. and Hausman R.E. 2007. (4thedition) The cell molecular approach. Sinauer associate, inc Suderland (USA).
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7. DeRobertis E.D.P. & E.M.F. De Robertis 2005. Cell and Molecular biology 8 edition Lippincott Williams Philadelphia.(B I publishing Pvt Ltd New Delhi.
8. Dharmalingam K. 1986. Experiments with M13. Gene Cloning & DNA sequencing Mac Millan (112 pages)
9. Gardner E.J., M.J. Simmons & D.P. Snustad. 1991. Principles to Genetics 8 edition John Wiley & Sons
10. Gupta P.K. 2000 Genetics and Cytogenetics Rastogi Publishers.
11. Karp Gerald 2002. Cell and Molecular Biology concepts and experiments 3 edition John Wiley & Sons.
12. Klug W.S. & M.R. Gummings 2003. Concepts of Genetics 7 edition. Pearson Edition 482, F.I.E. Patparganj Delhi -110092
13. Krishnamurthy K.V. 2000 Methods in cell wall cytochemistry. CRC press Boca Raton, Florida.
14. Kumar H.D. 2000. Molecular Biology Vikas 2 edition
15. Lewin Benjamin (2005) Genes VlII oxford
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24. Stansfield W.D. 1986. Theory & Problems of Genetics 2edition.Schaum's Outline series Mc Graw Hill
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26. Tamarin Robert & R.W. Leavitt 1991. Principles of Genetics. W.C. Brown Publ. USA 3 edition
27. Thorpe N.O. 1984. Cell Biology, John Wiley & Sons.
28. Turner P.C. at al. 1998. Instant Notes in Molecular Biology, Viva Books Pvt Ltd.
29. Vasishta P.C. & P.S. Gill 1998. Cell Biology & Molecular Biology, Pradeep
30. Verma P.S. & V.K. Agarwal 2004. Cell biology S. Chand
31. Verma P.S. & V.K. Agarwal 2006. Cell Biology, Genetics , Molecular Biology, Evolution, Ecology. S. Chand & company New Delhi.
32. Weaver R.F. & D.W.Hedrick 1997. Genetics 3 edition WCB Publ.
33. Winchester A.M.Genetics 3rd edition. 1966. Oxford & IBH Publ.
34. Winter P.C., G.I. Hickey a H.L. Fletcher 1999. Instant Notes in Genetics. Viva Books Pvt. Ltd. New Delhi

B.Sc. Degree - Botany
V Semester
BO - 301: PLANT PHYSIOLOGY- I & ECOLOGY -I

Total 36 hrs

UNIT-I **l0hrs**

PLANT WATER RELATIONS: Water absorption -Physical concepts of absorption, imbibition, diffusion and osmosis.Plasmolysis ,Plant cell an osmotic system-water potential ; $\Psi = \Psi p + \Psi s + \Psi m$,
MECHANISM OF WATER ABSORPTION - passive and active absorption .
ASCENT OF SAP: path and mechanism of ascent of sap - root pressure theory, cohesion tension theory.
TRANSPIRATION - Definition, cuticular, lenticular and stomatal transpiration, mechanism of stomatal movement - starch hydrolysis theory and K+/proton ion exchange theory, factors affecting the rate of transpiration. Significance of transpiration
GUTTATION - brief account.

UNIT-2 **8hrs**

MINERAL NUTRITION: Soil solution, functions of mineral elements in general, Mineral nutrition-macro [N,P,K,S,Fe,Mg,Ca] and micro [Mn,Zn,Cu,Mo,B] elements.
Hydroponics,Fertigation.
SALT ABSORPTION MECHANISM – passive absorption of salts -diffusion, ion exchange and Donnan's equilibrium and active absorption of salts- Lundegardh's Cytochrome Pump theory and Bennett Clark's Protien-Lecithin theory.
PLANT ENZYMES: Properties of enzymes, Nomenclature, structure and composition of enzymes, co-enzymes and co-factors, mode of enzyme action, enzyme inhibitors, factors affecting enzyme activity.

UNIT-3 **8hrs**

CARBOHYDRATE METABOLISM – Classification of Carbohydrates. Structure of ribose and deoxyribose sugars, glucose, fructose, sucrose, starch and cellulose, Metabolism of sucrose and starch,
NITROGEN METABOLISM - Sources of nitrogen, physical and biological nitrogen fixation and mechanism of biological nitrogen fixation- asymboitic and symbiotic,formation of root nodules in Leguminous plants, Nitrate reduction and amino acid synthesis.
FAT METABOLISM - General account of fats, synthesis of glycerol, synthesis of fatty acids, and condensation of fatty acid and glycerol, fat degradation, β (Beta) -oxidation, glyoxylate cycle and its significance, plant waxes.

UNIT 4 **10hrs**

ECOLOGIAL FACTORS: **Climatic** factors - influence of light, temperature, precipitation, humidity and wind on vegetation. **Topographic** factors, **Edaphic** factors - types of soil, soil profile, soil formation, mineral particle, soil pH, soil aeration, organic matters, soil humus, soil microorganisms and **Biotic** factors – plant-plant and plant -animal interactions.
ECOSYSTEM – Concept and types of ecosystems, pond ecosysytem, energy flow, food chain and ecological pyramids. Ecological niche, Biome, Biosphere, population,community.
PLANT SUCCESSION – Definition, stages of succession, types of succession, primary & secondary succession , Hydrosere and Xerosere

B.Sc. Degree - Botany
V SEMESTER -PRACTCAL
BO - 303 : PLANT PHYSIOLOGY - I ECOLOGY - I
(10 practicals of 2 hrs duration each, one practical per week)

MAJOR EXPERIMENTS (1-5)

1. Experiment to measure the solute potential of the cell sap by plasmolytic method.
2. Experiment to show the effect of environmental factors on the transpiration rate using Ganong's potometer.
3. Determination of the relation between absorption and transpiration.
4. Experiment to determine the suction due to transpiration.
5. Determination of porosity of soil samples from forest (humus), paddy field and coastal regions (sand) and determination of their pH.

CHEMICAL TESTS

6. Estimation of carbohydrates
7. Estimation of proteins

DEMONSTRATION EXPERIMENTS

8. a) Potato osmoscope experiment

   b)Thistle funnel experiment
   c) Experiment to demonstrate imbibition pressure by germinating seeds
9. a) Determination of differential rate of transpiration on the two surfaces of leaf using Garreau's apparatus.
   b) Bell jar experiment
   c) Experiment to prove aeriferous system in plants.
10. Study of pond ecosystem,

Note:- PROJECT WORK ON ECOLOGY

Students should be prepare a project on Ecosystem[pond ecosystem /forest ecosystem/grassland ecosystem/river ecosystem/marine ecosystem] and submit the report at the time of practical examination along with the certified class record

REFERENCES FOR V SEMESTER

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2. Devlin R.M. & F.H. Witham Plant Physiology 4 edition CBS Publ.
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B.Sc. Degree – Botany

V SEMESTER

BO – 302: ANGIOSPERM MORPHOLOGY,BIOTECHNOLOGY AND MICROBIOLOGY

Total – 36 hours

UNIT – I 9 hours

ANGIOSPERM MORPHOLOGY

Modifications of stem, root and leaf ,types of inflorescences and fruits,Flower and its parts, thalamus, insertion of floral parts, calyx, corolla and their variations, Androecium-structure and its variations; Gynoecium- structure and its variations. Plant propagation -Cutting, layering and grafting [wedge, approach, bud and tounge grafting]

UNIT-2 9 Hours

POLLINATION AND EMBRYOLOGY

Pollination types, Contrivances –dicliny, dichogamy, self sterility, heterostyly and herkogamy.Agents of pollination Wind, Water and Animals(insects, birds and bats). types of fruits, Microsporogenesis and male gametophyte.Megasporogenesis and female gametophyte. Monosporic (Polygonum) type of embryo sac.Double fertilization, Chalazogamy, Porogamy. Endosperm formation, types of endosperm- nuclear, cellular and helobial.Structure of mature monocot seed and embryo, dicot seed and embryo

UNIT – 3 9 Hours

BIOTECHNOLOGY:

Genetic engineering[Recombinant DNA technology], endonucleases and plasmids, Structure of P^{BR32} and P^{UC18} plasmids, gene cloning, applications of genetic engineering in pharmaceutical [enzymes, antibiotics, vitamins, vaccines, steroid],agricultural[transgenic plants, production of transgenic plant B.T.Cotton], industrial [Brewery, dairy] and environmental fields[waste disposal management and sewage water treatment], A brief account of PCR technology, tissue culture and its application, A brief account of protoplast culture, meristem culture, anther culture and pollen culture.

UNIT – 4 9 Hours

MICROBIOLOGY: Scope of microbiology. beneficial microbes and their applications (fermented foods, vitamins, dairy, antibiotics, steroids, breweries, organic acids and plant hormones), single cell proteins.

FOOD SPOILAGE: Canned and frozen foods, fruits, vegetables, grains, beer and wine.

FOOD POISONING: by Staphylococci, Clostridia and Salmonella.

FOOD PRESERVATION: Principles- low temperature, boiling, autoclaving, high OP, salting, chemical, irradiation – HACCP.

Biogas, Biomining and Bioremediation – a general account.

MYCORRHIZA: Ectotrophic and endotrophic, vesicular arbuscular mycorrhiza (VAM), Effects of mycorrhizae on their hosts.

B.Sc., Degree – Botany
V SEMESTER -PRACTCAL
BO- 304: ANGIOSPERM MORPHOLOGY, MICROBIOLOGY AND BIOTECHNOLOGY

(10 practicals of 2 hours duration each, one practical per week.)

1. Modification of stem, root and leaf, study of inflorescences and fruits

2. Study of Flower and its parts. calyx, corolla and their variations,
3. Study of Androecium-structure and its variations; Gynoecium-structure and its variations. T. S. of young and mature anther, Types of placentation, types of ovules,

4. Embryo mounting-ex; Mustard, structure of mature monocot embryo
5 Endosperm mounting- ex; Cucumber, structure of mature dicot embryo
6 Instrumentation in Microbiology and Biotechnology: Autoclave, Hot air oven, pH meter, laminar air flow chamber, Centrifuge, Incubator, Hemocytometer, colorimeter
7 Media preparation-Potato Dextrose Agar and MS media . Demonstration
8 Demonstration of pollen viability
9 Observation of fermented foods-curds, idli ,cheese, wine and toddy
10 Demonstration of grafting methods- Approach, wedge, tongue and bud grafting

NOTE: 1. Visit to nearby Microbiology/Biotechnology/Tissue culture Lab is recommended.
2. Students shall be taken to nearby nursery for learning grafting techniques.

REFERENCES FOR V SEMESTER

1. Chawla & Chawla 2009. Introduction to Plant Biotechnology Oxford and IBH Publishing Co. Pvt. Ltd.
2. Dutta A.C. 2008. Text book of Botany Oxford University Press.
3. Dwivedi J.N. 1990. Embryology of Angiosperms 2 edition Rastogi & Co. Meerüt
4. Harmann H.T. et al. 1997. Plant propagation principles & practices 6 edition. Prentice Hall EEE
5. Maheshwari P. 1950. An Introduction to the Embryology of Angiosperms. TMH Ed.
6. Malik C.P. Chitra W. & Bhavneeth. K. 2008 Biotehnology Perspective and prospects M.D. Publishing Pvt. Ltd.
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B.Sc. Degree - Botany
VI Semester
BO- 351 : PLANT PHYSIOLOGY -II ECOLOGY -II

Total 36 hrs

UNIT-I **9hrs**

PHOTOSYNTHESIS: Definition, ultra structure of the chloroplast, photosynthetic pigments and their composition, photosystem **1** and **11** , mechanism of photosynthesis - light reaction or Hill's reaction - Photolysis of water, cyclic and noncyclic photophosphorylation, chemiosmosis, Dark reaction – C_3 pathway (Calvin cycle), C_4 pathway and its significance, C_3 and C_4 plants, factors affecting photosynthesis, law of limiting factors. action spectrum, absorption spectrum. Red drop and Emerson effect, Significance of photosynthesis

TRANSLOCATION OF ORGANIC SOLUTES: Path of translocation, Girdling experiment, mechanism of translocation-protoplasmic streaming theory and pressure flow theory (Munch hypothesis).

UNIT-2 **9hrs**

RESPIRATION: Definition, types of respiration, ultra structure of mitochondrion, mechanism of aerobic respiration - glycolysis (EMP pathway), phosphorylation in glycolysis, breakdown of pyruvic acid and formation of acetyl co-enzyme-A; Kreb's cycle,Terminal oxidation[oxidative photophosphorylation] , anaerobic respiration, fermentation and its practical application, [enzymes in respiration must be mentioned]. Pasteur's effect, Respiratory Quotient (RQ), Significance of respiration.

DORMANCY: Introduction, bud dormancy - induction and removal of bud dormancy, seed dormancy, methods to break seed dormancy.

UNIT-3 **9hrs**

PHYSIOLOGY OF PLANT GROWTH:. Plant growth, phases of growth, sigmoid curve, factors affecting growth, Plant growth regulators: growth promotors - auxins, gibberllins and cytokinins; growth inhibitors - ethylene and abscisic acid (ABA).Practical applications of growth hormones in the field of agriculture and horticulture

PHYSIOLOGY OF FLOWERING : Photoperiodism - short day, long day and photoneutral plants, photoperiodic stimulus, induction and response, practical application of photoperiodism; Vernalisation and its practical application

PLANT MOVEMENTS - Introduction - Types of movements – movements of locomotion, movements of curvature and hygroscopic movenents

UNIT-4 **9hrs**

ECOLOGICAL ADAPTATIONS: morphological and anatomical adaptations of hydrophytes, xerophytes, epiphyte, halophytes and mesophytes.

PHYTOGEOGRAPHY: Vegetation types of India with special reference to Karnataka
[composition of evergreen, semievergreen, deciduous forest, mangroves, shoal and grassland]

ENVIRONMENTAL POLLUTION: causes , effects and control measures of green house effect, acid rains and ozone layer depletion. Impact of water and soil pollution on vegetation and its management, monoculture and its effect

BIODIVERSITY AND CONSERVATION ECOLOGY: Biodiversity – definition, habitat diversity (alpha, beta and gamma), species diversity, genetic diversity, Hot spots in India, Endemic plants of Western Ghats .RET plants[Rare, Endangered and Threatened plants] of Western Ghats, Man and Biosphere (MAB). Ethnobotany- definition and its significance

Conservation of natural resources, **soil** - prevention of soil erosion and maintenance of soil fertility, **water**- rain water harvesting and recharge of ground water, watershed management, **Forest**- in-situ and ex-situ conservation of forest, national parks, sanctuaries and bioreserves.

B.Sc. Degree - Botany
VI SEMESTER -PRACTCAL
BO- 353: PLANT PHYSIOLOGY -II & ECOLOGY -II
(10 practicats of 2 hrs duration each, one practical per week)

MAJOR EXPERIMENTS

1 Separation of photosynthetic pigmets by paper chromatography and calculation of Rf values
2. Experiment to show the liberation of oxygen during photosynthesis under different Light conditions
3. Ganong's respirometer experiment to demonstrate the liberation CO_2 during aerobic respiration.
4. Measurement of R.Q.using Mac Dougall's respiroscopes
5. Kuhne's fermentation tube experiment to demonstrate fermentation of sugar by yeast.

DEMONSTRATION EXPERIMENTS

6. a). Experiment to demonstrate the effect of different wave Lengths of Light on the rate of photosynthesis by using Ganong's coloured light screen apparatus.
   b). Mohl's half Leaf experiment to show the necessity of CO_2 for photosynthesis
   c). Dewar's flask experiment to demonstrate the evolution of heat during aerobic respiration
7. a). Experiment to demonstrate heliotropism using heliotropic chamber.
   b). Arc auxanometer to demonstrate growth.
   c). Klinostat experiment to demonstrate geotropism.

ECOLOGY:

8 Hydrophytes - External morphology of *Hydrilla, Vallisneria, Jussiaea, Pistia. Eichhornia, Nymphaea,* , anatomy of *Hydrilla* stem and *Nymphaea* petiole. Mesophytes - Anatomy of Leaf and stem of any mesophyte

9 Xerophytes - External morphology of *Asparagus, Muehlenbeckia, Opuntia, E.tirucalli, Casuarina* phylloclade, *Acacia* phyllode, *Aloe vera* leaf. Anatomy of *Casuarina* phylloclade Epiphytes – external morphology of *Acampe, Bulbophyllum, Dendrobium, Drynaria* with mantle leaf. T.S. of epiphytic root

10 Halophytes - External morphology of *Spinifex, Salicornia, Rhizophora* - stilt roots and vivipary, *Avicenia* - pneumatophore, T.S. of pneumatophore.
Heterotrophic nutrition: *Cuscuta, Loranthus, Striga, Balanophora, Nepenthes, Utricularia and Drosera*. (Live material or Models of plant material or slides may be kept]

Note: 1. Study tour should be conducted to students to nearby forests and coastal regions to study different types of vegetations .
2 Students of Botany may also be taken to sewage treatment plants to study sewage treatment and its purification

REFERENCES FOR VI SEMESTER

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24. Rao K.N.G. Sudhakara Rao & S. Bharatan 1987. A Text Book of Plant Physiology - The functioning Plant. S. Vishwanathan, Madras
25. Rawn David J. 1983. Biochemistry, Harpen & Row, New York

B Sc, Degree- Botany
VI Semester
BO- 352: TAXONOMY & ECONOMIC BOTANY

Totat 36 hrs

UNIT-I **l2 hrs.**

TAXONOMY: Introduction to taxonomy and study of Bentham and Hooker's and Englar and Prantle system of classification – merits - demerits
A brief account of recent trends in taxonomy and numerical taxonomy – Angiosperm phylogeny group (APG system of classification of flowering plants) A brief introduction.
Plant nomenclature, units of classification, international code of botanical nomenclature (ICBN). Importance of National Herbarium and regional herbaria.

Study of the following selected families of Angiosperms. (Bentham and Hooker's classification should be followed) and their economic importance .
DICOTS: POLYPETALAE - Brassicaceae, Malvaceae,Teliaceae, Rutaceae, Anacardiaceae, Fabaceae, Myrtaceae, Cucurbitaceae and Apiaceae

UNIT-2 **8 hrs.**

GAMOPETALAE: Rubiaceae, Asteraceae, Apocynaceae, Asclepiadaceae, Convolvulaceae, Solanaceae, ,Acanthaceae, Verbenaceae and Lamiaceae

UNIT-3 **8 hrs**

MONOCHLAMYDEAE: Amaranthaceae, Euphorbiaceae and Moraceae.
MONOCOTS: Orchidaceae, Musaceae, Zingiberaceae, Arecaceae and Poaceae.

UNIT- 4 **8 hrs.**

ECONOMIC BOTANY
Distribution, family, botanical name, parts used, extraction or processing of the commercially important products of the following:
Oil yielding plants**:** Ground nut, coconut, oil palm, sandal wood, sunflower and eucalyptus.
MedicinalPlants: Garudapathala, Ondelaga, Amruthaballi, Madhunashini, Kasarakana, Lolesara , Nithyapuspha,Ashwagandha , Tylophora and Cinchona
Beverages**:** coffee, tea and cocoa
Rubber yielding plants**:** Hevea
Sugar yielding plant: sugarcane
Fiber yielding plants**:** cotton, jute and coir
Timber yielding plants**:** teak, rosewood, jack and wild jack, bogi and rakta chandana
Cereals and Millets**:** wheat, maize, paddy, ragi and jowar
Spices and Condiments**:** pepper, clove, coriander, ginger, cardamom, garlic and cinnamum.
Pulses: Cajanus,Dolichos, Cicer. and Pisum
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B.Sc. Degree – Botany
VI SEMESTER-PRACTCAL
BO: 354 -TAXONOMY & ECONOMIC BOTANY
(10 practicals of 2 hrs duration each, one practical per week).

1. Study of families Malvaceae and Fabaceae [sub-family Faboideae]
2. Study of families Fabaceae [sub-families Caesalpinioideae and Mimosoideae].
3. Study of families Anacardiaceae and Rubiaceae
4. Study of families Myrtaceae and Apiaceae
5. Study of families Asteraceae and Apocynaceae
6. Study of families Asclepiadaceae and Solanceae
7. Study of families Acanthaceae and Verbenaceae
8. Study of families Amaranthaceae and Euphorbiaceae
9. Study of families Musaceae and Arecaceae
10 Study of economic importance of specimens/products mentioned in economic Botany

Note:

1. The students shall be given training in herbarium techniques and making field notes of plants collected.**.**
2. Local field trips: the students shall be taken around the college campus and nearby place for the study of local flora and a field diary shall be maintained by them
3. A botanical tour outside the local area to be under taken and report of the botanical tour and five identified herbarium specimens of any weeds should be submitted at the time of examination. **Endemic,endangered and rare plants should not be collected**

REFERENCES FOR V1 SEMESTER

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2. Asolkar L.V., K.K. Kakkar & O.J. Chakre 1992. Second supplement to Glossary of Indian Medicinal Plants with active principles. Part I A-K (1965-1981). CSIR Publ.
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GENERAL REFERENCES FOR ALL SEMESTERS

PRACTICALS:-

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2. MacLean R.C. & W.R.I. Cook, 1941. Plant Science Formulae Macmillan
3. Pandey B.P. 2005 Practical Botany vol I & II. S. Chand. Co.
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2. Mallikarjunappa H.K. 1973. Publ. Univ. of My Mysore – 6
3.Rao Narayana G.T. 2001.
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FLORAS:-

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3 Flora of Karnataka Vol I .Saldhanha C.J. 1984.. Oxford & IBH Brandis D.
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4 Flora of Coorg District.Karnataka. Keshavamurthy K.R. & S.N. Yoganarasimhan 1990 Vimsat PubI. 802, III Main, IV Block, Rajajinagar, Bangalore - 560 010
6. Flora of Hassan District.C.J.Saldhana and D.H.Nicolson.Amerind publishers,Janapath,New Delhi
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8 Gopalakrishna Bhat K & C.R. Nagendran 2001. Sedges & Grasses of O.K. and Udupi districts.
9 The Indian Trees.Brandis D. Bishen Singh Mahendra Pal Singh, Dehradun

GENERAL BOTANY:-

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Mangalore University
B.Sc. I semester -Practical Examination
BO- 102 : PROTOPHYTA AND PHYCOLOGY
Question paper and Scheme of evaluation

Time: 3 hrs. Batch…….. Date…… am/pm … Max. Marks: 40

1. Prepare a stained slide of specimen **A**. sketch, label and identify with reasons. Leave the preparation for inspection 06
2. Identify **B** & **C** giving reasons 3+3= 06
3. Write critical notes on **D** & **E** with labeled sketches 3+3=06
4. Sketch, label and identify with reasons the slides **F**,**G**, **H** & **I** 3+3+3+3 =12
5. Record , Submission of Specimens and Field Notes 10

<table>
<tr><td>1</td><td>A</td><td></td><td>Prep. Sk Id Cl Rea
2 1½ ½ ½ 1½
= 6</td><td rowspan="6"><u>Reg. No. of Candidates Assigned</u>

<u>Reg. No. of absentees:</u>

<u>Total examined:</u>

<u>Examiners:</u>

1.Internal

2.External</td></tr>
<tr><td rowspan="2">2</td><td>B</td><td></td><td rowspan="2">Id Rea
1 2 = 3 each

Sketch and Classification not required</td></tr>
<tr><td>C</td><td></td></tr>
<tr><td rowspan="2">3</td><td>D</td><td></td><td rowspan="2">Id* Sk Crt. Nts.
½ 1 1½ = 3 each

Classification not required</td></tr>
<tr><td>E</td><td></td></tr>
<tr><td rowspan="4">4</td><td>F</td><td></td><td rowspan="4">Sk Id Cl Rea
1 ½ ½ 1 = 3 each</td></tr>
<tr><td>G</td><td></td></tr>
<tr><td>H</td><td></td></tr>
<tr><td>I</td><td></td></tr>
<tr><td>5</td><td>a
b
c</td><td>Record
Specimens
Field notes</td><td>07
02
01 =10</td></tr>
</table>

Mangalore University
B.Sc. II semester - Practical Examination
BO- 152: MYCOLOGY, PLANT PATHOLOGY AND BRYOPHYTA
Question paper and Scheme of evaluation

Time: 3 hrs. Batch…….. Date…… am/pm … Max. Marks: 40

1. Prepare a temporary stained section of the material **A**. sketch, label and identify with reasons. Leave the preparation for inspection 06
2. Identify **B** & **C** giving reasons 3+3= 06
3. Write critical notes on **D, E** & **F** with labeled sketches 3+3+3=09
4. Sketch, label and identify with reasons the slides **G**, **H** & **I** 3+3+3 =09
5. Records , Submission of Specimens and field Notes 7+2+1=10

<table>
<tr><td>1</td><td>A</td><td></td><td>Prep. Sk Id Cl Rea
2 1½ ½ ½ 1½
= 6</td><td rowspan="4">Reg. No. of Candidates Assigned</td></tr>
<tr><td rowspan="2">2</td><td>B</td><td></td><td rowspan="2">Id Rea
1 2 = 3 each
Sketch and Classification not required</td></tr>
<tr><td>C</td><td></td></tr>
<tr><td rowspan="3">3</td><td>D</td><td></td><td rowspan="3">Id* Sk Crt. Nts.
½ 1 1½
= 3 each
Classification not required</td><td rowspan="3">Reg. No. of absentees:

Total examined:</td></tr>
<tr><td>E</td><td></td></tr>
<tr><td>F</td><td></td></tr>
<tr><td rowspan="3">4</td><td>G</td><td></td><td rowspan="3">Sk Id Cl Rea
1 ½ ½ 1
= 3 each</td><td rowspan="2">Examiners:

1.Internal</td></tr>
<tr><td>H</td><td></td></tr>
<tr><td>I</td><td></td><td></td></tr>
<tr><td>5</td><td>a
b
c</td><td>Record
Specimens
Field notes</td><td>07
02
01 =10</td><td>2.External</td></tr>
</table>

Mangalore University
B.Sc- III Semester Botany- Practical Examination
BO-202: PTERIDOPHYTA ,GYMNOSPERMS, HISTOLOGY AND ANATOMY
Question paper and Scheme of evaluation

Time: 3 hours Batch…….Date…… a.m. / p.m Max. Marks: 40

1. Prepare a temporary stained section of the material **A**. Sketch, label and identify. Leave the preparation for inspection. . 06
2. Sketch, Label, and identify specimens **B** and **C** 06
3. Write critical notes on **D**, **E** and **F** with identification and labeled sketches. 09
4. Sketch, label and identify with reasons.the **G**, **H**, and **I .** 09
5. Class Records, Submission specimens and field notes 7+2+1=10

1	**A**		Prep 03 Sk 02 ID 01 06 each	Reg. No. of Candidates Assigned
2	**B**		Sk 01 ID 01 Reason 01 03 each	
	C			
3	**D**		Sk o1 ID ½ CN 01½ 03 each	Reg. No. of absentees: Total examined:
	E			
	F			
4	**G**		Sk Id Cl Rea 1 ½ ½ 1 = 3 each	Examiners: 1.Internal
	H			
	I			
5		Record	10	2.External

Mangalore University

B.Sc - IV Semester Practical Examination

BO- 252 :CELL BIOLOGY,MOLECULAR BIOLOGY AND GENETICS

Question Paper and Scheme of evaluation

Time: 3 Hours Batch…….. Date…… AM/PM Max. Marks: 40

1. Prepare a squash of onion root tip (**A**) for the study of mitosis. Leave the slide for inspection. 07
2. Identify the stages of mitosis (**B**) with reasons and labeled diagram. 05
3. Identify the stages of meiosis (**C**) with reasons and labeled diagram. 05
4. Solve the genetic problems (**D**) and (**E**). 5x2=10
5. Identify the ergastic substance in the given permanent or temporary preparation of slide / material- **F**. 03
6. Class records+ three slides 7 +3=10

1	**A**		Procedure 02 Prep, Staining & Mounting 03 Sk 02 07	Reg. No. of Candidates Assigned
2	**B**		ID 01 Sk 02 Description 02 05	
3	**C**		ID 01 Sk 02 Description 02 05	Reg. No. of absentees:
4	**D**		05 x 2 = 10	Total examined:
	E			Examiners: 1.External
5	**F**		ID 01 Sk 01 Reasons 01 03	2.Internal
6		Class Record Slides	7+3=10	

Mangalore University
B.Sc- V Semester --Practical Examination
BO- 303 :PLANT PHYSIOLOGY-I AND ECOLOGY-I
Question Paper and Scheme of evaluation

Time: 3 Hours Batch…… Date…… AM/PM **Max. Marks: 40**

1. List the materials required for the major experiment- **A**, write down the procedure, principle, draw the diagram, set up the experiment and demonstrate the results. Draw the inference. Leave the set up for inspection. 12
2. Write the aim, the procedure, diagram, the expected results and the inference of the minor experiment- **B**. 06
3. Estimation of carbohydrates/protiens. 06
4 Evaluation of project work 06
4. Class records. 10

1	**A**		Requirements 01 Sk 01 Procedure 02 Principle 01 Setting & Results 04 Inference 01 10	Reg. No. of Candidates Assigned
2	**B**		Aim 01 Sk 01 Procedure 02 Result & Inference 01 05	Reg. No. of absentees:
3	**C**		Procedure 03 Setting & Results 03 06	Total examined:
4		Project work	Report 06 Viva-voce 04 =10	Examiners: 1.External
5		Class Record	10	2.Internal

MANGALORE UNIVERSITY
B.Sc -V Semester- Practical Examination
BO-304 : ANGIOSPERM MORPHOLOGY, BIOTECHNOLOGY AND MICROBIOLOGY

Question paper and Scheme of evaluation

Time: 3 hours Batch……. Date…… a.m. / p.m Max. Marks: 40

1. Prepare a stained slide of specimen **A** . Sketch, label and identify; Leave the preparation for inspection . 06
2. Sketch, label and identify with reasons, the slides **B** 03
3. Sketch, label,identify and comment on the instruments **C** and **D** 3x2 =06
4. Identify the microorganisms present in the material **E** and comment on it. 03
5. Draw labeled diagram to demonstrate grafting method in **F** and explain 03
6. Identify the specimens **G**,**H,** and **I** and explain their morphology . 2x3 = 06
7. Calculate the pollen viability 03
8 Record 10

1	A		Prep. Sk Id 3 2 1 = 6	x Reg. No. of Candidates Assigned:
2	B		Id Lb.sketch Rea 1 1 1	
3	C		Identification - 01 ,Lb.sketch - 01 Working principle and uses -01 [3 each]	Reg. No. of absentees:
	D			
4	E		Identification 01 Comments 02 =03	
5	F		Diagram 01 Explanation 02 =03	Total examined:
6	G		Id 01 Rea 01 [2 each]	Examiners: 1.Internal
	H			
	I			2.External
7			Procedure 01 Demostration 01 Calculation 01=03	
8		Record	10	

Mangalore University
B.Sc. - VI Semester -Practical Examination
BO- 353 :PLANT PHYSIOLOGY-II AND ECOLOGY-II
Question Paper and Scheme of evaluation

Time: 3 Hours Batch…… Date…… AM/PM **Max. Marks: 40**

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1. List the materials required for the major experiment- **A**, Write down the procedure, principle, draw the diagram, set up the experiment and demonstrate the results. Draw the inference. Leave the set up for inspection. 12
2. Write the aim, the procedure, diagram, the expected results and the inference of the minor experiment- **B**. 06
3. Prepare a stained temporary mount of the TS of material **C**. Draw a labeled diagram and comment on the ecological features of its anatomy. Leave the slide for inspection. 06
4. Identify the ecological group of the material **D**, **E**, and **F**. Comment on their ecological features/adaptations. 06
5. Class records. 10

1	**A**		Requirements 02 Sk 01 Principle 01 Procedure 02 Setting & Results 04 Inference 02 12	Reg. No. of Candidates Assigned Reg. No. of absentees: Total examined: Examiners: 1.External 2.Internal
2	**B**		Aim 01 Sk 01 Procedure 02 Result 01 Inference 01 06	
3	**C**		Prep 02 Sk 02 Features 02 06	
4	**D**		Ecol. Group 01 Ecol. features 01 02 each	
	E			
	F			
5		Class Record	10	

Mangalore University
B.Sc. -VI Semester- Practical Examination
BO- 354:TAXONOMY & ECONOMIC BOTANY
Question Paper and Scheme of evaluation

Time: 3 hours Batch……. Date…… a.m. / p.m **Max. Marks: 40**

1. Derive systematically and assign the plants **A**,**B** and **C** to their respective families giving important reasons. 4x3=12
   (Derivation-1, Family name-1, Characters-2)
2. Describe the plant **D** in technical terms. 06
   (Description- 6)
3. Give the floral diagram and floral formula of **E** ., 03
   (Floral diagram-2, Floral formula-1).
4. Give the economic importance of **F**, **G** and **H** mentioning the common name, botanical name, family and parts used. 3x3=09
   (Common name-1/2, Bot.name-1/2,Family-1/2,part used-1/2,Economic imp-1)
5. a) Class records 07+03=10
   b) Herbarium with field notes

i

1	**A**		Derivation 01 Family Name 01 Characters 02 04 each	Reg. No. of Candidates Assigned
	B			
	C			
2	**D**		Description 06	Reg. No. of absentees:
3	**E**		Fl. Dia 02 Fl.Form 01 03 each	
4	**F**		Com. Name ½ Bot. Name ½ Family ½ Parts used ½ Eco. Imp. 01 03 each	Total examined:
	G			Examiners: 1. External
	H			
5		a) Records b)Herbarium with field notes	07 03	2. Internal