

DAV UNIVERSITY JALANDHAR



**Course Scheme & Syllabus
For
B.Sc. (Hons.) Botany
(Program ID-4)**

1st TO 6th SEMESTER

Examinations 2021-22 Session Onwards

Syllabi Applicable For Admissions in 2021

Scheme of B.Sc. (Hons.)
B.Sc. (Hons.) Botany

Semester 1

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr.
1	BOT121	Algae and Microbiology	Core	4	0	0	4
2	BOT122A	Algae and Microbiology Laboratory	Core	0	0	3	2
3	BOT123	Biomolecules and Cell Biology	Core	4	0	0	4
4	BOT124A	Biomolecules and Cell Biology Laboratory	Core	0	0	3	2
5	ENG151A	Basic Communication Skills	AECC	3	0	0	3
6	ENG152	Communication Skills Laboratory	AECC	0	0	2	1
7	Generic Elective-I		GE				6
Total							22

L: Lectures T: Tutorial P: Practical Cr: Credits
AECC: Ability Enhancement Compulsory Course

GE (Generic Elective-I) (choose one)

S.No	Paper Code	Course Title	L	T	P	Cr.
1	ZOO154	Zoodiversity	4	0	0	4
	ZOO155	Zoodiversity Laboratory	0	0	3	2
2	MIC111	Introduction to Microbiology	4	0	0	4
	MIC112	Introduction to Microbiology Laboratory	0	0	3	2

Scheme of B.Sc. (Hons.)
B.Sc. (Hons.) Botany

Semester II

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr.
1	BOT125	Mycology and Phytopathology	Core	4	0	0	4
2	BOT126	Mycology and Phytopathology Laboratory	Core	0	0	3	2
3	BOT127	Archegoniate	Core	4	0	0	4
4	BOT128	Archegoniate Laboratory	Core	0	0	3	2
5	SGS107	Human Values and General Studies	AECC	4	0	0	4
5	EVS100	Environmental Studies	AECC	4	0	0	4
6	Generic Elective-II		GE				6
Total							26

L: Lectures T: Tutorial P: Practical Cr: Credits

GE (Generic Elective-II) (choose one)

S.No	Paper Code	Course Title	L	T	P	Cr.
1	CHE157	General Chemistry-I	4	0	0	4
	CHE158	General Chemistry-I- Lab	0	0	3	2
2	BTY361	Bioanalytical Tools	4	0	0	4
	BTY362	Bioanalytical Tools Laboratory	0	0	3	2

**Scheme of B.Sc. (Hons.)
B.Sc. (Hons.) Botany**

Semester III

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr.
1	BOT221	Morphology and Anatomy	Core	4	0	0	4
2	BOT222	Morphology and Anatomy Laboratory	Core	0	0	3	2
3	BOT223	Economic Botany	Core	4	0	0	4
4	BOT224	Economic Botany Laboratory	Core	0	0	3	2
5	BTY231	Genetics	Core	4	0	0	4
6	BTY232	Genetics Laboratory	Core	0	0	3	2
7	Generic Elective-III		GE				6
9	Skill Enhancement Course-I		SEC				2
Total							26

L: Lectures T: Tutorial P: Practical Cr: Credits
SEC: Skill Enhancement Course

SEC (Skill Enhancement Course)-I (choose one)

S.No	Paper Code	Course Title	L	T	P	Cr.
1	BOT225	Organic Farming	2	0	0	2
2	BOT230	Herbal Technology	2	0	0	2

GE (Generic Elective-III) (choose one)

S.No	Paper Code	Course Title	L	T	P	Cr.
1	ZOO257	Human Physiology	4	0	0	4
	ZOO258	Human Physiology Laboratory	0	0	3	2
2	MIC221	Microbial Physiology	4	0	0	4
	MIC222	Microbial Physiology Laboratory	0	0	3	2

Scheme of B.Sc. (Hons.)
B.Sc. (Hons.) Botany

Semester IV

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr.
1	BTY241	Molecular Biology	Core	4	0	0	4
2	BTY242	Molecular Biology Laboratory	Core	0	0	3	2
3	BOT226	Plant Ecology and Phytogeography	Core	4	0	0	4
4	BOT227	Plant Ecology and Phytogeography Laboratory	Core	0	0	3	2
5	BOT228	Plant Systematics	Core	4	0	0	4
6	BOT229	Plant Systematics Laboratory	Core	0	0	3	2
7	Skill Enhancement Course-II		SEC				2
8	Generic Elective-IV		GE				6
Total							26

L: Lectures T: Tutorial P: Practical Cr: Credits
SEC (Skill Enhancement Course)-II (choose one)

S.No	Paper Code	Course Title	L	T	P	Cr.
1	BOT231	Intellectual Property Rights	2	0	0	2
2	BOT232	Mushroom Culture Technology	2	0	0	2

GE (Generic Elective-IV) (choose one)

S.No	Paper Code	Course Title	L	T	P	Cr.
1	CHE257	General Chemistry-II	4	0	0	4
	CHE258	General Chemistry Laboratory-II	0	0	3	2
2	BTY243	Biotechnology and Human Welfare	4	0	0	4
	BTY244	Biotechnology and Human Welfare Laboratory	0	0	3	2

**Scheme of B.Sc. (Hons.)
B.Sc. (Hons.) Botany**

Semester V

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr.
1	BOT321	Reproductive Biology of Angiosperms	Core	4	0	0	4
2	BOT322	Reproductive Biology of Angiosperms Laboratory	Core	0	0	3	2
3	BOT323	Plant Physiology	Core	4	0	0	4
4	BOT324	Plant Physiology Laboratory	Core	0	0	3	2
5	Department Specific Elective-I		DSE				6
6	Department Specific Elective-II		DSE				6
Total							24

L: Lectures T: Tutorial P: Practical Cr: Credits

DSE- Discipline Specific Elective

DSE (Discipline Specific Electives-I and II) (choose two)

S.No	Paper Code	Course Title	L	T	P	Cr.
1	BOT325	Analytical Techniques in Plant Science	4	0	0	4
	BOT326	Analytical Techniques in Plant Science Laboratory	0	0	3	2
2	BOT327	Plant Breeding	4	0	0	4
	BOT328	Plant Breeding Laboratory	0	0	3	2
3	BOT329	Stress Biology	4	0	0	4
	BOT330	Stress Biology Laboratory	0	0	3	2

**Scheme of B.Sc. (Hons.)
B.Sc. (Hons.) Botany**

Semester VI

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr.
1	BOT331	Plant Metabolism	Core	4	0	0	4
2	BOT332	Plant Metabolism Laboratory	Core	0	0	3	2
3	BOT333	Plant Biotechnology	Core	4	0	0	4
4	BOT334	Plant Biotechnology Laboratory	Core	0	0	3	2
5	Department Specific Elective-III		DSE				6
6	Department Specific Elective-IV		DSE				6
Total							24

**L: Lectures T: Tutorial P: Practical Cr: Credits
DSE- Discipline Specific Elective**

DSE (Discipline Specific Electives-III and IV) (choose two)

S.No	Paper Code	Course Title	L	T	P	Cr.
1	BOT335	Natural Resource Management	4	0	0	4
	BOT336	Natural Resource Management Laboratory	0	0	3	2
2	BOT337	Research Methodology	4	0	0	4
	BOT338	Research Methodology Laboratory	0	0	3	2
3	BOT339	Biostatistics	4	0	0	4
	BOT340	Biostatistics Laboratory	0	0	3	2

Programme Name: B.Sc. (Hons.) Botany Semester I

Course Name: Algae and Microbiology

Course Code: BOT121

Total Credits: 4

Credit Components: L-4; T-0; P-0

Learning Objectives: To acquaint the students about the morphology, biology and importance of prokaryotes, eukaryotes, algal organisms, fungal organisms and lichens.

Unit I

Introduction to microbial world. Viruses: Discovery, physiochemical and biological characteristics; classification (Baltimore), general structure; replication, lytic and lysogenic cycle; DNA virus, RNA virus, TMV, T phage; economic importance of viruses with reference to vaccine production. **(10 lectures)**

Unit II

Bacteria: Discovery, general characteristics; Types-archaeobacteria, eubacteria, wall-less forms (mycoplasma and spheroplasts); Cell structure; Nutritional types; Reproduction-vegetative, asexual; recombination (conjugation, transformation and transduction); bacteria as causal organisms of plant diseases. Economic importance of bacteria with reference to their role in agriculture and industry (fermentation and medicine). **(10 lectures)**

Unit III

Algae: General characteristics; Ecology and distribution; range of thallus organization; Cell structure and components; cell wall, pigment system, reserve food (of only groups represented in the syllabus), flagella; methods of reproduction; Classification; Significant contributions of important phycologists of India. Economic importance of algae. **(11 lectures)**

Unit IV

Cyanophyta and Xanthophyta: Occurrence, thallus organization and Cell structure; Reproduction and life-cycle of Nostoc and Vaucheria. **(5 lectures)**

Chlorophyta and Charophyta: General characteristics; Occurrence; Cell structure and Reproduction. Life-cycles of Chlamydomonas, Volvox and Chara. **(6 lectures)**

Phaeophyta and Rhodophyta: Characteristics; occurrence; thallus organization in some important genera. Structure, reproduction and life-cycles of Ectocarpus and Polysiphonia. **(6 lectures)**

Learning Strategies: Class room lectures, practical, field visits, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students

Learning Outcome: The course will enable students to know the earlier plants, their vegetative and reproductive structures and their importance.

Assessment: Mid Semester Exam (MSE) – 25 Marks
Written Quiz (MCQs) – 10 Marks
Assignment (written) – 10 Marks
End Semester Examination (ESE) – 50 Marks
Attendance – 5 Marks

Model Question Paper: Q.1 Will Comprise of 5 parts having 1 mark each

Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be

attempted.

Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be attempted

Model Question

Paper: ESE

Q.1 Will Comprise of 10 parts having 1 mark each

Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be attempted.

Q.10 to Q.13 will carry 8 marks each out of which 2 question are to be attempted



DAV University, Jalandhar.

Term-Sample

MSE

Name: **Regd. No.:**

Course Code: BOT121

Roll No.:

Course Name: Algae and Microbiology

Time: 1 Hour30 Minutes

Maximum Marks: 25

Section – A

(Maximum Marks: 1 x 5 = 5)

All Questions are compulsory. Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1

- i. Define vaccine.
- ii. Define prions.
- iii. Define viroids.
- iv. Define bacteria
- v. Define fermentation.

Section – B

(Maximum Marks: 4 x 3 = 12)

Attempt any **3 Questions out of 5 Questions** and each question should be answered in maximum 2 pages.

Q.2 Explain physiochemical and biological characteristics of viruses.

Q.3 Make a labeled diagram of a bacterium and write comments.

Q.4 Write general characters of bacteria.

Q.5 write a note on classification of viruses.

Q.6 Explain mode of nutrition in bacteria.

Section – C

(Maximum Marks: 8 x 1 = 8)

Attempt **1 Question out of 2 Questions** and each question should be answered in maximum 4 pages.

Q.7 Explain sexual reproduction in bacteria in detail.

Q.8 Write mode of nutrition in viruses in detail.



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Term-Sample

ESE

Name: Regd. No.:

Course Code: BOT121

Roll No.:

Time: 3 Hours

Course Name: Algae and Microbiology

Maximum Marks: 50

Section – A (Maximum Marks: 1 x 10 = 10)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1

- i. Define Algae.
- ii. Define conjugation.
- iii. Explain virion.
- iv. Define Archaeobacteria.
- v. Define Mycoplasma.
- vi. Define red algae.
- vii. What is Prochloron?
- viii. Explain thallus.
- ix. What are Xanthophyta?
- x. Define replication.

Section – B (Maximum Marks: 4 x 6 = 24)

Short Answer Type: Attempt any **6 Questions out of 8 Questions** and each question should be answered in maximum 2 pages.

- Q.2 Write general characteristics of Chlorophyta.
- Q.3 Write an essay on ecological importance of bacteria.
- Q.4 Explain Cyanophyta in detail.
- Q.5 Write an essay on range of thallus organization in algae.
- Q.6 Explain mode of reproduction in algae.
- Q.7 Explain lysogeny cycle.
- Q.8 Write a note on the contribution of M.O.P. Iyenger.
- Q.9 Explain transduction.

Section – C (Maximum Marks: 8 x 2 = 16)

Long Answer Type: Attempt **2 Questions out of 4 Questions** and each question should be answered in maximum 4 pages.

- Q.10 Explain morphology and life-cycle of Polysiphonia.
- Q.11 Explain classification of algae proposed by Lee.
- Q.12 Describe morphology and life cycle of any blue-green algae.
- Q.13 Explain economic importance of bacteria with reference to their role in agriculture and industry (fermentation and medicine).

Programme Name: B.Sc. (Hons.) Botany Semester I
Course Name: Algae and Microbiology Laboratory
Course Code: BOT122
Total Credits: 2
Credit Components: L-0; T-0; P-3
Learning Objectives: To acquaint the students about the morphology, biology and importance of prokaryotes, eukaryotes, algal organisms, fungal organisms and lichens.

List of Experiments

Microbiology

1. Electron micrographs/Models of viruses – T-Phage and TMV, Line drawings/ Photographs of Lytic and Lysogenic Cycle.
2. Types of Bacteria to be observed from temporary/permanent slides/photographs. Electron micrographs of bacteria, binary fission, endospore, conjugation, root Nodule.
3. Gram staining.
4. Endospore staining with malachite green using the (endospores taken from soil bacteria).

Phycology

Study of vegetative and reproductive structures of *Nostoc*, *Chlamydomonas* (electron micrographs), *Volvox*, *Oedogonium*, *Chara*, *Vaucheria*, *Chlorella*, *Ectocarpus*, *Sargassum*, *Polysiphonia*, and *Spirogyra* through micrographs, temporary preparations and permanent slides.

Learning Strategies: Practical, models, field visits, charts, online demonstrations, group discussions and assignments

Learning Outcome: To acquaint the students about the morphology, biology and importance of prokaryotes, eukaryotes, algal organisms, fungal organisms and lichens.

Assessment: Continuous Assessment: 20 Marks
Practical Exam: 80 Marks

Model Question Paper: Practical Exam component is divided into the following sub components:

- Performance – 24 Marks
- Spotting – 16 Marks
- Viva-voce – 24 Marks
- Record – 8 Marks
- Internal Assessment – 8 marks

Text Books:
1. Lee, R.E. *Phycology*. 4th ed. Cambrid: Cambridge UP, 1999. Print.
2. Willey, J. M., L.M. Sherwood, and C.J. Woolverton. *Prescott's Microbiology*. 9th ed. New York: McGraw-Hill, 2013. Print.

Reference Books:
1. Lee, R.E. *Phycology*. 4th ed. Cambrid: Cambridge UP, 1999. Print.
2. Willey, J. M., L.M. Sherwood, and C.J. Woolverton. *Prescott's Microbiology*. 9th ed. New York: McGraw-Hill, 2013. Print.
3. Kumar, H.D. *Introductory Phycology*. Delhi: Affiliated East-West Press, 1999. Print.
4. Sahoo, D. (2000). *Farming the ocean: seaweeds cultivation and utilization*. New Delhi: Aravali International, 2000. Print.

5. Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A., Minorsky P.V. and Jackson R.B. *Biology*. 8th ed. USA: Pearson Benjamin Cummings, 2008. Print.
6. Pelczar, M.J. *Microbiology*. 5th ed. New Delhi: Tata McGraw-Hill Co., 2001. Print.

**Websites and
Audio Video
lectures:**

www.microbiology.com

Programme Name: B.Sc. (Hons.) Botany Semester I

Course Name: Biomolecules and Cell Biology

Course Code: BOT123

Total Credits: 4

Credit Components: L-4; T-0; P-0

Learning Objectives: • Make students well versed with cell structure and function. • To make them understand the basic regulation of cell processes and molecules. • To give them an idea about the functioning of cell.

Unit I

Biomolecules: Types and significance of chemical bonds; Structure and properties of water; pH and buffers. **Carbohydrates:** Nomenclature and classification; Monosaccharides; Disaccharides; Oligosaccharides and polysaccharides. **Lipids:** Definition and major classes of storage and structural lipids; Fatty acids structure and functions; Essential fatty acids; Triacyl glycerols structure, functions and properties; Phosphoglycerides. (12 lectures)

Unit II

Proteins: Structure of amino acids; Levels of protein structure-primary, secondary, tertiary and quaternary; Protein denaturation and biological roles of proteins. **Nucleic acids:** Structure of nitrogenous bases; Structure and function of nucleotides; Types of nucleic acids; Structure of A, B, Z types of DNA; Types of RNA; Structure of tRNA.

Enzymes: Structure of enzyme: holoenzyme, apoenzyme, cofactors, coenzymes and prosthetic group; Classification of enzymes; Features of active site, substrate specificity, mechanism of action (activation energy, lock and key hypothesis, induced - fit theory), Michaelis – Menten equation, enzyme inhibition and factors affecting enzyme activity. (14 lectures)

Unit III

The cell: Cell as a unit of structure and function; Characteristics of prokaryotic and eukaryotic cells; Origin of eukaryotic cell (Endosymbiotic theory). Cell wall and plasma membrane: Chemistry, structure and function of Plant cell wall. Overview of membrane function; fluid mosaic model; Chemical composition of membranes; Membrane transport – Passive, active and facilitated transport, endocytosis and exocytosis. Cell organelles-Nucleus: Structure-nuclear envelope, nuclear pore complex, nuclear lamina, molecular organization of chromatin; nucleolus. (12 Lectures)

Unit IV

Cytoskeleton: Role and structure of microtubules, microfilaments and intermediary filament. **Chloroplast, mitochondria and peroxisomes:** Structural organization; Function; Semiautonomous nature of mitochondria and chloroplast. **Endomembrane system:** Endoplasmic Reticulum – Structure, Rough and Smooth ER and lipid synthesis, export of proteins and lipids; Golgi Apparatus – organization, protein sorting and export from Golgi Apparatus; Lysosomes. **Cell division:** Phases of eukaryotic cell cycle, mitosis and meiosis; Regulation of cell cycle- checkpoints, role of protein Kinases. (12 Lectures)

Learning Strategies: Class room lectures, practical, field visits, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students

Learning Outcome: The course will enable the students to learn the working of the cell.

Assessment: Mid Semester Exam (MSE) – 25 Marks

Written Quiz (MCQs) – 10 Marks
Assignment (written) – 10 Marks
End Semester Examination (ESE) – 50 Marks
Attendance – 5 Marks

**Model Question
Paper: MSE**

Q.1 Will Comprise of 5 parts having 1 mark each
Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be attempted.
Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be attempted

**Model Question
Paper: ESE**

Q.1 Will Comprise of 10 parts having 1 mark each
Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be attempted.
Q.10 to Q.13 will carry 8 marks each out of which 2 question are to be attempted



DAV University, Jalandhar.
Term-Sample

MSE

Name:

Regd. No.:

Course Code: BOT121

Roll No.:

Course Name: Biomolecules and Cell Biology

Time: 1 Hour30 Minutes
Maximum Marks: 25

Section – A

(Maximum Marks: 1 x 5 = 5)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Describe following terms.

- i. Structure of A type of DNA.
- ii. Phosphodiester bond
- iii. Energy currency.
- iv. Buffers.
- v. Storage buffers.

Section – B

(Maximum Marks: 4 x 3 = 12)

Attempt any 3 Questions out of 5 Questions and each question should be answered in maximum 2 pages.

Q.1 What are the features of active sites?

Q.3 Write function of holoenzyme, Apoenzyme, Cofactor and coenzymes.

Q.4 Describe major classes of storage and structural lipids.

Q.5 Explain structure of nucleotides.

Q.6 Differentiate endergonic and exergonic reaction.

Section – C

(Maximum Marks: 8 x 1 = 8)

Attempt 1 Question out of 2 Questions and each question should be answered in maximum 4 pages.

Q.7 Explain lock and key hypothesis and induced fit theory.

Q.8 Explain structure of proteins.



DAV University, Jalandhar.
(Term-18191)

ETE

December, 2018

Name:

Regd. No.:

Course Code: BOT 123

Time: 3 Hours

Course Name:

Maximum Marks: 50

Section – A

(Maximum Marks: 1 x 10 = 10)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Explain briefly following terms:-

- i. Oligosaccharides
- ii. Phosphoglycerides
- iii. tRNA
- iv. endergonic reactions
- v. redox reactions
- vi. Protein denaturation
- vii. Polysaccharides
- viii. Apoenzyme
- ix Facilitated transport
- x Active site

Section – B

(Maximum Marks: 4 x 6 = 24)

Short Answer Type: Attempt any **6 Questions out of 8 Questions** and each question should be answered in maximum 2 pages.

- Q.2 Describe the structure and function of nucleotides.**
- Q.3 Explain properties and function of Phosphoglycerides.**
- Q.4 Explain Michaelis- Menten equation.**
- Q.5 Differentiate Passive and Active transport.**
- Q.6 Explain nuclear envelope and nuclear pore complex.**
- Q.7 Explain phases of mitosis.**

Section – C

(Maximum Marks: 8 x 2 = 16)

Long Answer Type: Attempt **2 Questions out of 4 Questions** and each question should be answered in maximum 4 pages.

- Q.10 Explain protein targeting and insertion of proteins in the Endoplasmic reticulum.**
- Q.11 Describe in detail Gas liquid Chromatography and HPLC.**
- Q.12 What is the principle of Electrophoresis? Explain SDS-PAGE technique.**
- Q. 13 Explain**
 - a) Check points
 - b) Role of protein kinases
 - c) Nucleolus
 - d) Exocytosis.

Programme Name: B.Sc. (Hons.) Botany Semester I
Course Name: Biomolecules and Cell Biology Laboratory

Course Code: BOT124A

Total Credits: 2

Credit Components: L-0; T-0; P-3

Learning Objectives: • Make students well versed with cell structure and function. • To make them understand the basic regulation of cell processes and molecules. • To give them an idea about the functioning of cell.

List of Experiments

1. Qualitative tests for carbohydrates, reducing sugars, non-reducing sugars, lipids and proteins.
2. Study of plant cell structure with the help of epidermal peel mount of Onion/Rhoeo/Crinum.
3. Demonstration of the phenomenon of protoplasmic streaming in Hydrilla leaf.
4. Measurement of cell size by the technique of micrometry
5. Counting the cells per unit volume with the help of haemocytometer. (Yeast/pollen grains).
6. Study of cell and its organelles with the help of electron micrographs.
7. Cytochemical staining of : DNA- Feulgen and cell wall in the epidermal peel of onion using Periodic Schiff's (PAS) staining technique.
8. Study the phenomenon of plasmolysis and deplasmolysis.
9. Study the effect of organic solvent and temperature on membrane permeability.
10. Study different stages of mitosis and meiosis.

Learning Strategies: Practical, models, field visits, charts, online demonstrations, group discussions and assignments

Learning Outcome: The course will enable the students to learn the working of the cell.

Assessment: Continuous Assessment: 20 Marks
Practical Exam: 80 Marks

Model Question Paper: Practical Exam component is divided into the following sub components:

- Performance – 24 Marks
- Spotting – 16 Marks
- Viva-voce – 24 Marks
- Record – 8 Marks
- Internal Assessment – 8 marks

Text Books:

1. Campbell, M.K. Biochemistry. 7th ed. China: Cengage Learning, 2012. Print.
2. Campbell, P. N., and A. D. Smith. Biochemistry Illustrated: Biochemistry and Molecular Biology in the Post-genomic Era. 4th ed. Edinburgh: Elsevier Churchill Livingstone, 2011. Print.
3. Tymoczko, J.L., Berg, J.M. and Stryer, L. Biochemistry: A short course. 2nd ed. New York.

Reference Books:

4. Berg, J.M., Tymoczko, J.L. and Stryer, L. Biochemistry. New York: W.H. Freeman and Company, 2011. Print.
5. Nelson, D.L. and Cox, M.M. Lehninger Principles of Biochemistry, 5th ed. New York: W.H. Freeman and Company, 2008. Print.
6. Karp, G. Cell Biology. 6th ed. USA: John Wiley & Sons, 2010. Print.
7. Hardin, J., Becker, G. and Skliensmith, L.J. Becker's World of the

- Cell. 8th ed. USA: Pearson Education Inc., 2012. Print.
8. Cooper, G.M. and Hausman, R.E. The Cell: A Molecular Approach. 5th ed. Washington, D.C: ASM Press, 2009. Print.
 9. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. The World of the Cell. 7th ed. San Francisco: Pearson Benjamin Cummings Publishing

Programme Name: B.Sc. (Hons.) Botany Semester II

Course Name: Mycology and Phytopathology

Course Code: BOT125

Total Credits: 4

Credit Components: L-4; T-0; P-0

Learning Objectives: To acquaint the students about the morphology, biology, harmful effects and importance of fungi to agricultural crops and humans.

Unit I

Introduction to true fungi: General characteristics; Affinities with plants and animals; Thallus organization; Cell wall composition; Nutrition and Classification.

Chytridiomycota and Zygomycota: Characteristic features; Ecology and significance; Life cycle of *Synchytrium* and *Rhizopus* .

Ascomycota: General characteristics (asexual and sexual fruiting bodies); Ecology; Life cycle, Heterokaryosis and parasexuality; Life cycle and classification with reference to *Saccharomyces*, *Aspergillus* and *Alternaria*.
(14 lectures)

Unit II

Basidiomycota: General characteristics; Habit and habitat; Life cycle and Classification with reference to black stem rust on wheat *Puccinia* (Physiological Specialization), loose and covered smut (symptoms only), *Agaricus*; Bioluminescence, Fairy Rings and Mushroom Cultivation.

Oomycota: General characteristics; Ecology; Life cycle and classification with reference to *Phytophthora*, *Albugo*.
(10 lectures)

Unit III

Symbiotic associations: Lichens – Occurrence; General characteristics; Growth forms and range of thallus organization; Nature of associations of algal and fungal partners; Reproduction;

Mycorrhiza-Ectomycorrhiza, Endomycorrhiza and their significance.

Applied Mycology: Role of fungi in biotechnology, food industry; Secondary metabolites (Pharmaceutical preparations); Agriculture (Biofertilizers); Mycotoxins; Biological control of different agricultural insect-pests.
(14 lectures)

Unit IV

Phytopathology: Terms and concepts; General symptoms; Geographical distribution of diseases; Etiology; Symptomology; Host-Pathogen relationships; Disease cycle and environmental relation; prevention and control of plant diseases, and role of quarantine. Bacterial diseases – Citrus canker and angular leaf spot of cotton. Viral diseases – Tobacco Mosaic viruses, vein clearing. Fungal diseases – Early blight of potato, Black stem rust of wheat, White rust of crucifers.
(12 lectures)

Learning Strategies: Class room lectures, practicals, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students

Learning Outcome: The course will enable students to know the beneficial and harmful fungi and about the growth and control of the same.

Assessment: Mid Semester Exam (MSE) – 25 Marks

Written Quiz (MCQs) – 10 Marks
Assignment (written) – 10 Marks
End Semester Examination (ESE) – 50 Marks
Attendance – 5 Marks

**Model Question
Paper: MSE**

Q.1 Will Comprise of 5 parts having 1 mark each
Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be attempted.
Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be attempted

**Model Question
Paper: ESE**

Q.1 Will Comprise of 10 parts having 1 mark each
Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be attempted.
Q.10 to Q.13 will carry 8 marks each out of which 2 question are to be attempted



DAV University, Jalandhar.
(Term-Sample)

MSE
Sample

Name:

Regd. No.:

Course Code: BOT125

Time: 1 Hour 30 Min

Course Name: Mycology and Phytopathology

Maximum Marks: 25

Section – A

(Maximum Marks: 1 x 5 = 5)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1

- i. What are the different types of flagella found in fungi?
- ii. What is mycorrhiza?
- iii. Name the five commonly known classes of fungi.
- iv. What are lichens?
- v. Discuss the composition of cell wall in fungi.

Section – B

(Maximum Marks: 4 x 3 = 12)

Attempt any **3 Questions out of 5 Questions** and each question should be answered in maximum 2 pages.

Q.2 Discuss the parasitic nature of the fungi.

Q.3 Discuss the types of reproductive methods found in ascomycetes.

Q.4 What are the different aggregations and modifications of hyphae in fungi?

Q.5 Write a note on asexual reproduction in *Rhizopus stolonifer*.

Q.6 What are the different types of ascocarps found in ascomycetes?

Section – C

(Maximum Marks: 1 x 8 = 8)

Attempt **1 Question out of 2 Questions** and each question should be answered in maximum 4 pages.

Q.7 Write an essay on characters, reproduction, alternation of generation and economic importance of yeast along with its systematic position.

Q.8 Write an essay on characters, reproduction, alternation of generation and economic importance of *Pythium debaryanum* along with its systematic position.



DAV University, Jalandhar.
(Term-Sample)

ESE
Sample

Name:

Regd. No.:

Course Code: BOT125

Time: 3 Hours

Course Name: Mycology and Phytopathology

Maximum Marks: 50

Section – A

(Maximum Marks: 1 x 10 = 10)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Define the following terms

- i. Chlamyospore
- ii. Pathogenesis
- iii. Spawning
- iv. Sclerotium
- v. Lichens
- vi. Ascogonium
- vii. Disease cycle
- viii. Basidiocarp
- ix. Zoospores
- x. Budding

Section – B

(Maximum Marks: 4 x 6 = 24)

Short Answer Type: Attempt any **6 Questions out of 8 Questions** and each question should be answered in maximum 2 pages.

Q.2 Write a short note on different types of relationships between plants and pathogens.

Q.3 Write a note on biological control.

Q.4 Write the salient features of class myxomycetes.

Q.5 How are oomycetes different from other fungi?

Q.6 Write an explanatory note on mycorrhiza.

Q.7 What is the causative agent of following diseases?

(a) Black rust of wheat; (b) Flag smut of wheat; (c) Damping-off of seedlings; (d) Citrus canker; (e) Late blight of potato

Q.8 Write a short note on mushroom cultivation.

Q.9 What are lichens? Discuss their nature of relationship, ecological significance.

Section – C

(Maximum Marks: 8 x 2 = 16)

Long Answer Type: Attempt **2 Questions out of 4 Questions** and each question should be answered in maximum 4 pages.

Q.10 What do you understand by the term mycotoxin? What are the different types of mycotoxins produced by the fungi?

Q.11 Write an explanatory note on the life history, habit and reproduction of the fungus *Puccinia graminis-tritici*.

Q.12 Discuss life cycle of *Agaricus*. What is the importance of *Agaricus* in food?

Q.13 Discuss the classification of plant diseases.

Programme Name: B.Sc. (Hons.) Botany Semester II
Course Name: Mycology and Phytopathology Laboratory

Course Code: BOT126

Total Credits: 2

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

Learning Objectives: To acquaint the students about the morphology, biology, harmful effects and importance of fungi to agricultural crops and humans.

List of Experiments

1. Introduction to the world of fungi (Unicellular, coenocytic/septate mycelium, ascocarps & basidiocarps).
2. *Rhizopus*: study of asexual stage from temporary mounts and sexual structures through permanent slides.
3. *Aspergillus* and *Penicillium*: study of asexual stage from temporary mounts. Study of Sexual stage from permanent slides/photographs.
4. *Peziza*: sectioning through ascocarp.
5. *Alternaria*: Specimens/photographs and temporary mounts.
6. *Puccinia*: Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves; sections/ mounts of spores on wheat and permanent slides of both the hosts.
7. *Agaricus*: Specimens of button stage and full grown mushroom; sectioning of gills of *Agaricus*, fairy rings and bioluminescent mushrooms to be shown.
8. Study of phaneroplasmodium from actual specimens and /or photograph. Study of *Stemonitis* sporangia.
9. *Albugo*: Study of symptoms of plants infected with *Albugo*; asexual phase study through section/temporary mounts and sexual structures through permanent slides.
10. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose) on different substrates. Study of thallus and reproductive structures (soredia and apothecium) through permanent slides. Mycorrhizae: ectomycorrhiza and endomycorrhiza (Photographs)
11. Phytopathology: Herbarium specimens of bacterial diseases; Citrus Canker; Angular leaf spot of cotton, Viral diseases: TMV, Vein clearing, Fungal diseases: Early blight of potato, Black stem rust of wheat and White rust of crucifers.

Learning Strategies: Practicals, models, charts, online demonstrations, group discussions and assignments

Learning Outcome: The course will enable students to know the beneficial and harmful fungi and about the growth and control of the same.

Assessment: Continuous Assessment: 20 Marks

Practical Exam: 80 Marks

Model Question Paper: Practical Exam component is divided into the following sub components:

- Performance – 24 Marks
- Spotting – 16 Marks
- Viva-voce – 24 Marks
- Record – 8 Marks
- Internal Assessment – 8 marks

Text Books: 1. Agrios, G.N. *Plant Pathology*. 4th ed. UK: Academic Press, 1997. Print.

2. Alexopoulos, C.J., Mims, C.W. and Blackwell, M. *Introductory Mycology*. 4th ed. Singapore: John Wiley & Sons, 1996. Print.

Reference Books:

3. Webster, J. and Weber, R. *Introduction to Fungi*. 3rd ed. Cambridge: Cambridge University Press, 2007. Print.
4. Sethi, I.K. and Walia, S.K. *Text book of Fungi and Their Allies*. India: Macmillan Publishers, 2011. Print.
5. Sharma, P.D. *Plant Pathology*. India: Rastogi Publication, 2011. Print.

Programme Name: B.Sc. (Hons.) Botany Semester II

Course Name: Archegoniate Biology

Course Code: BOT127

Total Credits: 4

Credit Components: L-4; T-0; P-0

Learning Objectives: To acquaint the students about the morphology, biology and importance of Bryophytes, Pteridophytes and Gymnosperms.

Unit I

Introduction: Unifying features of archegoniates; Transition to land habit; Alternation of generations.

Bryophytes: General characteristics; Adaptations to land habit; Classification (upto family); Range of thallus organization. **(10 lectures)**

Unit II

Type Studies- Bryophytes: Morphology, anatomy, reproduction and evolutionary trends of *Riccia*, *Marchantia*, *Pellia*, *Porella*, *Anthoceros*, *Sphagnum* and *Funaria* (developmental stages not included); Ecological and economic importance of bryophytes with special reference to *Sphagnum*. **(14 lectures)**

Unit III

Pteridophytes: General characteristics; Classification (up to family); Early land plants (*Cooksonia* and *Rhynia*); Morphology, anatomy and reproduction of *Psilotum*, *Selaginella*, *Equisetum* and *Pteris* (Developmental details not to be included). Apogamy, and apospory, heterospory and seed habit, telome theory, stelar evolution; Ecological and economic importance. **(12 lectures)**

Unit IV

Gymnosperms: General characteristics, classification (up to family), morphology, anatomy and reproduction of *Cycas*, *Pinus* and *Gnetum* (Developmental details not to be included); Ecological and economic importance. **(10 lectures)**

Learning Strategies: Class room lectures, practical, field visits, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students

Learning Outcome: The course will enable students to know the earlier plants, their vegetative and reproductive structures and their importance.

Assessment: Mid Semester Exam (MSE) – 25 Marks
Written Quiz (MCQs) – 10 Marks
Assignment (written) – 10 Marks
End Semester Examination (ESE) – 50 Marks
Attendance – 5 Marks

Model Question Paper: MSE Q.1 Will Comprise of 5 parts having 1 mark each

Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be attempted.

Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be attempted

**Model Question
Paper: ESE**

Q.1 Will Comprise of 10 parts having 1 mark each
Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be attempted.
Q.10 to Q.13 will carry 8 marks each out of which 2 question are to be attempted



**DAV University, Jalandhar.
(Term-Sample)**

**MSE
Sample**

Name:

Regd. No.:

Course Code: BOT127

Time: 1 Hour 30 Min

Course Name: Archegoniate Biology

Maximum Marks: 25

Section – A

(Maximum Marks: 1 x 5 = 5)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1

- i. Write two important characters of bryophytes.
- ii. Define foot and seta.
- iii. Explain adaptation.
- iv. Define protonema.
- v. Write the names of 4 common bryophytes in India.

Section – B

(Maximum Marks: 4 x 3 = 12)

Attempt any 3 Questions out of 5 Questions and each question should be answered in maximum 2 pages.

Q.2 Write a note on Archegoniate.

Q.3 Write salient features of the class Bryopsida.

Q.4 Explain alternation of generation in a bryophyte.

Q.5 Write salient features of Marchantiales.

Q.6 Write a note on sphagnum.

Section – C

(Maximum Marks: 8 x 1 = 8)

Attempt 1 Question out of 2 Questions and each question should be answered in maximum 4 pages.

Q.7 Write classification and explain salient features Hepaticopsida, Anthoceropsida and Bryopsida.

Q.8 Explain range of thallus organization in Bryophyta.



DAV University, Jalandhar.
(Term-Sample)

ESE
Sample

Name:

Regd. No.:

Course Code: BOT127

Time: 3 Hours

Course Name: Archegoniate Biology

Maximum Marks: 50

Section – A

(Maximum Marks: 1 x 10 = 10)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1

- i. Define Pteridophyte.
- ii. Define archegoniate.
- iv. Define Bryophyta.
- v. Define stele.
- vi. Explain Gymnosperm.
- vii. Explain seed habit.
- viii. Define megasporophyll.
- ix. Define heterospory.
- x. Explain microsporophyll.

Section – B

(Maximum Marks: 4 x 6 = 24)

Short Answer Type: Attempt any **6 Questions out of 8 Questions** and each question should be answered in maximum 2 pages.

- Q.2 Explain early land vascular plants.
- Q.3 Explain general characters of Pteridophytes.
- Q.4 Explain dissimilarities of Gymnosperms to Bryophytes.
- Q.5 Explain general characters of Gymnosperms.
- Q.6 Explain dissimilarities of Pteridophytes to Gymnosperms.
- Q.7 Make a transverse section of Gnetum stem.
- Q.8 Explain economic importance of Gymnosperms.
- Q.9 Make a labeled diagram of a transverse section of *Equisetum* stem.

Section – C

(Maximum Marks: 8 x 2 = 16)

Long Answer Type: Attempt **2 Questions out of 4 Questions** and each question should be answered in maximum 4 pages.

- Q.10 What are Pteridophytes? Write classification and explain salient features of each class.
- Q.11 Write an essay on ecological significance of Bryophytes.
- Q.12 Write Current trends in the classification of Gymnosperms.
- Q.13 Explain Heterospory and seed habit in detail.

Programme Name: B.Sc. (Hons.) Botany Semester II

Course Name: Archegoniate Biology Laboratory

Course Code: BOT128

Total Credits: 2

Credit Components: L-0; T-0; P-3

Learning Objectives: To acquaint the students about morphology, anatomy and reproductive systems of Bryophytes, Pteridophytes and Gymnosperms.

List of Experiments

1. *Riccia* – Morphology of thallus.
2. *Marchantia*- Morphology of thallus, whole mount of rhizoids & Scales, vertical section of thallus through Gemma cup, whole mount of Gemmae (all temporary slides), vertical section of Antheridiophore, Archegoniophore, longitudinal section of Sporophyte (all permanent slides).
3. *Anthoceros*- Morphology of thallus, dissection of sporophyte (to show stomata, spores, pseudoelaters, columella) (temporary slide), vertical section of thallus (permanent slide).
4. *Pellia, Porella*- Permanent slides.
5. *Sphagnum*- Morphology of plant, whole mount of leaf (permanent slide only).
6. *Funaria*- Morphology, whole mount of leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, longitudinal section of capsule and protonema.
7. *Psilotum*- Study of specimen, transverse section of synangium (permanent slide).
8. *Selaginella*- Morphology, whole mount of leaf with ligule, transverse section of stem, whole mount of strobilus, whole mount of microsporophyll and megasporophyll (temporary slides), longitudinal section of strobilus (permanent slide).
9. *Equisetum*- Morphology, transverse section of internode, longitudinal section of strobilus, transverse section of strobilus, whole mount of sporangiophore, whole mount of spores (wet and dry) (temporary slide), transverse section of rhizome (permanent slide).
10. *Pteris*- Morphology, transverse section of rachis, vertical section of sporophyll, whole mount of sporangium, whole mount of spores (temporary slides), transverse section of rhizome, whole mount of prothallus with sex organs and young sporophyte (permanent slide).
11. *Cycas*- Morphology (coralloid roots, bulbil, leaf), whole mount of microsporophyll, transverse section of coralloid root, transverse section of rachis, vertical section of leaflet, vertical section of microsporophyll, whole mount of spores (temporary slides), longitudinal section of ovule, transverse section of root (permanent slide).
12. *Pinus*- Morphology (long and dwarf shoots, whole mount of dwarf shoot, male and female cones), transverse section of Needle, transverse section of stem, longitudinal section of / transverse section of male cone, whole mount of microsporophyll, whole mount of Microspores (temporary slides), longitudinal section of female cone, tangential longitudinal section & radial longitudinal sections stem (permanent slide).
13. *Gnetum*- Morphology (stem, male & female cones), transverse section of stem, vertical section of ovule (permanent slide)
14. Botanical Excursion.

Learning Strategies: Practical, models, charts, online demonstrations, group discussions and assignments

Learning Outcome: The students will come know to about morphology, anatomy and reproductive systems of bryophytes, pteridophytes and gymnosperms.

Assessment: Continuous Assessment: 20 Marks

Practical Exam: 80 Marks

Model Question Paper:

Practical Exam component is divided into the following sub components:

- Performance – 24 Marks
- Spotting – 16 Marks
- Viva-voce – 24 Marks
- Record – 8 Marks
- Internal Assessment – 8 marks

Text Books:

1. Vashistha, P.C., Sinha, A.K. and Kumar, A. *Pteridophyta*. New Delhi: S. Chand, 2010. Print.
2. Bhatnagar, S.P. and Moitra, A. *Gymnosperms*. New Delhi: New Age International Pvt. Ltd. Publishers, 1996. Print.
3. Parihar, N.S. *An introduction to Embryophyta: Vol. I. Bryophyta*. Allahabad, India: Central Book Depot. 1991. Print.
4. Raven, P.H., Johnson, G.B., Losos, J.B. and Singer, S.R. *Biology*. New Delhi: Tata McGraw Hill, 2005. Print.

Reference Books:

5. Vanderpoorten, A. and Goffinet, B. *Introduction to Bryophytes*. Cambridge: Cambridge University Press, 2009. Print.
6. Rashid, A. *An Introduction to Pteridophyta*. New Delhi: Vikas Publishers, 1999. Print.
7. Mehra, P.N., and Gupta, A. *Gametophytes of Himalayan Ferns*. Chandigarh: Mehra P.N., Botany Department, P.U., 1986. Print.
8. Rashid, A. *An Introduction to Pteridophyta*. New Delhi: Vikas Publishers, 1999. Print.
9. Richardson, D.H.S. *Biology of Mosses*. Oxford: Blackwell Scientific Publications, 1981. Print.
10. Schofield, W.B. *Introduction to Bryology*, New York: Macmillan Publishing Company, 1985. Print.
11. Schuster, Rudolf M. *New Manual of Bryology*. Nichinan, Miyazaki: Hattori Botanical Laboratory, 1984. Print.
12. Sporne, K.R. *The morphology of Pteridophytes*, Bombay: B.I. Publications, 1982. Print.
13. Dalimore, W., Jackson, A.B., and Morrison, S.L. *A Handbook of Coniferae including Ginkgoaceae*, London: Edward Arnold and Co., 1966. Print.
14. Meyen, S.V. "Basic Features of Gymnosperms, Systematics and Phylogeny as Evidenced by the Fossil Record." *Botanical Review*: 50 (1984): 1-112. Print.
15. Rothwell, G.W. "The Role of Comparative Morphology and Anatomy in Interpreting the Systematics of Fossil Gymnosperms." *Botanical Review*: 51 (1985): 318-327. Print.
16. Sporne, K.R. *The Morphology of Gymnosperms*, Delhi: B.I. Publications, 1974. Print.
17. Sharma, O.P. and Dixit, S. *Gymnosperms*. Meerut: Pragati Prakashan, 2001. Print.

Websites and Audio Video lectures:

www.bryophyte.org, www.pteridophyte.org, www.gymnosperms.org

Programme Name: B.Sc. (Hons.) Botany Semester III

Course Name: Morphology and Anatomy

Course Code: BOT221

Total Credits: 4

Credit Components: L-4; T-0; P-0

Learning Objectives: To acquaint the students about various physiological processes at cellular and organ level in plants.

UNIT I

Introduction and scope of Plant Anatomy: Applications in systematics, forensics and pharmacognosy.

Structure and Development of Plant Body: Internal organization of plant body: The three tissue systems, types of cells and tissues. Development of plant body: Polarity, Cytodifferentiation and organogenesis during embryogenic development. **(12 lectures)**

UNIT II

Tissues: Classification of tissues; Simple and complex tissues (no phylogeny); cytodifferentiation of tracheary elements and sieve elements; Pits and plasmodesmata; Wall ingrowths and transfer cells, adcrustation and incrustation, Ergastic substances. Hydathodes, cavities, lithocysts and laticifers. **(10 lectures)**

UNIT III

Apical meristems: Evolution of concept of organization of shoot apex; Types of vascular bundles; Structure of dicot and monocot stem. Origin, development, arrangement and diversity in size and shape of leaves; Structure of dicot and monocot leaf, Kranz anatomy. Organization of root apex; Quiescent centre; Root cap; Structure of dicot and monocot root; Endodermis, exodermis and origin of lateral root. **(13 lectures)**

UNIT IV

Vascular Cambium and Wood: Structure, function and seasonal activity of cambium; Secondary growth in root and stem. Axially and radially oriented elements; Types of rays and axial parenchyma; Cyclic aspects and reaction wood; Sapwood and heartwood; Ring and diffuse porous wood; Early and late wood, tyloses; Dendrochronology. Development and composition of periderm, rhytidome and lenticels.

Adaptive and Protective Systems: Epidermal tissue system, cuticle, epicuticular waxes, trichomes (uni- and multicellular, glandular and nonglandular), stomata; Anatomical adaptations of xerophytes and hydrophytes. **(13 lectures)**

Learning Strategies: Class room lectures, practicals, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students

Learning Outcome: The students will come to know that plants are made up of which types of tissues and cells. They will understand relative distribution of different types of thickening materials in plants. Students will learn the type of living and non living substances are present in a cell.

Assessment: Mid Semester Exam (MSE) – 25 Marks

Written Quiz (MCQs) – 10 Marks

Assignment (written) – 10 Marks

End Semester Examination (ESE) – 50 Marks

Attendance – 5 Marks

**Model Question Paper:
MSE**

Q.1 Will Comprise of 5 parts having 1 mark each

Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be attempted.

Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be attempted

**Model Question Paper:
ESE**

Q.1 Will Comprise of 10 parts having 1 mark each

Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be attempted.

Q.10 to Q.13 will carry 8 marks each out of which 2 question are to be attempted



DAV University, Jalandhar.
Term-Sample

**MSE
March 2019**

Name:

Regd. No.:

Course Code: BOT221

Roll No.:

Course Name: Morphology and Anatomy

**Time: 1 Hour 30 Minutes
Maximum Marks: 25**

Section – A

(Maximum Marks: 1 x 5 = 5)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Explain the following terms:

- i. Bast fibers
- ii. Velamen
- iii. Endarch
- iv. Tissues
- v. Metaxylem

Section – B

(Maximum Marks: 4 x 3 = 12)

Attempt any **3 Questions out of 5 Questions** and each question should be answered in maximum 2 pages.

Q.2 What are plasmodesmata? Make well labeled diagram.

Q.3 Write a note on Ergastic substances.

Q.4 What are Transfer cells? Explain membrane-wall complex with the help of a suitable diagram.

Q.5 What is Torus? How it blocks entry of water? Make suitable diagram.

Q.6 Write a note on xylem differentiation.

Section – C

(Maximum Marks: 8 x 1 = 8)

Attempt **1 Question out of 2 Questions** and each question should be answered in maximum 4 pages.

Q.7 Why is phloem regarded as a complex permanent tissue? Briefly explain the structure and function of its components.

Q.8 Explain apical, intercalary and lateral meristem along with their different types? Show their positions with the help of a well labeled sketch.



DAV University, Jalandhar.
(Term-Sample)

ETE

Name:

Regd. No.:

Course Code: BOT221

Time: 3 Hours

Course Name: Morphology and Anatomy

Maximum Marks: 50

Section – A

(Maximum Marks: 1 x 10 = 10)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Explain the following terms:

- i. Tyloses
- ii. Cork Cambium
- iii. Dendrochronology
- iv. Ergastic substances
- v. Plasmodesmata
- vi. Motor cells
- vii. Mesarch condition
- viii. Lenticels
- ix. Endarch
- x. Rhytidome

Section – B

(Maximum Marks: 4 x 6 = 24)

Short Answer Type: Attempt any **6 Questions out of 8 Questions** and each question should be answered in maximum 2 pages.

- Q.2 Tabulate differences between shoot and root apical meristem.
- Q.3 Root apical meristem is subterminal in position. Comment. Make suitable diagram.
- Q.4 Discuss various anatomical adaptations in both xerophytes.
- Q.5 Differentiate between monocot and dicot leaf. Make well labeled T.S. of dicot leaf.
- Q.6 Explain various steps involved in xylem elements differentiation.
- Q.7 Explain radial, concentric and conjoint vascular bundle. Make suitable diagram.
- Q.8 What do you understand by secondary growth? Why monocots don't show this type of growth? Mention its significance.
- Q.9 Explain the formation of abscission layer with the help of a well labeled diagram.

Section – C

(Maximum Marks: 8 x 2 = 16)

Long Answer Type: Attempt **2 Questions out of 4 Questions** and each question should be answered in maximum 4 pages.

- Q.10 Explain various shoot apical meristem theories you have studied during the course. Make suitable diagrams.
- Q.11 Write a note on vascular tissue in plants. Discuss the structure and function of water conducting channels in plants.
- Q.12 Discuss the anatomy of epiphytic roots. Make well labeled diagrams.
- Q.13 What is Phloem? Name its components. Draw suitable sketches.

Programme Name: B.Sc. (Hons.) Botany Semester III
Course Name: Morphology and Anatomy Laboratory

Course Code: BOT222

Total Credits: 2

Credit Components: L-0; T-0; P-3

Learning Objectives: To acquaint the students about various Anatomical details at cellular and organ level in plants.

List of Experiments

1. Study of anatomical details through permanent slides/temporary stain mounts/macerations/museum specimens with the help of suitable examples
2. Apical meristem of root, shoot and vascular cambium.
3. Distribution and types of parenchyma, collenchyma and sclerenchyma.
4. Xylem: Tracheary elements-tracheids, vessel elements; thickenings; perforation plates;xylem fibres.
5. Wood: ring porous; diffuse porous; tyloses; heart- and sapwood.
6. Phloem: Sieve tubes-sieve plates; companion cells; phloem fibres.
7. Epidermal system: cell types, stomata types; trichomes: non-glandular and glandular.
8. Root: monocot, dicot, secondary growth.
9. Stem: monocot, dicot - primary and secondary growth; periderm; lenticels.
10. Leaf: isobilateral, dorsiventral, C4 leaves (Kranz anatomy).
11. Adaptive Anatomy: xerophytes, hydrophytes.
12. Secretory tissues: cavities, lithocysts and laticifers.

Learning Strategies: Practicals, models, charts, online demonstrations, group discussions and assignments

Learning Outcome: The students will come to know that how a plant cell responds to various biotic and abiotic stresses and modify their morphological and anatomical structures.

Assessment: Continuous Assessment: 20 Marks
Practical Exam: 80 Marks

Model Question Paper: Practical Exam component is divided into the following sub components:

- Performance – 24 Marks
- Spotting – 16 Marks
- Viva-voce – 24 Marks
- Record – 8 Marks
- Internal Assessment – 8 marks

Text Books:

1. Pande, B.P. *Plant Anatomy*. New York: Associated Press, 2002. Print.
2. Evert, R.F. *Esau's Plant Anatomy: Meristems, Cells, and Tissues of the Plant Body: Their Structure, Function and Development*. USA: John Wiley and Sons, Inc. 2006. Print

Reference Books:

1. Dickison, W.C. *Integrative Plant Anatomy*. USA: Harcourt Academic Press, 2009. Print. Stryer, L. *Biochemistry*. 5th ed. New York: W.H. Freeman and Co., 1995. Print.

2. Fahn, A. *Plant Anatomy*. USA: Pergmon Press, 1974. Print.
3. Mauseth, J.D. *Plant Anatomy*. USA: The Benjammin/Cummings Publisher, 1988. Print.

Programme Name: B.Sc. (Hons.) Botany Semester III
Course Name: Economic Botany
Course Code: BOT223
Total Credits: 4
Credit Components: L-4; T-0; P-0
Learning Objectives: To acquaint the students about the importance of plants in our day to day life.

Unit I

Origin of Cultivated Plants: Concept of Centres of Origin, their importance with reference to Vavilov's work. Examples of major plant introductions; Crop domestication and loss of genetic diversity; evolution of new crops/varieties, importance of germplasm diversity. (8 lectures)

Unit II

Cereals: Wheat and Rice (origin, morphology, processing & uses); Brief account of millets.
Legumes: Origin, morphology and uses of Chick pea, Pigeon pea and fodder legumes.
Sources of sugars and starches: Morphology and processing of sugarcane, products and by products of sugarcane industry. Potato – morphology, propagation & uses. (12 lectures)

Unit III

Spices: Listing of important spices, their family and part used. Economic importance with special reference to fennel, saffron, clove and black pepper.
Beverages: Tea, Coffee (morphology, processing & uses)
Sources of oils and fats: General description, classification, extraction, their uses and health implications groundnut, coconut, linseed, soybean and mustard.
Essential Oils: General account, extraction methods, comparison with fatty oils & their uses. (14 lectures)

Unit IV

Natural Rubber: Para-rubber: tapping, processing and uses.
Drug-yielding plants: Therapeutic and habit-forming drugs with special reference to Cinchona, Digitalis, Papaver and Cannabis; Morphology, processing, uses and health hazards of Tobacco.
Timber plants: General account with special reference to teak and pine.
Fibers: Classification based on the origin of fibers; Cotton, Coir and Jute (morphology, extraction and uses). (14 lectures)

Learning Strategies: Class room lectures, practicals, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students.

Learning Outcome: The course will enable students to understand how plants are important in our life and how they influence our life.

Assessment: Mid Semester Exam (MSE) – 25 Marks
Written Quiz (MCQs) – 10 Marks
Assignment (written) – 10 Marks
End Semester Examination (ESE) – 50 Marks
Attendance – 5 Marks

**Model Question
Paper: MSE**

Q.1 Will Comprise of 5 parts having 1 mark each
Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be attempted.
Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be attempted

**Model Question
Paper: ESE**

Q.1 Will Comprise of 10 parts having 1 mark each
Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be attempted.
Q.10 to Q.13 will carry 8 marks each out of which 2 question are to be attempted



DAV University, Jalandhar.
Term-Sample

MSE
Sample

Name:

Regd. No.:

Course Code: BOT223

Roll No.:

Course Name: ECONOMIC BOTANY

Time: 1 Hour30 Minutes
Maximum Marks: 25

Section – A

(Maximum Marks: 1 x 5 = 5)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Explain following

- i. Millets
- ii. Legumes
- iii. Crop domestication
- iv. Morphology of wheat plant.
- v. Polyploidy

Section – B

(Maximum Marks: 4 x 3 = 12)

Attempt any **3 Questions out of 5 Questions** and each question should be answered in maximum 2 pages.

Q.2 Write a short note on loss of genetic diversity.

Q.3 Give the origin, botanical description and uses of *Oryza sativa*.

Q.4 What is germplasm? Briefly describe evolution of new crop varieties.

Q.5 Write down source, family and morphological description of pigeon pea.

Q.6 Give an account of forage crops.

Section – C

(Maximum Marks: 8 x 1 = 8)

Attempt **1 Question out of 2 Questions** and each question should be answered in maximum 4 pages.

Q.7 Give the source, morphological descriptions and uses one tropical and one temperate millet.

Q.8 Give an account of centers of origins of crop plants.



DAV University, Jalandhar.
(Term-Sample)

ESE
Sample

Name:

Regd. No.:

Course Code: BOT223

Time: 3 Hours

Course Name : ECONOMIC BOTANY

Maximum Marks: 50

Section – A

(Maximum Marks: 1 x 10 = 10)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1

- i. What is semi drying oil? Give example.
- ii. What are bast fibers? Give examples.
- iii. Which plant yield Charas? Give the botanical name and family of the plant.
- iv. Which plant yield manila hemp? Give its 2 uses.
- v. Write the botanical name and family of coffee yielding plant. Also write the uses of coffee.
- vi. How tropical millet differ from temperate millet?
- vii. What is ginning?
- viii. Give the botanical name and family of Castor oil. Also mention its 2-3 uses.
- ix. Write the botanical name of two fodder plants with their one morphological feature.
- x. Which plant yield blue pine? Write the uses of blue pine.

Section – B

(Maximum Marks: 4 x 6 = 24)

Short Answer Type: Attempt any **6 Questions out of 8 Questions** and each question should be answered in maximum 2 pages.

- Q.2 Describe the botanical features and uses of a vegetable oil-yielding plant.
- Q.3 What is difference between softwood and hardwood? Describe one hardwood yielding plant with its uses.
- Q.4 Briefly describe the process of preparation of sugar from sugarcane plant.
- Q.5 Write the botanical name of para rubber tree. Briefly describe the tapping of para rubber.
- Q.6 Name the botanical name of cotton with its family. Give morphology and uses of cotton.
- Q.7 Briefly describe the morphology and medicinal importance of opium plant. Also, write the botanical name and family of the plant.
- Q.8 Write short note on the morphology of **i) rice ii) wheat**
- Q.9 Which plant yield reserpine. Give the botanical name, morphology and medicinal uses of the plant.

Section – C

(Maximum Marks: 8 x 2 = 16)

Long Answer Type: Attempt **2 Questions out of 4 Questions** and each question should be answered in maximum 4 pages.

- Q.10 Describe the origin, distribution, morphological features of any two legume crops.
- Q.11 What are essential oils? Explain the various methods of essential oil extraction.
- Q.12 Give the botanical name, family and botany of spices obtained from bark, flower bud and underground parts.
- Q.13 Give the botanical names of two beverage-yielding trees. Write a short note on the processing of tea leaves.

Programme Name: B.Sc. (Hons.) Botany Semester III

Course Name: Economic Botany Laboratory

Course Code: BOT224

Total Credits: 2

Credit Components: L-0; T-0; P-3

Learning Objectives: The course will enable students to know the importance of various plants in our daily life.

List of Experiments

1. **Cereals:** Wheat (habit sketch, L. S/T.S. grain, starch grains, micro -chemical tests)Rice (habit sketch, study of paddy and grain, starch grains, micro -chemical tests).
2. **Legumes:** Soybean, Groundnut, (habit, fruit, seed structure, micro -chemical tests).
3. **Sources of sugars and starches:** Sugarcane (habit sketch; cane juice - micro-chemical tests), Potato(habit sketch, tuber morphology, T.S. tuber to show localization of starch grains, w.m. starch grains, micro-chemical tests).
4. **Spices:** Black pepper, Fennel and Clove (habit and sections).
5. **Beverages:** Tea (plant specimen, tea leaves), Coffee (plant specimen, beans).
6. **Sources of oils and fats:** Coconut- T.S. nut, Mustard–plant specimen, seeds; tests for fats in crushed seeds.
7. **Essential oil-yielding plants:** Habit sketch of Rosa, Vetiveria, Santalum and Eucalyptus (specimens/photographs).
8. **Rubber:** specimen, photograph/model of tapping, samples of rubber products.
9. **Drug-yielding plants:** Specimens of Digitalis, Papaver and Cannabis.
10. **Tobacco:** specimen and products of Tobacco.
11. **Woods:**Tectona, Pinus: Specimen, Section of young stem.
12. **Fiber-yielding plants:** Cotton (specimen, whole mount of seed to show lint and fuzz; whole mount of fiber and test for cellulose), Jute (specimen, transverse section of stem, test for lignin on transverse section of stem and fiber).

Learning Strategies: Practicals, models, charts, online demonstrations, group discussions and assignments

Learning Outcome: The students will easily identify various drug yielding plants, spices, legumes and cereals, fibers in the field.

Assessment: Continuous Assessment: 20 Marks
Practical Exam: 80 Marks

Model Question Paper: Practical Exam component is divided into the following sub components:

- Performance – 24 Marks
- Spotting – 16 Marks
- Viva-voce – 24 Marks
- Record – 8 Marks
- Internal Assessment – 8 marks

Text Books: 1. Kochhar, S.L. Economic Botany in Tropics. New Delhi: MacMillan

& Co., 2012. Print.

2. Thakur, R.S., Puri, H.S. and Husain, A. Major Medicinal Plants of India. Lucknow: Central Institute of Medicinal and Aromatic Plants, 1989. Print

Reference Books:

1. Wickens, G.E. Economic Botany: Principles & Practices. The Netherlands: Kluwer Academic Publishers, 2001. Print.
2. Chrispeels, Maarten J., and David E. Sadava. Plants, Genes, and Agriculture. Boston, Mass.: Jones and Bartlett, 1994. Print.
3. Swaminathan, M.S., and Kocchar, S.L., (eds.). Plants and Society. London: MacMillan Publications Ltd., 1989. Print.

Other Supportive Material:

<http://krishikosh.egranth.ac.in/bitstream/1/2037487/1/16741.pdf>

Programme Name: B.Sc. (Hons.) Botany Semester III
Course Name: Organic Farming
Course Code: BOT225
Total Credits: 2
Credit Components: L-2; T-0; P-0
Learning Objectives: To acquaint the students about the biology and mechanism of organic farming.

UNIT I

General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis. Phosphate solubilizing bacteria-isolation, identification, mass multiplication. Siderophores-role in microbial iron transport. **(8 lectures)**

UNIT II

Azospirillum: isolation and mass multiplication – carrier based inoculant, associative effect of different microorganisms. Azotobacter: classification, characteristics – crop response to Azotobacter inoculum, maintenance and mass multiplication. Cyanobacteria (blue green algae), Azolla and Anabaena azollae association, nitrogen fixation, factors affecting growth, blue green algae and Azolla in rice cultivation. **(12 lectures)**

UNIT III

Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants. **(13 lectures)**

UNIT IV

Organic farming – Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application. Policies and certification process of organic farming. **(10 lectures)**

Learning Strategies: Class room lectures, practicals, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students

Learning Outcome: This course will enable students to know importance of organic farming and different living organisms in the field of agriculture.

Assessment: Mid Semester Exam (MSE) – 25 Marks
Written Quiz (MCQs) – 10 Marks
Assignment (written) – 10 Marks
End Semester Examination (ESE) – 50 Marks
Attendance – 5 Marks

Model Question Paper: MSE Q.1 Will Comprise of 5 parts having 1 mark each
Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be attempted.
Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be attempted

Model Question Paper: ESE Q.1 Will Comprise of 10 parts having 1 mark each
Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be

attempted.

Q.10 to Q.13 will carry 8 marks each out of which 2 question are to be attempted

Text Books:

1. Dubey, R.C. A Text book of Biotechnology. New Delhi:S.Chand & Co., 2005. Print.

Reference Books:

2. Kumaresan, V. Biotechnology.New Delhi:Saras Publications,2005. Print.

3. Prakash, J.J.E.Outlines of Plant Biotechnology. New Delhi: Emkay Publication, 2004. Print.

4. Sathe, T.V. Vermiculture and Organic Farming. India: Daya publishers, 2004. Print.

5. Subha Rao, N.S. Soil Microbiology.New Delhi:Oxford & IBH Publishers, 2000. Print.

6. Vayas,S.C, Vayas, S. and Modi, H.A. Bio-fertilizers and organic Farming.India: AktaPrakashan, Nadiad. 1998. Print.

**Websites and
Audio Video
lectures:**

https://www.youtube.com/watch?v=wd9_vZiwMq4



DAV University, Jalandhar.
Term-Sample

MSE
Sample

Name: Regd. No.:

Course Code: BOT225

Roll No.:

Time: 1 Hour 30 Minutes

Course Name: Organic Farming

Maximum Marks: 25

Section – A

(Maximum Marks: 1 x 5 = 5)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1

- i. What is Biopesticide?
- ii. Define Organic farming.
- iii. What is NOP?
- iv. Give principle of wet sieving and decanting.
- v. What do you mean by Humus?

Section – B

(Maximum Marks: 4 x 3 = 12)

Attempt any **3 Questions out of 5 Questions** and each question should be answered in maximum 2 pages.

Q.2 What are the benefits of organic farming?

Q.3 Explain the role of phosphate solubilizing bacteria as biofertilizers.

Q.4 Explain the nitrogen fixing mechanism of *Rhizobium* and its applications.

Q.5 Give a brief note about *Azospirillum* sp.

Q.6 What is biomagnification? How biopesticides and biofertilizers can solve this problem?

Section – C

(Maximum Marks: 8 x 1 = 8)

Attempt **1 Question out of 2 Questions** and each question should be answered in maximum 4 pages.

Q.7 Explain the methods of recycling of biodegradable and municipal waste.

Q.8 Explain the Organic farming scenario in India.



DAV University, Jalandhar.
Term-Sample

ETE

Name: Regd. No.:

Course Code: BOT225

Roll No.:

Time: 3 Hours

Course Name: Organic Farming

Maximum Marks: 50

Section – A

(Maximum Marks: 1 x 10 = 10)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

- i. What are biofertilizers?
- ii. What is symbiosis?
- iii. Expand the abbreviation VAM.
- iv. What is the function of akinetes in Cyanobacteria?
- v. What is FAO?
- vi. What is Endo-Mycorrhiza?
- vii. What is the Hartig net?
- viii. Name two symbiotic nitrogen fixing bacteria.
- ix. What is heterocyst?
- x. What do you mean by Green revolution?

Section – B

(Maximum Marks: 4 x 6 = 24)

Short Answer Type: Attempt any **6 Questions out of 8 Questions** and each question should be answered in maximum 2 pages.

- Q.2 What is Green Manure and its benefits? List some crops that can be used as a green manure.
- Q.3 What are the methods for recycling agriculture and industrial waste?
- Q.4 Explain the characteristics of organic farming?
- Q.5 Why organic food costs more than conventional food?
- Q.6 Explain about nitrogen fixation mechanism by Cyanobacteria.
- Q.7 List different types of biofertilizers. What are the advantages and disadvantages of using biofertilizers?
- Q.8 What are the main differences between bacteria and Cyanobacteria?
- Q.9 Explain the methods of reproduction in *Anabaena*.

Section – C

(Maximum Marks: 8 x 2 = 16)

Long Answer Type: Attempt **2 Questions out of 4 Questions** and each question should be answered in maximum 4 pages.

- Q.10 Give note on (a) *Azotobacter* (b) *Rhizobium*
- Q.11 Give a detailed description regarding the process, methods and applications of Vermicompositing.
- Q.12 Explain how VAM colonise in the environment. What is the procedures for isolation of VAM spores?
- Q.13 What is Mycorrhizal associations? Explain their occurrence and types.

Programme Name: B.Sc. (Hons.) Botany Semester III

Course Name: Herbal Technology

Course Code: BOT230

Total Credits: 2

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

Learning Objectives: To acquaint the students about the medicines that can be obtained from the plants.

Unit I

Herbal medicines: history and scope - definition of medical terms - role of medicinal plants in Siddha systems of medicine; cultivation - harvesting - processing - storage - marketing and utilization of medicinal plants. **(10 Lectures)**

Unit II

Pharmacognosy - systematic position medicinal uses of the following herbs in curing various ailments; Tulsi, Ginger, Fenugreek, Indian Goose berry and Ashoka. **(8 Lectures)**

Unit III

Phytochemistry - active principles and methods of their testing - identification and utilization of the medicinal herbs; *Catharanthus roseus* (cardiotonic), *Withania somnifera* (drugs acting on nervous system), *Clerodendron phlomoides* (anti-rheumatic) and *Centella asiatica* (memory booster). **(12 Lectures)**

Unit IV

Analytical pharmacognosy: Drug adulteration - types, methods of drug evaluation - Biological testing of herbal drugs - Phytochemical screening tests for secondary metabolites (alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds)

Medicinal plant banks micro propagation of important species (*Withania somnifera*, neem and tulsi- Herbal foods-future of pharmacognosy) **(12 Lectures)**

Learning Strategies: Class room lectures, practicals, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students

Learning Outcome: The course will enable students to know the importance of plants in medicinal world.

Assessment: Mid Semester Exam (MSE) – 25 Marks
Written Quiz (MCQs) – 10 Marks
Assignment (written) – 10 Marks
End Semester Examination (ESE) – 50 Marks
Attendance – 5 Marks

Model Question Paper: MSE Q.1 Will Comprise of 5 parts having 1 mark each
Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be attempted.
Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be attempted

Model Question Paper: ESE Q.1 Will Comprise of 10 parts having 1 mark each
Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be attempted.
Q.10 to Q.13 will carry 8 marks each out of which 2 question are to be

attempted

Text Books:

1. Chopra, R.N., Nayar, S.L. and Chopra, I.C. *Glossary of Indian medicinal plants*. New Delhi: C.S.I.R, 1956. Print.
2. Kanny, L, Dey and Raj B. *The indigenous drugs of India*. India: International Book Distributors. 1984. Print.

Reference Books:

3. Agnes, A. *Herbal plants and Drugs*. India: Mangal Deep Publications. 1999. Print.
4. Sivarajan, V.V. and Balachandra, I. *Ayurvedic drugs and their plant source*. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd., 1994. Print.
5. Light, M. and Bryan, M. *Ayurveda and Aromatherapy*. New Delhi: Banarsidass, 1988. Print.
6. Green, A. *Thorsons Principles of Ayurveda*. London: Thomsons, 2000. Print.
7. Kokate, C.K. *Pharmacognosy*. India: Nirali Prakashan, 1999. Print.

Programme Name: B.Sc. (Hons.) Botany Semester IV

Course Name: Plant Ecology and Phytogeography

Course Code: BOT226

Total Credits: 4

Credit Components: L-4; T-0; P-0

Learning Objectives: To acquaint the students about the interactions between the organisms and their environment.

Unit I

Introduction: Basic concepts; Levels of organization. Inter-relationships between the living world and the environment, the components and dynamism, homeostasis.

Soil: Importance; Origin; Formation; Composition; Physical; Chemical and Biological components; Soil profile; Role of climate in soil development.

Water: Importance: States of water in the environment; Atmospheric moisture; Precipitation types (rain, fog, snow, hail, dew); Hydrological Cycle; Water in soil; Water table. **(12 lecture)**

Unit II

Light, temperature, wind and fire: Variations; adaptations of plants to their variation.

Biotic interactions: Trophic organization, basic source of energy, autotrophy, heterotrophy; symbiosis, commensalism, parasitism; food chains and webs; ecological pyramids; biomass, standing crop.

Population ecology: Characteristics and dynamics. Ecological speciation **(11 lecture)**

Unit III

Plant communities: Concept of ecological amplitude; Habitat and niche; Characters: analytical and synthetic; Ecotone and edge effect; Dynamics: succession – processes, types; climax concepts.

Ecosystems: Structure; Processes; Trophic organisation; Food chains and Food webs; Ecological pyramids. **(14 lecture)**

Unit IV

Functional aspects of ecosystem: Principles and models of energy flow; Production and productivity; Ecological efficiencies; Biogeochemical cycles; Cycling of Carbon, Nitrogen and Phosphorus.

Phytogeography: Principles; Continental drift; Theory of tolerance; Endemism; Brief description of major terrestrial biomes (one each from tropical, temperate & tundra); Phytogeographical division of India; Local Vegetation. **(15 lecture)**

Learning Strategies: Class room lectures, practicals, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students

Learning Outcome: The course will enable students to understand how environment influence the life of different organisms and vice versa.

Assessment: Mid Semester Exam (MSE) – 25 Marks
Written Quiz (MCQs) – 10 Marks
Assignment (written) – 10 Marks
End Semester Examination (ESE) – 50 Marks
Attendance – 5 Marks

Model Question Paper: MSE Q.1 Will Comprise of 5 parts having 1 mark each

Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be

attempted.

Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be attempted

Q.1 Will Comprise of 10 parts having 1 mark each

Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be attempted.

Q.10 to Q.13 will carry 8 marks each out of which 2 question are to be attempted

Model Question

Paper: ESE



DAV University, Jalandhar.

Term-18192

MSE

March 2019

Name:

Regd. No.:

Course Code: BOT226

Roll No.:

Course Name: Plant Ecology and Phytogeography

Time: 1 Hour 30 Minutes

Maximum Marks: 25

Section – A

(Maximum Marks: 1 x 5 = 5)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Explain the following:

- i. Mortality
- ii. Ecological footprinting
- iii. Water table
- iv. Ecological efficiency
- v. Rain

Section – B

(Maximum Marks: 4 x 3 = 12)

Attempt any **3 Questions out of 5 Questions** and each question should be answered in maximum 2 pages.

Q.2 Give an account of soil profile. Support your answer with well labeled sketch.

Q.3 Explain different types of ecological pyramids with suitable examples.

Q.4 Define weathering. Discuss biological factors affecting the process of weathering.

Q.5 Write notes on the following:

- (a) Food chain
- (b) Survivorship curve

Q.6 Write notes on the following:

- (a) Stenothermal
- (b) Eurythermal
- (c) Wind throw
- (d) Epilimnion

Section – C

(Maximum Marks: 8 x 1 = 8)

Attempt **1 Question out of 2 Questions** and each question should be answered in maximum 4 pages.

Q.7 What do you understand by ecological succession? Discuss various processes of ecological succession.

Q.8 Give an account of soil profile. Support your answer with well labeled sketch.



DAV University, Jalandhar.
(Term-18191)

ETE
December, 2018

Name:

Regd. No.:

Course Code: BOT226

Time: 3 Hours

Course Name: Plant Ecology and Phytogeography
Section – A

Maximum Marks: 50
(Maximum Marks: 1 x 10 = 10)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Discuss the following:

- i. Weathering
- ii. Ecesis
- iii. Eolian
- iv. Commensalism
- v. Metalimnion
- vi. Nudation
- vii. Sere
- viii. Bergmann's rule
- ix. Vital Index
- x. Eluviation

Section – B

(Maximum Marks: 4 x 6 = 24)

Short Answer Type: Attempt any **6 Questions out of 8 Questions** and each question should be answered in maximum 2 pages.

Q.2 Explain the following:

- (a) Production ecology (b) Ecological efficiency

Q.3 Write notes on the following:

- (a) Climatic regions of India (b) Tropical wet evergreen forest

Q.4 Define endemics. Give various types of endemics.

Q.5 Discuss food web with suitable example.

Q.6 Describe various types of food chain with examples.

Q.7 Explain various types of ecological succession.

Q.8 Write a general account of ecotone and edge effect.

Q.9 Write note on the theory of tolerance.

Section – C

(Maximum Marks: 8 x 2 = 16)

Long Answer Type: Attempt **2 Questions out of 4 Questions** and each question should be answered in maximum 4 pages.

Q.10 Write notes on the following

- (a) Continuous distribution (b) Discontinuous distribution (c) Wides

Q.11 Describe the biotic and abiotic components of ecosystem.

Q.12 What do you understand by phytogeography. Explain various principles of phytogeography suggested by Lawrence.

Q.13 Explain nitrogen cycle in detail with well labeled sketch.

Programme Name: B.Sc. (Hons.) Botany Semester IV
Course Name: Plant Ecology and Phytogeography Laboratory

Course Code: BOT227

Total Credits: 2

Credit Components: L-0; T-0; P-3

Learning Objectives: To acquaint the students about the interactions between the organisms and their environment.

List of experiments

1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.
2. Determination of pH of various soil and water samples (pH meter, universal indicator/Lovibond comparator and pH paper)
3. Analysis for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency from two soil samples by rapid field tests.
4. Determination of organic matter of different soil samples by Walkley & Black rapid titration method.
5. Comparison of bulk density, porosity and rate of infiltration of water in soils of three habitats.
6. Determination of dissolved oxygen of water samples from polluted and unpolluted sources.
7. (a). Study of morphological adaptations of hydrophytes and xerophytes (four each).
(b). Study of biotic interactions of the following: Stem parasite (*Cuscuta*), Root parasite (*Orobancha*) Epiphytes, Predation (Insectivorous plants).
8. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus, by species area curve method (species to be listed).
9. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law.
10. Quantitative analysis of herbaceous vegetation for density and abundance in the college campus.
11. Field visit to familiarise students with ecology of different sites.

Learning Strategies: Class room lectures, practicals, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students

Learning Outcome: The course will enable students to understand how environment influence the life of different organisms and vice versa.

Assessment: Continuous Assessment: 20 Marks

Practical Exam: 80 Marks

Model Question Paper: Practical Exam component is divided into the following sub components:

- Performance – 24 Marks
- Spotting – 16 Marks
- Viva-voce – 24 Marks
- Record – 8 Marks
- Internal Assessment – 8 marks

Text Books: 1. Odum, E.P. *Fundamentals of Ecology*. 5thed. New Delhi: Cengage Learning India Pvt. Ltd., 2005. Print.

2. Singh, J.S., Singh, S.P. and Gupta, S. *Ecology Environment and Resource Conservation*. New Delhi: Anamaya Publications, 2006. Print.

Reference Books:

1. Sharma, P.D. *Ecology and Environment*. 8th ed. India: Rastogi Publications, 2010. Print.
2. Wilkinson, D.M. *Fundamental Processes in Ecology: An Earth Systems Approach*. USA: Oxford University Press, 2007. Print.
3. Kormondy, E.J. *Concepts of Ecology*. 4th ed. India: PHI Learning Pvt. Ltd., 1996. Print.

Programme Name: B.Sc. (Hons.) Botany Semester IV

Course Name: Plant Systematics

Course Code: BOT228

Total Credits: 4

Credit Components: L-4; T-0; P-0

Learning Objectives: To acquaint the students about the different systems of classification and how they developed.

Unit I

Significance of Plant systematic: Introduction to systematics; Plant identification, Classification, Nomenclature. Evidences from palynology, cytology, phytochemistry and molecular data. Field inventory; Functions of Herbarium; Important herbaria and botanical gardens of the world and India; Virtual herbarium; E-flora; Documentation: Flora, Monographs, Journals; Keys: Single access and Multi-access. **(13 lecture)**

Unit II

Taxonomic hierarchy: Concept of taxa (family, genus, species); Categories and taxonomic hierarchy; Species concept (taxonomic, biological, evolutionary). Botanical nomenclature: Principles and rules (ICN); Ranks and names; Typification, author citation, valid publication, rejection of names, principle of priority and its limitations; Names of hybrids. **(15 lecture)**

Unit III

Systems of classification: Major contributions of Theophrastus, Bauhin, Tournefort, Linnaeus, Adanson, de Candolle, Bessey, Hutchinson, Takhtajan and Cronquist; Classification systems of Bentham and Hooker (upto series) and Engler and Prantl (upto series); Brief reference of Angiosperm Phylogeny Group (APG III) classification. **(14 lecture)**

Unit IV

Biometrics, numerical taxonomy and cladistics: Characters; Variations; OTUs, character weighting and coding; Cluster analysis; Phenograms, cladograms (definitions and differences). Phylogeny of Angiosperms: Terms and concepts (primitive and advanced, homology and analogy, parallelism and convergence, monophyly, Paraphyly, polyphyly and clades). Origin and evolution of angiosperms; Co-evolution of angiosperms and animals; Methods of illustrating evolutionary relationship (phylogenetic tree, cladogram). General account of Ranunculaceae, Malvaceae, Apiaceae, Asteraceae and Poaceae. **(18 lecture)**

Learning Strategies: Class room lectures, practical, collection, field visits, herbaria, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students.

Learning Outcome: The course will enable students to the basis of angiosperm classification and features of few basic families of flowering plants.

Assessment: Mid Semester Exam (MSE) – 25 Marks
Written Quiz (MCQs) – 10 Marks
Assignment (written) – 10 Marks
End Semester Examination (ESE) – 50 Marks
Attendance – 5 Marks

Model Question Paper: Q.1 Will Comprise of 5 parts having 1 mark each

Paper: MSE Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be

attempted.

Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be attempted

**Model Question
Paper: ESE**

Q.1 Will Comprise of 10 parts having 1 mark each

Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be attempted.

Q.10 to Q.13 will carry 8 marks each out of which 2 question are to be attempted.



DAV University, Jalandhar.

Term-Sample

**MSE
Sample**

Name:

Regd. No.:

Course Code: BOT 228

Roll No.:

Course Name: Plant Systematics

**Time: 1 Hour30 Minutes
Maximum Marks: 25**

Section – A

(Maximum Marks: 1 x 5 = 5)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1

- i. Define Systematics.
- ii. Define Herbarium.
- iii. Define ICN.
- iv. Define Monograph.
- v. Define Flora

Section – B

(Maximum Marks: 4 x 3 = 12)

Attempt any **3 Questions out of 5 Questions** and each question should be answered in maximum 2 pages.

Q.2 Explain aims and objectives of plant Taxonomy.

Q.3 Explain function of Herbarium.

Q.4 Write a short note on major herbaria of India.

Q.5 Write a note on important botanical gardens of India.

Q.6 Explain the role of phytochemistry in relation to taxonomy.

Section – C

(Maximum Marks: 8 x 1 = 8)

Attempt **1 Question out of 2 Questions** and each question should be answered in maximum 4 pages.

Q.7 What is taxonomy? Describe the fundamental components of taxonomy.

Q.8 what are identification keys? Explain in detail.



DAV University, Jalandhar.
(Term-Sample)

ETE
Sample

Name:

Regd. No.:

Course Code: BOT228

Time: 3 Hours

Course Name: Plant Systematics

Maximum Marks: 50

Section – A

(Maximum Marks: 1 x 10 = 10)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1

- i. Define Systematics.
- ii. Define homoplasy.
- iii. Explain taxon.
- iv. Define flora.
- v. Define lineage.
- vi. Define identification Key.
- vii. What is apomorphy ?
- viii. Define E- flora.
- ix. What is herbarium?
- x. Define cladistics.

Section – B

(Maximum Marks: 4 x 6 = 24)

Short Answer Type: Attempt any **6 Questions out of 8 Questions** and each question should be answered in maximum 2 pages.

- Q.2 Write general characteristics of primitive angiosperms.
- Q.3 Write an essay on importance of Herbaria.
- Q.4 Explain origin of angiosperms.
- Q.5 Write an essay on Hutchinson's classification.
- Q.6 Explain ICBN in detail.
- Q.7 Explain homology and analogy.
- Q.8 Write a note on Type concept.
- Q.9 Explain principle of priority and its application.

Section – C

(Maximum Marks: 8 x 2 = 16)

Long Answer Type: Attempt **2 Questions out of 4 Questions** and each question should be answered in maximum 4 pages.

- Q.10 What is Phenogram? Explain and draw a suitable phylogenetic tree.
- Q.11 Give an account of Engler and Prantl's system of classification. Discuss the merits and demerits of the system.
- Q.12 What is APG? Discuss the APG III in detail.
- Q.13 write explanatory notes on the following: (a) Binomial Nomenclature (b) Identification keys.

Programme Name: B.Sc. (Hons.) Botany Semester IV
Course Name: Plant Systematics Laboratory
Course Code: BOT229
Total Credits: 2
Credit Components: L-0; T-0; P-3
Learning Objectives: To acquaint the students about the different systems of classification and how they developed, identification and preparation of herbarium.

List of Experiments

1. Study of vegetative and floral characters of the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification):

Ranunculaceae - *Ranunculus*, *Delphinium*

Brassicaceae - *Brassica*, *Alyssum* / *Iberis*

Myrtaceae - *Eucalyptus*, *Callistemon*

Umbelliferae - *Coriandrum* / *Anethum* / *Foeniculum*

Asteraceae - *Sonchus/Launaea*, *Vernonia/Ageratum*, *Eclipta/Tridax*

Solanaceae - *Solanum nigrum/Withania*

Lamiaceae - *Salvia/Ocimum*

Euphorbiaceae - *Euphorbia hirta/E.milii*, *Jatropha*

Liliaceae - *Asphodelus/Lilium/Allium*

Poaceae - *Triticum/Hordeum/Avena*

2. Field visit (local) – Subject to grant of funds from the university.

3. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).

Learning Strategies: Class room lectures, practical, collection, field visits, herbaria, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students

Learning Outcome: The course will enable students to the basis of angiosperm classification and features of few basic families of flowering plants, identification and preparation of herbarium.

Assessment: Continuous Assessment: 20 Marks

Practical Exam: 80 Marks

Model Question Paper: Practical Exam component is divided into the following sub components:

- Performance – 24 Marks
- Spotting – 16 Marks
- Viva-voce – 24 Marks
- Record – 8 Marks
- Internal Assessment – 8 marks

Text Books:

1. Singh, G. *Plant Systematics: Theory and Practice*. 3rd ed. New Delhi: Oxford & IBH Pvt. Ltd., 2012. Print.
2. Jeffrey, C. *An Introduction to Plant Taxonomy*. Cambridge: Cambridge University Press, 1982. Print.
3. Judd, W.S., Campbell, C.S., Kellogg, E.A. and Stevens, P.F. *Plant Systematics-A Phylogenetic Approach*. 2nd ed. USA: Sinauer Associates Inc., 2000. Print.

Reference Books:

1. Maheshwari, J.K. *Flora of Delhi*. New Delhi: CSIR, 1963. Print.
2. Radford, A.E. *Fundamentals of Plant Systematics*. New York: Harper and Row, 1986. Print

**Websites and
Audio Video
lectures:**

www.plantsytematics.org

Programme Name: B.Sc. (Hons.) Botany Semester IV

Course Name: Intellectual Property Rights

Course Code: BOT231

Total Credits: 2

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

Learning Objectives: To acquaint the students about the different types of property rights that a person possesses.

Unit I

Introduction to intellectual property right (IPR): Concept and kinds. Economic importance. IPR in India and world: Genesis and scope, some important examples. IPR and WTO (TRIPS, WIPO). Patents: Objectives, Rights, Patent Act 1970 and its amendments. Procedure of obtaining patents, Working of patents. Infringement. Copyrights: Introduction, Works protected under copyright law, Rights, Transfer of Copyright, Infringement. **(8 Lectures)**

Unit II

Trademarks: Objectives, Types, Rights, Protection of goodwill, Infringement, Passing off, Defences, Domain name. Geographical Indications: Objectives, Justification, International Position, Multilateral Treaties, National Level, Indian Position. Protection of Traditional Knowledge: Objective, Concept of Traditional Knowledge, Holders, Issues concerning, Bio-Prosppecting and Bio-Piracy, Alternative ways, Protectability, need for a Sui-Generis regime, Traditional Knowledge on the International Arena, at WTO, at National level, Traditional Knowledge Digital Library. **(11 Lectures)**

Unit III

Industrial Designs: Objectives, Rights, Assignments, Infringements, Defences of Design Infringement Protection of Plant Varieties: Plant Varieties Protection-Objectives, Justification, International Position, Plant varieties protection in India. Rights of farmers, Breeders and Researchers. National gene bank, Benefit sharing. Protection of Plant Varieties and Farmers' Rights Act, 2001. **(9 Lectures)**

Unit IV

Information Technology Related Intellectual Property Rights: Computer Software and Intellectual Property, Database and Data Protection, Protection of Semi-conductor chips, Domain Name Protection Biotechnology and Intellectual Property Rights. Patenting Biotech Inventions: Objective, Applications, Concept of Novelty, Concept of inventive step, Microorganisms, Moral Issues in Patenting Biotechnological inventions. **(10 Lectures)**

Learning Strategies: Class room lectures, practical, collection, field visits, herbaria, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students.

Learning Outcome:

Assessment: Mid Semester Exam (MSE) – 25 Marks
Written Quiz (MCQs) – 10 Marks
Assignment (written) – 10 Marks
End Semester Examination (ESE) – 50 Marks
Attendance – 5 Marks

Model Question Q.1 Will Comprise of 5 parts having 1 mark each

Paper: MSE

Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be attempted.

Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be attempted

Model Question

Paper: ESE

Q.1 Will Comprise of 10 parts having 1 mark each

Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be attempted.

Q.10 to Q.13 will carry 8 marks each out of which 2 question are to be attempted.

Text Books:

1. Gopalakrishnan, N.S. and Agitha, T.G. Principles of Intellectual Property. Lucknow, India: Eastern Book Company, 2009. Print.

2. Kerly, Mackenzie, D. and White, T. A. Kerly's Law of Trade Marks and Trade Names. 12th ed. London: Sweet & Maxwell, 1986. Print.

Reference Books:

3. Parulekar, Ajit. Indian Patents Law: Legal and Business Implications. Delhi: Macmillan India, 2006. Print.

4. Wadehra, B.L. Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications. India: Universal law Publishing Pvt. Ltd., 2000. Print.

5. Narayanan, P. Law of Copyright and Industrial Designs. New Delhi: Eastern law House, 2000. Print



DAV University, Jalandhar.
(Term-18191)

ETE

December, 2018

Name:

Regd. No.:

Course Code: BOT 231

Course Name: Intellectual Property

Rights.....

Time: 3 Hours

Maximum Marks: 50

Section – A

(Maximum Marks: 1 x 10 = 10)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Describe briefly

- i. WIPO
- ii. Bioprospecting and Biopiracy
- iii. Traditional knowledge
- iv. Sui- Generis regime
- v. National gene bank
- vi. Farmers right act 2001
- vii. Domain name
- viii. Infringement
- ix. Passing off
- x. Intellectual property Rights

Section – B

(Maximum Marks: 4 x 6 = 24)

Short Answer Type: Attempt any **6 Questions out of 8 Questions** and each question should be answered in maximum 2 pages.

Q.2 Write a short note on the works protected under copyright.

Q.3 What are the objectives of Geographical Indications.

Q.4 Write a short note on Traditional knowledge.

Q.5 What is copyright? How can we transfer copyright?

Q.6 What are the objectives of Protection of Traditional Knowledge ?

Q.7 Write a short note on National gene bank?

Q.8 Write a short note on Information technology related Intellectual Property Rights ?

Q.9 Write a note on objectives and infringement of Patents?

Section – C

(Maximum Marks: 8 x 2 = 16)

Long Answer Type: Attempt **2 Questions out of 4 Questions** and each question should be answered in maximum 4 pages.

Q.10 Explain role of Intellectual property rights in Biotechnology.

Q.11 How can we protect Database, Semiconductor chips and computer software ?

Q.12 Explain protection of plant varieties in India and its international position.

Q.13 Explain in detail Industrial designs.

Programme Name: B.Sc. (Hons.) Botany Semester IV

Course Name: Mushroom Culture Technology

Course Code: BOT232

Total Credits: 2

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

Learning Objectives: To acquaint the students about the mushrooms and the methodology of their production.

Unit I

Introduction, history. Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms. Types of edible mushrooms available in India - *Volvariella volvacea*, *Pleurotus citrinopileatus*, *Agaricus bisporus*. **(5 Lectures)**

Unit II

Cultivation Technology : Infrastructure: substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation - Low cost technology, Composting technology in mushroom production. **(12 Lectures)**

Unit III

Storage and nutrition : Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickles, papads), drying, storage in salt solutions. Nutrition - Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content - Vitamins. **(8 Lectures)**

Unit IV

Food Preparation: Types of foods prepared from mushroom. Research Centres - National level and Regional level. Cost benefit ratio - Marketing in India and abroad, Export Value. **(5 lectures)**

Learning Strategies: Class room lectures, practical, collection, field visits, herbaria, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students.

Learning Outcome: The course will enable students to understand the art and science underlying the mushroom production mechanisms.

Assessment: Mid Semester Exam (MSE) – 25 Marks
Written Quiz (MCQs) – 10 Marks
Assignment (written) – 10 Marks
End Semester Examination (ESE) – 50 Marks
Attendance – 5 Marks

Model Question Paper: MSE Q.1 Will Comprise of 5 parts having 1 mark each
Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be attempted.
Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be attempted

Model Question Paper: ESE Q.1 Will Comprise of 10 parts having 1 mark each
Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be attempted.

Q.10 to Q.13 will carry 8 marks each out of which 2 question are to be attempted.

Text Books:

1. Marimuthu, T. Krishnamoorthy, A.S. Sivaprakasam, K. and Jayarajan. R. Oyster Mushrooms. India: Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore. 1991. Print.

Reference Books:

2. Swaminathan, M. Food and Nutrition. India: The Bangalore Printing and Publishing Co. Ltd., 1990. Print.

3. Tewari, S.C. and Kapoor, P. Mushroom cultivation. India: Mittal Publications, 1988. Print.

4. Bahl, N. Hand book of Mushrooms. 4th ed. New Delhi: Oxford Publishing Co. Pvt. Ltd, 2000. Print.



DAV University, Jalandhar.
Term-18192/1819T (Backlog)

MSE
March 2019

Name:

Regd. No.:

Course Code: BOT 232

Roll No.:

Course Name: ...Mushroom

Time: 1 Hour 30 Minutes

cultivation.....

Maximum Marks: 25

Section – A

(Maximum Marks: 1 x 5 = 5)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Describe following terms.

- i. Pousnous mushrooms
- ii. Sterlization
- iii. Thatched house
- iv. Composting
- v. Spawn

Section – B

(Maximum Marks: 4 x 3 = 12)

Attempt any 3 Questions out of 5 Questions and each question should be answered in maximum 2 pages.

Q.2 Write a short note on Pleurotus.

Q.3 Write a short note on poisonous mushrooms.

Q.4 What are the factors affecting the mushroom bed preparation?

Q.5 How medium affects the mushroom cultivation?

Q.6 Explain medicinal value of *Volvariella volvaceae*.

Section – C

(Maximum Marks: 8 x 1 = 8)

Attempt 1 Question out of 2 Questions and each question should be answered in maximum 4 pages.

Q.7 Explain infrastructure required for mushroom cultivation.

Q. 6 Explain a) composting technology in mushroom production.

b) *Agaricus bisporus*



DAV University, Jalandhar.
(Term-18191)

ETE
December, 2018

Name:

Regd. No.:

Course Code: BOT 232

Course Name: Mushroom cultivation

Time: 3 Hours

Maximum Marks: 50

Section – A

(Maximum Marks: 1 x 10 = 10)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Describe briefly

- i. Mushroom cultivation
- ii. edible mushrooms
- iii. Poisonous mushrooms
- iv. Inoculation
- v. Culture
- vi. medium for mushroom cultivation
- vii. spawn
- viii. compost
- ix. Agaricus bisporus
- x. inoculation loop

Section – B

(Maximum Marks: 4 x 6 = 24)

Short Answer Type: Attempt any **6 Questions out of 8 Questions** and each question should be answered in maximum 2 pages.

- Q.2 Explain preparation of medium for mushroom cultivation.**
- Q.3 Explain multiplication of mushrooms.**
- Q.4 Write a short note on medicinal value of mushrooms.**
- Q.5 What are the favourable conditions required for mushroom bed preparation?**
- Q.6 How nutrition affects mushroom growth ?**
- Q.7 Write a short note on food items prepared mushroom.**
- Q.8 Describe marketing of mushrooms in India.**
- Q.9 Explain storage of mushrooms.**

Section – C

(Maximum Marks: 8 x 2 = 16)

Long Answer Type: Attempt **2 Questions out of 4 Questions** and each question should be answered in maximum 4 pages.

- Q.10 Explain infrastructure required for mushroom cultivation.**
- Q.11 Explain marketing of mushroom in Abroad.**
- Q.12 Explain long term storage of mushrooms.**
- Q.13 Write types of food items prepared from Mushrooms.**

Programme Name: B.Sc. (Hons) Botany Semester V

Course Name: Reproductive Biology of Angiosperms

Course Code: BOT321

Total Credits: 4

Credit Components: L-4; T-0; P-0

Learning Objectives: To acquaint the students about the mechanism of reproduction in the angiosperms.

Unit I

Introduction: History, Contributions of notable embryologists with focus on Indian embryologists and scope. **Reproductive development:** Induction of flowering; flower as a modified determinate shoot. **Flower development:** genetic and molecular aspects.

(10 lectures)

Unit II

Anther and pollen biology: Anther wall: Structure and functions, microsporogenesis, callose deposition and its significance. Microgametogenesis; Pollen wall structure, MGU (male germ unit) structure, NPC system; Palynology (a brief account); Pollen wall proteins; Pollen viability, storage and germination.

Ovule: Structure; Types; Special structures—endothelium, obturator, aril, caruncle and hypostase; Female gametophyte – megasporogenesis (monosporic, bisporic and tetrasporic) and megagametogenesis (details of Polygonum type); Organization and ultrastructure of mature embryo sac.

(15 lectures)

Unit III

Pollination and fertilization: Pollination types and significance; structure of stigma and style; path of pollen tube in pistil; double fertilization.

Self incompatibility: Basic concepts (interspecific, intraspecific, homomorphic, heteromorphic, GSI and SSI); Pollen morphology; Methods to overcome self- incompatibility: mixed pollination, bud pollination, stub pollination; Intra-ovarian and in vitro pollination; Modification of stigma surface, parasexual hybridization; Cybrids, in vitro fertilization.

(12 lectures)

Unit IV

Embryo, Endosperm and Seed: Structure and types; General pattern of development of dicot and monocot embryo and endosperm; Suspensor: structure and functions; Embryo - endosperm relationship; Nutrition of embryo; Unusual features; Embryo development in Paeonia. Seed structure, importance and dispersal mechanisms

Polyembryony and apomixes: Introduction; Classification; Causes and applications.

(12 lectures)

Learning Strategies: The course will enable students to know the vegetative and reproductive structures of angiosperms and their mechanism of action

Learning Outcome: The course will enable students to know about the various types of ovule and pollen structure which are important for pollinations in plants. Students will also know about the importance of seeds and their different dispersal mechanism.

Assessment: Mid Semester Exam (MSE) – 25 Marks

Written Quiz (MCQs) – 10 Marks

Assignment (written) – 10 Marks
End Semester Examination (ESE) – 50 Marks
Attendance – 5 Marks

Model Question
Paper: MSE

Q.1 Will Comprise of 5 parts having 1 mark each
Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be attempted.
Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be attempted

Model Question
Paper: ESE

Q.1 Will Comprise of 10 parts having 1 mark each
Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be attempted.
Q.10 to Q.13 will carry 8 marks each out of which 2 question are to be attempted



DAV University, Jalandhar.
Term-Sample

MSE
Sample

Name:

Regd. No.:

Course Code: BOT321

Roll No.:

Course Name: Reproductive Biology of Angiosperms
Section – A

Time: 1 Hour30 Minutes
Maximum Marks: 25
(Maximum Marks: 1 x 5 = 5)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Explain following

- i. Microsporogenesis
- ii. Megasporogenesis
- iii. Megagametogenesis
- iv. Pollinia
- v. Caruncle

Section – B

(Maximum Marks: 4 x 3 = 12)

Attempt any **3 Questions out of 5 Questions** and each question should be answered in maximum 2 pages.

- Q.2 Write short note on anther wall composition.
- Q.3 Differentiate between monosporic and bisporic embryo sac.
- Q.4 Give the contribution of various scientist in embryology.
- Q.5 Write down the functions of anther wall.
- Q.6 What are pollen wall protein? Give their functions.

Section – C

(Maximum Marks: 8 x 1 = 8)

Attempt **1 Question out of 2 Questions** and each question should be answered in maximum 4 pages.

- Q.7 Give the various structural components of female gametophyte. Draw the suitable diagram.
- Q.8 Define embryology. What are the various scope of embryology?



DAV University, Jalandhar.
(Term-Sample)

ETE
Sample

Name:

Regd. No.:

Course Code: BOT321

Time: 3 Hours

Course Name: Reproductive Biology of Angiosperms

Maximum Marks:
50

Section – A

(Maximum Marks: 1 x 10 = 10)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Explain following:

- i. Bisporic embryo
- ii. Cybrids
- iii. In vitro fertilization
- iv. Pollen grains
- v. Synergids
- vi. Nutrition of embryo
- vii. Parasexual hybridization
- viii. Tetrasporicembryosac
- ix. Micropyle
- x. Chalaza

Section – B

(Maximum Marks: 4 x 6 = 24)

Short Answer Type: Attempt any **6 Questions out of 8 Questions** and each question should be answered in maximum 2 pages.

- Q.2 Define apomixes. Give the practical importance of apomixes.
- Q.3 Give the biological significance of incompatibility
- Q.4 Briefly describe the different types of endosperm.
- Q.5 Describe the different types of tetrasporic type of embryo sac.
- Q.6 Write an essay on pollen wall development.
- Q.7 What is tapetum? Write down the various functions of tapetum.
- Q.8 Write a short note on pollen tube growth.
- Q.9 Write down various functions of endosperms.

Section – C

(Maximum Marks: 8 x 2 = 16)

Long Answer Type: Attempt **2 Questions out of 4 Questions** and each question should be answered in maximum 4 pages.

- Q.10 Define pollination. What are various types of pollination? Give its importance
- Q.11 Write an essay on various mechanism to overcome self-incompatibility.
- Q.12 Briefly describe the development of monocot and dicot embryo.
- Q.13 Describe the process of sporogenesis. Draw the suitable diagrams.

Programme Name: B.Sc. (Hons) Botany Semester V
Course Name: Reproductive Biology of Angiosperms Laboratory
Course Code: BOT322
Total Credits: 2
Credit Components: L-0; T-0; P-3
Learning Objectives: The course will enable students about the mechanism of reproduction in the angiosperms.

List of Experiments

1. **Anther:** Wall and its ontogeny; Tapetum (amoeboid and glandular); MMC, spore tetrads, uninucleate, bicelled and dehiscent anther stages through slides/micrographs, male germ unit(MGU) through photographs and schematic representation.
2. **Pollen grains:** Fresh and acetolyzed showing ornamentation and aperture, pseudomonads, polyads, pollinia (slides/photographs, fresh material), ultrastructure of pollen wall(micrograph);
3. **Pollen viability:** Tetrazolium test, germination: Calculation of percentage germination in different media using hanging drop method.
4. **Ovule:** Types-anatropous, orthotropous, amphitropous/campylotropous, circinotropous, unitegmic, bitegmic; Tenuinucellate and crassinucellate; Special structures: Endothelium, obturator, hypostase, caruncle and aril (permanent slides/specimens/photographs).
5. **Female gametophyte through permanent slides/ photographs:** Types, ultrastructure of mature egg apparatus.
6. **Intra-ovarian pollination;** Test tube pollination through photographs.
7. **Endosperm:** Dissections of developing seeds for endosperm with free -nuclear haustoria.
8. **Embryogenesis:** Study of development of dicot embryo through permanent slides; dissection of developing seeds for embryos at various developmental stages; Study of suspensor through electron micrographs

Learning Strategies: Practicals, models, charts, online demonstrations, group discussions and assignments

Learning Outcome: The students will come to know about various types of pollen grains and ovules in angiosperms, viable pollen for pollination and endosperm function.

Assessment: Continuous Assessment: 20 Marks
Practical Exam: 80 Marks

Model Question Paper: Practical Exam component is divided into the following sub components:

- Performance – 24 Marks
- Spotting – 16 Marks
- Viva-voce – 24 Marks
- Record – 8 Marks
- Internal Assessment – 8 marks

Text Books: 1. Bhojwani, S.S. and Bhatnagar, S.P. The Embryology of Angiosperms. 5thed. New Delhi: Vikas Publishing House, 2011. Print.

Reference Books:

1. Shivanna, K.R. Pollen Biology and Biotechnology. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd., 2003. Print.
2. Raghavan, V. Developmental Biology of Flowering plants, Netherlands: Springer, 2000. Print.
3. Johri, B.M. Embryology of Angiosperms. Netherlands: Springer-Verlag, 1984. Print.
4. Maheshwari, P. Recent advances in embryology. International Soc. Plant Morphol, New York. 1963. Print.
5. Maheshwari, P. An introduction to the embryology of Angiosperms. McGraw Hill, New York. 1950. Print.

Other Supportive Material:

<http://krishikosh.egranth.ac.in/bitstream/1/2034347/1/353.pdf>

Programme Name: B.Sc. (Hons) Botany Semester V
Course Name: Plant Physiology
Course Code: BOT323
Total Credits: 4
Credit Components: L-4; T-0; P-0
Learning Objectives: To acquaint the students about the various life supporting life processes in plants.

Unit I

Plant-water relations: Water Potential and its components, water absorption by roots, aquaporins, pathway of water movement, symplast, apoplast, transmembrane pathways, root pressure, guttation. Ascent of sap– cohesion-tension theory. Transpiration and factors affecting transpiration, antitranspirants, mechanism of stomatal movement. **(10 Lectures)**

Unit II

Mineral nutrition: Essential and beneficial elements, macro and micronutrients, methods of study and use of nutrient solutions, criteria for essentiality, mineral deficiency symptoms, roles of essential elements, chelating agents.

Nutrient Uptake: Soil as a nutrient reservoir, transport of ions across cell membrane, passive absorption, electrochemical gradient, facilitated diffusion, active absorption, role of ATP, carrier systems, proton ATPase pump and ion flux, uniport, co -transport, symport, antiport. **(12 Lectures)**

Unit III

Translocation in the phloem: Experimental evidence in support of phloem as the site of sugar translocation. Pressure–Flow Model; Phloem loading and unloading; Source–sink relationship.

Plant growth regulators: Discovery, chemical nature (basic structure), bioassay and physiological roles of Auxin, Gibberellins, Cytokinin, Abscisic acid, Ethylene, Brassinosteroids and Jasmonic acid. **(14 Lectures)**

Unit IV

Physiology of flowering: Photoperiodism, flowering stimulus, florigen concept, vernalization, seed dormancy.

Phytochrome, cryptochromes and phototropins: Discovery, chemical nature, role in photomorphogenesis, low energy responses (LER) and high irradiance responses (HIR), mode of action. **(11 Lectures)**

Learning Strategies: Class room lectures, practicals, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students.

Learning Outcome: The course will enable students to know the importance of nutrients, photosynthesis and other life supportive processes in plants.

Assessment: Mid Semester Exam (MSE) – 25 Marks
Written Quiz (MCQs) – 10 Marks
Assignment (written) – 10 Marks
End Semester Examination (ESE) – 50 Marks
Attendance – 5 Marks

**Model Question Paper:
MSE**

Q.1 Will Comprise of 5 parts having 1 mark each
Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be attempted.
Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be attempted

**Model Question Paper:
ESE**

Q.1 Will Comprise of 10 parts having 1 mark each
Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be attempted.
Q.10 to Q.13 will carry 8 marks each out of which 2 question are to be attempted



DAV University, Jalandhar.
Term-Sample

**MSE
Sample**

Name:

Regd. No.:

Course Code: BOT323

Roll No.:

Course Name: PLANT PHYSIOLOGY

Time: 1 Hour30 Minutes

Maximum Marks: 25

Section – A

(Maximum Marks: 1 x 5 = 5)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Explain following

- i. Osmosis
- ii. Chelating agent
- iii. Guttation
- iv. Active transport
- v. Role of stomata

Section – B

(Maximum Marks: 4 x 3 = 12)

Attempt any **3 Questions out of 5 Questions** and each question should be answered in maximum 2 pages.

Q.2 What is trans membrane transporter proteins and how many types are there? Briefly describe any one type of them.

Q.3 Define ascent of sap. Describe mechanism of ascent of sap by cohesion -tension theory.

Q.4 Define water potential. Describe its various components.

Q.5 Give an account of various factors which affect rate of transpiration.

Q.6 What is Arnon's criteria of essentiality of mineral? Explain physiological role and deficiency symptoms of boron.

Section – C

(Maximum Marks: 8 x 1 = 8)

Attempt **1 Question out of 2 Questions** and each question should be answered in maximum 4 pages.

Q.7 What is transpiration? What are its various types? Explain mechanism of stomatal movement.

Q.8 What is mineral nutrition? Explain the mechanism of absorption of mineral salts from the soil by plants.



DAV University, Jalandhar.
Term-Sample

ESE
Sample

Name:

Regd. No.:

Course Code: BOT323

Roll No.:

Course Name: PLANT PHYSIOLOGY

Time: 3 Hours
Maximum Marks: 25

Section – A

(Maximum Marks: 1 x 10 = 10)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1

- i. Define standard solution.
- ii. How anisocytic type differs from paracytic type of stomata?
- iii. What is photoperiodic induction?
- iv. Name the disease caused by Sulphur and Molybdenum.
- v. Define growth hormone.
- vi. What are quiescent seeds?
- vii. Which growth hormone acts antagonistic to Auxin in apical dominance?
- viii. What is vernalization?
- ix. Give the occurrence and distribution of ABA in plants.
- x. What is skotomorphogenesis?

Section – B

(Maximum Marks: 4 x 6 = 24)

Short Answer Type: Attempt any **6 Questions out of 8 Questions** and each question should be answered in maximum 2 pages.

- Q.2 Discuss the effect of deficiency of boron and manganese.
- Q.3 Explain, how organic solutes are translocated in plants?
- Q.4 How Auxins are transported in plants? Give the mechanism for auxin transport.
- Q.5 Define photomorphogenesis. Describe an account of photoresponses due to phytochrome pigment.
- Q.6 Write a short note on photoperiodism.
- Q.7 What are brassinosteroids? Give their physiological role.
- Q.8 Discuss in brief, the process of vernalization.
- Q.9 How secondary transport of ions occurs across the cell membrane?

Section – C

(Maximum Marks: 8 x 2 = 16)

Long Answer Type: Attempt **2 Questions out of 4 Questions** and each question should be answered in maximum 4 pages.

- Q.10 What is dormancy of seeds? Give the various factors due to which seed dormancy occurs. Describe some methods of breaking seed dormancy.
- Q.11 Explain the mechanism of absorption of mineral salt by plants.
- Q.12 What are phytohormone? Describe the physiological role of gibberellins and cytokinins.
- Q.13 What is transpiration? Describe the mechanism of stomatal transpiration

Programme Name: B.Sc. (Hons) Botany Semester V
Course Name: Plant Physiology Laboratory
Course Code: BOT324
Total Credits: 2
Credit Components: L-0; T-0; P-3
Learning Objectives: The course will enable students to know the importance of nutrients, photosynthesis and other life supportive processes in plants.

List of Experiments

1. Determination of osmotic potential of plant cell sap by plasmolytic method.
2. Determination of water potential of given tissue (potato tuber) by weight method.
3. Study of the effect of wind velocity and light on the rate of transpiration in excised twig/leaf.
4. Calculation of stomatal index and stomatal frequency from the two surfaces of leaves of a mesophyte and xerophyte.
5. To calculate the area of an open stoma and percentage of leaf area open through stomata in a mesophyte and xerophyte (both surfaces).
6. To study the phenomenon of seed germination (effect of light).
7. To study the effect of different concentrations of IAA on Avena coleoptile elongation (IAA Bioassay).
8. To study the induction of amylase activity in germinating barley grains.

Demonstration experiments

1. To demonstrate suction due to transpiration.
2. Fruit ripening/Rooting from cuttings (Demonstration).
3. Bolting experiment/Avenacoleptile bioassay (demonstration)

Learning Strategies: Practicals, models, charts, online demonstrations, group discussions and assignments

Learning Outcome: The students will come to know about the self and cross pollination system in various plants, hybridization techniques and selection of superior variety crop.

Assessment: Continuous Assessment: 20 Marks
Practical Exam: 80 Marks

Model Question Paper: Practical Exam component is divided into the following sub components:

- Performance – 24 Marks
- Spotting – 16 Marks
- Viva-voce – 24 Marks
- Record – 8 Marks
- Internal Assessment – 8 marks

Text Books: 1. Taiz, L., Zeiger, E., Moller, I.M. and Murphy, A. Plant Physiology and Development. 6th ed. USA: Sinauer Associates Inc., 2014. Print.

Reference Books: 1. Hopkins, W.G. and Huner, A. Introduction to Plant Physiology. 4th ed. USA: John Wiley and Sons, 2008. Print.

2. Bajracharya D. Experiments in Plant Physiology-A Laboratory Manual. New Delhi: Narosa Publishing House, 1999. Print.
3. Buchanan, B.B., Gruissem, W. and Jones, R.L. Biochemistry and Molecular Biology of Plants. India: I K Internationals, 2005. Print.
4. Voet, D., and Voet, J.G. Biochemistry. New York: John Wiley and Sons Inc., 1995. Print.

**Websites and
Audio Video**

lectures:

**Other Supportive
Material:**

www.plantphys.org

<https://www.nature.com/subjects/plant-physiology>

Programme Name: B.Sc. (Hons) Botany Semester V
Course Name: Analytical Techniques in Plant Science
Course Code: BOT325
Total Credits: 4
Credit Components: L-4; T-0; P-0
Learning Objectives: To acquaint the students about the different techniques that are used in the study of plants.

Unit I

Imaging and related techniques: Principles of microscopy; Light microscopy; Fluorescence microscopy; Confocal microscopy; Use of fluorochromes: (a) Flow cytometry (FACS); (b) Applications of fluorescence microscopy: Chromosome banding, FISH; Transmission and Scanning electron microscopy – sample preparation for electron microscopy. **(12 lectures)**

Unit II

Cell fractionation: Centrifugation: Differential and density gradient centrifugation, sucrose density gradient, CsCl₂ gradient, analytical centrifugation, ultracentrifugation, marker enzymes. Radioisotopes: Use in biological research, auto-radiography, pulse chase experiment. Spectrophotometry: Principle and its application in biological research. **(14 lectures)**

Unit III

Chromatography: Principle; Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ion-exchange chromatography; Molecular sieve chromatography; Affinity chromatography. Characterization of proteins and nucleic acids: Mass spectrometry; X-ray diffraction; X-ray crystallography; Characterization of proteins and nucleic acids; Electrophoresis: AGE, PAGE, SDS-PAGE **(14 lectures)**

Unit IV

Biostatistics: Statistics, data, population, samples, parameters; Representation of Data: Tabular, Graphical; Measures of central tendency: Arithmetic mean, mode, median; Measures of dispersion: Range, mean deviation, variation, standard deviation; Chi-square test for goodness of fit. **(13 lectures)**

Learning Strategies: Class room lectures, practicals, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students.

Learning Outcome:

Assessment: Mid Semester Exam (MSE) – 25 Marks
Written Quiz (MCQs) – 10 Marks
Assignment (written) – 10 Marks
End Semester Examination (ESE) – 50 Marks
Attendance – 5 Marks

Model Question Paper: MSE Q.1 Will Comprise of 5 parts having 1 mark each
Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be attempted.
Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be attempted

Model Question Paper: Q.1 Will Comprise of 10 parts having 1 mark each

ESE

Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be attempted.
Q.10 to Q.13 will carry 8 marks each out of which 2 questions are to be attempted



DAV University, Jalandhar.
Term-18192/1819T (Backlog)

MSE
March 2019

Name:

Regd. No.:

Course Code: BOT 325

Roll No.:

Course Name: ...Analytical Techniques in plant science.....

Time: 1 Hour 30 Minutes
Maximum Marks: 25

Section – A

(Maximum Marks: 1 x 5 = 5)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Describe following terms.

- i. Fluorochromes
- ii. FISH
- iii. SEM
- iv. Shadow casting
- v Cryofixation

Section – B

(Maximum Marks: 4 x 3 = 12)

Attempt any 3 Questions out of 5 Questions and each question should be answered in maximum 2 pages.

- Q.2 Write principles of Light Microscopy.
- Q.3 Write application of Fluorescence microscope.
- Q.4 How can we prepare a sample for Electron Microscopy?
- Q.5 Explain sucrose density gradient.
- Q.6 Write a short note on SEM.

Section – C

(Maximum Marks: 8 x 1 = 8)

Attempt 1 Question out of 2 Questions and each question should be answered in maximum 4 pages.

- Q.7 Explain principle and application of Spectrophotometer.
- Q.8 Differentiate differential and gradient centrifugation.



DAV University, Jalandhar.
(Term-18191)

ETE
December, 2018

Name:

Regd. No.:

Course Code: BOT 325

Course Name: Analytical Techniques in Plant

Science.....

Time: 3 Hours

Maximum Marks: 50

Section – A

(Maximum Marks: 1 x 10 = 10)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Explain briefly following terms:-

- i. Fluorochromes
- ii. Cryofixation
- iii. Biostatistics
- iv. Shadow Casting
- v. FISH
- vi. Arithmetic mean
- vii. Mode
- viii. Electrophoresis
- ix Standard deviation
- x Harmonic Mean

Section – B

(Maximum Marks: 4 x 6 = 24)

Short Answer Type: Attempt any **6 Questions out of 8 Questions** and each question should be answered in maximum 2 pages.

Q.2 What is the principle of Chromatography? How Column chromatography is better than Thin layer chromatography?

Q.3 Explain Mass Spectrometry along with its principle and applications.

Q.4 Write the application of Radioisotope and X-ray diffraction in biological research.

Q.5 Give an account on methods of Collection of Data.

Q.6 Explain Ion exchange chromatography.

Q.7 If the arithmetic mean of the following series is 115.86; find the missing value.

Wages (Rs)	110	112	113	117	?	125	128	130
Number of Workers	25	17	13	15	14	8	6	2

Q.8 The data below gives wages of workers in a factory. Find out mean deviation and its coefficient.

S.No	1	2	3	4	5	6	7	8	9
Rs	40	42	45	47	50	51	54	55	57

Q.9 Calculate mean, median and mode from the following data:

Class interval	30-40	40-50	50-60	60-70	70-80	80-90
Frequency	18	37	45	27	5	8

Section – C

(Maximum Marks: 8 x 2 = 16)

Long Answer Type: Attempt **2 Questions out of 4 Questions** and each question should be answered in maximum 4 pages.

Q.10 Give an account on Measures of central tendency and Measures of dispersion (definition, their formulae,application and relation if any).

Q.11 Describe in detail Gas liquid Chromatography and HPLC.

Q.12 What is the principle of Electrophoresis? Explain SDS-PAGE technique.

Q.13 Give application of

- a) Statistics.
- b) PAGE.
- c) Molecular Sieve Chromatography.
- d) Affinity Chromatography.

Programme Name: B.Sc. (Hons) Botany Semester V
Course Name: Analytical Techniques in Plant Science Laboratory
Course Code: BOT326
Total Credits: 2
Credit Components: L-0; T-0; P-3
Learning Objectives:

List of Experiments

1. Study of Blotting techniques: Southern, Northern and Western, DNA fingerprinting, DNA sequencing, PCR through photographs.
2. Demonstration of ELISA.
3. To separate nitrogenous bases by paper chromatography.
4. To separate sugars by thin layer chromatography.
5. Isolation of chloroplasts by differential centrifugation.
6. To separate chloroplast pigments by column chromatography.
7. To estimate protein concentration through Lowry's methods.
8. To separate proteins using PAGE.
9. To separation DNA (marker) using AGE.
10. Study of different microscopic techniques using photographs/micrographs (freeze fracture, freeze etching, negative staining, positive staining, fluorescence and FISH).
11. Preparation of permanent slides (double staining).

Learning Strategies: Practicals, models, charts, online demonstrations, group discussions and assignments

Assessment: Continuous Assessment: 20 Marks
Practical Exam: 80 Marks

Model Question Paper: Practical Exam component is divided into the following sub components:

- Performance – 24 Marks
- Spotting – 16 Marks
- Viva-voce – 24 Marks
- Record – 8 Marks
- Internal Assessment – 8 marks

Text Books:

1. Plummer, D.T. An Introduction to Practical Biochemistry. 3rd ed. New Delhi: Tata McGrawHill Publishing Co. Ltd., 1996. Print.
2. Ruzin, S.E. Microtechnique and Microscopy. New York: Oxford University Press, 1999. Print.

Reference Books:

3. Ausubel, F., Brent, R., Kingston, R. E., Moore, D.D., Seidman, J.G., Smith, J.A. and Struhl, K. Short Protocols in Molecular Biology. 3rd ed. USA: John Wiley & Sons, 1995. Print.
4. Zar, J.H. Biostatistical Analysis. 4th ed. USA: Pearson Publication. 2012. Print.
5. Wilson, K., and Walker, J. Principles and Techniques of Practical Biochemistry. Cambridge: Cambridge University Press. 2000. Print.

Programme Name: B.Sc. (Hons) Botany Semester V

Course Name: Plant Breeding

Course Code: BOT327

Total Credits: 4

Credit Components: L-4; T-0; P-0

Learning Objectives: To acquaint the students about the methods and techniques of hybrid generation.

Unit I

Plant Breeding: Introduction and objectives. Breeding systems: modes of reproduction in crop plants. Important achievements and undesirable consequences of plant breeding. **(10 lectures)**

Unit II

Methods of crop improvement: Introduction: Centres of origin and domestication of crop plants, plant genetic resources; Acclimatization; Selection methods: For self-pollinated, cross pollinated and vegetatively propagated plants

Hybridization: For self, cross and vegetatively propagated plants – Procedure, advantages and limitations. **(15 lectures)**

Unit III

Quantitative inheritance: Concept, mechanism, examples of inheritance of Kernel colour in wheat, Skin colour in human beings. Monogenic vs polygenic Inheritance.

Inbreeding depression and heterosis: History, genetic basis of inbreeding depression and heterosis; Applications. **(14 lectures)**

Unit IV

Sexual Incompatibility and Male sterility

Crop improvement and breeding: Breeding for biotic and abiotic stress resistance, Role of mutations; physical and chemical mutagens; Gamma gardens; Polyploidy; Distant hybridization and role of biotechnology in crop improvement. **(12 lectures)**

Learning Strategies: Class room lectures, practicals, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students.

Learning Outcome: The course will enable students to know about the various techniques involved in plant breeding.

Assessment: Mid Semester Exam (MSE) – 25 Marks
Written Quiz (MCQs) – 10 Marks
Assignment (written) – 10 Marks
End Semester Examination (ESE) – 50 Marks
Attendance – 5 Marks

Model Question Paper: Q.1 Will Comprise of 5 parts having 1 mark each
MSE Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be attempted.
Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be attempted

Model Question Paper: Q.1 Will Comprise of 10 parts having 1 mark each

ESE

Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be attempted.
Q.10 to Q.13 will carry 8 marks each out of which 2 questions are to be attempted



DAV University, Jalandhar.
(Term-Model)

MSE
Model

Name:

Regd. No.:

Course Code: BOT327

Time: 1 Hour 30 Min

Course Name: PLANT BREEDING

Maximum Marks: 25

Section – A (Maximum Marks: 1 x 5 = 5)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1

- i. Q.1 Explain following
- i. Anthesis
- ii. Male sterility
- iii. Apomixis
- iv. Mutation breeding
- v. Emasculation

Section – B (Maximum Marks: 4 x 3 = 12)

Attempt any **3 Questions** out of **5 Questions** and each question should be answered in maximum 2 pages.

- Q.2 Define plant breeding. What are the main objectives of plant breeding?
- Q.3 Briefly discuss the procedure for hybridization.
- Q.4 Write a short note on the mechanism of self-incompatibility.
- Q.5 Define pollination. Give a brief account of types of pollination.
- Q.6 Write a short note on distant hybridization.

Section – C (Maximum Marks: 8 x 1 = 8)

Attempt **1 Question** out of **2 Questions** and each question should be answered in maximum 4 pages.

- Q.7 Give an account of sexual reproduction in plants with suitable sketches.
- Q.8 What is self-incompatibility in plants? Discuss heteromorphic system of self-incompatibility.



DAV University, Jalandhar.
(Term-18191)

ETE
December, 2018

Name:

Regd. No.:

Course Code: BOT327

Time: 3 Hours

Course Name: PLANT BREEDING

Maximum Marks: 50

Section – A

(Maximum Marks: 1 x 10 = 10)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1

- i. Mutation breeding
- ii. Parthenogenesis
- iii. Heteromorphic system of self-incompatibility
- iv. Bagging
- v. Allopolyploidy
- vi. Inbreeding depression
- vii. Recalcitrant seeds
- viii. Artificial selection
- ix. Plant breeding
- x. Mass selection

Section – B

(Maximum Marks: 4 x 6 = 24)

Short Answer Type: Attempt any **6 Questions out of 8 Questions** and each question should be answered in maximum 2 pages.

Q.2 What is plant introduction? Briefly describe the procedure of plant introduction under the heading

- i) procurement of germplasm and
- ii) quarantine

Q.3 What is mutation? Describe the types of mutation and its effects on the survival.

Q.4 Briefly describe about gamma gardens.

Q.5 Define distant hybridization? What are barriers for the production of distant hybrids? Also, give applications of distant hybridization.

Q.6 Write a short note on role of polyploidy in evolution.

Q.7 What is quantitative inheritance? How monogenic and polygenic inheritance differs from each other?

Q.8 What is abiotic stress? Briefly describe breeding for drought resistance.

Q.9 Briefly describe role of biotechnology in crop improvement.

Section – C

(Maximum Marks: 8 x 2 = 16)

Long Answer Type: Attempt **2 Questions out of 4 Questions** and each question should be answered in maximum 4 pages.

Q.10 What are selection techniques? Discuss the selection technique for homozygous crops.

Q.11 What are plant genetic resources (PGRs)? What are conservation strategies for PGRs? Explain in brief.

Q.12 Define male sterility. Briefly describe the various types of male sterility in plants.

Q.13 Define heterosis. Explain briefly the different hypotheses for genetic basis of heterosis

Programme Name: B.Sc. (Hons) Botany Semester V
Course Name: Plant Breeding Laboratory
Course Code: BOT328
Total Credits: 2
Credit Components: L-0; T-0; P-3
Learning Objectives: To acquaint the students about various physiological processes at cellular and organ level in plants.

List of Experiments

1. Correlation of floral structure with pollination system in *Salvia*, *Pisumsativum*, *Lathyrus*, *Triticum*, *Oryzasativa*, *Zea maize*.
2. Emasculation and bagging of flowers (according to their availability).
3. Based on theory contents of each section.

Learning Strategies: Practicals, models, charts, online demonstrations, group discussions and assignments

Learning Outcome: The students will come to know about the self and cross pollination system in various plants, hybridization techniques and selection of superior variety crop.

Assessment: Continuous Assessment: 20 Marks
Practical Exam: 80 Marks

Model Question Paper: Practical Exam component is divided into the following sub components:

- Performance – 24 Marks
- Spotting – 16 Marks
- Viva-voce – 24 Marks
- Record – 8 Marks
- Internal Assessment – 8 marks

Text Books: 1. Singh, B.D. Plant Breeding: Principles and Methods. 7thed. India: Kalyani Publishers, 2005. Print.

Reference Books: 1. Chaudhari, H.K. Elementary Principles of Plant Breeding. 2nded. New Delhi: Oxford and IBH Pub., 1984. Print.
2. Acquaah, G. Principles of Plant Genetics and Breeding. Malden, MA: Blackwell Pub., 2007. Print.

Websites and Audio

Video lectures:

Other Supportive Material:

https://www.researchgate.net/publication/328732030_Fundamentals_of_Plant_Breeding

https://www.academia.edu/19550092/Fundamentals_of_Genetics_and_Plant_Breeding

Programme Name: B.Sc. (Hons) Botany
Course Name: Stress Biology
Course Code: BOT329
Total Credits: 4
Credit Components: L-4; T-0; P-0
Learning Objectives: To acquaint the students about various physiological processes at cellular and organ level in plants.

UNIT I

Defining plant stress: Acclimation and adaptation.

Environmental factors: Water stress; Salinity stress, High light stress; Temperature stress
(12 lectures)

UNIT II

Hypersensitive reaction; Pathogenesis– related (PR) proteins; Systemic acquired resistance; Mediation of insect and disease resistance by jasmonates.

Stress sensing mechanisms in plants: Calcium modulation, Phospholipid signaling (15 lectures)

UNIT III

Developmental and physiological mechanisms that protect plants against biotic stress

Developmental and physiological mechanisms that protect plants against abiotic stress
(14 lectures)

UNIT IV

Adaptation in plants; Changes in root: shoot ratio; Aerenchyna development; Osmotic adjustment; Compatible solute production.

Reactive oxygen species–Production and scavenging mechanisms. (15 lectures)

Learning Strategies: Class room lectures, practicals, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students

Learning Outcome: The students will come to know that how a plant cell responds to various biotic and abiotic stresses. This will acquaint the students about the effect of various disadvantageous environmental conditions on metabolism and growth of plants.

Assessment: Mid Semester Exam (MSE) – 25 Marks
Written Quiz (MCQs) – 10 Marks
Assignment (written) – 10 Marks
End Semester Examination (ESE) – 50 Marks
Attendance – 5 Marks

Model Question Paper: MSE Q.1 Will Comprise of 5 parts having 1 mark each
Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be attempted.
Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be attempted

Model Question Paper: ESE Q.1 Will Comprise of 10 parts having 1 mark each
Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be attempted.
Q.10 to Q.13 will carry 8 marks each out of which 2 question are to be attempted



DAV University, Jalandhar.
Term-Sample

MSE

Name:

Regd. No.:

Course Code: BOT329

Roll No.:

Course Name: Stress Biology

Time: 1 Hour 30 Minutes

Maximum Marks: 25

Section – A

(Maximum Marks: 1 x 5 = 5)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Explain the following terms:

- i. ROS
- ii. Antioxidants
- iii. Phytoalexins
- iv. Chalk glands
- v. Motor cells

Section – B

(Maximum Marks: 4 x 3 = 12)

Attempt any **3 Questions out of 5 Questions** and each question should be answered in maximum 2 pages.

Q.2 Discuss phospholipid signaling.

Q.3 Mention various radical scavenging enzymes present in cell. Explain working of any one of these enzymes.

Q.4 What do you understand by osmotic adjustment?

Q.5 Explain systemic acquired resistance.

Q.6 How hypersensitive response of plant helps to overcome spread of disease. Explain.

Section – C

(Maximum Marks: 8 x 1 = 8)

Attempt **1 Question out of 2 Questions** and each question should be answered in maximum 4 pages.

Q.7 Discuss various adaptations of plants under drought stress.

Q.8 Explain various developmental and physiological mechanisms that protect plants against biotic stress.



DAV University, Jalandhar.
Term-Sample

ESE

Name:

Regd. No.:

Course Code: BOT329

Roll No.:

Course Name: Stress Biology

Time: 3 Hours

Maximum Marks: 50

Section – A

(Maximum Marks: 1 x 10 = 10)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Explain the following:

- i. Chalk glands
- ii. Endosmosis
- iii. Lipid peroxidation
- iv. Water potential
- v. Calmodulins
- vi. Aquaporins
- vii. DPD
- viii. Velamen
- ix. Hemiparasite
- x. Pneumatophores

Section – B

(Maximum Marks: 4 x 6 = 24)

Short Answer Type: Attempt any **6 Questions out of 8 Questions** and each question should be answered in maximum 2 pages.

Q.2 Discuss “Compatible solute production”.

Q.3 Enlist various physiological processes which lead to production of reactive oxygen species in plants.

Q.4 What do you understand by osmotic adjustment in plants? Under what conditions these are effected?

Q.5 What are PR proteins? What is their contribution in plant defense?

Q.6 What do you understand by Systemic acquired resistance.

Q.7 How changes in temperature affects plants. Discuss.

Q.8 Explain aerenchyma development in plants. Make suitable diagrams.

Q.9 Give an account of role of jasmonic acid in plant defense.

Section – C

(Maximum Marks: 8 x 2 = 16)

Long Answer Type: Attempt **2 Questions out of 4 Questions** and each question should be answered in maximum 4 pages.

Q.10 Discuss various stress signaling mechanisms operating in plants.

Q.11 Enlist major ROS and RNS produced in plants under stress conditions and explain their mode of action in disrupting structural and genetic component of a plant cell.

Q.12 Explain various developmental and physiological mechanisms that protect plants against abiotic stress.

Q.13 How salinity stress affects anatomical and morphological adaptations in plants.

Programme Name: B.Sc. (Hons.) Botany
Course Name: Stress Biology Laboratory
Course Code: BOT330
Total Credits: 2
Credit Components: L-0; T-0; P-3
Learning Objectives: To acquaint the students about various physiological processes at cellular and organ level in plants.

List of Experiments

1. Quantitative estimation of peroxidase activity in the seedlings in the absence and presence of salt stress.
2. Superoxide activity in seedlings in the absence and presence of salt stress.
3. Zymographic analysis of peroxidase.
4. Zymographic analysis of superoxide dismutase activity.
5. Quantitative estimation and zymographic analysis of catalase
6. Quantitative estimation and zymographic analysis of glutathione reductase.
7. Estimation of superoxide anions.

Learning Strategies: Practicals, models, charts, online demonstrations, group discussions and assignments

Learning Outcome: The students will come to know that how a plant cell responds to various biotic and abiotic stresses.

Assessment: Continuous Assessment: 20 Marks
Practical Exam: 80 Marks

Model Question Paper: Practical Exam component is divided into the following sub components:

- Performance – 24 Marks
- Spotting – 16 Marks
- Viva-voce – 24 Marks
- Record – 8 Marks
- Internal Assessment – 8 marks

Text Books: 1. Hopkins, W.G. and Huner, A. *Introduction to Plant Physiology*. 4th ed. USA: John Wiley and Sons, 2008. Print.

2. Taiz, L., and Zeiger, E. *Plant Physiology*. California: The Benjamin/Cumming Publishing Company, 1998. Print.

Reference Books: 3. Pareek A., Sopory S. K., Bohnert, H.J. and Govindjee. *Abiotic Stress Adaptation in Plants*. Springer, 2009. Print. Stryer, L. *Biochemistry*. 5th ed. New York: W.H. Freeman and Co., 1995. Print.

4. Ahmad P. *Oxidative Damage to Plants - Antioxidant Networks and Signaling*. Elsevier. 2015. Print. Wilkins, M.B. *Advanced Plant Physiology*. New York: Pitman, 1984. Print.

5. Tuteja N. and Gill S.S. *Plant Acclimation to Environmental Stress*. Springer. 2015. Print.

Websites and Audio Video lectures: www.plantphys.org

Programme Name:	B.Sc. (Hons) Botany Semester VI
Course Name:	Plant Metabolism
Course Code:	BOT331
Total Credits:	4
Credit Components:	L-4; T-0; P-0
Learning Objectives:	To acquaint the students about the different metabolic events occurring in the plants.

Unit I

Concept of metabolism: Introduction, anabolic and catabolic pathways, regulation of metabolism, role of regulatory enzymes.

Carbon assimilation: Historical background, photosynthetic pigments, role of photosynthetic pigments (chlorophylls and accessory pigments), antenna molecules and reaction centres, photochemical reactions, photosynthetic electron transport, PSI, PSII, CO₂ reduction, photorespiration, C₄ pathways; Crassulacean acid metabolism; Factors affecting CO₂ reduction. **(13 lectures)**

Unit II

Carbohydrate metabolism: Synthesis and catabolism of sucrose and starch.

Carbon Oxidation: Glycolysis, fate of pyruvate, oxidative pentose phosphate pathway, oxidative decarboxylation of pyruvate, NADH shuttle; TCA cycle, amphibolic role, anaplerotic reactions, regulation of the cycle, mitochondrial electron transport, oxidative phosphorylation, factors affecting respiration. **(12 lectures)**

Unit III

ATP-Synthesis: Mechanism of ATP synthesis, substrate level phosphorylation, chemiosmotic mechanism (oxidative and photophosphorylation), ATP synthase, Boyers conformational model; role of uncouplers.

Lipid metabolism: Synthesis and breakdown of triglycerides, β -oxidation, glyoxylate cycle, gluconeogenesis and its role in mobilisation of lipids during seed germination, α oxidation. **(15 lectures)**

Unit IV

Nitrogen metabolism: Nitrate assimilation, biological nitrogen fixation (examples of legumes and non-legumes); Physiology and biochemistry of nitrogen fixation; Ammonia assimilation and transamination.

Mechanisms of signal transduction: Receptor-ligand interactions; Second messenger concept, Calcium calmodulin, MAP kinase cascade. **(13 lectures)**

Learning Strategies: Class room lectures, practicals, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students.

Learning Outcome: The course will enable students to know about the events that help in maintenance of metabolism in plants

Assessment:
 Mid Semester Exam (MSE) – 25 Marks
 Written Quiz (MCQs) – 10 Marks
 Assignment (written) – 10 Marks

End Semester Examination (ESE) – 50 Marks

Attendance – 5 Marks

**Model Question Paper:
MSE**

Q.1 Will Comprise of 5 parts having 1 mark each

Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be attempted.

Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be attempted

**Model Question Paper:
ESE**

Q.1 Will Comprise of 10 parts having 1 mark each

Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be attempted.

Q.10 to Q.13 will carry 8 marks each out of which 2 question are to be attempted



DAV University, Jalandhar.

Term-Sample

MSE

Sample

Name:

Regd. No.:

Course Code: BOT331

Roll No.:

Course Name: PLANT METABOLISM

Time: 1 Hour 30 Minutes

Maximum Marks: 25

Section – A

(Maximum Marks: 1 x 5 = 5)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1

- i. Explain Emerson's first experiment.
- ii. Give the role of dehydrogenases, reductases and oxygenases.
- iii. What is the difference between chlorophyll a and chlorophyll b? Give their empirical formula also.
- iv. Explain competitive inhibition with suitable examples.
- v. How photophosphorylation differs from oxidative phosphorylation?

Section – B

(Maximum Marks: 4 x 3 = 12)

Attempt any **3 Questions out of 5 Questions** and each question should be answered in maximum 2 pages.

Q.2 List the three phases of Calvin cycle of photosynthesis. Explain them with suitable diagrams.

Q.3 How phosphofructo kinase is regulated during fasting and fed condition? Explain.

Q.4 Briefly describe the mechanism of O₂ evolution and NADPH formation during photosynthesis.

Q.5 Describe the pathway of glycolysis in plants along with its site of occurrence.

Q.6 Discuss the kreb cycle with suitable sketches. How many ATP will be generated through this cycle for one glucose molecule?

Section – C

(Maximum Marks: 8 x 1 = 8)

Attempt **1 Question out of 2 Questions** and each question should be answered in maximum 4 pages.

Q.7 Why enzyme regulation is necessary? Give the various mechanisms for enzyme regulation. Explain zymogen activation in detail.

Q.8 What is terminal oxidation? Discuss the various complexes and also inhibitors of terminal oxidation with reference to respiration in plants.



DAV University, Jalandhar.
Term-Sample

ESE
Sample

Name:

Regd. No.:

Course Code: BOT331

Roll No.:

Course Name: PLANT METABOLISM

Time: 3 Hours

Maximum Marks: 25

Section – A

(Maximum Marks: 1 x 10 = 10)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Explain following:

- i. Enhancement effect.
- ii. Floating respiration
- iii. Reaction centre
- iv. Antenna complex
- v. Reductases
- vi. Prosthetic group
- vii. Complex II inhibitors
- viii. Photophosphorylation
- ix. Signal transduction
- x. Cell surface receptors

Section – B

(Maximum Marks: 4 x 6 = 24)

Short Answer Type: Attempt any **6 Questions out of 8 Questions** and each question should be answered in maximum 2 pages.

- Q.2 How kreb cycle is regulated? Explain.
- Q.3 Differentiate between photophosphorylation and oxidative phosphorylation.
- Q.4 Give an account of activation and β oxidation of fatty acids.
- Q.5 Describe the biochemistry of nitrogenase enzyme with suitable diagrams.
- Q.6 What are the various properties of enzymes?
- Q.7 Define respiration. Describe the process of glycolysis with suitable sketch.
- Q.8 Write an essay on calvin cycle. Draw suitable sketch.
- Q.9 Write an essay on cyanide respiration.

Section – C

(Maximum Marks: 8 x 2 = 16)

Long Answer Type: Attempt **2 Questions out of 4 Questions** and each question should be answered in maximum 4 pages.

- Q.10 Give an account of nitrate and nitrite assimilation in plants with suitable reaction.
- Q.11 Give an account of oxidative phosphorylation and its inhibitors.
- Q.12 Write short notes on i) Calvin cycle ii) CAM pathway
- Q.13 Write a note on synthesis and breakdown of triglycerides.

Programme Name: B.Sc. (Hons) Botany Semester VI
Course Name: Plant Metabolism Laboratory
Course Code: BOT332
Total Credits: 2
Credit Components: L-0; T-0; P-3
Learning Objectives: The course will enable students to know about the events that help in maintenance of metabolism in plants

List of Experiments

1. Chemical separation of photosynthetic pigments.
2. Experimental demonstration of Hill's reaction.
3. To study the effect of light intensity on the rate of photosynthesis.
4. Effect of carbon dioxide on the rate of photosynthesis.
5. To compare the rate of respiration in different parts of a plant.
6. To demonstrate activity of Nitrate reductase in germinating leaves of different plant sources.
7. To study the activity of lipases in germinating oilseeds and demonstrate mobilization of lipids during germination.
8. Demonstration of fluorescence by isolated chlorophyll pigments.
9. Demonstration of absorption spectrum of photosynthetic pigments

Learning Strategies: Practicals, models, charts, online demonstrations, group discussions and assignments.

Learning Outcome: The students will come to know that how various factors affect rate of photosynthesis, respiration and about various enzyme activity.

Assessment: Continuous Assessment: 20 Marks
Practical Exam: 80 Marks

Model Question Paper: Practical Exam component is divided into the following sub components:

- Performance – 24 Marks
- Spotting – 16 Marks
- Viva-voce – 24 Marks
- Record – 8 Marks
- Internal Assessment – 8 marks

Text Books: 1. Taiz, L., and Zeiger, E. *Plant Physiology*. California: The Benjamin/Cumming Publishing Company, 1998. Print.

Reference Books: 1. Hopkins, W.G. and Huner, A. 4th ed. USA: John Wiley and Sons, 2008. Print.
2. Harborne, J.B. *Phytochemical Methods*. New York: John Wiley & Sons, 1973. Print.
3. Stryer, L. *Biochemistry*. 5th ed. New York: W.H. Freeman and Co., 1995. Print.
4. Voet, D., and Voet, J.G. *Biochemistry*. New York: John Wiley and Sons Inc., 1995. Print

Websites and www.plantphys.org

Audio Video

lectures:

Other Supportive <https://www.nature.com/subjects/plant-physiology>

Material:

Programme Name: B.Sc. (Hons) Botany Semester VI

Course Name: Plant Biotechnology

Course Code: BOT333

Total Credits: 4

Credit Components: L-4; T-0; P-0

Learning Objectives: To acquaint the students about the application of biotechnology in plant science.

Unit I

Plant Tissue Culture: Historical perspective; Composition of media; Nutrient and hormone requirements (role of vitamins and hormones); Totipotency; Organogenesis; Embryogenesis (somatic and zygotic); Protoplast isolation, culture and fusion; Tissue culture applications (micropropagation, androgenesis, virus elimination, secondary metabolite production, haploids, triploids and hybrids; Cryopreservation; Germplasm Conservation). **(12 lectures)**

Unit II

Recombinant DNA technology: Enzymes – Nucleases, Restriction Endonucleases, Ligases, Polymerases, Alkaline Phosphatase, Topoisomerases; Restriction Mapping (Linear and Circular); Cloning Vectors: Prokaryotic (pUC 18 and pUC19, pBR322, Ti plasmid, BAC); Lambda phage, M13 phagemid, Cosmid, Shuttle vector; Eukaryotic Vectors (YAC). **(10 lectures)**

Unit III

Gene Cloning: Techniques in gene cloning, Bacterial Transformation and selection of recombinant clones, PCR mediated gene cloning; Gene Construct; construction of genomic and cDNA libraries, screening DNA libraries to obtain gene of interest by genetic selection; complementation, colony hybridization.

Methods of gene transfer: Agrobacterium-mediated, Direct gene transfer by Electroporation, Microinjection, Microprojectile bombardment; Selection of transgenics– selectable marker and reporter genes (Luciferase, GUS, GFP). **(15 lectures)**

Unit IV

Applications of Biotechnology: Pest resistant (Bt-cotton); herbicide resistant plants (RoundUp Ready soybean); Transgenic crops with improved quality traits (Flavr Savr tomato, Golden rice); Improved horticultural varieties (Moondust carnations); Role of transgenics in bioremediation (Superbug); edible vaccines; Industrial enzymes (Aspergillase, Protease, Lipase); Genetically Engineered Products–Human Growth Hormone; Humulin; Biosafety concerns. **(14 lectures)**

Learning Strategies: Class room lectures, practicals, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students

Learning Outcome: The course will enable students to know understand the application of various technological advances which has brought about change in the understanding of plant science.

Assessment: Mid Semester Exam (MSE) – 25 Marks
Written Quiz (MCQs) – 10 Marks
Assignment (written) – 10 Marks
End Semester Examination (ESE) – 50 Marks

**Model Question
Paper: MSE**

Attendance – 5 Marks

Q.1 Will Comprise of 5 parts having 1 mark each
Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be attempted.

Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be attempted

**Model Question
Paper: ESE**

Q.1 Will Comprise of 10 parts having 1 mark each

Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be attempted.

Q.10 to Q.13 will carry 8 marks each out of which 2 question are to be attempted



DAV University, Jalandhar.
Term-Sample

**MSE
Sample**

Name:

Regd. No.:

Course Code: BOT333

Roll No.:

Course Name: PLANT BIOTECHNOLOGY

Time: 1 Hour 30 Minutes

Maximum Marks: 25

Section – A

(Maximum Marks: 1 x 5 = 5)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1

- i. What are cybrids?
- ii. What do you understand by the term somatic hybridization?
- iii. What are the different gelling agents used for culture media preparation?
- iv. What are the different forms of plant tissue culture?
- v. What do you understand by the term micropropagation?

Section – B

(Maximum Marks: 4 x 3 = 12)

Attempt any **3 Questions out of 5 Questions** and each question should be answered in maximum 2 pages.

- Q.2 Write a short note on axillary bud proliferation.
Q.3 Write a note on haploid production and mention its types.
Q.4 What are the different components of a nutrient medium? Discuss in short.
Q.5 What are the different applications of embryo culture technology?
Q.6 What are the three stages of micropropagation? Explain.

Section – C

(Maximum Marks: 8 x 1 = 8)

Attempt **1 Question out of 2 Questions** and each question should be answered in maximum 4 pages.

- Q.7 Write an essay on protoplast isolation and fusion.
Q.8 Discuss in details the process of organogenesis and embryogenesis.



DAV University, Jalandhar.
(Term-Sample)

**ESE
Sample**

Name:

Regd. No.:

Course Code: BOT333

Time: 3 Hours

Course Name: Plant Biotechnology

Maximum Marks: 50

Section – A

(Maximum Marks: 1 x 10 = 10)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Write a short note on the following

- i. Restriction enzymes
- ii. DNA polymerase
- iii. Cloning
- iv. Plasmid
- v. Cosmid
- vi. BAC
- vii. PCR
- viii. BT Cotton
- ix. Micropropagation
- x. Edible vaccines

Section – B

(Maximum Marks: 4 x 6 = 24)

Short Answer Type: Attempt any **6 Questions out of 8 Questions** and each question should be answered in maximum 2 pages.

- Q.2 What is totipotency? What is its importance in plant tissue culture?
- Q.3 What are the different types of cloning vectors used in DNA cloning?
- Q.4 Write a short note on selectable markers used in DNA cloning.
- Q.5 Discuss the steps involved in PCR.
- Q.6 Write a short note on microinjection.
- Q.7 What is golden rice? Why it was made?
- Q.8 Write a short note on genetically engineered products.
- Q.9 Write a short note on secondary metabolite production in plants.

Section – C

(Maximum Marks: 8 x 2 = 16)

Long Answer Type: Attempt **2 Questions out of 4 Questions** and each question should be answered in maximum 4 pages.

- Q.10 Write an essay on restriction enzymes. Discuss restriction mapping.
- Q.11 Discuss the process and applications of protoplast culture technique.
- Q.12 How is PCR mediated gene cloning different from bacterial transformation technique?
- Q.13 Discuss in details the methods of gene transfer.

Programme Name: B.Sc. (Hons) Botany Semester VI
Course Name: Plant Biotechnology Laboratory
Course Code: BOT334
Total Credits: 2
Credit Components: L-0; T-0; P-2
Learning Objectives: To acquaint the students about the application of biotechnology in plant science.

List of Experiments

1. (a) Preparation of MS medium.
(b) Demonstration of in vitro sterilization and inoculation methods using leaf and nodal explants of tobacco, *Datura*, *Brassica* etc.
2. Study of anther, embryo and endosperm culture, micropropagation, somatic embryogenesis & artificial seeds through photographs.
3. Isolation of protoplasts.
4. Construction of restriction map of circular and linear DNA from the data provided.
5. Study of methods of gene transfer through photographs: Agrobacterium-mediated, direct gene transfer by electroporation, microinjection, microprojectile bombardment.
6. Study of steps of genetic engineering for production of Bt cotton, Golden rice, Flavr Savr tomato through photographs.
7. Isolation of plasmid DNA.
8. Restriction digestion and gel electrophoresis of plasmid DNA.

Learning Strategies: Practicals, models, charts, online demonstrations, group discussions and assignments

Learning Outcome: The course will enable students to know understand the application of various technological advances which has brought about change in the understanding of plant science.

Assessment: Continuous Assessment: 20 Marks
Practical Exam: 80 Marks

Model Question Paper: Practical Exam component is divided into the following sub components:

- Performance – 24 Marks
- Spotting – 16 Marks
- Viva-voce – 24 Marks
- Record – 8 Marks
- Internal Assessment – 8 marks

Text Books:

1. Bhojwani, S.S. and Razdan, M.K. *Plant Tissue Culture: Theory and Practice*. The Netherlands: Elsevier Science Amsterdam, 1996. Print.
2. Glick, B.R. and Pasternak, J.J. *Molecular Biotechnology- Principles and Applications of recombinant DNA*. Washington: ASM Press, 2003. Print.

Reference Books:

3. Bhojwani, S.S. and Bhatnagar, S.P. *The Embryology of Angiosperms*. 5th ed. New Delhi: Vikas Publication House Pvt. Ltd., 2011. Print.
4. Snustad, D.P. and Simmons, M.J. *Principles of Genetics*. 5th ed. UK: John Wiley and Sons, 2010. Print.
5. Stewart, C.N. Jr. *Plant Biotechnology & Genetics: Principles, Techniques and Applications*. USA: John Wiley & Sons Inc., 2008. Print.

Programme Name: B.Sc. (Hons) Botany Semester VI

Course Name: Natural Resource Management

Course Code: BOT335

Total Credits: 4

Credit Components: L-4; T-0; P-0

Learning Objectives: To acquaint the students about the methods used in the maintenance of different natural resources.

Unit I

Natural resources: Definition and types.

Sustainable utilization: Concept, approaches (economic, ecological and socio-cultural).

Land: Utilization (agricultural, pastoral, horticultural, silvicultural); Soil degradation and management. **(10 lectures)**

Unit II

Water: Fresh water (rivers, lakes, groundwater, aquifers, watershed); Marine; Estuarine; Wetlands; Threats and management strategies.

Biological Resources: Biodiversity-definition and types; Significance; Threats; Management strategies; Bioprospecting; IPR; CBD; National Biodiversity Action Plan). **(12 lectures)**

Unit III

Forests: Definition, Cover and its significance (with special reference to India); Major and minor Forest products (wood products, wood fibers, and wood energy); Depletion; Management.

Energy: Renewable and non-renewable sources of energy **(13 lectures)**

Unit IV

Contemporary practices in resource management:EIA, GIS, Participatory Resource Appraisal, Ecological Footprint with emphasis on carbon footprint, Resource Accounting; Waste management.

National and international efforts in resource management and conservation **(15 lectures)**

Learning Strategies: Class room lectures, practicals, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students.

Learning Outcome: The course will enable students to know about various natural resources, how to make a sustainable use of them, different resource management strategies and their conservation.

Assessment: Mid Semester Exam (MSE) – 25 Marks
Written Quiz (MCQs) – 10 Marks
Assignment (written) – 10 Marks
End Semester Examination (ESE) – 50 Marks
Attendance – 5 Marks

Model Question Paper: MSE Q.1 Will Comprise of 5 parts having 1 mark each

Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be attempted.

Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be

attempted

Model Question

Paper: ESE

Q.1 Will Comprise of 10 parts having 1 mark each

Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be attempted.

Q.10 to Q.13 will carry 8 marks each out of which 2 question are to be attempted



DAV University, Jalandhar.
Term-Sample

**MSE
Sample**

Name:

Regd. No.:

Course Code: BOT335

Roll No.:

Course Name: Natural Resource Management

Time: 1 Hour30 Minutes
Maximum Marks: 25

Section – A

(Maximum Marks: 1 x 5 = 5)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Explain following

- i. Inexhaustible resource
- ii. Ecological approach of sustainable utilization
- iii. Silviculture
- iv. Nonrenewable source of energy
- v. Characteristics of Tropical scrub forest.

Section – B

(Maximum Marks: 4 x 3 = 12)

Attempt any **3 Questions out of 5 Questions** and each question should be answered in maximum 2 pages.

Q.2 What is bioprospecting? Briefly describe its merits.

Q.3 Define agroforestry with its various components. What are potential of agroforestry for income generation?

Q.4 How soil is degraded? What are the important steps for its management?

Q.5 Briefly describe mineral resources and environmental effects of extracting mineral resources.

Q.6 Briefly describe water resources and how sustainable water management is done?

Section – C

(Maximum Marks: 8 x 1 = 8)

Attempt **1 Question out of 2 Questions** and each question should be answered in maximum 4 pages.

Q.7 What are natural resources? Give an account of its sources and explain the various energy resources.

Q.8 Define biodiversity and how it can be measured? Write the various significance of biodiversity.



DAV University, Jalandhar.
(Term-18191)

ETE
December,2018

Name:

Regd. No.:

Course Code: BOT 335

Time: 3 Hours

Course Name: Natural Resource Management

Maximum Marks:
50

Section – A

(Maximum Marks: 1 x 10 = 10)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Explain following:

- i. Inexhaustible resource
- ii. Greenhouse gas
- iii. Wetlands
- iv. Endangered species
- v. Bioprospecting
- vi. Ecological footprinting
- vii. Intellectual property
- viii. Agrisilviculture
- ix. EIA
- x. Tropical rain forest

Section – B

(Maximum Marks: 4 x 6 = 24)

Short Answer Type: Attempt any **6 Questions out of 8 Questions** and each question should be answered in maximum 2 pages.

- Q.2 Give an account of various minor wood products.
- Q.3 Write a short note on CBD (Convention on Biological Diversity).
- Q.4 Write an essay on EIA.
- Q.5 Write a short note on trademark.
- Q.6 Discuss briefly ecological role of wetlands.
- Q.7 What is carbon foot printing? How it can be reduced? Describe briefly.
- Q.8 Write a short note on bio prospecting.
- Q.9 Briefly describe Indian forest on the basis of canopy density.

Section – C

(Maximum Marks: 8 x 2 = 16)

Long Answer Type: Attempt **2 Questions out of 4 Questions** and each question should be answered in maximum 4 pages.

- Q.10 Define wetlands. What are the major threats to wetlands? Give the appropriate management strategies.
- Q.11 What are natural resources? Give an account of its sources and explain the various energy resources.
- Q.12 What is GIS? Explain its various components and functions.
- Q.13 What is intellectual property right? Briefly describe it with special emphasis on Patent.

Programme Name: B.Sc. (Hons) Botany Semester VI
Course Name: Natural Resource Management Laboratory
Course Code: BOT336
Total Credits: 2
Credit Components: L-0; T-0; P-3
Learning Objectives:

List of Experiments

1. Estimation of solid waste generated by a domestic system (biodegradable and nonbiodegradable) and its impact on land degradation.
2. Collection of data on forest cover of specific area.
3. Measurement of dominance of woody species by DBH (diameter at breast height) method.
4. Calculation and analysis of ecological footprint.
5. Ecological modeling.

Learning Strategies: Practicals, models, charts, online demonstrations, group discussions and assignments.

Learning Outcome: The students will come to know that how various factors affect rate of photosynthesis, respiration and about various enzyme activity.

Assessment: Continuous Assessment: 20 Marks
Practical Exam: 80 Marks

Model Question Paper: Practical Exam component is divided into the following sub components:

- Performance – 24 Marks
- Spotting – 16 Marks
- Viva-voce – 24 Marks
- Record – 8 Marks
- Internal Assessment – 8 marks

Text Books:

- 1 Vasudevan, N. Essentials of Environmental Science. New Delhi: Narosa Publishing House, 2006. Print.
- 2 Singh, J.S., Singh, S.P. and Gupta, S. Ecology, Environment and Resource Conservation. New Delhi: Anamaya Publications, 2006. Print.

Reference Books:

- 1 Rogers, P.P., Jalal, K.F. and Boyd, J.A. An Introduction to Sustainable Development. New Delhi: Prentice Hall of India Private Limited, 2008. Print.
- 2 Shmulsky, Rubin and P.D. Jones. Forest Products and Wood Science, an Introduction. 6th Ed. Blackwell publishing. 2011. Print.
- 3 Hoadley, R.B. Identifying Wood, Accurate Results with Simple Tools. Taunton Press. 1990. Print.
- 4 Hoadley, R.B. Understanding Wood. A Craftsman's Guide to Wood Technology. The Taunton Press. 1990. Print

Other Supportive Material: <http://www.fao.org/3/a-i3928e.pdf>
<https://nptel.ac.in/courses/122102006/7>

Programme Name: B.Sc. (Hons) Botany Semester VI
Course Name: Research Methodology
Course Code: BOT337
Total Credits: 4
Credit Components: L-4; T-0; P-0
Learning Objectives: To acquaint the students about the different methods and procedures used in botanical research.

Unit I

Basic concepts of research: Research-definition and types of research (Descriptive vs analytical; applied vs fundamental; quantitative vs qualitative; conceptual vs empirical). Research methods vs methodology. Literature-review and its consolidation; Library research; field research; laboratory research.

General laboratory practices: Common calculations in botany laboratories. Understanding the details on the label of reagent bottles. Molarity and normality of common acids and bases. Preparation of solutions. Dilutions. Percentage solutions. Molar, molal and normal solutions. Technique of handling micropipettes; Knowledge about common toxic chemicals and safety measures in their handling. **(14 lectures)**

Unit II

Data collection and documentation of observations: Maintaining a laboratory record; Tabulation and generation of graphs. Imaging of tissue specimens and application of scale bars. The art of field photography.

Overview of Biological Problems: History; Key biology research areas, Model organisms in biology (A Brief overview): Genetics, Physiology, Biochemistry, Molecular Biology, Cell Biology, Genomics, Proteomics, Transcriptional regulatory network. **(16 lectures)**

Unit III

Methods to study plant cell/tissue structure: Whole mounts, peel mounts, squash preparations, clearing, maceration and sectioning; Tissue preparation: living vs fixed, physical vs chemical fixation, coagulating fixatives, non-coagulant fixatives; tissue dehydration using graded solvent series; Paraffin and plastic infiltration; Preparation of thin and ultrathin sections. **(14 lectures)**

Unit IV

Plant micro techniques: Staining procedures, classification and chemistry of stains. Staining equipment. Reactive dyes and fluorochromes (including genetically engineered protein labeling with GFP and other tags). Cytogenetic techniques with squashed plant materials.

The art of scientific writing and its presentation: Numbers, units, abbreviations and nomenclature used in scientific writing. Writing references. Powerpoint presentation. Poster presentation. Scientific writing and ethics, Introduction to copyright-academic misconduct/plagiarism. **(18 lectures)**

Learning Strategies: Class room lectures, practicals, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students

Learning Outcome: The students know about the different methods and procedures used in botanical research.

Assessment: Mid Semester Exam (MSE) – 25 Marks
Written Quiz (MCQs) – 10 Marks

Assignment (written) – 10 Marks
 End Semester Examination (ESE) – 50 Marks
 Attendance – 5 Marks

Model Question
Paper: MSE

Q.1 Will Comprise of 5 parts having 1 mark each
 Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be attempted.
 Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be attempted

Model Question
Paper: ESE

Q.1 Will Comprise of 10 parts having 1 mark each
 Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be attempted.
 Q.10 to Q.13 will carry 8 marks each out of which 2 question are to be attempted



DAV University, Jalandhar.
Term-Sample

Name:

Course Code: BOT337

Course Name: Research Methodology

Section – A

MSE
Sample

Regd. No.:

Roll No.:

Time: 1 Hour 30 Minutes

Maximum Marks: 25

(Maximum Marks: 1 x 5 = 5)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Explain the following terms briefly:

- i. Empirical research
- ii. Acute toxins
- iii. Molality
- iv. Differentiate between field and laboratory research.
- v. Sensitizers

Section – B

(Maximum Marks: 4 x 3 = 12)

Attempt any **3 Questions out of 5 Questions** and each question should be answered in maximum 2 pages.

Q.2 How to prepare 0.5M solution of formaldehyde (MW= 30.03) in 200 ml of distilled water.

Q.3 Differentiate between methods and methodology.

Q.4 Describe various methods of descriptive and analytical research.

Q.5 Prepare a line graph for the following data:

Species	A	B	C	D	E	F	G	H	I
Number	4	6	7	7	5	6	11	7	10

Q.6 Explain the procedure for maintenance of laboratory record.

Section – C

(Maximum Marks: 8 x 1 = 8)

Attempt **1 Question out of 2 Questions** and each question should be answered in maximum 4 pages.

Q.7 What do you understand by toxic chemicals? Describe carcinogens and reproductive toxins with suitable examples.

Q.8 Explain different methods of data collection and documentation of observations.



DAV University, Jalandhar.
Term-Sample

MSE
Sample

Name:

Regd. No.:

Course Code: BOT337

Roll No.:

Course Name: Research Methodology

Time: 1 Hour 30 Minutes
Maximum Marks: 25

Section – A

(Maximum Marks: 1 x 10 = 10)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.2 Explain the following briefly:

- i. Reproductive toxins
- ii. Empirical research
- iii. Applied research
- iv. References
- v. Toxic chemicals
- vi. Scientific research
- vii. GFP
- viii. Molarity
- ix. Literature review
- x. Irritants

Section – B

(Maximum Marks: 4 x 6 = 24)

Short Answer Type: Attempt any **6 Questions out of 8 Questions** and each question should be answered in maximum 2 pages.

Q.2 Write a note on the fluorochromes.

Q.3 Describe coagulating and non-coagulating fixatives with suitable examples.

Q.4 Write a general account of clearing.

Q.5 What do you understand by plagiarism and self-plagiarism. Write names of five software are used to check plagiarism.

Q.6 Describe chronic and acute toxins with suitable examples.

Q.7 Describe the various types of reference style with one example.

Q.8 How to prepare 100 ml of 1N HCl (MW= 36.48 g/mol) with weight percentage is 35% and density 1.16.

Q.9 Define maceration. Describe the procedure for preparation of macerated plant materials.

Section – C

(Maximum Marks: 8 x 2 = 16)

Long Answer Type: Attempt **2 Questions out of 4 Questions** and each question should be answered in maximum 4 pages.

Q.10 Explain the whole-mount immunolocalization protocol in plants.

Q.11 What do you understand by reactive dyes. Discuss the properties and classification of reactive dyes.

Q.12 Explain the following:

(a) Microsoft power point

(b) Protocol for preparation of tissue specimens

Q.13 Describe the chemistry and process of gram staining technique. Also describe different types of stains.

Programme Name: B.Sc. (Hons) Botany Semester VI
Course Name: Research Methodology Laboratory
Course Code: BOT338
Total Credits: 2
Credit Components: L-0; T-0; P-3
Learning Objectives: To acquaint the students about the different methods and procedures used in botanical research.

List of Experiments

1. Experiments based on chemical calculations.
2. Plant microtechnique experiments.
3. The art of imaging of samples through microphotography and field photography.
4. Poster presentation on defined topics.
5. Technical writing on topics assigned.

Learning Strategies: Practicals, models, charts, online demonstrations, group discussions and assignments.

Learning Outcome: The students will come to know that how various factors affect rate of photosynthesis, respiration and about various enzyme activity.

Assessment: Continuous Assessment: 20 Marks
Practical Exam: 80 Marks

Model Question Paper: Practical Exam component is divided into the following sub components:

- Performance – 24 Marks
- Spotting – 16 Marks
- Viva-voce – 24 Marks
- Record – 8 Marks
- Internal Assessment – 8 marks

Text Books: 1. Dawson, C. *Practical research methods*. New Delhi: UBS Publishers, 2002. Print.

Reference Books: 1. Stapleton, P., Yondeowei, A., Mukanyange, J. and Houten, H. *Scientific writing for agricultural research scientists – a training reference manual*. Hong Kong: West Africa Rice Development Association, 1995. Print.

Other Supportive Material: <http://www.fao.org/3/a-i3928e.pdf>
<https://nptel.ac.in/courses/122102006/7>

Programme Name: B.Sc. (Hons) Botany Semester VI

Course Name: Biostatistics

Course Code: BOT339

Total Credits: 4

Credit Components: L-4; T-0; P-0

Learning Objectives: To acquaint the students about the principles of statistics applied to the field of biology.

Unit I

Biostatistics: Definition - statistical methods - basic principles. Variables - measurements, functions, limitations and uses of statistics.

Collection of data primary and secondary: Types and methods of data collection procedures - merits and demerits. Classification - tabulation and presentation of data - sampling methods.

(14 lectures)

Unit II

Measures of central tendency: Mean, median, mode, geometric mean - merits & demerits.
Measures of dispersion - range, standard deviation, mean deviation, quartile deviation - merits and demerits; Co-efficient of variations.

(12 lectures)

Unit III

Correlation: Types and methods of correlation, regression, simple regression equation, fitting prediction, similarities and dissimilarities of correlation and regression

(14 lectures)

Unit IV

Statistical inference: Hypothesis - Simple and composite hypotheses, Null and alternative hypotheses; Type I and Type II errors

Level of significance p-value

Student 't' test - chi square test.

(16 lectures)

Learning Strategies: Class room lectures, practicals, models, charts, power point presentations, online lectures, group discussions, assignments and presentations by students

Learning Outcome: The course will enable students to understand the application of statistical methods in fields of life science and will provide a scientific virtue to the students.

Assessment: Mid Semester Exam (MSE) – 25 Marks
Written Quiz (MCQs) – 10 Marks
Assignment (written) – 10 Marks
End Semester Examination (ESE) – 50 Marks
Attendance – 5 Marks

Model Question Paper: MSE Q.1 Will Comprise of 5 parts having 1 mark each
Q.2 to Q.6 will carry 4 marks each out of which 3 questions are to be attempted.
Q.7 and Q.8 will carry 8 marks each out of which 1 question is to be attempted

Model Question Paper: ESE Q.1 Will Comprise of 10 parts having 1 mark each
Q.2 to Q.9 will carry 4 marks each out of which 6 questions are to be

attempted.
 Q.10 to Q.13 will carry 8 marks each out of which 2 question are to be attempted



DAV University, Jalandhar.
Term-Sample

Name:

Course Code: BOT339

Course Name: Biostatistics

**MSE
 Sample**

Regd. No.:

Roll No.:

Time: 1 Hour 30 Minutes

Maximum Marks: 25

(Maximum Marks: 1 x 5 = 5)

Section – A

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Explain the following terms briefly:

- i. Central tendency
- ii. Dispersion
- iii. Bar graph
- iv. Pie chart
- v. Mean

Section – B

(Maximum Marks: 4 x 3 = 12)

Attempt any **3 Questions out of 5 Questions** and each question should be answered in maximum 2 pages.

Q.2 Write a short note on different types of graphs routinely used in research.

Q.3 Write a short note on uses and applications of statistics.

Q.4 Describe various methods used for sampling.

Q.5 Prepare a line graph for the following data:

Species	A	B	C	D	E	F	G	H	I
Number	4	6	7	7	5	6	11	7	10

Q.6 Discuss merits and demerits of geometric mean.

Section – C

(Maximum Marks: 8 x 1 = 8)

Attempt **1 Question out of 2 Questions** and each question should be answered in maximum 4 pages.

Q.7 Calculate mean, median and mode for the following data:

CI	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Frequency	12	15	15	18	20	22	13	12

Q.8 Calculate standard deviation and variance for the following data:

CI	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Frequency	23	25	26	29	32	33	28	20



DAV University, Jalandhar.
Term-Sample

ESE
Sample

Name:

Regd. No.:

Course Code: BOT339

Roll No.:

Course Name: Biostatistics

Time: 3 Hours

Maximum Marks: 50

Section – A

(Maximum Marks: 1 x 10 = 10)

All Questions are compulsory.

Very Short Answer Type: Each question should be answered within 5-8 lines.

Q.1 Write a short note on the following

- i. Correlation
- ii. Type I error
- iii. Quartile deviation
- iv. Null hypothesis
- v. Partial correlation
- vi. Regression
- vii. Research Design
- viii. LOS
- ix. p-value
- x. Standard curve

Section – B

(Maximum Marks: 4 x 6 = 24)

Short Answer Type: Attempt any **6 Questions out of 8 Questions** and each question should be answered in maximum 2 pages.

Q.2 Discuss the steps involved in calculation of regression equations.

Q.3 Write a short note on statistical hypothesis.

Q.4 What are the different types of errors frequently encountered by a researcher?

Q.5 Discuss in short the uses and applications of different types of chi-square tests.

Q.6 Calculate median and mode for the following data

CI	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Frequency	12	15	15	18	20	22	13	12

Q.7 Calculate correlation coefficient between the two given series X and Y, and comment on the relationship between them.

X:	23	25	29	33	37	43	52	36
Y:	12	50	50	28	32	56	65	30

Q.8 Calculate geometric mean and quartile deviation for the following data: 22, 35, 25, 30, 50, 20

Q.9 Calculate standard deviation for the following data:

CI	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Frequency	23	25	26	29	32	33	28	20

Section – C

(Maximum Marks: 8 x 2 = 16)

Long Answer Type: Attempt **2 Questions out of 4 Questions** and each question should be answered in maximum 4 pages.

Q.10 Random samples are drawn from two populations and the following results were obtained regarding their blood cholesterol:

Sample X	16	15	20	22	22	18	15	18	20	19		
Sample Y	19	25	20	20	19	19	23	23	25	20	35	15

Compare the groups and comment whether sample X had higher cholesterol than sample Y. [$F_{(9,11,0.05)} = 2.90$; $F_{(11,9,0.05)} = 3.11$; $t_{(21,0.05)} = 1.721$; $t_{(9,0.05)} = 1.833$; $t_{(11,0.05)} = 1.796$]

Q.11 Calculate the regression equations of X on Y and Y on X from the following data:

X:	23	25	29	33	37	43	52	36
Y:	12	50	50	28	32	56	65	30

Q.12 Describe in details the classification and tabulation of data.

Q.13 Write an essay on data collection.

Programme Name: B.Sc. (Hons) Botany Semester VI
Course Name: Biostatistics Laboratory
Course Code: BOT340
Total Credits: 2
Credit Components: L-0; T-0; P-2
Learning Objectives: To acquaint the students about the principles of statistics applied to the field of biology.

List of Experiments

- 1) Calculation of mean, standard deviation and standard error
- 2) Calculation of correlation coefficient values and finding out the probability
- 3) Calculation of 'F' value and finding out the probability value for the F value.

Learning Strategies: Practicals, models, charts, online demonstrations, group discussions and assignments

Learning Outcome: The course will enable students to understand the application of statistical methods in fields of life science and will provide a scientific virtue to the students.

Assessment: Continuous Assessment: 20 Marks
Practical Exam: 80 Marks

Model Question Paper: Practical Exam component is divided into the following sub components:

- Performance – 24 Marks
- Spotting – 16 Marks
- Viva-voce – 24 Marks
- Record – 8 Marks
- Internal Assessment – 8 marks

Text Books: 1. Danniel, W.W. *Biostatistic*. New York: John Wiley Sons, 1987. Print.

2. Sundarrao, P.S.S and Richards, J. *An introduction to Biostatistics*. 5th ed. New Delhi: PHI Learning Pvt. Ltd., 2012. Print.

Reference Books: 3. Selvin, S. *Statistical Analysis of epidemiological data*. USA: New York University Press. 1991. Print.

4. Bishop, O.N. *Statistics for Biology*. USA: Houghton, Mifflin Co. Boston, 1966. Print.

5. Freedman, P. *The Principles of scientific research*. New York: Oxford Pergamon Press, 1960. Print.

6. Selvin, S. *Biostatistics – How it Works*. First Impression. New Delhi: Pearson Education Inc., 2007. Print.

7. Agarwal, B.L. *Basic Statistics*. New Delhi: New Age International, 2006. Print.

B.Sc. Botany (Hons.) Semester I
Course Title: Basic Communication Skills

Course Code: ENG151B

L	T	P	Credits	Marks
3	0	0	3	75

Course Objective:

- To enhance students' vocabulary and comprehensive skills through prescribed texts.
- To hone students' writing skills.

Learning Outcomes: Students will be able to improve their writing skills as well as will enrich their word power.

Unit – A Applied Grammar (Socio-Cultural Context)

1. Parts of Speech: Noun, Pronoun, Adjective, Verb, Adverb, Preposition, Conjunction, Interjection 5 hours
2. Tenses (Rules and Usages in Socio-cultural contexts) 6 hour
3. Modals: Can, Could, May, Might, Will, Would, Shall, Should, Must, Ought to 5hours
4. Passive/Active 5 hours
5. Reported/Reporting Speech 5 hour

Unit – B Reading (Communicative Approach to be Followed)

1. J M Synge: Riders to the Sea (One Act Play) 7 hours
2. Anton Chekhov : Joy (Short Story) 5 hours
3. Swami Vivekanand : The Secret of Work (Prose) 7 hours

Unit – C Writing

1. Essay Writing and Letter Writing 5Hours
2. Report Writing 5 hours
3. Group Discussion & Facing an Interview 5hours

References:

a. Books

1. Kumar, Sanjay and PushpLata. *Communication Skills*. India: OUP, 2012. Print.
2. Vandana, R. Singh. *The Written Word* by. New Delhi: Oxford University Press, 2008. Print.

b. Websites

1. www.youtube.com (to download videos for panel discussions). Web.
2. www.letterwritingguide.com. Web.
3. www.teach-nology.com. Web.
4. www.englishforeveryone.org. Web.
5. www.dailywritingtips.com. Web.
6. www.englishworksheets.com. Web.
7. www.mindtools.com. Web.

B.Sc. Botany (Hons.) Semester I
Course Title: Basic Communication Skills Laboratory

L	T	P	Credits	Marks
0	0	2	1	25

Course Code: ENG152A

Course Objective:

- To improve fluency in speaking English.
- To promote interactive skills through Group Discussions and role plays.

Learning Outcome: Students will get exposure to speaking through the above mentioned interactive exercises. In addition, they will develop a technical understanding of language learning software, which will further improve their communicative skills.

Unit – A Speaking/Listening

- | | |
|----------------------|----------|
| 1. Movie-Clippings | 10 hours |
| 2. Role Plays | 10 hours |
| 3. Group Discussions | 10 hours |

References:

Books

1. Gangal, J. K. *A Practical Course In Spoken English*. India: PHI Private Limited, 2012. Print.
2. Kumar, Sanjay and PushpLata. *Communication Skills*. India: OUP, 2012. Print.

Websites

1. www.youtube.com (to download videos for panel discussions).Web.
2. www.englishforeveryone.org.Web.
3. www.talkenglish.com.Web.
4. www.mindtools.com.Web.

B.Sc. Botany (Hons.) Semester I
GENERIC ELECTIVE COURSE

Course Title: Zoodiversity

Paper Code: ZOO154

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: To acquaint students with the general characters of invertebrates and chordates emphasizing on the special characters of each group.

UNIT-A

- **Protozoa:** General characters of Protozoa; life cycle of *Plasmodium* 4 hours
- **Porifera:** General characters of Porifera; canal system in Porifera. 3 hours
- **Radiata:** General characters of Coelenterata; Polymorphism. 3 hours

UNIT-B

- **Acoelomates:** General characters of Helminthes; Life cycle of *Taenia solium* 3 hours
- **Pseudocoelomates:** General characters of Nemethehelminthes; Parasitic adaptations 3 hours

UNIT-C

- **Coelomate Protostomes:** General characters of Annelida; Metamerism 3 hours
- **Arthropoda:** General characters of Arthropoda; social life in insects 4 hours
- **Mollusca:** General characters of Mollusca; Pearl formation 3 hours
- **Coelomate Deuterostomes:** General characters of Echinodermata; Water vascular system in star fish 3 hours

UNIT-D

- **Protochordata:** Salient features 2 hours
- **Pisces:** Osmoregulation. Migration of Fishes 4 hours
- **Amphibia:** General characters, Adaptations for terrestrial life, Parental care in Amphibia 4 hours
- **Reptilia:** Amniotes, origin of reptiles, terrestrial adaptations in reptiles 5 hours
- **Aves:** The origin of birds; flight adaptations 5 hours
- **Mammalia:** Early evolution of mammals; Primates; Dentition in mammals 6 hours

Reference books

1. Kotpal, R.L. *Modern Text Book of Zoology Invertebrates*. 10th ed., Meerut: Rastogi Publishers, 2012. Print.
2. Kotpal, R.L. *Minor phyla*. 5th ed. Meerut: Rastogi Publishers, 2006. Print.
3. Dhama, P.S. and Dhama, J.K. *Invertebrate Zoology*. 5th ed., New Delhi: R. Chand and Co., 2004. Print.
4. Parker, T.J. and Haswell, W.A. *Text book of Zoology, Invertebrates*. 7th ed., Vol. I (eds. A.J. Marshall & W.D. Williams), New Delhi: CBS Publishers & Distributors., 1992. Print.

5. Hyman L.H. *The Invertebrates*. Vol. I, II, III, IV and V. New York: McGraw Hill Book Company. Inc., 1959. Print.
6. Barnes, R.D. *Invertebrate Zoology*. USA: Saunders College Pub., 1992. Print.
7. Ruppert, Fox and Barnes. *Invertebrate Zoology. A functional Evolutionary Approach*. 7th ed., Cole: Thomson Books, 2006. Print.
8. Campbell and Reece. *Biology*. Singapore: Pearson Education, Pvt. Ltd., 2005. Print.
9. Kardong, K. V. *Vertebrates Comparative Anatomy. Function and Evolution*. New Delhi: Tata McGraw Hill Publishing Company, 2002. Print.
10. Raven, P. H. and Johnson, G. B. *Biology*. 6th ed. New Delhi: Tata McGraw Hill Publications, 2004. Print.

B.Sc. Botany (Hons.) Semester I

Course Title: Zoodiversity

Paper Code: ZOO155

L	T	P	Credits	Marks
0	0	3	2	50

1. Study of following specimens with the help of charts/models/e-resources;

Non Chordates: *Euglena, Noctiluca, Paramecium, Sycon, Physalia, Tubipora, Metridium, Taenia, Ascaris, Nereis, Aphrodite, Leech, Peripatus, Limulus, Hermitcrab, Daphnia, Millipede, Centipede, Beetle, Chiton, Dentalium, Octopus, Asterias, and Antedon.*

Chordates: *Balanoglossus, Amphioxus, Petromyzon, Pristis, Hippocampus, Labeo, Ichthyophis/Uraeotyphlus, Salamander, Rhacophorus, Draco, Uromastix, Naja, Viper, Archaeopteryx, any three common birds-(Crow, duck, Owl), Squirrel and Bat.*

2. Study of following through e-resources:

Cross section of *Sycon*, Sea anemone and *Ascaris* (male and female). T. S. of Earthworm passing through pharynx, gizzard, and typhlosolar intestine. Bipinnaria and Pluteus larva, Septal & pharyngeal nephridia of earthworm, Placoid, cycloid and ctenoid scales.

3. Study of the following through e-resources:

- Digestive and nervous system of Cockroach.
- Urinogenital system of Rat

B.Sc. Botany (Hons.) Semester I

Course Title: Introduction to Microbiology

Paper Code: MIC111

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: To acquaint students with the general characters of microorganisms and their economical importance.

Unit History of Development of Microbiology

No. of Hours: 15

Development of microbiology as a discipline. Spontaneous generation vs. biogenesis.

Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming Role of microorganisms in fermentation, Germ theory of disease, Development of various microbiological techniques and golden era of microbiology, Development of the field of soil microbiology: Contributions of Martinus W. Beijerinck, Sergei N. Winogradsky, Selman A. Waksman

Establishment of fields of medical microbiology and immunology through the work of Paul Ehrlich, Elie Metchnikoff, Edward Jenner

Unit 2 Diversity of Microbial World

No. of Hours: 40

A. Systems of classification Binomial Nomenclature, Whittaker's five kingdom and Carl Woese's three kingdom classification systems and their utility. Difference between prokaryotic and eukaryotic microorganisms

B. General characteristics of different groups: Acellular microorganisms (Viruses, Viroids, Prions) and Cellular microorganisms (Bacteria, Algae, Fungi and Protozoa) with emphasis on distribution and occurrence, morphology, mode of reproduction and economic importance.

• Algae

History of phycology with emphasis on contributions of Indian scientists; General characteristics of algae including occurrence, thallus organization, algae cell ultra structure, pigments, flagella, eyespot food reserves and vegetative, asexual and sexual reproduction. Different types of life cycles in algae with suitable examples: Haplobiontic, Haplontic, Diplontic, Diplobiontic and Diplohaplontic life cycles. Applications of algae in agriculture, industry, environment and food.

• Fungi

Historical developments in the field of Mycology including significant contributions of eminent mycologists. General characteristics of fungi including habitat, distribution, nutritional requirements, fungal cell ultra- structure, thallus organization and aggregation, fungal wall structure and synthesis, asexual reproduction, sexual reproduction, heterokaryosis, heterothallism and parasexual mechanism. Economic importance of fungi with examples in agriculture, environment, Industry, medicine, food, biodeterioration and mycotoxins.

• Protozoa

General characteristics with special reference to Amoeba, Paramecium, Plasmodium, Leishmania and Giardia

Unit 3 An overview of Scope of Microbiology

No. of Hours: 5

SUGGESTED READING

1. Tortora, G.J., Funke, B.R. and Case, C.L. *Microbiology: An Introduction*. 9th ed. San Francisco: Pearson Education, 2008. Print.
2. Madigan, M.T., Martinko, J.M., Dunlap, P.V. and Clark, D.P. *Brock Biology of Microorganisms*. 14th ed. San Francisco: Pearson International Edition, 2014. Print.
3. Cappucino, J. and Sherman, N. *Microbiology: A Laboratory Manual*. 9th ed. San Francisco: Pearson Education Limited, 2010. Print.
4. Wiley, J.M., Sherwood, L.M. and Woolverton, C.J. *Prescott's Microbiology*. 9th ed. New York: McGraw Hill International, 2013. Print.
5. Atlas, R.M. *Principles of Microbiology*. 2nd ed. St. Louis: W.M.T. Brown Publishers, 1997. Print.
6. Pelczar, M.J., Chan, E.C.S. and Krieg, N.R. *Microbiology*. 5th ed. New York: McGraw Hill Book Company, 1993. Print.
7. Stanier, R.Y., Ingraham, J.L., Wheelis, M.L. and Painter, P.R. *General Microbiology*. 5th ed. Basingstoke (Hants): McMillan Education, 2005. Print.

B.Sc. Botany (Hons.) Semester I

Course Title: Introduction to Microbiology Laboratory

Paper Code: MIC112

L	T	P	Credits	Marks
0	0	3	2	50

1. Microbiology Good Laboratory Practices and Biosafety.
2. To study the principle and applications of important instruments (biological safety cabinets, autoclave, incubator, BOD incubator, hot air oven, light microscope, pH meter) used in the microbiology laboratory.
3. Preparation of culture media for bacterial cultivation.
4. Sterilization of medium using Autoclave and assessment for sterility
5. Sterilization of glassware using Hot Air Oven and assessment for sterility
6. Sterilization of heat sensitive material by membrane filtration and assessment for sterility
7. Demonstration of the presence of microflora in the environment by exposing nutrient agar plates to air.
8. Study of *Rhizopus*, *Penicillium*, *Aspergillus* using temporary mounts
9. Study of *Spirogyra* and *Chlamydomonas*, *Volvox* using temporary Mounts
10. Study of the following protozoans using permanent mounts/photographs: *Amoeba*, *Entamoeba*, *Paramecium* and *Plasmodium*

B.Sc. Botany (Hons.) Semester II

Course Title: Human Values and General Studies

Course Code: SGS107

L	T	P	Cr.
4	0	0	4

Course Objectives

- To sensitize students about the role and importance of human values and ethics in personal, social and professional life.
- To enable students to understand and appreciate ethical concerns relevant to modern lives.
- To prepare a foundation for appearing in various competitive examinations
- To sensitize the students about the current issues and events of national and international importance
- To provide opportunity to the students to study inter disciplinary subjects like Geography, Science, Economy, Polity, History, International Relations etc.

Part - A

Human Values

1. Concept of Human Values: Meaning, Types and Importance of Values. 2 Hrs
2. Value Education : Basic guidelines for value education 2 Hrs
3. Value crisis and its redressal 1 Hrs

Being Good and Responsible

1. Self Exploration and Self Evaluation 2 Hrs
2. Acquiring Core Values for Self Development 2 Hrs
3. Living in Harmony with Self, Family and Society 3 Hrs
4. Values enshrined in the Constitution: Liberty, Equality 3 Hrs
5. Fraternity and Fundamental Duties.

Part - B

Value – based living

1. Vedic values of life 2 Hrs
2. *Karma Yoga* and *Jnana Yoga* 2 Hrs
3. *Ashta Marga* and *Tri-Ratna* 2 Hrs

Ethical Living:

1. Personal Ethics 2 Hrs
2. Professional Ethics 3 Hrs
3. Ethics in Education 2 Hrs

Part-C

General Geography, World Geography 3 Hrs

The Universe, The Solar System, The Earth, Atmosphere, The World we live in, Countries rich in Minerals, Wonders of the World, Biggest and Smallest.

Indian Geography 3 Hrs

Location, Area and Dimensions, Physical Presence, Indian States and Union Territories, Important sites and Monuments, Largest-Longest and Highest in India.

General History 3 Hrs

Glimpses of India History, Ancient Indian, Medieval India, Modern India, Various Phases of Indian National Movement, Prominent Personalities, Glimpses of Punjab history with special reference to period of Sikh Gurus

Glimpses of World History 3 Hrs

Important Events of World History, Revolutions and Wars of Independence, Political Philosophies like Nazism, Fascism, Communism, Capitalism, Liberalism etc.

Indian Polity: Constitution of India 3 Hrs

Important Provisions, Basic Structure, Union Government, Union Legislature and Executive, State Government: State Legislature and Executive, Indian Judiciary, The Election Commission, Panchayati Raj System, RTI etc.

General Economy 3 Hrs

The process of liberalization, privatization, globalization and Major World Issues, Indian Economy, Indian Financial System, Major Economic Issues, Economic Terminology.

Part-D

General Science 3 Hrs

General appreciation and understandings of science including the matters of everyday observation and experience, Inventions and Discoveries

Sports and Recreation 3 Hrs

The World of Sports and recreation, Who's Who is sports, Major Events, Awards and Honours. Famous personalities, Festivals, Arts and Artists

Current Affairs 3 Hrs

National and International Issues and Events in News, Governments Schemes and Policy Decisions

Miscellaneous Information

Who is who 2 Hrs

Books and Authors, Persons in News, Awards and Honours, Abbreviations and Sports

References:

1. Tripathi, A.N. *Human Values*. 3rd ed. New Delhi: New Age International Publishers, 2009. Print.
2. Subiramanian, R. *Professional Ethics*. New Delhi: Oxford University Press, 2013. Print.
3. Anand, R. and Prakashan, S. *Human Values and Professional Ethics*. New Delhi: Satya Prakashan, 2012. Print.
4. Bhalla S. *Human Values and Professional Ethics*. New Delhi: Satya Prakashan, 2012. Print.

5. Soryan, R. *Human Values and Professional Ethics*. 1st ed. New Delhi: Dhanpat Rai & Co. Pvt. Ltd., 2010. Print.
6. Jayshree, S. and Raghavan, B.S. *Human Values and Professional Ethics*. New Delhi: S Chand & Co. Ltd., 2007. Print.
7. Singh, Y. and Garg, A. *Human Values and Professional Ethics*. New Delhi: Aitbs publishers, 2011. Print.
8. Kumar, V. *Human Values and Professional Ethics*. Ludhiana: Kalyani Publishers, 2013. Print.
9. Gaur, R.R., Sangal, R. and Bagaria, G.P. *Human Values and Professional Ethics*. New Delhi: Excel Books, 2010. Print.
10. Osula, B. and Upadhyay, S. *Values and Ethics*. India: Asian Books Pvt. Ltd., 2011. Print.
11. Radhakrishnan, S. *Indian Philosophy*. New York: George Allen & Unwin Ltd. Humanities Press INC, 1929. Print.
12. Dwivedi, A.N. *Essentials of Hinduism, Jainism and Buddhism*. New Delhi: Books Today, 1979. Print.
13. Bhan, S. *Dayanand : His life and work*. New Delhi: DAVCMC, 2001. Print.
14. Dwivedi, K.D. *Esence of Vedas*. Hoshiarpur: Katyayan Vedic Sahitya Prakashan, 1990. Print.
15. Chaubey, B.B. *Vedic Concepts*. Hoshiarpur: Katyayan Vedic Sahitya Prakashan, 1990. Print.
16. Aggarwal, R.S. *Advance Objective General Knowledge*. India: S. Chand Publisher, 2013. Print.
17. Sen, S. *Concise General Knowledge Manual*. India: Unique Publishers, 2013. Print.
18. Verma, R.P. *Encyclopedia of General Knowledge and General Awareness*. India: Penguin Books Ltd., 2010. Print.
19. Thorpe, E. and Thorpe, S. *General Knowledge Manual*. Delhi: The Pearson, 2013-14. Print.
20. Mohanty, M. *General Knowledge Manual*. Delhi: Macmillan Publishers India Ltd., 2013-14. Print.
21. Government of India (Ministry of Information Broadcasting). *India 2013*, New Delhi: Publication Division, 2013. Print.
22. Methew, M. *Manorama Year Book 2013-14*. Kottayam: Malayalam Manorama Publishers, 2013. Print.
23. *Spectrum's Handbook of General Studies – 2013-14*. New Delhi: Spectrum Books Pvt. Ltd., 2013. Print.

Current Affairs

Magazines

Economic and Political Weekly, Yojna, the Week, India Today, Frontline, Spectrum.

Competition Success Review, Competition Master, Civil Services Chronicle, Current Affairs, World Atlas Book

Newspapers

The Hindu, Times of India, The Hindustan Times, The Tribune

B.Sc. Botany (Hons.) Semester II

Course Title: Environmental Studies

Paper Code: EVS100

L	T	P	Credits
4	0	0	4

Course Objective: This course aims at understanding the students in aspects of environmental problems, its potential impacts on global ecosystem and its inhabitants, solutions for these problems as well as environmental ethics which they should adopt to attain sustainable development.

Unit 1

The multidisciplinary nature of environmental studies (2 Hours)

Definition, scope and importance, Need for public awareness

Natural Resources: Renewable and non-renewable resources: (8 Hours)

Natural resources and associated problems.

(a) **Forest resources:** Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

(b) **Water resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

(c) **Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

(d) **Food resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

(e) **Energy resources:** Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.

(f) **Land resources:** Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Ecosystem: (4 Hours)

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem

b. Grassland ecosystem

c. Desert ecosystem

d. Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

Unit II

Biodiversity and its conservation

4 Hours

- Introduction – Definition: Genetic, Species and Ecosystem Diversity
- Bio-geographical classification of India
- Value of biodiversity: Consumptive use, Productive use, Social, Ethical, Aesthetic and Option values
- Biodiversity at global, national and local levels
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity, global and national efforts.

Environmental Pollution

8Hours

- Definition, causes, effects and control measures of:
 - a. Air pollution
 - b. Water pollution
 - c. Soil pollution
 - d. Marine pollution
 - e. Noise pollution
 - f. Thermal pollution
 - g. Nuclear pollution
 - Solid waste management: Causes, effects and control measures of urban and industrial wastes.
 - Role of an individual in prevention of pollution
 - Pollution case studies
 - Disaster management: floods, earthquake, cyclone and landslides

Unit III

Social Issues and the Environment

7 Hours

- Population growth, variation among nations, Population explosion – Family Welfare Programmes.
- Environment and human health,
- From unsustainable to sustainable development
- Urban problems and related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation
- Consumerism and waste products
- Environmental Laws: The Environment Protection Act, 1986; The Air (Prevention and Control of Pollution) Act, 1981; The Water (Prevention and control of Pollution) Act 1974; The Wildlife Protection Act, 1972; Forest Conservation Act, 1980.
- Issues involved in enforcement of environmental legislation
- Public Awareness

Unit IV

Human Population and Environment 5 Hours

- Population Growth and Variations among Nations
- Population Explosion
- Human Rights
- Value Education
- HIV / AIDS
- Women and Child Welfare
- Role of Information Technology in Environment and Human Health
- Case Studies

Field Work

5 Hours

- Visit to a local area to document environmental assets river/ forest/ grassland/hill/mountain
- Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
- Study of common plants, insects, birds
- Study of simple ecosystems-Pond, river, hill slopes, etc (Field work equal to 5 lecture hours)

Suggested Readings:

1. Odum, E.P. *Basic Ecology*. Japan: Halt Saundurs, 1983. Print.
2. Botkin, D.B. and Kodler, E.A. *Environmental Studies: The Earth as a living planet*. New York: John Wiley and Sons Inc., 2000. Print.
3. Singh, J.S., Singh, S.P. and Gupta, S.R. *Ecology, Environment and Resource Conservation*. New Delhi: Anamaya Publishers, 2006. Print.
4. De, A.K. *Environmental Chemistry*. New Delhi: Wiley Eastern Ltd., 1990. Print.
5. Sharma, P.D. *Ecology and Environment*. Meerut: Rastogi Publications, 2004. Print.

B.Sc. Botany (Hons.) Semester II

Course Name: General Chemistry-I

Course Code: CHE157

ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS

L	T	P	Credits	Marks	Min. Marks
4	0	0	4	100	40

Section A: Inorganic Chemistry-1 (30 Periods)

Atomic Structure: Review of: Bohr's theory and its limitations, dual behaviour of matter and radiation, de-Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Need of a new approach to Atomic structure. What is Quantum mechanics? Time independent Schrodinger equation and meaning of various terms in it. Significance of ψ and ψ^2 , Schrödinger equation for hydrogen atom. Radial and angular parts of the hydrogenic wave functions (atomic orbitals) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals (Only graphical representation). Radial and angular nodes and their significance. Radial distribution functions and the concept of the most probable distance with special reference to 1s and 2s atomic orbitals. Significance of quantum numbers, orbital angular momentum and quantum numbers n , l and m . Shapes of s , p and d atomic orbitals, nodal planes. Discovery of spin, spin quantum number (s) and magnetic spin quantum number (m_s). Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals, concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations.

Chemical Bonding and Molecular Structure

Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.

Covalent bonding: VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements.

Concept of resonance and resonating structures in various inorganic and organic compounds. MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for $s-s$, $s-p$ and $p-p$ combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of $s-p$ mixing) and heteronuclear diatomic molecules such as CO, NO and NO^+ . Comparison of VB and MO approaches.

Section B: Organic Chemistry-1 (30 Periods)

Fundamentals of Organic Chemistry

Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis. Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates:

Carbocations, Carbanions and free radicals. Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Huckel's rule.

Stereochemistry

Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newman, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L *cis* – *trans* nomenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms) and E / Z Nomenclature (for upto two C=C systems).

Aliphatic Hydrocarbons

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.

Alkanes: (Upto 5 Carbons). *Preparation:* Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. *Reactions:* Free radical Substitution: Halogenation.

Alkenes: (Upto 5 Carbons) *Preparation:* Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff rule); *cis* alkenes (Partial catalytic hydrogenation) and *trans* alkenes (Birch reduction). *Reactions:* *cis*-addition (alk. $KMnO_4$) and *trans*-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis, oxymercuration-demercuration, Hydroboration-oxidation.

Alkynes: (Upto 5 Carbons) *Preparation:* Acetylene from CaC_2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal dihalides. *Reactions:* formation of metal acetylides, addition of bromine and alkaline $KMnO_4$ ozonolysis and oxidation with hot alk. $KMnO_4$

Reference Books:

- J. D. Lee: *A new Concise Inorganic Chemistry*, E L. B. S. Print.
 - F. A. Cotton & G. Wilkinson: *Basic Inorganic Chemistry*, USA: John Wiley. Print.
 - Douglas, McDaniel and Alexander: *Concepts and Models in Inorganic Chemistry*, USA: John Wiley. Print.
 - James E. H., Keiter, E. and Keiter, R. *Inorganic Chemistry: Principles of Structure and Reactivity*, Pearson Publication. Print.
 - Solomon, T.W.G. *Organic Chemistry*, USA: John Wiley and Sons. Print.
 - Sykes, P. *A Guide Book to Mechanism in Organic Chemistry*, Orient Longman. Print.
 - Eliel, E.L. *Stereochemistry of Carbon Compounds*, Tata McGraw Hill. Print.
 - Finar, I.L. *Organic Chemistry* (Vol. I & II), E. L. B. S. Print.
 - Morrison, R.T. and Boyd, R.N. *Organic Chemistry*, Prentice Hall. Print.
 - Bahl, A. and Bahl, B.S. *Advanced Organic Chemistry*, India: S. Chand. Print.
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Course Name: General Chemistry-I-Laboratory

Course Code: CHE158

L	T	P	Credits	Marks	Min. Marks
0	0	3	2	50	20

Section A: Inorganic Chemistry - Volumetric Analysis

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
2. Estimation of oxalic acid by titrating it with KMnO_4 .
3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO_4 .
4. Estimation of Fe (II) ions by titrating it with $\text{K}_2\text{Cr}_2\text{O}_7$ with internal indicator.
5. Estimation of Cu (II) ions iodometrically using $\text{Na}_2\text{S}_2\text{O}_3$.

Section B: Organic Chemistry

1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements).
2. Separation of mixtures by Chromatography: Measure the R_f value in each case (combination of two compounds to be given):
 - (a) Identify and separate the components of a given mixture of 2 amino acids (glycine, aspartic acid, glutamic acid, tyrosine or any other amino acid) by paper chromatography
 - (b) Identify and separate the sugars present in the given mixture by paper chromatography.

Paper: Bioanalytical Tools

Course Code: BTY361

L	T	P	Credits	Marks	Min. Marks
4	0	0	4	100	40

BIO-ANALYTICAL TOOLS

UNIT I

Simple microscopy, phase contrast microscopy, fluorescence and electron microscopy (TEM and SEM), pH meter, absorption and emission spectroscopy

UNIT II

Principle and law of absorption fluorimetry, colorimetry, spectrophotometry (visible, UV, infrared), centrifugation, cell fractionation techniques, isolation of sub-cellular organelles and particles.

UNIT III

Introduction to the principle of chromatography. Paper chromatography, thin layer chromatography, column chromatography: silica and gel filtration, affinity and ion exchange chromatography, gas chromatography, HPLC.

UNIT IV

Introduction to electrophoresis. Starch-gel, polyacrylamide gel (native and SDS-PAGE), agarose gel electrophoresis, pulse field gel electrophoresis, immuno-electrophoresis, isoelectric focusing, Western blotting. Introduction to Biosensors and Nanotechnology and their applications.

Paper: Bioanalytical Tools Laboratory

Course Code: BTY362

L	T	P	Credits	Marks	Min. Marks
0	0	3	2	50	20

PRACTICAL

1. Native gel electrophoresis of proteins
2. SDS-polyacrylamide slab gel electrophoresis of proteins under reducing conditions.
3. Preparation of the sub-cellular fractions of rat liver cells.
4. Preparation of protoplasts from leaves.
5. Separation of amino acids by paper chromatography.
6. To identify lipids in a given sample by TLC.
7. To verify the validity of Beer's law and determine the molar extinction coefficient of NADH.

Course Title: Principles of Genetics**Paper Code: BTY231**

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective:

This course is aimed at understanding the basic concepts of genetics at molecular level to develop analytical and quantitative skills from classical to molecular genetics.

Course Contents:**Unit I: Chromosome Theory of Inheritance (6 lectures)**

The chromosome theory of heredity, Sex chromosomes, Sex linkage, the parallel behaviour of autosomal genes and chromosomes.

Unit II: Mendelian Genetics (15 lectures)

Mendelian laws of inheritance, Monohybrid cross and the law of segregation, Dihybrid cross and law of independent assortment, Chromosome theory of inheritance, Multiple allele, lethal allele, Blood group, Rh factor, Gene interactions, Modified dihybrid ratio. Basic eukaryotic chromosome mapping, The discovery of linkage, Recombination linkage symbolism, Linkage of genes on X chromosomes, Linkage maps, Three point testcross, Interference, Calculating recombinant frequencies from selfed dihybrids, examples of linkage maps, The X2 test mitotic segregation in humans.

Unit III: Fine Structure of Genes and Chromosomes (14 lectures)

The concept of promoter, Coding sequence, Terminator, Induction of gene for expression. Structural organisation of chromatids, Centromeres, Telomeres, Chromatin, Nucleosome organisation; Euchromatin and heterochromatin; Special chromosomes (e.g., polytene and lampbrush chromosomes), Banding patterns in human chromosomes. Structural and numerical aberrations involving chromosomes; Hereditary defects - Klinefelter, Turner, Cri-du-Chat and Down syndromes. Mutations - spontaneous and induced, Chemical and physical mutagens.

Unit IV: Extrachromosomal inheritance and Molecular Genetics (10 lectures)

Coiling of shell in snails, Mitochondrial and chloroplast genetic systems, population genetics: Hardy-Weinberg equilibrium, Gene and genotypic frequencies.

Reference Books:

1. Strickberger, M.W. *Genetics*. 3rd ed. India: Prentice-Hall, 2008. Print.
2. Jones, S. *The Language of the Genes*. HarperCollins Publishers, 2012. Print.
3. Ridley, M. *Nature via Nurture: Genes, Experience, & What Makes Us Human*. HarperCollins Publishers, 2004. Print.
4. Aggarwal, V.K. and Verma, V.S. *Genetics*. 9th ed. India: S. Chand, 2010. Print.
5. Snustad, D.P. and Simmons, M.J. *Principles of Genetics*. 6th ed. USA: John Wiley & Sons, 2011. Print.
6. Pierce, B.A. *Genetics: A Conceptual Approach*. 4th ed. W.H. Freeman & Company, 2010. Print.

Course Title: Genetics Practical

Paper Code: BTY232

L	T	P	Credits	Marks
0	0	3	2	50

Experiments

- To make squash preparations of pre-treated metaphase chromosomes, and PMCs to view diplotene, diakinesis, metaphase I and anaphase I in *Phlox drummondii*, *Allium cepa* and (or) *Rhoeo discolor*
- Preparation of karyograms from the given photographs for karyotypic formula
- To study through photographs normal and deviant cytogenetic mechanisms
- Study of Mendel's laws, and deviations from Mendelian ratios using seed samples in the ratios of 9:7, 9:4:3, 13:3, 15:1, 12:3:1. Use Chi-Square Test for Testing the ratios
- Isolation of chloroplasts by sucrose gradient. Photographs of Restriction site variation of chloroplast DNA
- Exercises wrt determination of correct sequence and distance between the linked genes
- Induction and recovery of mutants in bacteria by UV irradiation
- Segregation demonstration in preserved material (Maize)
- Detection of Blood groups (A B O & Rh factors)
- Inheritance of other human characteristics, ability to test PTC, Thiourea
- Paternity disputes (blood groups)

B.Sc. Botany (Hons.) Semester III

Course Title: Human Physiology

Paper Code: ZOO257

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: To acquaint students with the functioning of all systems of the human body.

UNIT-A

- **Nutrition:** Types of nutrition and nutrients; sources and functions of nutrients and the diseases associated with their excess or lesser intake. 2 hours
- **Digestive System:** Alimentary canal; Structure and function of digestive glands; Digestion and absorption of carbohydrates, fats and proteins; Nervous and Hormonal control of Digestion 10 hours

UNIT-B

- **Respiratory System:** Ventilation; External and Internal Respiration; Transport of oxygen and carbon dioxide in blood; Factors affecting transport of gases. 6 hours
- **Circulatory System:** Composition of blood; Lymph; Blood groups; Blood coagulation; Structure of heart; co-ordination of heart beat, Cardiac cycle; ECG 10 hours
- **Excretory System:** Functional anatomy of kidney; Mechanism and regulation of urine formation. 8 hours

UNIT-C

- **Endocrine System:** Structure of pituitary, thyroid, parathyroid, pancreas, adrenal, ovaries, testes; and the diseases associated with them 7 hours
- **Reproductive System:** Spermatogenesis; Oogenesis; Physiology of male and female reproductive systems; hormonal and neuronal control 7 hours

UNIT-D

- **Nervous System:** Structure of Neuron; Propagation of nerve impulses (myelinated and non-myelinated nerve fibres); neuromuscular junctions 5 hours
- **Muscular system:** Structure of skeletal muscle, Mechanism of muscle contraction (sliding filament theory) 5 hours

Reference books

1. Guyton, A.C., Hall, J.E. *Text Book of Medical Physiology*. 12th ed. Harcourt Asia Pvt. Ltd./W.B. Saunders Company, 2011. Print.
2. Best, J.P. *Best and Taylor's physiological basis of medical practice*. 11th ed., William and Wilkins, 1985. Print.
3. Hoar, W.S. *General and comparative physiology, Adaptation and Environment*. 3rd ed. Cambridge: Cambridge University Press, 1983. Print.
4. Rhoades, R.A. and Tanner, G.A. *Medical Physiology*. 2nd ed. Lippincott Williams and Wilkins, 2003. Print.
5. Tortora, G.J. and Derrickson, B.H. *Principles of Anatomy and Physiology*. 12th ed. USA: John Wiley and Sons, Inc., 2009. Print.

Course Title: Human Physiology Laboratory

Paper Code: ZOO258

L	T	P	Credits	Marks
0	0	3	2	50

- Identification of food stuffs-starch, sucrose, glucose, proteins and fats.
- Demonstration of osmosis and diffusion.
- Demonstration of the presence of amylase enzyme in saliva. Effect of pH and temperature on enzyme action.
- Determination of coagulation and bleeding time of blood.
- Determination of blood groups of human blood samples.
- Recording of blood pressure of man.
- Enumeration of red blood corpuscles and white blood corpuscles of man.
- Estimation of haemoglobin content in blood.

B.Sc. Botany (Hons.) Semester III

Paper: Microbial Physiology

Course Code: MIC221

L	T	P	Credits	Marks	Min. Marks
4	0	0	4	100	40

Objective:

To acquaint the students about the importance of plants in our day to day life.

Learning Outcome

The course will enable students to understand how plants are important in our life and how they influence our life.

Unit I Microbial Growth and Effect of Environment on Microbial Growth Hours: 12
Definitions of growth, measurement of microbial growth, Batch culture, Continuous culture, generation time and specific growth rate, synchronous growth, diauxic growth curve. Microbial growth in response to environment -Temperature (psychrophiles, mesophiles, thermophiles, extremophiles, thermodurics, psychrotrophs), pH (acidophiles, alkaliphiles), solute and water activity (halophiles, xerophiles, osmophilic), Oxygen (aerobic, anaerobic, microaerophilic, facultative aerobe, facultative anaerobe), barophilic. Microbial growth in response to nutrition and energy – Autotroph/ Phototroph, heterotrophy, Chemolithoautotroph, Chemolithoheterotroph, Chemoheterotroph, Chemolithotroph, photolithoautotroph, Photoorganoheterotroph.

Unit 2 Nutrient uptake and Transport Hours: 10

Passive and facilitated diffusion: Primary and secondary active transport, concept of uniport, symport and antiport Group translocation Iron uptake [Strengthen this unit,,add material...convert to 4 units as whole](#)

Unit 3 Chemoheterotrophic Metabolism - Aerobic Respiration Hours: 16

Concept of aerobic respiration, anaerobic respiration and fermentation Sugar degradation pathways i.e. EMP, ED, Pentose phosphate pathway, TCA cycle Electron transport chain: components of respiratory chain, comparison of mitochondrial and bacterial ETC, electron transport phosphorylation, uncouplers and inhibitors

Unit 4 Chemoheterotrophic Metabolism- Anaerobic respiration and fermentation

Hours: 6

Anaerobic respiration with special reference to dissimilatory nitrate reduction (Denitrification; nitrate /nitrite and nitrate/ammonia respiration; fermentative nitrate reduction) Fermentation - Alcohol fermentation and Pasteur effect; Lactate fermentation (homofermentative and heterofermentative pathways), concept of linear and branched fermentation pathways

Unit 5 Chemolithotrophic and Phototrophic Metabolism Hours: 10

Introduction to aerobic and anaerobic chemolithotrophy with an example each. Hydrogen oxidation (definition and reaction) and methanogenesis (definition and reaction) Introduction to phototrophic metabolism - groups of phototrophic microorganisms, anoxygenic vs. oxygenic photosynthesis with reference to photosynthesis in green bacteria, purple bacteria and cyanobacteria

Unit 6 Nitrogen Metabolism - an overview

Hours: 6

Introduction to biological nitrogen fixation Ammonia assimilation Assimilatory nitrate reduction, dissimilatory nitrate reduction, denitrification

SUGGESTED READINGS

1. Madigan, M.T. and Martinko, J.M. *Brock Biology of Microorganisms*. 14th ed. Prentice Hall International Inc. 2014. Print.
2. Moat, A.G. and Foster, J.W. *Microbial Physiology*. 4th ed. USA: John Wiley & Sons, 2002. Print.
3. Reddy, S.R. and Reddy, S.M. *Microbial Physiology*. India: Scientific Publishers, 2005. Print.
4. Gottschalk, G. *Bacterial Metabolism*. 2nd ed. Springer Verlag, 1986. Print.
6. Stanier, R.Y., Ingrahm, J.I., Wheelis, M.L. and Painter, P.R. *General Microbiology*. 5th ed. McMillan Press, 1987. Print.
7. Willey, J.M., Sherwood, L.M. and Woolverton, C.J. *Prescott's Microbiology*. 9th ed. McGraw Hill Higher Education, 2013. Print.

Paper: Microbial Physiology Laboratory
Course Code: MIC222

L	T	P	Credits	Marks	Min. Marks
0	0	3	2	50	20

1. Study and plot the growth curve of *E. coli* by turbidometric and standard plate count methods.
2. Calculations of generation time and specific growth rate of bacteria from the graph plotted with the given data
3. Effect of temperature on growth of *E. coli*
4. Effect of pH on growth of *E. coli*
5. Effect of carbon and nitrogen sources on growth of *E.coli*
6. Effect of salt on growth of *E. coli*
7. Demonstration of alcoholic fermentation
8. Demonstration of the thermal death time and decimal reduction time of *E. coli*.

Paper: Molecular Biology**Course Code: BTY241**

L	T	P	Credits	Marks	Min. Marks
4	0	0	4	100	20

Course Objective: The aim is to extend understanding of the molecular mechanisms via which genetic information is stored, expressed and transmitted among generations.

Course Contents:**UNIT I: DNA structure and replication**

DNA as genetic material, Structure of DNA, Types of DNA, Replication of DNA in prokaryotes and eukaryotes: Semiconservative nature of DNA replication, Bi-directional replication, DNA polymerases, The replication complex: Pre-priming proteins, primosome, replisome, Rolling circle replication, Unique aspects of eukaryotic chromosome replication, Fidelity of replication.

UNIT II: DNA damage, repair and homologous recombination

DNA damage and repair: causes and types of DNA damage, mechanism of DNA repair: Photoreactivation, base excision repair, nucleotide excision repair, mismatch repair, translesion synthesis, recombinational repair, nonhomologous end joining. Homologous recombination: models and mechanism.

UNIT III: Transcription and RNA processing

RNA structure and types of RNA, Transcription in prokaryotes: Prokaryotic RNA polymerase, role of sigma factor, promoter, Initiation, elongation and termination of RNA chains. Transcription in eukaryotes: Eukaryotic RNA polymerases, transcription factors, promoters, enhancers, mechanism of transcription initiation, promoter clearance and elongation. RNA splicing and processing: processing of pre-mRNA: 5' cap formation, polyadenylation, splicing, rRNA and tRNA splicing.

UNIT IV: Regulation of gene expression and translation

Regulation of gene expression in prokaryotes: Operon concept (inducible and repressible system), Genetic code and its characteristics, Prokaryotic and eukaryotic translation: ribosome structure and assembly, Charging of tRNA, aminoacyl tRNA synthetases, Mechanism of initiation, elongation and termination of polypeptides, Fidelity of translation, Inhibitors of translation. Posttranslational modifications of proteins.

Reference Books:

1. Freshney, R. I. *Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications*. 6th ed. Wiley-Blackwell, 2010. Print.
2. Atala, A. and Lanza, R. *Methods of Tissue Engineering*. 1st ed. Academic Press, 2001. Print.
3. Harrison, M.A. and Rae, I.F. *General Techniques of Cell Culture*. 1st ed. Cambridge: Cambridge University Press, 1997. Print.
4. Masters, J.R.W. *Animal Cell Culture: A Practical Approach*. 3rd ed. Oxford University Press, 2000. Print.
5. Friefelder, D. *Molecular Biology*. 2nd ed. Narosa Book Distributors Pvt. Ltd., 2008. Print.
6. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K. and Walter, P. *Molecular Biology of the Cell*. 5th ed. Garland Science, 2007. Print.

Paper: Molecular Biology Laboratory
Course Code: BTY242

L	T	P	Credits	Marks	Min. Marks
0	0	3	2	50	20

Experiments

- Isolation of DNA from animal and plant tissue using classical methods
- Isolation of RNA from animal and plant tissue using classical methods
- Isolation of plasmid DNA from *E. coli* using boiling-prep and alkali lysis method
- Restriction fragment length polymorphism
- Agarose gel electrophoresis
- Polyacrylamide gel electrophoresis
- Elution of nucleic acids from agarose gel
- Primer Designing
- Polymerase Chain Reaction

B.Sc. Botany (Hons.) Semester IV

Course Name: General Chemistry-II

Course Code: CHE257

L	T	P	Credits	Marks	Min. Marks
4	0	0	4	100	40

CHEMICAL ENERGETICS, EQUILIBRIA & FUNCTIONAL ORGANIC CHEMISTRY-I

Section A: Physical Chemistry-1 (30 Lectures)

Chemical Energetics

Review of thermodynamics and the Laws of Thermodynamics. Important principles and definitions of thermochemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution. Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data. Variation of enthalpy of a reaction with temperature – Kirchhoff's equation. Statement of Third Law of thermodynamics and calculation of absolute entropies of substances.

Chemical Equilibrium:

Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium. Distinction between ΔG and ΔG° , Le Chatelier's principle. Relationships between K_p , K_c and K_x for reactions involving ideal gases.

Ionic Equilibria:

Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. Salt hydrolysis – calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.

Section B: Organic Chemistry-2 (30 Lectures)

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.

Aromatic hydrocarbons

Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzenesulphonic acid.

Reactions: (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) (upto 4 carbons on benzene). Side chain oxidation of alkyl benzenes (upto 4 carbons on benzene).

Alkyl and Aryl Halides

Alkyl Halides (Upto 5 Carbons) Types of Nucleophilic Substitution reactions.

Preparation: from alkenes and alcohols.

Reactions: hydrolysis, nitrite & nitro formation, nitrile & isonitrile formation. Williamson's ether synthesis: Elimination vs substitution.

Aryl Halides *Preparation*: (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer & Gattermann reactions.

Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: KNH_2/NH_3 or NaNH_2 .
Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and arylhalides.

Alcohols: *Preparation:* Preparation of primary, secondary and tertiary alcohols: using Grignard reagent, Esterhydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters.

Reactions: With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. KMnO_4 , acidic dichromate, conc. HNO_3). Oppeneauer oxidation *Diols:* (Upto 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement.

Phenols: (Phenol case) *Preparation:* Cumene hydroperoxide method, from diazonium salts.

Reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer-Tiemann Reaction, Gattermann-Koch Reaction, Houben–Hoesch Condensation, Schotten –Baumann reaction.

Ethers (aliphatic and aromatic): Cleavage of ethers with HI.

Aldehydes and ketones (aliphatic and aromatic): (Formaldehyde, acetaldehyde, acetone and benzaldehyde)

Preparation: from acid chlorides and from nitriles.

Reactions – Reaction with HCN, ROH, NaHSO_3 , NH-G derivatives. Iodoform test. Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation. Clemmensen reduction and Wolff Kishner reduction. Meerwein-Ponndorf Verley reduction.

Reference Books:

- T. W. Graham Solomons: *Organic Chemistry*. John Wiley and Sons. Print.
 - Sykes, P. *A Guide Book to Mechanism in Organic Chemistry*, Orient Longman. Print.
 - Finar, I.L. *Organic Chemistry* (Vol. I & II), E. L. B. S. Print.
 - Morrison, R.T. and Boyd, R.N. *Organic Chemistry*. Prentice Hall. Print.
 - Bahl, A. and Bahl, B.S. *Advanced Organic Chemistry. India:* S. Chand. Print.
 - Barrow, G.M. *Physical Chemistry*. Tata McGraw-Hill, 2007. Print.
 - Castellan, G.W. *Physical Chemistry* 4th ed. Narosa, 2004. Print.
 - Kotz, J.C., Treichel, P.M. and Townsend, J.R. *General Chemistry*. India: Cengage Learning India Pvt. Ltd., 2009. Print.
 - Mahan, B.H. *University Chemistry*. 3rd ed. Narosa, 1998. Print.
 - Petrucci, R.H. *General Chemistry* 5th ed. New York: Macmillan Publishing Co., 1985. Print.
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Course Name: General Chemistry-II-Lab

Course Code: CHE258

L	T	P	Credits	Marks	Min. Marks
0	0	3	2	50	20

Section A: Physical Chemistry

Thermochemistry

1. Determination of heat capacity of calorimeter for different volumes.
2. Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.
3. Determination of enthalpy of ionization of acetic acid.
4. Determination of integral enthalpy of solution of salts (KNO_3 , NH_4Cl).
5. Determination of enthalpy of hydration of copper sulphate.
6. Study of the solubility of benzoic acid in water and determination of ΔH .

Ionic equilibria

pH measurements

- a) Measurement of pH of different solutions like aerated drinks, fruit juices, shampoos and soaps (use dilute solutions of soaps and shampoos to prevent damage to the glass electrode) using pH-meter.
- b) Preparation of buffer solutions:
 - (i) Sodium acetate-acetic acid
 - (ii) Ammonium chloride-ammonium hydroxideMeasurement of the pH of buffer solutions and comparison of the values with theoretical values.

Section B: Organic Chemistry

1. Purification of organic compounds by crystallization (from water and alcohol) and distillation.
2. Criteria of Purity: Determination of melting and boiling points.
3. Preparations: Mechanism of various reactions involved to be discussed. Recrystallization, determination of melting point and calculation of quantitative yields to be done.
 - (a) Bromination of Phenol/Aniline
 - (b) Benzoylation of amines/phenols
 - (c) Oxime and 2,4 dinitrophenylhydrazone of aldehyde/ketone

Reference Books

- Vogel, A.I. *Textbook of Practical Organic Chemistry*. 5th ed. Prentice-Hall. Print.
- Mann, F.G. and Saunders, B.C. *Practical Organic Chemistry*. Orient Longman, 1960. Print.
- Khosla, B.D. *Senior Practical Physical Chemistry*. R. Chand & Co. Print.

Paper: Biotechnology and Human Welfare

Course Code: BTY243

L	T	P	Credits	Marks	Min. Marks
4	0	0	4	100	40

UNIT I

Industry: protein engineering; enzyme and polysaccharide synthesis, activity and secretion, alcohol and antibiotic formation.

UNIT II

Agriculture: N₂ fixation: transfer of pest resistance genes to plants; interaction between plants and microbes; qualitative improvement of livestock.

UNIT III

Environments: e.g. chlorinated and non-chlorinated organ pollutant degradation; degradation of hydrocarbons and agricultural wastes, stress management, development of biodegradable polymers such as PHB.

UNIT IV

Forensic science: e.g. solving violent crimes such as murder and rape; solving claims of paternity and theft etc. using various methods of DNA finger printing.

UNIT V

Health: e.g. development of non-toxic therapeutic agents, recombinant live vaccines, gene therapy, diagnostics, monoclonal in *E.coli*, human genome project.

Paper: Biotechnology and Human Welfare Laboratory

Course Code: BTY244

L	T	P	Credits	Marks	Min. Marks
0	0	3	2	50	40

PRACTICALS

1. Perform of ethanolic fermentaion using Baker's yeast
2. Study of a plant part infected with a microbe
3. To perform quantitative estimation of residual chlorine in water samples
4. Isolation and analysis of DNA from minimal available biological samples
5. Case studies on Bioethics (any two)