FACULTY OF LIFE SCIENCES

SYLLABUS

FOR

B.Sc. (Hons.) Botany (Credit Based Evaluation & Grading System) (Semester : I-IV)

Examinations: 2019-20



GURU NANAK DEV UNIVERSITY AMRITSAR

- Note: (i) Copy rights are reserved. Nobody is allowed to print it in any form. Defaulters will be prosecuted.
 - (ii) Subject to change in the syllabi at any time. Please visit the University website time to time.

B.Sc. (HONS.) BOTANY (SEMESTER SYSTEM) (CREDIT BASED EVALUATION & GRADING SYSTEM)

Semester- I

Course No.	Core / Elective	Course Opted	Course Title	L	Т	Р	Total
BSL 101	C	Core Course - I	Algae and Microbiology	3	1	0	4
BSL 102	С	Core Course - II	Biomolecules and Cell Biology	3	1	0	4
BSP121	C	Core Course - I & II (Practical)	Botany Lab I (Based on BSL101 and BSL102)	0	0	3	3
CYL 191	Е	Generic Elective-I	Organic Chemistry	3	1	0	4
CYP 193	E	(Practical)	Organic Chemistry Lab	0	0	3	3
ENL 101	E	Ability Enhancement Compulsory Course - I	Communicative English-I	2	0	0	2
PBL 121/ PBL 122/ HSL-101	E	Ability Enhancement Compulsory Course-II	Punjabi Compulsory OR *ਮੁੱਢਲੀ ਪੰਜਾਬੀ OR **Punjab History & Culture	2	0	0	2
*SOA 101	E	Ability Enhancement Compulsory Course-III	***Drug Abuse : Problem, Management and Prevention (Compulsory ID Course)	3	0	0	3
			Total Credits	16	3	6	25

Note:

1. *Special Paper in lieu of Punjabi Compulsory.

2. **For those students who are not domicile of Punjab.

3. ***Student can opt this Paper whether in 1st or 2nd Semester.

B.Sc. (HONS.) BOTANY (SEMESTER SYSTEM) (CREDIT BASED EVALUATION & GRADING SYSTEM)

Semester- II

Course No.	Core / Elective	Course Opted	Course Title	L	Т	Р	Total
BSL151	C	Core Course - III	Mycology and Phytopathology	3	1	0	4
BSL152	С	Core Course - IV	Archegoniates	3	1	0	4
BSP171	С	Core Course - III & IV (Practical)	Botany Lab II (Based on BSL151 and BSL152)	0	0	3	3
CYL 192	C	Generic Elective-II	Inorganic Chemistry	3	1	0	4
CYP 192	E	Generic Elective- (Practical based on CYL192)	Inorganic Chemistry Lab	0	0	3	3
ENL 151	E	Ability Enhancement Compulsory Course - IV	Communicative English-II	2	0	0	2
PBL 131/ PBL 132/ HSL-102	Е	Ability Enhancement Compulsory Course- V	Punjabi Compulsory OR *ਮੁੱਢਲੀ ਪੰਜਾਬੀ OR **Punjab History & Culture	2	0	0	2
SOA-101	E	Ability Enhancement Compulsory Course-V	***Drug Abuse : Problem, Management and Prevention (Compulsory ID Course)	3	0	0	3
Interdisciplinary/ Optional Courses							
	Ι	To be offered from outside	the department	4	-	-	4
			Total Credits	17	3	6	26

Note-1:

1. *Special Paper in lieu of Punjabi Compulsory.

2. **For those students who are not domicile of Punjab.

3. ***Student can opt this Paper whether in 1st or 2nd Semester.

Note-2: PSL-053 ID Course Human Rights & Constitutional Duties (Compulsory ID Course). Students can opt. this paper in any semester except the 1st Semester. This ID Course is one of the total ID Courses of this course.

B.Sc. (HONS.) BOTANY (SEMESTER-I) (CREDIT BASED EVALUATION & GRADING SYSTEM)

Semester- III

Course No.	Core / Elective	Course Opted	Course Title	L	Т	Р	Total
BSL 201	С	Core Course - V	Morphology and Anatomy	3	1	0	4
BSL 202	С	Core Course - VI	Economic Botany	3	1	0	4
BSL 203	C	Core Course -VII	Genetics	3	1	0	4
BSP221	С	Core Course -V,VI & VII (Practical)	Botany Lab III (Based on BSL201, BSL202 and BSL203)	0	0	3.5	3.5
ZOL 102	E	Generic Elective-III	Biology of Non Chordates	3	1	0	4
ZOP 102	E	Generic Elective (Practical based on ZOL102)	Zoology Lab I	0	0	1.5	1.5
*ESL 220	E	Ability Enhancement Compulsory Course - VII	Environmental Studies (Compulsory)	4	0	0	
	E	Skill Enhancement Course-I	To be chosen from the Elective Courses List	2	0	0	2
	ι .		Total Credits	14	4	5	23

*Note : Credits will not be included in the total.

B.Sc. (HONS.) BOTANY (SEMESTER-I) (CREDIT BASED EVALUATION & GRADING SYSTEM)

Semester- IV

Course	Core /	Course Opted	Course Title	L	Т	P	Total
No.	Elective						
BSL251	С	Core Course - VIII	Molecular Biology	3	1	0	4
BSL252	С	Core Course - IX	Plant Ecology and	3	1	0	4
			Phytogeography				
BSL253	С	Core Course - X	Plant Systematics	3	1	0	4
BSP 271	С	Core Course - VIII, IX &	Botany Lab IV	0	0	3.5	3.5
		X	(Based on BSL251,				
		(Practical)	BSL252 and BSL253)				
ZOL 152	Е	Generic Elective-IV	Biology of Chordates	3	1	0	4
ZOP 152	Е	Generic Elective	Zoology Lab-II	0	0	1.5	1.5
		(Practical Based on					
		ZOL152)					
CYL 291	E	Generic Elective-V	Physical Chemistry	3	1	0	4
CYP 292	E	Generic Elective	Physical Chemistry	0	0	1	1
		(Practical based on	Lab				
		CYL291)					
	E	Skill Enhancement	To be chosen from the	2	0	0	2
		Course-II	Elective Courses List				
Total Credits				17	5	6	28

List of electives (Skill Enhancement Courses)

BSL261 Biofertilizers

BSL262 Herbal Technology

BSL263 Nursery and Gardening

BSL264 Floriculture

BSL265 Medicinal Botany

BSL266 Plant Diversity and Human Welfare

BSL267 Ethnobotany

BSL268 Mushroom Culture Technology

BSL269 Intellectual Property Rights

Core Course – I: BSL101 Algae and Microbiology THEORY

Credits: 3-1-0

Time: 3 Hours

Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

SECTION-A

1.Introduction to microbial world

Microbial nutrition, growth and metabolism. Economic importance of viruses with reference to vaccine production, role in research, medicine and diagnostics, as causal organisms of plant diseases. Economic importance of bacteria with reference to their role in agriculture and industry (fermentation and medicine).

2. Viruses

Discovery, physiochemical and biological characteristics; classification (Baltimore), general structure with special reference to viroids and prions; replication (general account), DNA virus (T-phage), lytic and lysogenic cycle; RNA virus (TMV).

SECTION-B

3. Bacteria

Discovery, general characteristics; Types-archaebacteria, eubacteria, wall-less forms (mycoplasma and spheroplasts); Cell structure; Nutritional types; Reproduction-vegetative, asexual and recombination (conjugation, transformation and transduction).

4. 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; criteria, system of Fritsch, and evolutionary classification of Lee (only upto groups); Significant contributions of important phycologists (F.E. Fritsch, G.M. Smith, R.N. Singh, T.V. Desikachary, H.D. Kumar, M.O.P. Iyengar). Role of algae in the environment, agriculture, biotechnology and industry.

B.Sc. (HONS.) BOTANY (SEMESTER-I) (CREDIT BASED EVALUATION & GRADING SYSTEM)

SECTION-C

5. Cyanophyta and Xanthophyta

Ecology and occurrence; Range of thallus organization; Cell structure; Reproduction, Morphology and life-cycle of *Nostoc* and *Vaucheria*.

6. Chlorophyta and Charophyta

General characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction.

Morphology and life-cycles of *Chlamydomonas, Volvox, Oedogonium, Coleochaete, Chara.* Evolutionary significance of *Prochloron.*

SECTION-D

7. Phaeophyta and Rhodophyta

Characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of *Ectocarpus*, *Fucus* and *Polysiphonia*.

Practical

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, Coleochaete, Chara, Vaucheria, Ectocarpus, Fucus and Polysiphonia, Procholoron* through electron micrographs, temporary preparations and permanent slides.

Suggested Readings

- 1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.
- 2. Wiley JM, Sherwood LM and Woolverton CJ. (2013) Prescott's Microbiology. 9th Edition. McGraw Hill International.
- 3. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi.
- 4. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.
- Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A. Minorsky P.V., Jackson R.B. (2008). Biology, Pearson Benjamin Cummings, USA. 8th edition.
- 6. Pelczar, M.J. (2001) Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.

B.Sc. (HONS.) BOTANY (SEMESTER-I) (CREDIT BASED EVALUATION & GRADING SYSTEM)

Core Course – II: BSL102 Biomolecules and Cell Biology THEORY

Credits: 3-1-0

Time: 3 Hours

Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

SECTION-A

1. 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.

Proteins: Structure of amino acids; Levels of protein structure-primary, secondary, tertiary and quarternary; 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.

SECTION-B

2. Bioenergenetics

Laws of thermodynamics, concept of free energy, endergonic and exergonic reactions, coupled reactions, redox reactions. ATP: structure, its role as a energy currency molecule.

3. 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 theroy), Michaelis – Menten equation, enzyme inhibition and factors affecting enzyme activity.

B.Sc. (HONS.) BOTANY (SEMESTER-I) (CREDIT BASED EVALUATION & GRADING SYSTEM)

SECTION-C

4. The cell

Cell as a unit of structure and function; Characteristics of prokaryotic and eukaryotic cells; Origin of eukaryotic cell (Endosymbiotic theory).

5. 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.

SECTION-D

6. Cell organelles

Nucleus: Structure-nuclear envelope, nuclear pore complex, nuclear lamina, molecular organization of chromatin; nucleolus.

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, targeting and insertion of proteins in the ER, protein folding, processing; Smooth ER and lipid synthesis, export of proteins and lipids; Golgi Apparatus – organization, protein glycosylation, protein sorting and export from Golgi Apparatus; Lysosomes

7. Cell division

Phases of eukaryotic cell cycle, mitosis and meiosis; Regulation of cell cycle- checkpoints, role of protein kinases.

Suggested Readings

- 1. Campbell, MK (2012) Biochemistry, 7th ed., Published by Cengage Learning
- 2. Campbell, PN and Smith AD (2011) Biochemistry Illustrated, 4th ed., Published by Churchill Livingstone
- 3. Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd ed., W.H.Freeman
- 4. Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H.Freeman and Company
- 5. Nelson DL and Cox MM (2008) Lehninger Principles of Biochemistry, 5th Edition., W.H. Freeman and Company.
- 6. Karp, G. (2010). Cell Biology, John Wiley & Sons, U.S.A. 6th edition.
- 7. Hardin, J., Becker, G., Skliensmith, L.J. (2012). Becker's World of the Cell, Pearson Education Inc. U.S.A. 8th edition.
- 8. Cooper, G.M. and Hausman, R.E. (2009) The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
- 9. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009) The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco

Practical

- 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.

BSP121 : BOTANY LAB-I (BASED ON BSL101 & BSL 102)

CYL-191 : ORGANIC CHEMISTRY

Credits: 3-1-0

Time: 3 Hours

Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

Section-A

Chemistry Alkanes ,Alkenes and Alkynes: Conformations of alkanes and cycloalkanes: conformational analysis of ethane, butane, cyclohexane, monosubstituted and disubstituted cyclohexane, conformation of small, medium and large ring cycloalkanes and of polycyclic ring systems. Dehydration of alcohols and regioselectivity of these reactions. Acid catalysed dehydration of alcohols with complete mechanistic discussion. Mechanism of dehydrohalogenation of alkythalides (E mechanism), stereoselective and antielimination in E reactions, the E Mechanism, electrophilic addition of hydrogen halides to alkenes its regioselectivity explained on the basis of mechanism, free radical addition of hydrogen bromide to alkenes, acid catalysed hydration of alkene with mechanism stereochemistry of halogen addition to alkenes and its mechanistic explanation. Hypohalous acid addition to alkenes, epoxidation of alkenes. Acidity of acetylene and terminal alkenes, metal ammonia reduction of alkyne, addition of hydrogen halides and water to alkynes, with detailed discussion of mechanism of these reactions, the diels Alder reaction, orbital symmetry and the diels Adler reaction.

Section-B

Stereochemistry: Molecular chirality, enantiomers/symmetry in archiaral structures, chiral centres in chiral molecules, properties of chiral molecules –optical activity, absolute and relative configuration, the Cahn-Ingold Perlog R-S notional system physical properties of enantiomers. Stereochemistry of chemical reactions that produce chiral centres, chemical reactions that produce stereoisomers, Resolution of enantiomers, chiral centres other than carbon. Stereochemistry of alkenes, naming stereo isometric alkenes by the E-Z system, mechanism of hydrogenation of alkenes. Stereochemistry of hydrogenation of cycloalkenes, stereochemistry of halogen addition to alkenes and its mechanistic explanation.

Section-C

Nucleophilis Substitution and Addition Reaction: (a) Functional group transformation by nucleophilic substitution, the biomolecular (SN), mechanism of nucleophilic substitution, stereochemistry of SN reactions, how SN reactions occur, steric effect in SN reaction, nucleophilics and nucleophilicity, the unimolecular (SN) mechanism of nucleophilic substitution, carbocation stability and the rate of substitution, by the SN mechanism stereochemistry of SN reactions, carbocation real arrangements in SN reactions, solvent effect, substitution and elimination as competing reactions.

(b) Principles of nucleophilic addition to carbonyl groups: Hydration acetal formation, cyanohydrins formation; reactions with primary and secondary amines, Witting reaction, steroselective addition to carbonyl groups mechanism of halogenations, acid and base catalysed cholization, haloform reaction, aldol condensation, conjugate nucleophillic addition to unsaturated carbonyl compounds.

Section-D

Spectroscopy: Principles of molecular spectroscopy, electromagnetic radiation, quantized energy states, NMR (H) Spectroscopy, nuclear shielding and chemical shift measurements, chemical shift and molecular structure, interpreting proton NMR spectra, spin- spin splitting in NMR and conformations carbons- 13 nuclear magnetic resonance, the sensitivity problem, interpretation of spectra. Infrared spectroscopy, ultraviolet visible (UV-VIS) spectroscopy and mass spectrometry.

Reference Books:

- 1. R.T. Morison and R.N Boyd, Organic Chemistry.
- 2. I.L. Finar, Organic Chemistry, Vol. I IV ed.
- 3. Advanced Organic Chemistry, Reactions Mechanism and Structure by J. March.
- 4. Schaum's Outlines Series Theory and Problems of Organic Chemistry.
- 5. Problems and their solution in Organic Chemistry by I.L. Finar, Modern Organic Chemistry by J.D. Robbert and M.C. Caserio.
- 6. Organic Chemistry by D.J. Cram and G.S. Hammond.
- 7. J.E. Banks, Naming Organic Compounds Programmed Introduction to Organic Chemistry.
- 8. E.L. Eliel, Stereochemistry of carbon compounds.
- 9. W. Camp, Organic Spectroscopy
- 10. F.A. Carey, Organic Chemistry.

CYP-193 : ORGANIC CHEMISTRY LAB (Practical)

Credits: 0-0-3

The preliminary examination of physical and chemical characteristics (Physical state, color, odor and ignition tests), elemental analysis (nitrogen, sulphur, chlorine, bromine, iodine), solubility tests including acid-base reactions, classification tests involving functional reactivity other than acid-base test, preparation of derivatives for given pure organic compounds.

The following categories of compounds should be analyzed

- -phenols, carboxylic acids
- -carbonyl compounds- ketones aldehydes
- -carbohydrates

-aromatic amines

-amides, ureas and anilides

-aromatic hydrocarbons and their halo-derivatives.

Suggested Book

1. Practical Organic Chemistry by F.G. Mann and B.C. Saunders.

B.Sc. (HONS.) BOTANY (SEMESTER-I) (CREDIT BASED EVALUATION & GRADING SYSTEM)

ENL-101 : COMMUNICATIVE ENGLISH-I

Credits: 02 (L= 2, T=0, U=0) Total Marks-50

Time: 3 Hours

Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

Objective: To introduce students to the skills and strategies of reading and writing by identifying organizational patterns, spotting classification systems and understanding associations between ideas. This course will prepare students to read a variety of texts and also to communicate more effectively through writing. The course will also pay special attention to vocabulary building.

Prescribed Text books:

- The Written Word by Vandana R. Singh, Oxford University Press, New Delhi.
- *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Second Edition.

Section-A

"Word List", "Correct Usage of Commonly used words and Phrases" from the chapter "Vocabulary" given in *The Written Word* by Vandana R. Singh.

Section-B

Letter- writing as prescribed in *The Written Word* by Vandana R. Singh. Report writing as prescribed in *The Written Word* by Vandana R. Singh.

Section-C

Section 1 from *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Second Edition.

Section-D

Section 2 from *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Second Edition.

B.Sc. (HONS.) BOTANY (SEMESTER-I) (CREDIT BASED EVALUATION & GRADING SYSTEM)

PBL 121 : ਪੰਜਾਬੀ ਲਾਜ਼ਮੀ - I (Credit Based)

Credit : 2-0-0

Time: 3 Hours

Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

- 1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
- 2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
- 3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
- 4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਸੈਕਸ਼ਨ–ਏ

- I. **ਦੋ ਰੰਗ** (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)
 - ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿਚੋਂ ਹੇਠ ਲਿਖੇ ਕਵੀ :
 - (ਓ) ਭਾਈ ਵੀਰ ਸਿੰਘ
 - (ਅ) ਧਨੀ ਰਾਮ ਚਾਤਿਕ
 - (ੲ) ਪ੍ਰੋ. ਪੂਰਨ ਸਿੰਘ

(ਕਵੀ ਦਾ ਜੀਵਨ, ਕਵਿਤਾ-ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਾਵਿ-ਕਲਾ)

II. ਗੁਰਮੁਖੀ ਔਰਥੋਗਰਾਫੀ ਦੀ ਜੁਗਤ (ਪੈਂਤੀ, ਮੁਹਾਰਨੀ, ਬਿੰਦੀ, ਟਿੱਪੀ ਤੇ ਅੱਧਕ); ਵਿਸ਼ਰਾਮ ਚਿੰਨ੍ਹ, ਸ਼ਬਦ ਜੋੜ (ਸ਼ੁਧ-ਅਸ਼ੁਧ)

ਸੈਕਸ਼ਨ–ਬੀ

- **ਦੋ ਰੰਗ** (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ) ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿਚੋਂ ਹੇਠ ਲਿਖੇ ਕਵੀ :
 - (ੳ) ਫਿਰੋਜ਼ਦੀਨ ਸ਼ਰਫ
 - (ਅ) ਪ੍ਰੋ. ਮੋਹਨ ਸਿੰਘ (ਕਵੀ ਦਾ ਜੀਵਨ, ਕਵਿਤਾ-ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਾਵਿ-ਕਲਾ)
- II. ਲੇਖ ਰਚਨਾ (ਜੀਵਨੀ-ਪਰਕ, ਸਮਾਜਕ ਅਤੇ ਚਲੰਤ ਵਿਸ਼ਿਆਂ ਉੱਤੇ) : 10 ਲੇਖ ਲਿਖਵਾਉਣੇ (ਕਲਾਸ ਵਿਚ ਅਤੇ ਘਰ ਲਈ ਅਭਿਆਸ)

B.Sc. (HONS.) BOTANY (SEMESTER-I) (CREDIT BASED EVALUATION & GRADING SYSTEM)

ਸੈਕਸ਼ਨ–ਸੀ

- **ਦੋ ਰੰਗ** (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ) ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿਚੋਂ ਹੇਠ ਲਿਖੇ ਕਵੀ :
 - (ੳ) ਨੰਦ ਲਾਲ ਨੂਰਪੁਰੀ
 - (ਅ) ਅਮ੍ਰਿਤਾ ਪ੍ਰੀਤਸ
 - (ੲ) ਡਾ. ਹਰਿਭੇਜਨ ਸਿੰਘ
 - , (ਕਵੀ ਦਾ ਜੀਵਨ, ਕਵਿਤਾ-ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਾਵਿ-ਕਲਾ)
- II. ਸ਼ੁੱਧ, ਅਸ਼ੁੱਧ : ਦਿੱਤੇ ਪੈਰ੍ਹੇ ਵਿਚੋਂ ਅਸ਼ੁੱਧ ਸ਼ਬਦਾਂ ਨੂੰ ਸ਼ੁੱਧ ਕਰਨਾ (15 ਪੈਰ੍ਹਿਆਂ ਦੇ ਸ਼ੱਧ ਅਸ਼ੱਧ ਅਭਿਆਸ ਕਰਵਾਉਣੇ)

ਸੈਕਸ਼ਨ-ਡੀ

- I. ਦੋ ਰੰਗ (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ) ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿਚੋਂ ਹੇਠ ਲਿਖੇ ਕਵੀ :
 - (ੳ) ਸ਼ਿਵ ਕੁਮਾਰ ਬਟਾਲਵੀ
 - (ਅ) ਸੁਰਜੀਤ ਪਾਤਰ

(ਕਵੀ ਦਾ ਜੀਵਨ, ਕਵਿਤਾ-ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਾਵਿ-ਕਲਾ)

II. ਅਖ਼ਬਾਰੀ ਇਸ਼ਤਿਹਾਰ : ਨਿੱਜੀ, ਦਫ਼ਤਰੀ ਤੇ ਸਮਾਜਕ ਗਤੀਵਿਧੀਆਂ ਨਾਲ ਸੰਬੰਧਤ

PBL-122: ਮੁੱਢਲੀ ਪੰਜਾਬੀ (In lieu of Punjabi Compulsory)

Time: 3 Hours

Credits: 2-0-0 Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

- 1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
- ਵਿੰਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿਚੇਂ ਇਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ।
- ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
- ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
- 4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਪਾਠ–ਕ੍ਰਮ

ਸੈਕਸ਼ਨ–ਏ

ਪੈਂਤੀ ਅੱਖਰੀ, ਅੱਖਰ ਕ੍ਰਮ, ਮਾਤ੍ਰਾਵਾਂ (ਮੁਢਲੀ ਜਾਣ-ਪਛਾਣ) ਲਗਾਖਰ (ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ) : ਪਛਾਣ ਤੇ ਵਰਤੋਂ

ਸੈਕਸ਼ਨ-ਬੀ

ਪੰਜਾਬੀ ਸ਼ਬਦ ਬਣਤਰ : ਮੁੱਢਲੀ ਜਾਣ-ਪਛਾਣ ਸਾਧਾਰਨ ਸ਼ਬਦ, ਸੰਯੁਕਤ ਸ਼ਬਦ, ਮਿਸ਼ਰਤ ਸ਼ਬਦ ਮੁਲ ਸ਼ਬਦ, ਅਗੇਤਰ ਅਤੇ ਪਿਛੇਤਰ

ਸੈਕਸ਼ਨ-ਸੀ

ਸ਼ੁੱਧ ਅਸ਼ੁੱਧ : ਦਿੱਤੇ ਪੈਰ੍ਹੇ ਵਿਚੋਂ ਅਸ਼ੁੱਧ ਸ਼ਬਦ ਨੂੰ ਸ਼ੁੱਧ ਕਰਨਾ। ਸਮਾਨਾਰਥਕ ਤੇ ਵਿਰੋਧਾਰਥਕ ਸ਼ਬਦ

ਸੈਕਸ਼ਨ–ਡੀ

ਹਫਤੇ ਦੇ ਸੱਤ ਦਿਨਾਂ ਦੇ ਨਾਂ, ਬਾਰ੍ਹਾਂ ਮਹੀਨਿਆਂ ਦੇ ਨਾਂ, ਰੁੱਤਾਂ ਦੇ ਨਾਮ, ਇਕ ਤੋਂ ਸੌ ਤੱਕ ਗਿਣਤੀ ਸ਼ਬਦਾਂ ਵਿੱਚ।

B.Sc. (HONS.) BOTANY (SEMESTER-I) (CREDIT BASED EVALUATION & GRADING SYSTEM)

HSL-101 : Punjab History & Culture (1450-1716) (Special paper in lieu of Punjabi Compulsory) (For those students who are not domicile of Punjab)

Credits: 2-0-0

Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

Section-A

- 1. Land and the People.
- 2. Bhakti Movement

Section-B

- 3. Life and Teaching of Guru Nanak Dev.
- 4. Contribution of Guru Angad Dev, Guru Arjun Dev, Guru Amar Das and Guru Ram Das.

Section-C

- 5. Guru Hargobind.
- 6. Martyrdom of Guru Teg Bahadur

Section-D

- 7. Guru Gobind Singh and the Khalsa.
- 8. Banda Singh Bahadur: Conquests and Execution.

Suggested Reading

- 1. Kirpal Singh(ed.), *History and Culture of the Punjab, Part-ii, Punjabi University*, Patiala, 1990.
- 2. Fauja Singh (ed.), History of Punjab, Vol, III Punjabi University, Patiala, 1987.
- 3. J.S. Grewal, The Sikhs of the Punjab, Cup, Cambridge, 1991.
- 4. Khushwant Singh, A History of the Sikhs, Vol. I, OUP, New Delhi, 1990

Time: 3 Hours

B.Sc. (HONS.) BOTANY (SEMESTER-I) (CREDIT BASED EVALUATION & GRADING SYSTEM)

SOA-101 : DRUG ABUSE: PROBLEM, MANAGEMENT AND PREVENTION (COMPULSORY ID COURSE) (Student can opt. this paper whether in 1st or 2nd semester)

PROBLEM OF DRUG ABUSE

Credit 3-0-0

Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

Section – A

Meaning of Drug Abuse:

- 1) Meaning, Nature and Extent of Drug Abuse in India and Punjab.
- 2) Consequences of Drug Abuse for:

1		6
Individual	:	Education, Employment, Income
Family	:	Violence.
Society	:	Crime.
Nation	:	Law and Order problem.
		Section – B

Management of Drug Abuse:

- (i) Medical Management: Medication for treatment and to reduce withdrawal effects.
- (ii) Psychiatric Management: Counselling, Behavioural and Cognitive therapy.
- (iii) Social Management: Family, Group therapy and Environmental Intervention.

Section – C

Prevention of Drug abuse:

- (i) Role of family: Parent child relationship, Family support, Supervision, Shaping values, Active Scrutiny.
- (ii) School: Counselling, Teacher as role-model. Parent-teacher-Health Professional Coordination, Random testing on students.

Time: 3 Hours

B.Sc. (HONS.) BOTANY (SEMESTER-I) (CREDIT BASED EVALUATION & GRADING SYSTEM)

Section – D

Controlling Drug Abuse:

- (i) Media: Restraint on advertisements of drugs, advertisements on bad effects of drugs, Publicity and media, Campaigns against drug abuse, Educational and awareness program
- (ii) Legislation: NDPs act, Statutory warnings, Policing of Borders, Checking Supply/Smuggling of Drugs, Strict enforcement of laws, Time bound trials.

References:

- 1. Ahuja, Ram (2003), Social Problems in India, Rawat Publication, Jaipur.
- 2. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
- 3. Inciardi, J.A. 1981. The Drug Crime Connection. Beverly Hills: Sage Publications.
- 4. Kapoor. T. (1985) Drug epidemic among Indian Youth, New Delhi: Mittal Pub.
- 5. Kessel, Neil and Henry Walton. 1982, Alcohalism. Harmond Worth: Penguin Books.
- 6. Modi, Ishwar and Modi, Shalini (1997) *Drugs: Addiction and Prevention*, Jaipur: Rawat Publication.
- 7. National Household Survey of Alcohol and Drug abuse. (2003) New Delhi, Clinical Epidemiological Unit, All India Institute of Medical Sciences, 2004.
- 8. Ross Coomber and Others. 2013, *Key Concept in Drugs and Society*. New Delhi: Sage Publications.
- 9. Sain, Bhim 1991, *Drug Addiction Alcoholism*, Smoking obscenity New Delhi: Mittal Publications.
- 10. Sandhu, Ranvinder Singh, 2009, *Drug Addiction in Punjab*: A Sociological Study. Amritsar: Guru Nanak Dev University.
- 11. Singh, Chandra Paul 2000. Alcohol and Dependence among Industrial Workers: Delhi: Shipra.
- 12. Sussman, S and Ames, S.L. (2008). *Drug Abuse: Concepts, Prevention and Cessation,* Cambridge University Press.
- 13. Verma, P.S. 2017, "*Punjab's Drug Problem: Contours and Characterstics*", Economic and Political Weekly, Vol. LII, No. 3, P.P. 40-43.
- 14. World Drug Report 2016, United Nations office of Drug and Crime.
- 15. World Drug Report 2017, United Nations office of Drug and Crime.

B.Sc. (HONS.) BOTANY (SEMESTER-II) (CREDIT BASED EVALUATION & GRADING SYSTEM)

Core Course III: BSL151 Mycology and Phytopathology THEORY

Credits: 3-1-0

Time: 3 Hours

Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

SECTION-A

1. Introduction to true fungi

General characteristics; Affinities with plants and animals; Thallus organization; Cell wall composition; Nutrition; Classification.

2. Chytridiomycota and Zygomycota

Characteristic features; Ecology and significance; Thallus organisation; Reproduction; Life cycle with reference to *Synchytrium, Rhizopus*.

3. Ascomycota

General characteristics (asexual and sexual fruiting bodies); Ecology; Life cycle, Heterokaryosis and parasexuality; Life cycle and classification with reference to *Saccharomyces, Aspergillus*, *Penicillium, Alternaria, Neurospora* and *Peziza*.

SECTION-B

4. Basidiomycota

General characteristics; Ecology; 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.

5. Allied Fungi

General characteristics; Status of Slime molds, Classification; Occurrence; Types of plasmodia; Types of fruiting bodies.

B.Sc. (HONS.) BOTANY (SEMESTER-II) (CREDIT BASED EVALUATION & GRADING SYSTEM)

SECTION-C

6. Oomycota

General characteristics; Ecology; Life cycle and classification with reference to *Phytophthora*, *Albugo*.

7. Symbiotic associations

Lichen – 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.

SECTION-D

8. Applied Mycology

Role of fungi in biotechnology; Application of fungi in food industry (Flavour & texture, Fermentation, Baking, Organic acids, Enzymes, Mycoproteins); Secondary metabolites (Pharmaceutical preparations); Agriculture (Biofertilizers); Mycotoxins; Biological control (Mycofungicides, Mycoherbicides, Mycoinsecticides, Myconematicides); Medical mycology.

9. 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.

Suggested Readings

- 1. Agrios, G.N. (1997) Plant Pathology, 4th edition, Academic Press, U.K.
- Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley & Sons (Asia) Singapore. 4th edition.
- 3. Webster, J. and Weber, R. (2007). Introduction to Fungi, Cambridge University Press, Cambridge. 3rd edition.
- 4. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, Macmillan Publishers India Ltd.
- 5. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India.

Practical

- 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.

B.Sc. (HONS.) BOTANY (SEMESTER-II) (CREDIT BASED EVALUATION & GRADING SYSTEM)

Core Course IV:BSL 152 Archegoniates THEORY

Credits: 3-1-0

Time: 3 Hours

Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

SECTION-A

1.Introduction (4 lectures) Unifying features of archegoniates; Transition to land habit; Alternation of generations.

2. Bryophytes

General characteristics; Adaptations to land habit; Classification; Range of thallus organization.

SECTION-B

3. Type Studies- Bryophytes

Classification (up to family), morphology, anatomy and reproduction of *Riccia, Marchantia*, *Pellia, Porella, Anthoceros, Sphagnum and Funaria*; Reproduction and evolutionary trends in *Riccia, Marchantia, Anthoceros* and *Funaria* (developmental stages not included). Ecological and economic importance of bryophytes with special reference to *Sphagnum*.

SECTION-C

4. Pteridophytes

General characteristics, Classification; Early land plants (Cooksonia and Rhynia)

5. Type Studies- Pteridophytes

Classification (up to family), 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.

SECTION-D

6. 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.

Suggested Readings

- 1. Vashistha, P.C., Sinha, A.K., Kumar, A. (2010). Pteridophyta. S. Chand. Delhi, India.
- 2. Bhatnagar, S.P. & Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
- 3. Parihar, N.S. (1991). An introduction to Embryophyta: Vol. I. Bryophyta. Central Book Depot. Allahabad.
- 4. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, Delhi.
- 5. Vanderpoorten, A. & Goffinet, B. (2009) Introduction to Bryophytes. Cambridge University Press.

Practical

- 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, wholemount 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.

BSP 171 : BOTANY LAB-II (BASED ON BSL151 & BSL 152)

B.Sc. (HONS.) BOTANY (SEMESTER-II) (CREDIT BASED EVALUATION & GRADING SYSTEM)

CYL-192 : INORGANIC CHEMISTRY

LTP

310

Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

Section-A

Introduction, Werner's coordination theory, naming of co-ordinate complexes.Co-ordination numbers 1-12 and their stereo-chemistries.Factors affecting co-ordination numbers and stereo-chemistry (a) Configurational Isomers (b) Conformational isomerism, VSPER theory, molecular orbital theory applied to homoneuclear diatomic molecules and heteronuclear Diatomic molecules.Bonding in metal complexes, Valence bond theory for co-ordinate complexes, inner and outer orbital complexes,Electro-eutrality and back bonding, limitations of V.B. theory.

15 Lectures

Stability of coordination compounds Introduction, Stability constant, stepwise stability constant, overall stability constant. Factors affecting the stability of metal ion complexes with general ligands, HSAB principle. Crystal field theory- Splitting of d-orbitals in octahedral, tetrahedral, cubic and square planer fields of ligands. Calculation of C.F.S.E. in high spin and low spin octahedral and High spin tetrahedral complexes, factors affecting the 10 Dq Value. Structural effects of crystal field splitting (Jahn-Teller distortion, variation of Ionic radii with increase in atomic number). Thermodynamics effects of C.F. splitting, variation in lattice energies, Hydration energies, Dissociation energies, Formation constants of hexammines. Site selection in spinels, Paramagnetism, diamagnetism, ferro and anti ferromagnetism. 15Lectures

Section-C

Microstates and spectroscopic terms, a calculation of spectroscopic terms for $d^1 - d^{10}$ electronic configurations, L S coupling, Hund's rule for finding the ground state terms, Electronic spectral properties of Ist transition series, Orgel Diagrams for $d^1 - d^{10}$ systems, for weak field octahedral and tetrahedral complexes, limitations of C.F.T Molecular Orbital Theory-Evidence for covalent character in Bonding, MOEL diagram for octahedral and tetrahedral complexes involving bonding, charge transfer transitions. 15 Lectures

Time: 3 Hours

Section-B

B.Sc. (HONS.) BOTANY (SEMESTER-II) (CREDIT BASED EVALUATION & GRADING SYSTEM)

Section-D

Acid Ligands definition Carbon monoxide complexes, bonding in linear MCO groups, polynuclear metal carbonyls, vibrational spectra, Reactions, carbonyl hydrides and halides. Metal-metal bonding metal-metal multiple bonding , isolable analogies, Structure of high nuclearity carbonyl clusters, counting of electrons in carbonyl clusters. Alkali metal and alkaline earth metal chelators, Macrocyclic ligands, macrocyclic effect, crown ethers and podands, coronands, cryptands, structure of 18 crown-6 complex with KNCS, ion cavity complex, effect of anion and cation type on complex structure, simultaneous complexation of metal ion and water or of two metal ions, sandwich formation, cryptands and their cation complexes, podands with aromatic donors and groups.

15 Lectures

Text and Reference Books:

- 1. J.E. Huheey, Inorganic Chemistry, 3rd Ed.
- 2. F.A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry.
- 3. B.E. Douglas and D.H. McDaniel, Concepts and Models of Inorganic Chemistry.
- 4. R. Hilgenfeld and W. Saengar, Topics in current chemistry Vol-II.

CYP-192 : INORGANIC CHEMISTRY LAB (PRACTICAL BASED ON CYL192))

Credits: 0-0-3

Identification of cations and anions in a mixture which may contain four ions (cations and anions) Perform systematic group analyses to identify the cations in the mixture. Any cation from Group I, Group II (Group IIA and IIB) Group IV, Group V and Group VI may be present.

Book Recommended :

1. Vogel's book on Inorganic Qualitative Analysis.

B.Sc. (HONS.) BOTANY (SEMESTER-II) (CREDIT BASED EVALUATION & GRADING SYSTEM)

ENL-151 :COMMUNICATIVE ENGLISH-II

Credits: 02 (L= 2, T=0, U=0) Total marks-50

Time: 3 Hours

Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

Objective: To introduce students to the skills and strategies of reading and writing by identifying organizational patterns, spotting classification systems and understanding associations between ideas. This course will prepare students to read a variety of texts and also to communicate more effectively through writing. The course will also pay special attention to vocabulary building.

Prescribed Text books:

- *The Written Word* by Vandana R. Singh, Oxford University Press, New Delhi.
- *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Second Edition.

SECTION-A

Practical question on Note Making, Summarizing and Abstracting as given in *The Written Word* by Vandana R. Singh

SECTION-B

Practical question on Paragraph writing as prescribed in The Written Word by Vandana R. Singh

SECTION-C

Theoretical questions based on ABC of Good Notes as prescribed in *The Written Word* by Vandana R. Singh.

Section C from *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Second Edition.

SECTION-D

Practical question on Essay writing from *The Written Word* by Vandana R. Singh Section 4 from *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Second Edition.

B.Sc. (HONS.) BOTANY (SEMESTER-II) (CREDIT BASED EVALUATION & GRADING SYSTEM)

PBL 131 : ਪੰਜਾਬੀ ਲਾਜ਼ਮੀ - II (Credit Based)

Time: 3 Hours

Credit : 2-0-0 Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

- 1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
- ਵਿੰਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿਚੈਂ ਇਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
- 3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
- 4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਸੈਕਸ਼ਨ–ਏ

- I. ਦੋ ਰੰਗ (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ) ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿਚੋਂ ਹੇਠ ਲਿਖੇ ਕਹਾਣੀਕਾਰ :
 - (ਓ) ਨਾਨਕ ਸਿੰਘ : ਭੁਆ
 - (ਅ) ਗਰਮਖ ਸਿੰਘ ਮਸਾਫਿਰ : **ਬਾਗੀ ਦੀ ਧੀ**
 - (ੲ) ਸੰਤ ਸਿੰਘ ਸੇਖੋਂ : ਪੇਮੀ ਦੇ ਨਿਆਣੇ

(ਕਹਾਣੀਕਾਰ ਦਾ ਜੀਵਨ, ਕਹਾਣੀ ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਹਾਣੀ ਕਲਾ)

II. ਪੰਜਾਬੀ ਸ਼ਬਦ ਬਣਤਰ : ਧਾਤੁ/ਮੁਲ, ਵਧੇਤਰ (ਅਗੇਤਰ, ਪਿਛੇਤਰ, ਵਿਉਂਤਪਤ ਅਤੇ ਰੁਪਾਂਤਰੀ), ਸਮਾਸ।

ਸੈਕਸ਼ਨ–ਬੀ

I. ਦੋ ਰੰਗ (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)

ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿਚੋਂ ਹੇਠ ਲਿਖੇ ਕਹਾਣੀਕਾਰ :

- (ੳ) ਸੁਜਾਨ ਸਿੰਘ : ਬਾਗਾਂ ਦਾ ਰਾਖਾ
- (ਅ) ਕਰਤਾਰ ਸਿੰਘ ਦੁੱਗਲ : **ਤੈਂ ਕੀ ਦਰਦ ਨਾ ਆਇਆ**
 - (ਕਹਾਣੀਕਾਰ ਦਾ ਜੀਵਨ, ਕਹਾਣੀ ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਹਾਣੀ ਕਲਾ)
- II. ਪੈਰ੍ਹਾ ਰਚਨਾ : ਕਲਾਸ ਵਿਚ 10 ਵਿਸ਼ਿਆਂ (ਸਭਿਆਚਾਰ, ਧਾਰਮਕ ਅਤੇ ਰਾਜਨੀਤਕ) 'ਤੇ ਪੈਰ੍ਹਾ ਰਚਨਾ ਦੇ ਅਭਿਆਸ ਕਰਵਾਉਣੇ।

B.Sc. (HONS.) BOTANY (SEMESTER-II) (CREDIT BASED EVALUATION & GRADING SYSTEM)

ਸੈਕਸ਼ਨ–ਸੀ

- I. ਦੋ ਰੰਗ (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ) ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿਚੋਂ ਹੇਠ ਲਿਖੇ ਕਹਾਣੀਕਾਰ :
 - (ਓ) ਕੁਲਵੰਤ ਸਿੰਘ ਵਿਰਕ : ਧਰਤੀ ਹੇਠਲਾ ਬੋਲਦ
 - (ਅ) ਨਵਤੇਜ ਸਿੰਘ : **ਦੂਜੀ ਵਾਰ ਜੇਬ ਕੱਟੀ ਗਈ**
 - (ੲ) ਪ੍ਰੇਮ ਪ੍ਰਕਾਸ਼ : **ਲੱਛੌਮੀ** (ਕਹਾਣੀਕਾਰ ਦਾ ਜੀਵਨ, ਕਹਾਣੀ ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਹਾਣੀ ਕਲਾ)
 - II. ਮੁਹਾਵਰੇ ਤੇ ਅਖਾਣ (ਅਖਾਣ ਤੇ ਮੁਹਾਵਰਾ ਕੋਸ਼ ਵਿਚ) 200 ਮੁਹਾਵਰਿਆਂ ਅਤੇ 100 ਅਖਾਣਾਂ ਨੂੰ ਵਾਕਾਂ ਵਿਚ ਵਰਤਣ ਦੇ ਅਭਿਆਸ ਕਰਵਾਉਣੇ (ਕਲਾਸ ਵਿਚ ਤੇ ਘਰ ਲਈ)।

ਸੈਕਸ਼ਨ–ਡੀ

- I. ਦੋ ਰੰਗ (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ) ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿਚੋਂ ਹੇਠ ਲਿਖੇ ਕਹਾਣੀਕਾਰ :
 - (ਓ) ਅਜੀਤ ਕੌਰ : **ਬੁੱਤ ਸ਼ਿਕਨ**
 - (ਅ) ਦਲੀਪ ਕੌਰ ਟਿਵਾਣਾ : ਬੱਸ ਕੰਡਕਟਰ

(ਕਹਾਣੀਕਾਰ ਦਾ ਜੀਵਨ, ਕਹਾਣੀ ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੁ, ਕਹਾਣੀ ਕਲਾ)

II. ਸ਼ਬਦ ਸ਼੍ਰੇਣੀਆਂ : ਨਾਂਵ, ਪੜਨਾਂਵ, ਵਿਸ਼ੇਸ਼ਣ, ਕਿਰਿਆ, ਕਿਰਿਆਂ ਵਿਸ਼ੇਸ਼ਣ, ਸੰਬੰਧਕ

B.Sc. (HONS.) BOTANY (SEMESTER-II) (CREDIT BASED EVALUATION & GRADING SYSTEM)

PBL-132: ਮੁੱਢਲੀ ਪੰਜਾਬੀ

(In lieu of Punjabi Compulsory)

Time: 3 Hours

Credits: 2-0-0 Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

- 1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
- ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ।ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
- ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
- 4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਪਾਠ-ਕ੍ਰਮ

ਸੈਕਸ਼ਨ-ਏ

ਸਬਦ ਸ਼੍ਰਣਾਆ : ਪਛਾਣ ਅਤ ਵਰਤ

(ਨਾਂਵ, ਪੜਨਾਂਵ, ਵਿਸ਼ੇਸ਼ਣ, ਕਿਰਿਆ, ਕਿਰਿਆ ਵਿਸ਼ਸ਼ਣ)

ਸੈਕਸ਼ਨ–ਬੀ

।ਨਤ ਵਰਤ ਦਾ ਪਜਾਬਾ ਸ਼ਬਦਾਵਲਾ : ਬਾਜ਼ਾਰ, ਵਪਾਰ, ।ਰਸ਼ਤ-ਨਾਤੇ, ਖੇਤੀ ਅਤੇ ਹੋਰ ਧੰਦਿਆਂ ਨਾਲ ਸਬੰਧਤ ।

ਸੈਕਸ਼ਨ–ਸੀ

ਪੰਜਾਬੀ ਵਾਕ-ਬਣਤਰ

ਸਾਧਾਰਨ-ਵਾਕ (ਪਛਾਣ ਅਤ ਵਰਤ)

ਸੰਯੁਕਤ-ਵਾਕ (ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ)

ਮਿਸ਼ਰਤ-ਵਾਕ (ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ)

ਸੈਕਸ਼ਨ–ਡੀ

ਪਰ੍ਹਾ ਰਚਨਾ

ਸੰਖੇਪ ਰਚਨਾ
HSL-102 : Punjab History & Culture (1717-1947) (Special paper in lieu of Punjabi Compulsory) (For those students who are not domicile of Punjab)

Credits: 2-0-0

Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

Section-A

- 1. Sikh Struggle for Sovereignty.
- 2. Ranjit Singh : Conquests, Administration and the Anglo-Sikh Relations.

Section-B

- 3. Anglo-Sikh Wars and the Annexation.
- 4. The Punjab under the British: New Administration, Education and social Change.

Section-C

- 5. Economic Changes: Agricultural
- 6. Socio-Religious Reform Movements.

Section-D

- 7. Role of Punjab in the Freedom Struggle.
- 8. Fairs and Festivals.

Suggested Reading

- 1. Kirpal Singh (ed.), *History and Culture of the Punjab*, Part-II, Punjabi University, Patiala, 1990.
- 2. Fauja Singh (ed.), *History of Punjab*, Vol, III, Punjabi University, Patiala, 1987.
- 3. J.S. Grewal, The Sikhs of the Punjab, Cup, Cambridge, 1991.
- 4. Khushwant Singh, A History of the Sikhs, Vol. I, OUP, New Delhi, 1990

Time: 3 Hours

SOA-101 : DRUG ABUSE: PROBLEM, MANAGEMENT AND PREVENTION (COMPULSORY ID COURSE) (Student can opt. this paper whether in 1st or 2nd semester)

PROBLEM OF DRUG ABUSE

Credit 3-0-0

Time: 3 Hours

Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

Section – A

Meaning of Drug Abuse:

- 1. Meaning, Nature and Extent of Drug Abuse in India and Punjab.
- 2. Consequences of Drug Abuse for:
 - Individual:Education, Employment, Income.Family:Violence.Society:Crime.Nation:Law and Order problem.

Section – B

Management of Drug Abuse:

- (iv) Medical Management: Medication for treatment and to reduce withdrawal effects.
- (v) Psychiatric Management: Counselling, Behavioural and Cognitive therapy.
- (vi) Social Management: Family, Group therapy and Environmental Intervention.

Section – C

Prevention of Drug abuse:

- (iii) Role of family: Parent child relationship, Family support, Supervision, Shaping values, Active Scrutiny.
- (iv) School: Counselling, Teacher as role-model. Parent-teacher-Health Professional Coordination, Random testing on students.

38

B.Sc. (HONS.) BOTANY (SEMESTER-II) (CREDIT BASED EVALUATION & GRADING SYSTEM)

Section – D

Controlling Drug Abuse:

- (iii) Media: Restraint on advertisements of drugs, advertisements on bad effects of drugs, Publicity and media, Campaigns against drug abuse, Educational and awareness program
- (iv) Legislation: NDPs act, Statutory warnings, Policing of Borders, Checking Supply/Smuggling of Drugs, Strict enforcement of laws, Time bound trials.

References:

- 1. Ahuja, Ram (2003), Social Problems in India, Rawat Publication, Jaipur.
- 2. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
- 3. Inciardi, J.A. 1981. The Drug Crime Connection. Beverly Hills: Sage Publications.
- 4. Kapoor. T. (1985) Drug epidemic among Indian Youth, New Delhi: Mittal Pub.
- 5. Kessel, Neil and Henry Walton. 1982, Alcohalism. Harmond Worth: Penguin Books.
- 6. Modi, Ishwar and Modi, Shalini (1997) *Drugs: Addiction and Prevention*, Jaipur: Rawat Publication.
- 7. National Household Survey of Alcohol and Drug abuse. (2003) New Delhi, Clinical Epidemiological Unit, All India Institute of Medical Sciences, 2004.
- 8. Ross Coomber and Others. 2013, *Key Concept in Drugs and Society*. New Delhi: Sage Publications.
- 9. Sain, Bhim 1991, *Drug Addiction Alcoholism*, Smoking obscenity New Delhi: Mittal Publications.
- 10. Sandhu, Ranvinder Singh, 2009, *Drug Addiction in Punjab*: A Sociological Study. Amritsar: Guru Nanak Dev University.
- 11. Singh, Chandra Paul 2000. Alcohol and Dependence among Industrial Workers: Delhi: Shipra.
- 12. Sussman, S and Ames, S.L. (2008). *Drug Abuse: Concepts, Prevention and Cessation,* Cambridge University Press.
- 13. Verma, P.S. 2017, "*Punjab's Drug Problem: Contours and Characterstics*", Economic and Political Weekly, Vol. LII, No. 3, P.P. 40-43.
- 14. World Drug Report 2016, United Nations office of Drug and Crime.
- 15. World Drug Report 2017, United Nations office of Drug and Crime.

39

B.Sc. (HONS.) BOTANY (SEMESTER-III) (CREDIT BASED EVALUATION & GRADING SYSTEM)

Core Course V: BSL 201 Morphology and Anatomy THEORY

Time: 3 Hours

Credits: 3-1-0 Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

SECTION-A

1. Introduction to roots and shoot system

Types of root system, modification of the root, function of the root, stem and its modifications, leaves and its parts, structure of the flower

2. 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.

3. 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.

SECTION-B

4. Apical meristems

Evolution of concept of organization of shoot apex (Apical cell theory, Histogen theory, Tunica Corpus theory, continuing meristematic residue, cytohistological zonation); 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 (Apical cell theory, Histogen theory, Korper-Kappe theory); Quiescent centre; Root cap; Structure of dicot and monocot root; Endodermis, exodermis and origin oflateral root.

SECTION-C

5. 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.

SECTION-D

6. Adaptive and Protective Systems

Epidermal tissue system, cuticle, epicuticular waxes, trichomes(uni-and multicellular, glandular and nonglandular, two examples of each), stomata (classification); Adcrustation and incrustation; Anatomical adaptations of xerophytes and hydrophytes.

Suggested Readings

- 1. Dickison, W.C. (2000). Integrative Plant Anatomy. Harcourt Academic Press, USA.
- 2. Fahn, A. (1974). Plant Anatomy. Pergmon Press, USA.
- 3. Mauseth, J.D. (1988). Plant Anatomy. The Benjammin/Cummings Publisher, USA.
- 4. Evert, R.F. (2006) Esau's Plant Anatomy: Meristems, Cells, and Tissues of the Plant Body: Their Structure, Function and Development. John Wiley and Sons, Inc.

41

B.Sc. (HONS.) BOTANY (SEMESTER-III) (CREDIT BASED EVALUATION & GRADING SYSTEM)

Practical

- 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.

Core Course VI: BSL202 Economic Botany THEORY

Time: 3 Hours

Credits: 3-1-0 Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

SECTION-A

1. 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.

2. Cereals (6 lectures) Wheat and Rice (origin, morphology, processing & uses); Brief

account of millets.

3. Legumes

Origin, morphology and uses of Chick pea, Pigeon pea and fodder legumes. Importance to man and ecosystem.

SECTION-B

Unit 4: Sources of sugars and starches

Morphology and processing of sugarcane, products and by-products of sugarcane industry.

Potato – morphology, propagation & uses.

Unit 5: Spices Listing of important spices, their family and part used. Economic importance with special reference to fennel, saffron, clove and black pepper

Unit 6: Beverages

Tea, Coffee (morphology, processing & uses)

SECTION-C

Unit 7: Sources of oils and fats

General description, classification, extraction, their uses and health implications groundnut, coconut, linseed, soybean, mustard and coconut (Botanical name, family & uses). Essential Oils: General account, extraction methods, comparison with fatty oils & their uses.

Unit 8: Natural Rubber

Para-rubber: tapping, processing and uses.

SECTION-D

Unit 9: Drug-yielding plants

Therapeutic and habit-forming drugs with special reference to Cinchona, Digitalis, Papaver and Cannabis; Tobacco (Morphology, processing, uses and health hazards

Unit 10: Timber plants

General account with special reference to teak and pine

Unit 11: Fibers

Classification based on the origin of fibers; Cotton, Coir and Jute (morphology, extraction and uses).

Suggested Readings

- 1. Kochhar, S.L. (2012). Economic Botany in Tropics, MacMillan & Co. New Delhi, India.
- 2. Wickens, G.E. (2001). Economic Botany: Principles & Practices. Kluwer Academic Publishers, The Netherlands.
- 3. Chrispeels, M.J. and Sadava, D.E. 1994 Plants, Genes and Agriculture. Jones & Bartlett Publishers.

Practical

- 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).

Core Course VII: BSL203 Genetics THEORY

Time: 3 Hours

Credits: 3-1-0 Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

SECTION-A

1. Mendelian genetics and its extension

Mendelism: History; Principles of inheritance; Chromosome theory of inheritance; Autosomes and sex chromosomes; Probability and pedigree analysis; Incomplete dominance and codominance; Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Recessive and Dominant traits, Penetrance and Expressivity, Numericals; Polygenic inheritance.

SECTION-B

2. Extrachromosomal Inheritance

Chloroplast mutation: Variegation in Four o'clock plant; Mitochondrial mutations in yeast; Maternal effects-shell coiling in snail; Infective heredity- Kappa particles in *Paramecium*.

3. Linkage, crossing over and chromosome mapping

Linkage and crossing over-Cytological basis of crossing over; Recombination frequency, two factor and three factor crosses; Interference and coincidence; Numericals based on gene mapping; Sex Linkage.

SECTION-C

4. Variation in chromosome number

Deletion, Duplication, Inversion, Translocation, Position effect,

5. Variation in chromosome structure

Euploidy and Aneuploidy

SECTION-D

6. Gene mutations

Types of mutations; Molecular basis of Mutations; Mutagens – physical and chemical (Base analogs, deaminating, alkylating and intercalating agents); Detection of mutations: ClB method. DNA repair mechanisms.

7. Population and Evolutionary Genetics

Allele frequencies, Genotype frequencies, Hardy-Weinberg Law, role of natural selection, mutations, genetic drift. Genetic variation and Speciation.

Suggested Readings

- 1. Gardner, E.J., Simmons, M.J., Snustad, D.P. (1991). Principles of Genetics, John Wiley & sons, India. 8th edition.
- Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics, John Wiley & Sons Inc., India. 5th edition.
- 3. Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. Benjamin Cummings, U.S.A. 9th edition.
- 4. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10th edition.

Practical

- 1. Meiosis through temporary squash preparation.
- 2. Mendel's laws through seed ratios. Laboratory exercises in probability and chi-square.
- 3. Chromosome mapping using point test cross data.
- 4. Pedigree analysis for dominant and recessive autosomal and sex linked traits.
- 5. Incomplete dominance and gene interaction through seed ratios (9:7, 9:6:1, 13:3, 15:1, 12:3:1, 9:3:4).
- 6. Blood Typing: ABO groups & Rh factor.
- 7. Study of aneuploidy: Down's, Klinefelter's and Turner's syndromes.
- 8. Photographs/Permanent Slides showing Translocation Ring, Laggards and Inversion Bridge.
- 9. Study of human genetic traits: Sickle cell anemia, Xeroderma Pigmentosum, Albinism, red-green Colour blindness, Widow's peak, Rolling of tongue, Hitchhiker's thumb and Attached ear lobe.

BSP 221 : BOTANY LAB-III (BASED ON BSL201, BSL202 & BSL203

ZOL 102: Biology of Non Chordates

Credit 3-1-0

Time: 3 Hours

Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

Section-A

The Invertebrates: An Introduction

Protozoa

General Characters Detailed study of *Amoeba* and *Paramecium*

Porifera

General Characters Detailed study of Sycon / Scypha Skeleton in Sponges Canal System in Sponges

Section-B

Coelenterata

General Characters Detailed study of *Obelia* Polymorphism Coral Reefs

Platyhelminthes

General Characters Detailed study of *Fasciola hepatica*

Aschelminthes

General Characters Detailed study of Ascaris

Annelida

General Characters Detailed study of *Pheretima* **Arthropoda** General Characters Detailed study of *Periplaneta* Metamorphosis in Insects Section-C

Section-D

Mollusca

General Characters Detalied study of Pila Molluscan Larvae Shell in Mollusca , Torsion in mollusca shell

Echinodermata

General Characters Detalied study of Starfish Echinoderm Larvae

Suggested Reading Material:

- Barnes, R. D. (1980). The Invertebrate Zoology, Hotl-Saunder, Philadelphia, 4th ed.
- Barth, R. H. and Brosherars, R. E. (1982). The Invertebrate World. Holt-Saunders, Tokyo, Japan. Engemann, J. G. And Hegner, R. W. (1981). The invertebrate Zoology 3rd edition . Macmillan, New York.
- Hyman, L. H. The invertebrates (Vol. I-VI)
- Vol. I Protozoa through Ctenophora (1940)
- Vol. II Platyhelminthes and Rhynchocoela (1951).
- Vol. III Acanthocephala, Aschelminthes and Entprocta (1951). McGraw Hill, New York.
- Meglitsh, P. (1972). Invertebrate Zoology. Oxford Uni. Press, New York.
- Parker, T. J. And Haswell, W.A. (1972). A text book of Zoology Vol. I (revised by Marshall) ELBS and the Macmillan Co. London.
- Russel- Hunter, W. D. (1968). A Biology of Lower Invertebrates. McMillan Co. New York.
- Russel-Hunter, W. D. (1968). A Biology of Higher Invertebrates. MacMillan Co. New York.
- Sherman, I. W. and Sherman, V. G. (1970). The Invertebrates, Function and form, MacMillan Co. New York.
 - **Books of Indian Authors:**
- Dhami, P. S. And Dhami, J. K. (2015). Invertebrates Zoology, R., Chand& Company, New Delhi.
- Kotpal, R. L., Aggarwal, S. K. &Khetarpal, R. P. (2015). Modern Text Book of Zoology Invertebrates, Rastogi Publications, Meerut.
- Kotpal, R. L. Zoology, Phylum Books, Rastogi Publications, Meerut

ZOP 102: Zoology Lab-I (PRACTICAL BASED ON ZOL102)

Credit 0-0-1.5

Portozoa:

- a) Examining Protozoan cultures.
- b) Permanent slides- Amoeba, Paramecium, Trypanosoma, Euglena, Noctiluca, Leishmania, Plasmodium, Giardia, Eimeria, Monocystis, Nyclotherus, Balantidium, Opalina, Vorticella

Parazoa :

- a) Permanent slides- T.S. Sycon, L. S. Sycon, Gemmule, spicules.
- b) General Survey Sycon, Grantia, Euplectella, Hyalonema, Spongilla, Euspongia.

Cnidaria :

a) Permanent slides –*Hydra* (W.M.), *Hydra* with bud, T. S. of *Hydra*, *Bougainvilla*, *Tubularia*, *Sertularia*, *Plumularia*, *Obelia*, (Colony and Medusa), *Aurelia*.
b) General Survey – *Millipora*, *Physalia*, *Velella*, *Porpita*, *Aurelia*, *Alcyonium*, *Tubipora*, *Pennatula*, *Metridium*, *Madrepora*, *Favia*, *Fungia*, *Astraea*, *Zoanthus*.

Platyhelminthes :

a) Permanent slides – T. S. *Taenia*, T. S. *Fasciola*, T. S. *Dugesia*, *Miracidium*, *Sporocyst*, *Redia*, *Cercaria*, *Scolex* and *Proglottid* (Mature and gravid of Taenia).
b) General survey-*Dugesia*, *Schistosoma*, *Fasciola*, *Taenia*, *Echinococcus*.

Aschelminthes :

a) Permanent slides – T. S. *Ascaris*(Male and Female).b) General survey-*Trichinella*, *Ascaris*, *Ancylostoma*.

Annelida :

a) Permanent slides - T. S. earthworm (pharyngeal and typhlosolar region), setae, nephridia, ovary and spermatheca, T. S. leech.

b) General Survey-Polynoe, Heteronereis, Aphrodite, Eunice, Chaetopteus. Arenicola, Pheretima, Hirudo, Pontobdella, Tubifex.

Arthropoda :

a) Permanent slides - head, mouthparts and trachea of cockroach, mouthparts of housefly, honeybee, mosquito.

b) General Survey-Peripatus, Apis, Cyclops, Daphnia, Lepas, Balanus, Sacculina, Prawn, Crab, Lobster, Eupagurus, Millipede, Scolopendra, Lepisma, Periplaneta, Schistocerca, Poicilocerous, Gryllus, Mantis, Cicada, Foricula, Dragonfly, Bug, Moth, Beetle, Polistes, Bombyx, Pediculus, Palamnaeus, Limulus, Aranea.

ESL-220 : ENVIRONMENTAL STUDIES (COMPULSORY)

Teaching Methodologies

Credits: 4-0-0

The Core Module Syllabus for Environmental Studies includes class room teaching and field work. The syllabus is divided into 8 Units [Unit-1 to Unit-VII] covering 45 lectures + 5 hours for field work [Unit-VIII]. The first 7 Units will cover 45 lectures which are class room based to enhance knowledge skills and attitude to environment. Unit-VIII comprises of 5 hours field work to be submitted by each candidate to the Teacher in-charge for evaluation latest by 15 December, 2019.

Exam Pattern: End Semester Examination- 75 marks Project Report/Field Study- 25 marks [based on submitted report] Total Marks- 100

The structure of the question paper being:

Part-A, Short answer pattern with inbuilt choice – **25 marks** Attempt any five questions out of seven distributed equally from Unit-1 to Unit-VII. Each question carries 5 marks. Answer to each question should not exceed 2 pages.

Part-B, Essay type with inbuilt choice – **50 marks**

Attempt any five questions out of eight distributed equally from Unit-1 to Unit-VII. Each question carries 10 marks. Answer to each question should not exceed 5 pages.

Project Report / Internal Assessment:

Part-C, Field work – 25 marks [Field work equal to 5 lecture hours]

The candidate will submit a hand written field work report showing photographs, sketches, observations, perspective of any topic related to Environment or Ecosystem. The exhaustive list for project report/area of study are given just for reference:

- 1. Visit to a local area to document environmental assets: River / Forest/ Grassland / Hill / Mountain / Water body / Pond / Lake / Solid Waste Disposal / Water Treatment Plant / Wastewater Treatment Facility etc.
- 2. Visit to a local polluted site Urban / Rural / Industrial / Agricultural
- 3. Study of common plants, insects, birds
- 4. Study of tree in your areas with their botanical names and soil types
- 5. Study of birds and their nesting habits
- 6. Study of local pond in terms of wastewater inflow and water quality
- 7. Study of industrial units in your area. Name of industry, type of industry, Size (Large, Medium or small scale)
- 8. Study of common disease in the village and basic data from community health centre
- 9. Adopt any five young plants and photograph its growth
- 10. Analyze the Total dissolved solids of ground water samples in your area.
- 11. Study of Particulate Matter ($PM_{2.5}$ or PM_{10}) data from Sameer website. Download from Play store.
- 12. Perspective on any field on Environmental Studies with secondary data taken from Central Pollution Control Board, State Pollution Control Board, State Science & Technology Council etc.

Unit-I

The multidisciplinary nature of environmental studies

Definition, scope and importance, Need for public awareness

(2 lectures)

Natural Resources: Renewable and non-renewable resources:

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.

Unit-II

- (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.

(8 Lectures)

Unit-III

Ecosystems

- 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: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

(6 Lectures)

Unit-IV

Biodiversity and its conservation

- Introduction Definition: genetic, species and ecosystem diversity
- Biogeographical 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

(8 Lectures)

Unit-V

Environmental Pollution

Definition

- Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, 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

(8 Lectures)

Unit-VI

Social Issues and the Environment

- 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 Protection Act, 1986
- Air (Prevention and Control of Pollution) Act, 1981
- Water (Prevention and control of Pollution) Act, 1974
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation
- Public awareness

(7 Lectures)

Unit-VII

Human Population and the Environment

- Population growth, variation among nations
- Population explosion Family Welfare Programmes
- Environment and human health
- Human Rights
- Value Education
- HIV / AIDS
- Women and Child Welfare
- Role of Information Technology in Environment and Human Health
- Case Studies

(6 Lectures)

Unit-VIII

Field Work

- 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)

References:

- 1. Bharucha, E. 2005. Textbook of Environmental Studies, Universities Press, Hyderabad.
- 2. Down to Earth, Centre for Science and Environment, New Delhi.
- 3. Heywood, V.H. & Waston, R.T. 1995. Global Biodiversity Assessment, Cambridge House, Delhi.
- 4. Joseph, K. & Nagendran, R. 2004. Essentials of Environmental Studies, Pearson Education (Singapore) Pte. Ltd., Delhi.
- 5. Kaushik, A. & Kaushik, C.P. 2004. Perspective in Environmental Studies, New Age International (P) Ltd, New Delhi.
- 6. Rajagopalan, R. 2011. Environmental Studies from Crisis to Cure. Oxford University Press, New Delhi.
- 7. Sharma, J. P., Sharma. N.K. & Yadav, N.S. 2005. Comprehensive Environmental Studies, Laxmi Publications, New Delhi.
- 8. Sharma, P. D. 2009. Ecology and Environment, Rastogi Publications, Meerut.
- 9. State of India's Environment 2018 by Centre for Sciences and Environment, New Delhi
- 10. Subramanian, V. 2002. A Text Book in Environmental Sciences, Narosa Publishing House, New Delhi.

Core Course VIII: BSL 251 Molecular Biology

THEORY

Time: 3 Hours

Credits: 3-1-0 Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

SECTION-A

1. Nucleic acids : Carriers of genetic information

Historical perspective; DNA as the carrier of genetic information (Griffith's, Hershey & Chase, Avery, McLeod & McCarty, Fraenkel-Conrat's experiment.

2. The Structures of DNA and RNA / Genetic Material

DNA Structure: Miescher to Watson and Crick- historic perspective, DNA structure, Salient features of double helix, Types of DNA, Types of genetic material, denaturation and renaturation, cot curves; Organization of DNA- Prokaryotes, Viruses, Eukaryotes.RNA Structure Organelle DNA -- mitochondria and chloroplast DNA.The Nucleosome Chromatin structure- Euchromatin, Heterochromatin- Constitutive and Facultative heterochromatin.

SECTION-B

3. The replication of DNA

Chemistry of DNA synthesis (Kornberg's discovery); General principles – bidirectional, semiconservative and semi discontinuous replication, RNA priming; Various models of DNA replication, including rolling circle, (theta) mode of replication, replication of linear ds-DNA, replication of the 5'end of linear chromosome; Enzymes involved in DNA replication.

4. Central dogma and genetic code

Key experiments establishing-The Central Dogma (Adaptor hypothesis and discovery of mRNA template), Genetic code (deciphering & salient features)

SECTION-C

5. Transcription

Transcription in prokaryotes and eukaryotes. Principles of transcriptional regulation; Prokaryotes: Regulation of lactose metabolism and tryptophan synthesis in *E.coli*. Eukaryotes: transcription factors, heat shock proteins, steroids and peptide hormones; Gene silencing.

SECTION-D

6. Processing and modification of RNA

Split genes-concept of introns and exons, removal of introns, spliceosome machinery, splicing pathways, group I and group II intron splicing, alternative splicing eukaryotic mRNA processing(5' cap, 3' polyA tail); Ribozymes; RNA editing and mRNA transport.

7. Translation

Ribosome structure and assembly, mRNA; Charging of tRNA, aminoacyl tRNA synthetases; Various steps in protein synthesis, proteins involved in initiation, elongation and termination of polypeptides; Fidelity of translation; Inhibitors of protein synthesis; Post-translational modifications of proteins.

Suggested Readings

- 1. Watson J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M., Losick, R. (2007). Molecular Biology of the Gene, Pearson Benjamin Cummings, CSHL Press, New York, U.S.A. 6th edition.
- Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons Inc., U.S.A. 5th edition.
- Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. Benjamin Cummings. U.S.A. 9th edition.
- 4. Russell, P. J. (2010). i-Genetics- A Molecular Approach. Benjamin Cummings, U.S.A. 3rd edition.
- 5. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10th edition.

58

B.Sc. (HONS.) BOTANY (SEMESTER-IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

Practical

- 1. Preparation of LB medium and raising E.Coli.
- 2. Isolation of genomic DNA from E.Coli.
- 3. DNA isolation from cauliflower head.
- 4. DNA estimation by diphenylamine reagent/UV Spectrophotometry.
- 5. Study of DNA replication mechanisms through photographs (Rolling circle, Theta replication and semi-discontinuous replication).
- 6. Study of structures of prokaryotic RNA polymerase and eukaryotic RNA polymerase II through photographs.
- 7. Photographs establishing nucleic acid as genetic material (Messelson and Stahl's, Avery et al, Griffith's, Hershey & Chase's and Fraenkel & Conrat's experiments)
- 8. Study of the following through photographs: Assembly of Spliceosome machinery; Splicing mechanism in group I & group II introns; Ribozyme and Alternative splicing.

Core Course IX: BSL252 Plant Ecology and Phytogeography THEORY

Time: 3 Hours

Credits: 3-1-0 Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

SECTION-A

1. Introduction

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

2. Soil

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

3. Water

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

SECTION-B

4. Light, temperature, wind and fire

Variations; adaptations of plants to their variation.

5. Biotic interactions

Trophic organization, basic source of energy, autotrophy, heterotrophy; symbiosis, commensalism, parasitism; food chains and webs; ecological pyramids; biomass, standing crop. **6. Population ecology**

Characteristics and Dynamics .Ecological Speciation

SECTION-C

7. Plant communities

Concept of ecological amplitude; Habitat and niche; Characters: analytical and synthetic;

Ecotone and edge effect; Dynamics: succession – processes, types; climax concepts. **8. Ecosystems**

Structure; Processes; Trophic organisation; Food chains and Food webs; Ecological pyramids.

SECTION-D

9. Functional aspects of ecosystem

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

10. 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.

Suggested Readings

- 1. Odum, E.P. (2005). Fundamentals of ecology. Cengage Learning India Pvt. Ltd., New Delhi. 5th edition.
- 2. Singh, J.S., Singh, S.P., Gupta, S. (2006). Ecology Environment and Resource Conservation. Anamaya Publications, New Delhi, India.
- 3. Sharma, P.D. (2010). Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
- 4. Wilkinson, D.M. (2007). Fundamental Processes in Ecology: An Earth Systems Approach. Oxford University Press. U.S.A.
- 5. Kormondy, E.J. (1996). Concepts of ecology. PHI Learning Pvt. Ltd., Delhi, India. 4th edition.

Practical

- 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 (*Orobanche*) 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.

Core Course X: BSL253 Plant Systematics THEORY

Time: 3 Hours

Credits: 3-1-0 Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

SECTION-A

1. Significance of Plant systematics

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.

2. Taxonomic hierarchy

Concept of taxa (family, genus, species); Categories and taxonomic hierarchy; Species concept (taxonomic, biological, evolutionary).

SECTION-B

3. 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.

SECTION-C

4. 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.

SECTION-D

5. Biometrics, numerical taxonomy and cladistics

Characters; Variations; OTUs, character weighting and coding; C luster analysis; Phenograms, cladograms (definitions and differences).

6. 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).

Suggested Readings

- 1. Singh, (2012). *Plant Systematics:* Theory and Practice Oxford & IBH Pvt. Ltd., New Delhi. 3rdedition.
- 2. Jeffrey, C. (1982). An Introduction to *Plant Taxonomy*. Cambridge University Press, Cambridge.
- 3. Judd, W.S., Campbell, C.S., Kellogg, E.A., Stevens, P.F. (2002). Plant Systematics-A Phylogenetic Approach. Sinauer Associates Inc., U.S.A. 2nd edition.
- 4. Maheshwari, J.K. (1963). *Flora* of Delhi. CSIR, New Delhi.
- 5. Radford, A.E. (1986). Fundamentals of *Plant Systematics*. Harper and Row, New York.

Practical

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).

BSP271 : BOTANY LAB-IV (BASED ON BSL251, BSL252 & BSL253)

66

B.Sc. (HONS.) BOTANY (SEMESTER-IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

ZOL 152: Biology of Chordates

Credit 3-1-0

Time: 3 Hours

Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

Section-A

Hemichordata, Urochordata and Cephalochordata

General Characters, Economic Importance and Affinities Detailed study of *Balanoglossus*, *Herdmania and Amphioxus*

Section **B**

Cyclostomata and Pisces:

General Characters, Economic Importance and Affinities. External features of Petromyzon and affinities of cyclostomes Detailed study of *Scoliodon/Labeo rohita*.

Section-C

Amphibia:

General characters, Economic Importance and Affinities. Detailed study of *Rana tigrina*.

Reptilia :

General characters, Economic Importance and Affinities. Detailed study of lizard.

Section-D

Aves :

General characters, Economic Importance and Affinities. Detailed study of Pigeon.

Mammalia :

General characters, Economic Importance and Affinities. Detailed study of Rat.

Suggested Reading Material:

- 1. Saxena, R. K. and Saxena ., S. (2008). Comparative anatomy of vertebrates. Viva book.
- 2. Weichat, C. K. (1970). Anatomy of the chordates. McGraw-Hill book company.
- 3. Dhami, P.S. and Dhami, J. K. (2015). A text book of Zoology. Pradeep publications.
- 4. Marshall, A. J., Parker, T. J. and Haswell, W. A. (1972). Textbook of Zoology vertebrates. English language books Society and Macmillan.
- 5. Prasad, S. N. (1970). A text book of vertebrate Zoology. KitabMahal Allahabad.
- Hairston, N.G. (1994). Vertebrate Zoology- An experimental field approach, Cambridge University press.
- 7. Vaughan, T.A. (1972). Mammology. W. B. Sanders Company.
- 8. Orr, R. T. Vertebrate biology (1981). Saunders College Publishing.
- 9. Linzey, D. Vertebrate(2004). Biology. McGraw-Hill Higher Education.
- 10. Wetty, J. C.(1985). The Life of Birds. W. B. Saunders Company.
- 11. Singh, G. and Bhaskar, H.(2002). Advanced Chordate Zoology Birds. Vol. -4, Campus books international.
- 12. Bhamrah, H. S. &Juneja, K.(2002). An Introduction to Birds, Anmol Publications Pvt. Ltd.

ZOP 152: Zoology Lab.-II (PRACTICAL BASED ON ZOL152)

Credit 0-0-1.5

Study of Museum specimens of Hemichordata-*Balanoglossus*

Urochordata-Oikapleura, Herdmania, Ascidia, Botryllus, Doliolum, Salpa.

Cephalochordata – Amphioxus

Pisces – Scoliodon, Rhinobatus, Raja, Chimaera, Polypterus, Acipenser, Mystus, Lepidosteus, Labeo, Catlacatla, Cyprinuscorpio, Exocoetus, Diodon, Hippocampus.

Amphibia- Ichthyophis, Amphiuma, Salamandra, Ambysotoma, Triturus, Bufo, Proteus, Axolotle larva, Hyla.

Reptilia : Chelone, Testudo, Chameleon, Hemidactylus, Varanus, Heloderma, Vipera, Naja, Bungarus, Crocodilus.

Aves: Archaeopteryx, Columba livia, Kingfisher, Beads and Claws, Feathers.

Mammalia: Echidna, Bat, Manis, Loris, Lemur.

Anatomy of the following through models/charts: *Herdmania*,*Scolidon*, Frog, Lizard, Pigeon, Rat.

Minor changes in the practical can be made according to the availability of materials.

69

B.Sc. (HONS.) BOTANY (SEMESTER-IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

CYL 291 : PHYSICAL CHEMISTRY

LTP

Time: 3 Hours

3 1 0 Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

SECTION-A

Chemical Thermodynamics:System and surroundings properties and variables of a system, laws of thermodynamics, Enthalpy of a system, heat capacity, Isothermal & adiabatic processes in ideal gases, Joule-Thomos effect, Carnot cycle, thermodynamic efficiency. Thermo-Chemistry: heat of reaction at constant volume and pressure thermochemical equations, calculations of E from H & vice versa, Hess's law of heat summation, heat of formation, heats of combustion, heat of solution, heat of neutralization of acids & bases, heat of formations of ions, heat of reaction from bond enthalpies, dependence of H & E for a reaction (Kirchoff's equation). II & III law of thermodynamics: Entropy, dependence of entropy on variables of a system, Entropy change in ideal gases, entropy of mixing for ideal gases, entropy change in physical transformations, Entropy change in chemical reactions, absolute Entropies, residual entropy, thermodynamics of III Law.

15 Lectures

SECTION-B

Spontaneity and Equilibrium :General conditions for Equilibrium and Spontaneity under constraints, Helmholtz free energy (A) for reactions, Gibbs free energy.

Chemical Equilibrium:Chemical potential, Gibbs free energy and entropy of mixing of ideal gases. The Equilibrium constants Kp and Kc of real gases Temperature dependence of Equilibrium constant. The Lechatelier principle.

10 Lectures

70

B.Sc. (HONS.) BOTANY (SEMESTER-IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

SECTION-C

Phase Rule: Gibbs Phase rule, derivation of phase rule, one component system, the water system, the sulphur system, two components system-simple eutectic diagram, formation of compound with congruent M. pt. Chemical Kinetics: Measurement of reaction rate, order, molecularity of reaction, first order reactions, second order reactions, third order reactions. Methods of determination of order, effect of temperature, activation energy, catalysis, Homogeneous catalysis in gases, homogenous catalysis in solutions.

20 Lectures

SECTION-D

Electro Chemistry: Conductance & Ionic Equilibrium: Faraday's law of electrolysis, transference numbers determination of transference numbers, electrolytic conductance, variation of conductance with concentration, equivalent conductance at infinite dilution, intrinsic attraction theory of conductance, Absoute velocities of ions, degree of ionization & conductance activity & activity coefficients of strong electrolytes, determination of activity coefficients, Debye-Huckel Theory of activity coefficients, Ionization constants of weak acids, & weak bases. Ionic product of water, pH & pOH Buffer solution, hydrolysis, calculation of hydrolytic constants, solubility product, salt effect & solubility. Electrochemical Cells: Reversible & Irreversible cells, standard cells, cell reaction & EMP, single electrode potential & its calculation, thermodynamic & EMF, standard potential & equilibrium constants, Classification of electrodes, chemical & concentration cells, Junction potential, solubility product & EMF.

15 Lectures

Reference Books:

- 1 Physical Chemistry by Samuel H, Carl P. Prutton Americ Inc. Co.
- 2 Physical chemistry by Glassstone, The Macmillian Press Ltd.
- 3 Kinectic and Mechanism by frost A and Pearson R.G, Wiley Eastern Pvt. Ltd.
- 4 Chemical Kinectic by K.J. Laidler, Harper and Row.
- 5 Physical chemistry by Glberg W. Castellian Addison- Wesley publishing Comp

CYP 292 : PHYSICAL CHEMISTRY LAB. (PRACTICAL BASED ON CYL291)
B.Sc. (HONS.) BOTANY (SEMESTER-III & IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

(ELECTIVE COURSES)

Skill Enhancement Course

BSL261 Biofertilizers

Time: 3 Hours

Credits 2-0-0 Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

SECTION-A

1. General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis.

2. 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.

SECTION-B

3. Cyanobacteria (blue green algae), *Azolla* and *Anabaena azollae* association, nitrogen fixation, factors affecting growth, blue green algae and *Azolla* in rice cultivation.

SECTION-C

4. 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.

SECTION-D

5. Organic farming – Green manuring and organic fertilizers, Recycling of bio-degradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application.

B.Sc. (HONS.) BOTANY (SEMESTER-III & IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

(ELECTIVE COURSES)

- 1. Dubey, R.C., 2005 A Text book of Biotechnology S.Chand & Co, New Delhi.
- 2. Kumaresan, V. 2005, Biotechnology, Saras Publications, New Delhi.
- John Jothi Prakash, E. 2004. Outlines of Plant Biotechnology. Emkay Publication, New Delhi.
- 4. Sathe, T.V. 2004 Vermiculture and Organic Farming. Daya publishers.
- 5. Subha Rao, N.S. 2000, Soil Microbiology, Oxford & IBH Publishers, New Delhi.
- Vayas, S.C, Vayas, S. and Modi, H.A. 1998 Bio-fertilizers and organic Farming Akta Prakashan, Nadiad

B.Sc. (HONS.) BOTANY (SEMESTER-III & IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

(ELECTIVE COURSES)

Skill Enhancement Course BSL262 Herbal Technology

Credits 2-0-0

Time: 3 Hours

Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

SECTION-A

1. 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.

2. Pharmacognosy - systematic position m edicinal uses of the following herbs in curing various ailments; Tulsi, Ginger, Fenugreek, Indian Goose berry and Ashoka.

SECTION-B

3. 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).

SECTION-C

4. 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)

SECTION-D

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

B.Sc. (HONS.) BOTANY (SEMESTER-III & IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

(ELECTIVE COURSES)

- 1. Glossary of Indian medicinal plants, R.N.Chopra, S.L.Nayar and I.C.Chopra, 1956. C.S.I.R, New Delhi.
- 2. The indigenous drugs of India, Kanny, Lall, Dey and Raj Bahadur, 1984. International Book Distributors.
- 3. Herbal plants and Drugs Agnes Arber, 1999. Mangal Deep Publications.
- 4. Ayurvedic drugs and their plant source. V.V. Sivarajan and Balachandran Indra 1994. Oxford IBH publishing Co.
- 5. Ayurveda and Aromatherapy. Miller, Light and Miller, Bryan, 1998. Banarsidass, Delhi.
- 6. Principles of Ayurveda, Anne Green, 2000. Thomsons, London.
- 7. Pharmacognosy, Dr.C.K.Kokate et al. 1999. Nirali Prakashan.

B.Sc. (HONS.) BOTANY (SEMESTER-III & IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

(ELECTIVE COURSES)

Skill Enhancement Course BSL263 Nursery and Gardening

Time: 3 Hours

Credits 2-0-0 Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

SECTION-A

1.Nursery: definition, objectives and scope and building up of infrastructure for nursery, planning and seasonal activities - Planting - direct seeding and transplants.

2. Seed: Structure and types - Seed dormancy; causes and methods of breaking dormancy - Seed storage: Seed banks, factors affecting seed viability, genetic erosion - Seed production technology - seed testing and certification.

SECTION-B

3. Vegetative propagation: air-layering, cutting, selection of cutting, collecting season, treatment of cutting, rooting medium and planting of cuttings - Hardening of plants - green house - mist chamber, shed root, shade house and glass house.

SECTION-C

4. Gardening: definition, objectives and scope - different types of gardening - landscape and home gardening - parks and its components - plant materials and design - computer applications in landscaping - Gardening operations: soil laying, manuring, watering, management of pests and diseases and harvesting.

SECTION-D

5. Sowing/raising of seeds and seedlings - Transplanting of seedlings - Study of cultivation of different vegetables: cabbage, brinjal, lady's finger, onion, garlic, tomatoes, and carrots - Storage and marketing procedures.

B.Sc. (HONS.) BOTANY (SEMESTER-III & IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

(ELECTIVE COURSES)

- 1. Bose T.K. & Mukherjee, D., 1972, Gardening in India, Oxford & IBH Publishing Co., New Delhi.
- 2. Sandhu, M.K., 1989, Plant Propagation, Wile Eastern Ltd., Bangalore, Madras.
- 3. Kumar, N., 1997, Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.
- 4. Edmond Musser & Andres, Fundamentals of Horticulture, McGraw Hill Book Co., New Delhi.
- 5. Agrawal, P.K. 1993, Hand Book of Seed Technology, Dept. of Agriculture and Cooperation, National Seed Corporation Ltd., New Delhi.
- 6. Janick Jules. 1979. Horticultural Science. (3rd Ed.), W.H. Freeman and Co., San Francisco, USA.

B.Sc. (HONS.) BOTANY (SEMESTER-III & IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

(ELECTIVE COURSES)

Skill Enhancement Course BSL264 Floriculture

Time: 3 Hours

Credits 2-0-0 Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

SECTION-A

1.Introduction: History of gardening; Importance and scope of floriculture and landscape gardening.

2. Nursery Management and Routine Garden Operations: Sexual and vegetative methods of propagation; Soil sterilization; Seed sowing; Pricking; Planting and transplanting; Shading; Stopping or pinching; Defoliation; Wintering; Mulching; Topiary; Role of plant growth regulators.

SECTION-B

3. Ornamental Plants: Flowering annuals; Herbaceous perennials; Divine vines; Shade and ornamental trees; Ornamental bulbous and foliage plants; Cacti and succulents; Palms and Cycads; Ferns and Selaginellas; Cultivation of plants in pots; Indoor gardening; Bonsai.

SECTION-C

4. Principles of Garden Designs: English, Italian, French, Persian, Mughal and Japanese gardens; Features of a garden (Garden wall, Fencing, Steps, Hedge, Edging, Lawn, Flower beds, Shrubbery, Borders, Water garden. Some Famous gardens of India.

5. Landscaping Places of Public Importance: Landscaping highways and Educational institutions.

B.Sc. (HONS.) BOTANY (SEMESTER-III & IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

(ELECTIVE COURSES)

SECTION-D

6. Commercial Floriculture: Factors affecting flower production; Production and packaging of cut flowers; Flower arrangements; Methods to prolong vase life; Cultivation of Important cut flowers (Carnation, Aster, Chrysanthemum, Dahlia, Gerbera, Gladiolous, Marigold,Rose, Lilium, Orchids).

7. Diseases and Pests of Ornamental Plants.

Suggested Readings

1. Randhawa, G.S. and Mukhopadhyay, A. 1986. Floriculture in India. Allied Publishers.

B.Sc. (HONS.) BOTANY (SEMESTER-III & IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

(ELECTIVE COURSES)

Skill Enhancement Course BSL265 Medicinal Botany

Time: 3 Hours

Credits 2-0-0 Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

SECTION-A

1. History, Scope and Importance of Medicinal Plants. Indigenous Medicinal Sciences; Definitionand Scope-Ayurveda: History, origin, panchamahabhutas, saptadhatu and tridosha concepts, Rasayana, plants used in ayurvedic treatments, Siddha: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine. Unani: History, concept: Umoor-e- tabiya, tumors treatments/ therapy, polyherbal formulations.

SECTION-B

2. Conservation of endangered and endemic medicinal plants. Definition: endemic and endangered medicinal plants, Red list criteria; In situ conservation: Biosphere reserves, sacred groves, National Parks; Ex situ conservation: Botanic Gardens,

SECTION-C

3. Ethnomedicinal plant Gardens. Propagation of Medicinal Plants: Objectives of the nursery, its classification, important components of a nursery, sowing, pricking, use of green house for nursery production, propagation through cuttings, layering, grafting and budding.

SECTION-D

4. Ethnobotany and Folk medicines. Definition; Ethnobotany in India: Methods to study ethnobotany; Applications of Ethnobotany: National interacts, Palaeo-ethnobotany. folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India. Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases.

81 B.Sc. (HONS.) BOTANY (SEMESTER-III & IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

(ELECTIVE COURSES)

- 1. Trivedi P C, 2006. Medicinal Plants: Ethnobotanical Approach, Agrobios, India.
- Purohit and Vyas, 2008. Medicinal Plant Cultivation: A Scientific Approach, 2nd edn. Agrobios, India.

B.Sc. (HONS.) BOTANY (SEMESTER-III & IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

(ELECTIVE COURSES)

Skill Enhancement Course BSL266 Plant Diversity and Human Welfare

Time: 3 Hours

Credits 2-0-0 Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

SECTION-A

1. Plant diversity and its scope- Genetic diversity, Species diversity, Plant diversity at theecosystem level, Agrobiodiversity and cultivated plant taxa, wild taxa. Values and uses of Biodiversity:Ethical and aesthetic values, Precautionary principle, Methodologies for valuation, Uses of plants, Uses of microbes.

SECTION-B

2. Loss of Biodiversity: Loss of genetic diversity, Loss of species diversity, Loss of ecosystem diversity, Loss of agrobiodiversity, Projected scenario for biodiversity loss, **Management of Plant Biodiversity:** Organizations associated with biodiversity management-Methodology for execution-IUCN, UNEP, UNESCO, WWF, NBPGR; Biodiversity legislation and conservations, Biodiversity information management and communication.

SECTION-C

3. Conservation of Biodiversity: Conservation of genetic diversity, speciesdiversity and ecosystem diversity, *In situ* and *ex situ* conservation, Socialapproaches to conservation, Biodiversity awareness programmes, Sustainable development.

83 B.Sc. (HONS.) BOTANY (SEMESTER-III & IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

(ELECTIVE COURSES)

SECTION-D

4. Role of plants in relation to Human Welfare; a) Importance of forestry their utilization and commercial aspects b) Avenue trees, c) Ornamental plants of India. d) Alcoholic beverages through ages. Fruits and nuts: Important fruit crops their commercial importance. Wood and its uses.

Suggested Readings

1. Krishnamurthy, K.V. (2004). An Advanced Text Book of Biodiversity - Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi

B.Sc. (HONS.) BOTANY (SEMESTER-III & IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

(ELECTIVE COURSES)

Skill Enhancement Course BSL267 Ethnobotany

Time: 3 Hours

Credits 2-0-0 Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

SECTION-A

1. Ethnobotany: Introduction, concept, scope and objectives; Ethnobotany as an interdisciplinary science. The relevance of ethnobotany in the present context; Major and minor ethnic groups or Tribals of India, and their life styles. Plants used by the tribals: a) Food plants b) intoxicants and beverages c) Resins and oils and miscellaneous uses.

SECTION-B

Unit 2: Methodology of Ethnobotanical studies

a) Field work b) Herbarium c) Ancient Literature d) Archaeological findings e) temples and sacred places.

SECTION-C

3: Role of ethnobotany in modern Medicine: Medico-ethnobotanical sources in

India;Significance of the following plants in ethno botanical practices (along with their habitat and morphology) a) *Azadiractha indica* b) *Ocimum sanctum c)Vitex negundo*. d) *Gloriosa superba* e) *Tribulus terrestris* f) *Pongamia pinnata* g) *Cassia auriculata* h) *Indigofera tinctoria*. Role of ethnobotany in modern medicine with special example *Rauvolfia sepentina, Trichopus zeylanicus, Artemisia, Withania*.

Role of ethnic groups in conservation of plant genetic resources. Endangered taxa and forest management (participatory forest management).

SECTION-D

4. Ethnobotany and legal aspects: Ethnobotany as a tool to protect interests of ethnic groups. Sharing of wealth concept with few examples from India. Biopiracy, Intellectual Property Rights and Traditional Knowledge.

B.Sc. (HONS.) BOTANY (SEMESTER-III & IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

(ELECTIVE COURSES)

- 1) S.K. Jain, Manual of Ethnobotany, Scientific Publishers, Jodhpur, 1995.
- 2) S.K. Jain (ed.) Glimpses of Indian. Ethnobotny, Oxford and I B H, New Delhi 1981
- 3) Lone et al,. Palaeoethnobotany
- S.K. Jain (ed.) 1989. Methods and approaches in ethnobotany. Society of ethnobotanists, Lucknow, India.
- 5) S.K. Jain, 1990. Contributions of Indian ethnobotny. Scientific publishers, Jodhpur.
- Colton C.M. 1997. Ethnobotany Principles and applications. John Wiley and sons Chichester
- 7) Rama Ro, N and A.N. Henry (1996). The Ethnobotany of Eastern Ghats in Andhra Pradesh, India.Botanical Survey of India. Howrah. 8) Rajiv K. Sinha – Ethnobotany The Renaissance of Traditional Herbal Medicine – INA –SHREE Publishers, Jaipur-1996 9) Faulks, P.J. 1958.An introduction to Ethnobotany, Moredale pub. Ltd.

B.Sc. (HONS.) BOTANY (SEMESTER-III & IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

(ELECTIVE COURSES)

Skill Enhancement Course BSL268 Mushroom Culture Technology

Credits 2-0-0

Time: 3 Hours

Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

SECTION-A

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

SECTION-B

2. 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.

SECTION-C

3. Storage and nutrition: Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickels, papads), drying, storage in saltsolutions. Nutrition - Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content - Vitamins.

SECTION-D

4. 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.

B.Sc. (HONS.) BOTANY (SEMESTER-III & IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

(ELECTIVE COURSES)

- Marimuthu, T. Krishnamoorthy, A.S. Sivaprakasam, K. and Jayarajan. R (1991) Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
- Swaminathan, M. (1990) Food and Nutrition. Bappeo, The Bangalore Printing and Publishing Co. Ltd., No. 88, Mysore Road, Bangalore - 560018.
- Tewari, Pankaj Kapoor, S.C., (1988). Mushroom cultivation, Mittal Publications, Delhi.
- 4. Nita Bahl (1984-1988) Hand book of Mushrooms, II Edition, Vol. I & Vol. II.

B.Sc. (HONS.) BOTANY (SEMESTER-III & IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

(ELECTIVE COURSES)

Skill Enhancement Course BSL269 Intellectual Property Rights

Credits 2-0-0

Time: 3 Hours

Max. Marks: 100 Mid Semester Marks : 20 End Semester Marks : 80

Mid Semester Examination: 20% weightage End Semester Examination: 80% weightage

Instructions for the Paper Setters:

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

SECTION-A

1. 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).

2. Patents: Objectives, Rights, Patent Act 1970 and its amendments. Procedure of obtaining patents, Working of patents. Infringement.

SECTION-B

3. Copyrights: Introduction, Works protected under copyright law, Rights, Transfer of Copyright, Infringement.

4. Trademarks: Objectives, Types, Rights, Protection of goodwill, Infringement, Passing off, Defences, Domain name.

5. Geographical Indications: Objectives, Justification, International Position, Multilateral Treaties, National Level, Indian Position.

SECTION-C

6. Protection of Traditional Knowledge: Objective, Concept of Traditional Knowledge, Holders, Issues concerning, Bio-Prospecting and Bio-Piracy, Alternative ways, Protectability, needfor a Sui-Generis regime, Traditional Knowledge on the International Arena, at WTO, at National level, Traditional Knowledge Digital Library.

7. Industrial Designs: Objectives, Rights, Assignments, Infringements, Defences of Design Infringement

8. 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.

B.Sc. (HONS.) BOTANY (SEMESTER-III & IV) (CREDIT BASED EVALUATION & GRADING SYSTEM)

(ELECTIVE COURSES)

SECTION-D

9. Information Technology Related Intellectual Property Rights: Computer Software and Intellectual Property, Database and Data Protection, Protection of Semi-conductor chips, Domain Name Protection

10. Biotechnology and Intellectual Property Rights: Patenting Biotech Inventions: Objective, Applications, Concept of Novelty, Concept of inventive step, Microorganisms, Moral Issues in Patenting Biotechnological inventions.

- 1. N.S. Gopalakrishnan & T.G. Agitha, (2009) Principles of Intellectual Property Eastern Book Company, Lucknow.
- 2. Kerly's Law of Trade Marks and Trade Names (14th Edition) Thomson, Sweet & Maxweel.
- 3. Ajit Parulekar and Sarita D' Souza, (2006) Indian Patents Law Legal & Business Implications; Macmillan India Ltd.
- 4. B.L.Wadehra (2000) Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications; Universal law Publishing Pvt. Ltd., India.
- 5. P. Narayanan (2010) Law of Copyright and Industrial Designs; Eastern law House, Delhi.